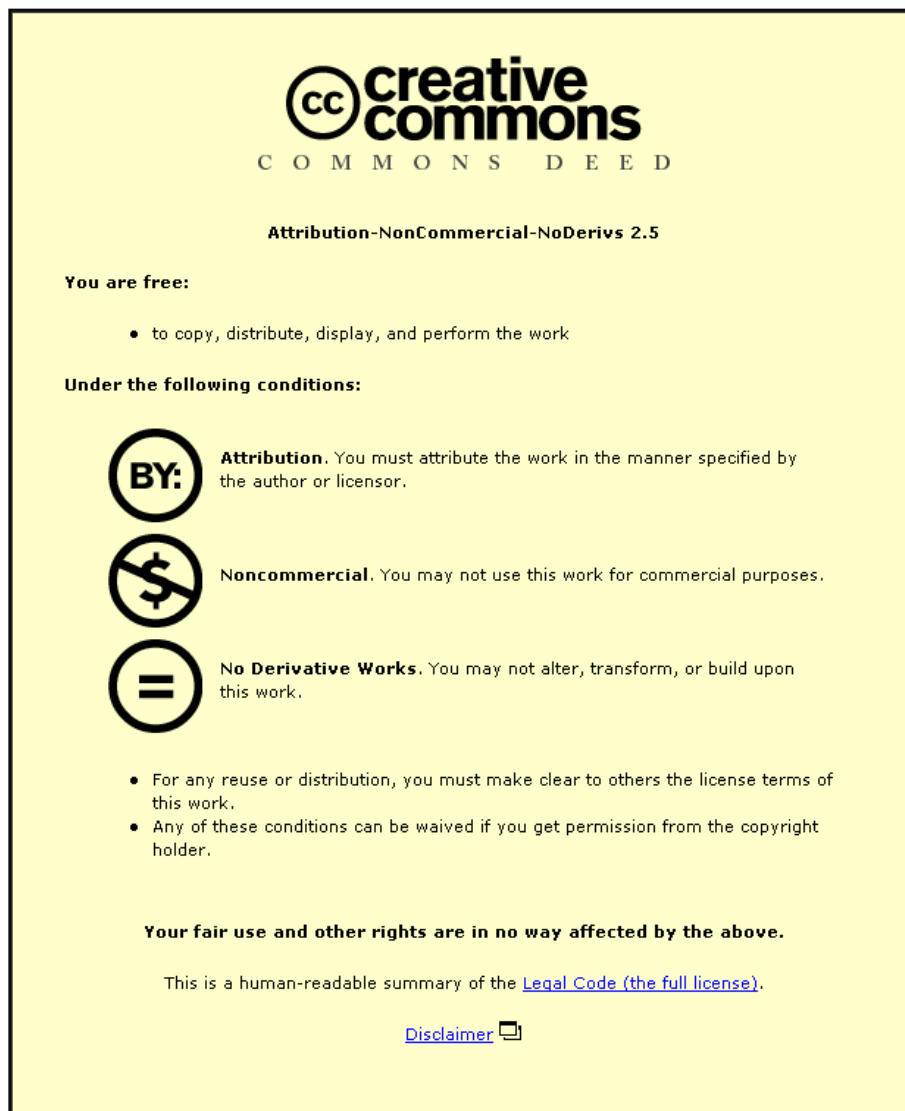


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Managing Portfolios of Projects

APPENDICES

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Chapter One - Appendices

1 Chapter One - Introduction

1.1 Layout of Appendices

For ease of reference, those elements of the research that add substantiation to the main text in the Thesis are published in these Appendices as a companion to the Thesis. They are laid out and headed in a manner corresponding to the Thesis, however, there are no Appendices for this Chapter One 'Introduction' of the Thesis.

Chapter Two - Appendices

2 Chapter Two – Methodology

2.1 Layout of Appendices

For ease of reference, the Appendices for this Chapter of the Thesis are laid out in the order referenced within the Thesis, Chapter Two.

2.2 HKG SAR classification-index of public works

PWP Programme	Sub-programme
A - air and sea communications (formerly "aviation and shipping")	<ul style="list-style-type: none">• A – airport• P – port works• G – support
B - public safety	<ul style="list-style-type: none">• A – ambulance services• F – fire services• L – landslip prevention
C - civil engineering	<ul style="list-style-type: none">• A – land acquisition• D – drainage and erosion protection• G – multi-purpose• L – land development
D - environmental protection	<ul style="list-style-type: none">• P – pollution control• R – refuse disposal• S – sewerage and sewage treatment
E - education	<ul style="list-style-type: none">• P – primary• S – secondary• T – tertiary
F - food supply	<ul style="list-style-type: none">• S – abattoirs, wholesale markets and other territory-wide food supply facilities.
G - support	<ul style="list-style-type: none">• A – trade and industry• B – border facilities (other than road works)• C – revenue collection and financial control• D – immigration control• E - employment• I - intra-Governmental services• K – others
H - housing	<ul style="list-style-type: none">• H – rural housing improvement• S – squatter area improvement• T – temporary housing
I - fitting out	<ul style="list-style-type: none">• A – trade and industry• B – employment• C – internal security• D – immigration control

	<ul style="list-style-type: none"> • E – education • F – district and community relations • G – revenue collection and financial controls • I – intra-Governmental services • M – health • P – posts, telecommunications and power • S – social welfare • – others
J - quarters	<ul style="list-style-type: none"> • A – internal security • B – intra-Governmental services • – others
K - Government offices	<ul style="list-style-type: none"> • A – intra-Governmental services • O – others
L -law and order	<ul style="list-style-type: none"> • C – correctional services • J – judiciary • P – police
M - health (formerly "medical and health")	<ul style="list-style-type: none"> • C – clinics • H – hospitals • T – teaching
P - posts, telecommunications and power (formerly "posts and telecommunications")	<ul style="list-style-type: none"> • P – post office • T – telecommunications
R - recreation, culture and amenities	<ul style="list-style-type: none"> • B – burial grounds, columbaria and crematoria • E – cultural facilities • G – mixed amenity packages • M – retail markets and cooked food centres • - open spaces • R - refuse collection points and cleaning depots • S - sports facilities • T - toilets and bath houses
S - social welfare and community building	<ul style="list-style-type: none"> • C - community centres and halls • R - rehabilitation facilities
T – transport	<ul style="list-style-type: none"> • B - footbridges and pedestrian tunnels • C -traffic control • F - ferry piers • H - roads • I - interchanges and bus termini • P - car parks • R - railways • S –studies • T -bridges and tunnels
W -water supply	<ul style="list-style-type: none"> • C - combined fresh/salt water supply projects • F - fresh water supplies • S - salt water supplies

Source: Project Administration Handbook for Civil Engineering Works, Volume One, Chapter Two 'Project Approval', Appendix 2.2. 'Programme and sub-programme descriptions in the public works programme'. (Civil Engineering Services. 1992).

Chapter Three - Appendices

3 Chapter Three - Research Environment

3.1 Layout of Appendices

For ease of reference, the Appendices for this Chapter of the Thesis are laid out in the order referenced within the Thesis, Chapter Three.

3.2 HKG SAR Census and Statistics Definitions with regard to 'National Accounts and Inward Investment'

Gross Domestic Product : GDP is a measure of the total value of production of all resident producing units of a country or territory in a specified period, before deducting allowance for consumption of fixed capital. Per capita GDP of a country or territory is obtained by dividing total GDP in a year by the corresponding population of that country or territory. Gross Domestic Product for Hong Kong is compiled using two approaches : the expenditure approach and the production approach.

Expenditure-based Gross Domestic Product (GDP) estimates : Under the expenditure approach, GDP is equal to the value of goods and services produced for final use less their import content. It is the sum of the following components :

- i. Private consumption expenditure : This refers to the value of all expenditure by households and private non-profit bodies serving households on goods and services for final consumption. It is the sum of the estimates of consumption expenditure on goods and services in the domestic market and the expenditure of Hong Kong residents abroad less the expenditure of non-residents in the domestic market.
- ii. Government consumption expenditure : This refers to the current expenditure on goods and services by non-trading government departments and quasi-government non-profit bodies. Government trading departments are distinguished from non-trading departments in that they are engaged in the production of goods and services mainly for sale to the public. Current expenditure on goods and services by non-trading departments is the sum of compensation of employees and purchases of goods and services less receipts from sales of goods and services.
- iii. Gross domestic fixed capital formation : This covers the gross value of investment expenditure on construction as well as machinery and equipment; real estate developers' margin; and transfer costs of land and buildings.

- iv. Changes in inventories : This refers to the value of physical change in the inventories of work-in-progress, raw materials and finished goods held by manufacturers and distributors.
- v. Exports of goods and services less imports of goods and services : Exports of goods include domestic exports and re-exports of goods recorded on f.o.b. basis, and imports of goods are valued at c.i.f. Gold for industrial use is included. Exports and imports of services cover transactions in services between Hong Kong residents and the rest of the world.

Estimates of expenditure-based GDP are compiled both at current market prices and constant (1990) market prices. In the constant price estimates, the effect of price changes is removed.

Source: Census and Statistics Department. Hong Kong Annual Digest of Statistics 1998 Edition, Hong Kong Special Administration Region, People's Republic of China.

Chapter Four - Appendices

4 Chapter Four – Literature Review

4.1 Layout of Appendices

There are no Appendices for this Chapter of the Thesis.

Chapter Five - Appendices

5 Chapter Five - Assessing The Current Practices Of Hong Kong Contractors For Managing Portfolios-Of-Projects

5.1 Layout of Appendices

For ease of reference, the appendices for this Chapter of the Thesis are laid out in the order referenced within the Thesis, Chapter Five.

5.2 Covering letter and Questionnaire

1st Letter inviting participation in the survey of Hong Kong contractors

WB(WM) 1/1/3

Company Address
Date

Dear Sir,

1998 Works Bureau Information Technology Survey

I will be grateful for your cooperation by completing the enclosed questionnaire. We are conducting a survey into the use of commonplace information technology by our public works contractors. The survey will provide important knowledge, which will help us ensure that the information technologies we use, to plan and manage public works projects, are developed at a pace, and in a manner, which is also useful to our contractors.

It is the Government's intention to apply information technologies where it provides improved performance and public benefit. However, this will be less satisfactory if we do it in isolation. Construction is a team effort and we want to be sure that our assumptions, about the use of information technology in the construction industry, is founded on fact and not assumption. In the longer term, the results of this survey will help in identifying technologies that are mutually beneficial and suit the industry as a whole.

It is important that you complete this questionnaire so that we can take your response into account. The information you provide will be kept confidential: it will only be used for the purpose of this industry-wide appraisal. A final report, on the overall results of the survey, will be produced that will be also be used for academic purposes. It will contain summary statistical information, but not the data collected in the survey. In this manner, confidentiality will be maintained in all published reports on this survey.

Please complete the questionnaire and return it to the Works Bureau by February ??, 1998. If you have any queries about the survey then please contact Keith Futcher, Chief Assistant Secretary/Public Works Systems Administration at 28482437.

Thank you

(K.G.Futcher)
for the Secretary for Works

.....

2nd Letter to respondents ~ requesting participation from the Hong Kong contractors
.....

WB(WM) 1/1/3

The Managing Director,
Able Engineering Co. Ltd.
Rm. 703,
West Coast International Bldg.,
290-296 Un Chau Street,
Sham Shui Po.
Kowloon.
March 23, 1998

Dear Sir,

1998 Works Bureau Information Technology Survey

I have not received from you, a response to the questionnaire, which I mailed to you on February 27, 1998. It is important that we include your response in the survey. I will be grateful if you complete the questionnaire and send it to me as soon as possible, at least by March 31, 1998.

As I mentioned in my earlier letter, this is a comprehensive and important survey. Your input is needed: it is important to the quality of this work. The results of the survey will provide important knowledge, which will help us ensure that the information technologies we use, to plan and manage public works projects, are developed at a pace, and in a manner, which is also useful to our contractors. Please complete the questionnaire so that we can take your response into account.

I assure you that the information you provide will be kept confidential: it will only be used for the purpose of this industry-wide appraisal. The final report will contain the summary statistical information, but not the data collected in the survey.

If your response is already in the post then please ignore this letter. If you have any queries about the survey then please contact Keith Fletcher, Chief Assistant Secretary/Public Works Systems Administration at 28482437.

Thank you

(K.G.Fletcher)
for the Secretary for Works

.....

Final reminder to the Hong Kong contractors

WB(WM) 1/1/3

The Managing Director,
«Contractor_Name»
«Address1»
«Address2»
«Address3»
«Address4»
«Address5»
April 2, 1998

Dear Sir,

1998 Works Bureau Information Technology Survey

I notice from our records that we have not received from you, a response to the questionnaire, which I mailed to you on February 27, 1998. Enclosed is another copy of the questionnaire in case the one supplied earlier has gone astray. I will be grateful if you complete the questionnaire and send it to me as soon as possible, at least by April 15, 1998. If your response is already in the post then please ignore this letter. I am grateful for your support.

As I have stated in my earlier letter, this is a comprehensive and important survey. Your input is needed: it is important to the quality of this work. The results of the survey will provide important knowledge, which will help us ensure that the information technologies we use, to plan and manage public works projects, are developed at a pace, and in a manner, which is also useful to our contractors. Please complete the questionnaire so that we can take your response into account.

I assure you that the information you provide will be kept confidential: it will only be used for the purpose of this industry-wide appraisal. The final report will contain the summary statistical information, but not the data collected in the survey.

If you have any queries about the survey then please contact Keith Futcher, Chief Assistant Secretary/Public Works Systems Administration at 28482437.

Thank you

(K.G.Futcher)
for the Secretary for Works

.....

A copy of the proforma Questionnaire is provided on the following pages.

5.3 Attributes of the list of 1,636 Hong Kong Contractors provided by the HKG SAR

File	Field data	Field attribute
Contractor <i>829 records</i>	CONTRACTOR_REF	Contractor's unique reference code
	APPROVE_LIST_IND	<i>Yes (approved), No (Not approved)</i>
	JOINT_VENTURE_IND	<i>Yes (a JV), No (Not a JV)</i>
	CONTRACTOR_STATUS	<i>ACT (Active), INA (Inactive)</i>
	CONTRACTOR_NAME	Contractor's name
	CONTRACTOR_ADS	Contractor's address in Hong Kong
	CONTRACTOR_PHONE	Contractor's telephone number
	CONTRACTOR_FAX	Contractor's fax number
	CONTRACTOR_OTHER_ADS	Contractor's overseas address
	CONTRACTOR_OTHER_PHONE	Contractor's overseas telephone
	CONTRACTOR_OTHER_FAX	Contractor's overseas fax number
	NATION_CODE	Nationality code
	BUS_STATUS	Business status (CO=corp, PT=partnership, PR=proprietorship)
ISO <i>486 records</i>	CONTRACTOR_REF	Contractor's unique reference code
	ISO_CAT_CODE	List category code (BD, PW, RD, SF, WW)
	ISO_CERT_NO	ISO 9000 certificate number
	ISO_CERT_BODY	ISO 9000 certification body
Contractor _list _cat _grp <i>1636 records</i>	CONTRACTOR_REF	Contractor's unique reference code
	LIST_CODE	List code (AC=approved contractor, SPEC= specialist)
	CAT_CODE	List category code (BD, PW, RD, SF, WW) (BD, PW, RD, SF, WW)
	CLASS_CODE	Class code (specialism)
	GRP_CODE	Group code (A, B, C)
	CONFIRM_FLAG	<i>C=confirmed on Contractors List, P=probation before on list</i>

Table 5-1 Data items provided from HKG's list of public works Contractors.

5.4 Question-by-question statistical analysis of the survey response and interpretative commentary

General

A summary of the analysis of the results for each question is provided here in the order used within the questionnaire. Each question is repeated in italic font and the results provided in the form of a commentary. A tabulation of the statistical results derived in the numerical analysis of the survey response is provided in section 5.5. Of these, the mode is taken to be the most useful indicator of the prevalent response. If the median value and the mean value are close to the mode then no further comment

is made on the distribution. If they are not close, then the bias in the distribution is noted in these summary comments.

Questionnaire Section 1.1, Telephone communication

Q.1.1.1. Does your company provide telephones for communication?

The survey investigates the use of technology that supports communication. Telephones are the most obvious devices that fall within this category. Although the supply and use of telephone for construction personnel is self-evident, the question does query the supply of this technology to four categories of staff: managerial, professional, supervisory, and to labour. Telephones for this latter category cannot be assumed to be self-evident- especially for the smaller contractor doing more piecemeal work although the need is uncertain. The response to the question is as expected: contractors provide telephones to their managerial, professional and supervisory staff as a norm. They do not provide telephones to their labour although they can use them if needed by using onsite facilities or because pay-phones are set up on site.

Q.1.1.2 Which telephone services does your company use?

This question measures the use of commercial telephone services. It is expected that the response would be universally commercial services, although remote sites or high security requirements may require private services? The survey found that Contractors use public services in general, although about fifty percent of the respondents also said that they used leased line services and about twenty five percent said they used radio telephone services.

Q.1.1.3. Does your company provide/use mobile telephones for communication?

The supply of mobile telephones for senior staff is frequently an assumed norm but not for other categories of staff. Nor is the supply of mobile telephones self-evident.

- Seventy five percent of the respondent contractors provide mobile telephones to their managerial staff.
- Fifty six percent provide them for professional staff. Thirty five percent extend the supply to supervisory staff.
- Labour are not supplied except in a few cases.
- These percents increase for Group A (87%) and Group B (72%) contractors.

Q.1.1.4 Which special mobile telephone services does your company use?

Queries the use of enhanced communication services- messaging being a form of electronic-mail. The additional open-ended part to this question allows a few out of many other services to be listed in order of importance. Forty six percent of the respondents use 'message services' and fifty four percent use 'call forwarding'. The use of message services is similar for Group A, B, and C contractors. A higher percent of Group A (61%) and Group B (57%) contractors use call forwarding.

Q.1.1.5 Is it your company policy/instruction that important telephone communications are recorded?

This question is to indicate a respect for recording those voice communications, which have a material bearing on project issues. It also shows an understanding of the need for fully documented records of contract dialogues. The mode response is 'no'. A range of 22% to 27% of the respondents for the six sample sectors state that it is company policy/instruction to record important telephone communications. Twenty two percent of the firms with ISO9000 certification state that they have this arrangement. In general, it is not company policy/instruction to record important telephone communications.

Q.1.1.6. How does your company make a record of important telephone communications?

Measures the use of technology to satisfy this rudimentary need. Anything other than a written note of the communication indicates recognition of the importance of information management. The mode response is 'no' for the use of message recording facilities/services or recording from a speaker telephone. The mode response is 'yes' for recording telephone messages on a written note. The percent response shows that the Group C contractors (13%) and the contractors with ISO9000 certification (11%) are using recording services/facilities to a greater extent than Group A (3%), B (6%) or the non-ISO9000 firms (6%).

Questionnaire Section 1.2 Fax communication

Q.1.2.1 Does your company use facsimile (fax) for communication?

An apparently self-evident question but less so than for telephones and none-the-less a bona fide query. More than ninety-five percent of the response in all sample sectors state the use of facsimile in their head office. This falls to more than fifty percent in other company offices, but is greater than eighty percent in site offices – except for Group A contractors (>60%).

Q.1.2.2 Does your company use facsimile (fax) to and from personal computers (PC's) for communication?

PC's to fax machines is a readily available service that is likely to be used only in circumstances where PC skills are good. It also requires the use of PC's with modem connectivity to the telephone network. The mode response to the use of faxing message to PC's is 'no'. However, the opposite is true for sending faxes from PC's. More than seventy percent of the sample sectors state that they use PC's to send faxes, except for Group A contractors (>50%).

Questionnaire Section 1.3 Meetings for communication

Q.1.3.1 Does your company use formal, regular, face-to-face meetings for the communication of project information?

The use of formally arranged project meetings as a means of communicating project information is an established good practice that is tested, as a foundation question, for the purposes of the follow-on questions. The mode response is 'yes' for the use of meeting in the company head office. Seventy-one to seventy-six percent of the sector samples gave a 'yes' response, except Group A contractors (64%). The seventy-six percent 'yes' response being Group C contractors. Nearly 100% affirmative response is stated if the 'mostly yes' response of twenty-one to twenty-four percent is added.

This positive response is maintained for the use of meetings in site offices. It remains positive with a mode response of 'yes' or 'mostly yes' in the case of the use of meetings in other company offices and between site offices and other offices.

Q.1.3.2 Is it your company policy/instruction that minutes/notes of meetings are recorded?

Measures the extent that standard good practice is used and leads to the subsequent question, which measures the ways in which meeting notes are recorded. The mode response is 'yes'. Sixty-seven percent of the Group C contractors state 'yes' and 'twenty-seven' state 'mostly yes'. This affirmative response is repeated for the other sector samples but to a lesser degree. The range of 'yes' is fifty-one to sixty four percent for 'yes' and thirty-one to forty percent for 'mostly yes'.

Q.1.3.3 How does your company record minutes/notes of meetings?

This question measures the use of manual or technology-aided methods in a routine project task. The prevalent means of recording the minutes/notes of meetings is by hand written means. The mode was 'yes' for this approach. 'Yes' (56%-61%) or 'mostly yes' (21%-26%) responses across the sector samples. The use of tape recorders (0%-3%), word-processors (24%-36%), or electronic notice boards (0%) to record notes/minutes of meetings is slight.

Questionnaire Section 1.4, Video-conferencing for communication

Q.1.4.1 Does your company use video-conference facilities for communication?

The question is asked on the assumption that it is unlikely that video-conferencing is used within Hong Kong unless the systems are low-cost, such as Internet enabled, and the communication otherwise difficult, such as a remote high-tech site. For communication outside of Hong Kong, the likelihood is much greater as video-conferencing services are well established in the SAR. The mode response is 'no' to the use of video-conferencing within Hong Kong (92%-94% 'noes') or internationally (91-93% 'noes').

Q.1.4.2 Which video-conference services does your company use?

Measures the extent that companies have installed video-conferencing or are using Internet arrangements. The use of commercially hired video-conferencing (0-3%) or company-owned services is slight (0-2%). The Group C contractors or those with

ISO9000 certification are the sample sectors with the highest stated use of video-conferencing. Using the Internet for video-conferencing received a more positive response. The mode remains 'no' but zero to six percent said 'yes' to the use of the Internet for video-conferencing. The Group A contractor and the 'without ISO9000 certification' sample sectors being at the top end (6%) of the affirmative response.

Questionnaire Section 1.5, Images used for communication

Q.1.5.1 How does your company produce construction drawings?

Measures the extent that CAD is used in company main offices and on their construction sites. A higher use in the main offices is expected, with a low use on site. There is a wider distribution of response in this series of questions. Looking at the total response.

- The use of manual drafting methods in company offices is twenty-nine percent 'yes' and thirty-four percent 'mostly yes'. With a median and mode of 'mostly yes' and a mean on the negative side of 'mostly yes'. This response is similar in all the sector samples but with Group C contractors (19% 'yes') and those with ISO9000 (20% 'yes') stating a lesser use of manual drafting methods
- The use of CAD in company offices is thirty percent 'yes' and twenty-eight percent 'mostly yes'. The median is 'mostly yes', the mode is 'no' and the mean is on the negative side of 'mostly yes'. Group A contractors (mode is 'no') and 'without ISO9000' contractors (mode is 'no') have a lesser use of CAD. Group B, C and 'with ISO9000' have a mode of 'yes' and a median of 'mostly yes'.
- Hiring of manual drafting services has a median and mode of 'no' across all the sample sectors.
- Hiring of CAD services also has a median and mode of 'no' across all the sample sectors.
- The use of manual drafting methods on site is greater than in the company head offices. Thirty-two percent overall, state 'yes' and thirty-nine percent 'mostly yes'. The mode is 'mostly yes'. There is a greater use of manual methods on site for Group A contractors (46% and a mode of 'yes').
- The use of CAD methods on site is less than in the company head office. Fifty-three percent state 'no'. The mode is 'no' across all of the sample sectors but Group C contractors (23% 'yes' and 35% 'mostly yes') or those with ISO9000 certification (23% 'yes' and 31% 'mostly yes') have a greater prevalence of the use of CAD on site.

Q.1.5.2 How does your company distribute construction drawings?

Tests the extent that an electronic inter-change of construction drawing is used. This question avoids issue of inter-operability, but infers an understanding, on the part of the respondent, that there are obvious benefits to CAD portability.

- All of the sample sectors state a mode of 'yes' for the distribution of construction drawings by hardcopy. The 'yes' response was received, in a range of sixty-six percent to seventy-nine percent, with 'mostly yes' in a range of sixteen percent to twenty-four percent.

- Distribution of construction drawings as electronic files on disk received a wider distribution of response. The mode is 'no' with a median of 'no' or 'mostly no' and a mean of 'mostly no' for the sample overall, for Group A and Group B contractors, and for contractors 'without ISO9000 certification'. The results differ for Group C contractors (or contractors 'with ISO9000 certification'. The median and mode is 'mostly yes' and the mean is on the positive side of negative side of 'mostly no'. In these more proactive groups the ten percent 'yes' and forty-one percent 'mostly yes' is counterbalanced by a twenty-four percent 'mostly no' and twenty-six percent 'no' response.
- A mode of 'no' from all of the sample sectors is the response to the distribution of construction drawings across a LAN. A more positive response is received from the Group C contractors and the 'with ISO9000 certification' group (10% 'yes', 10% 'mostly yes' in both cases).
- A mode of 'no' from all of the sample sectors is the response to the distribution of construction drawings as electronic files via a modem. A more positive response is received from the Group C contractors and the 'with ISO9000 certification' group (4% 'yes', 11-10% 'mostly yes' in both cases).
- A mode of 'no' from all of the sample sectors is the response to the distribution of construction drawings as electronic files via the Internet. A more positive response is received from the Group C contractors and the 'with ISO9000 certification' group (5% 'yes', 14-12% 'mostly yes' in both cases).

Q.1.5.3 How does your company record the distribution of construction drawings?

This question measures the use of manual or electronic registers of transmittals. A mode of 'yes' and a response of seventy-two percent to seventy-six percent across the sample sectors state that a record of transmittal is by hardcopy. In contrast a mode of 'no' and a response of seven to nine percent 'yes' and eight to sixteen percent 'mostly yes' across the sample sectors state that a record of transmittal is by an electronic database register.

Q.1.5.4 How does your company check/revise construction drawings?

Measures the use of electronic interchange of drawings for checking and revision purposes.

- Drawings are revised/checked in hardcopy form received a 'yes' response in a range of sixty-two to seventy-three percent, 'mostly yes' in a range of twenty-three to thirty-one percent across the sample sectors. The mode is 'yes'.
- Whereas drawings revised/checked in electronic form received the opposite response. A range of forty-five to seventy-two percent 'no' and fifteen to twenty-six percent 'mostly no' across the sample sectors. Group C contractors have a mode of 'no' but a median of 'mostly no' and a mean on the positive side of 'no'. Eight percent of Group C contractors said 'yes' and twenty percent said 'mostly yes' to electronic revision/checking of construction drawings.

Q.1.5.5 Does your company use picture images for communication?

Measures the extent that photographs and video clips are used as a record of construction issues.

- Use of photographs. A mode of 'yes' and a response range of fifty-four to seventy-one percent 'yes' and eighteen to twenty-seven percent 'mostly yes' was stated across the sample sectors.
- Use of digital photographs. A mode of 'no' and a response range of fifty-three to seventy-five percent 'no' and nine to twenty-four percent 'mostly no' was stated across the sample sectors.
- Use of video images. A mode of 'no' and a response range of fifty-two to seventy percent 'no' and ten to twenty-six percent 'mostly no' was stated across the sample sectors.

Q.1.5.6 How does your company distribute picture images for communication?

This measures the extent that digital images are used on electronic media as a means of communication and as part of a communication process.

- Distribution of picture images in the original physical form has a mode of 'yes' and a response range of sixty-one to sixty-seven percent 'yes' and nineteen to twenty-five percent 'mostly yes' stated across the sample sectors.
- Distribution of picture images in electronic digital form has a mode of 'no' and a response range of fifty-nine to seventy-eight percent 'no' and thirteen to twenty-nine percent 'mostly no' was stated across the sample sectors. Group C contractors (7 % 'yes and 13% 'mostly yes') and contractors with 'ISO9000 certification' (6 % 'yes and 15% 'mostly yes') had a higher positive response than the other sample sectors.

Questionnaire Section 1.6, Written communication

Q.1.6.1 Does your company produce written documents according to company standards and pre-determined document formats?

This is a foundation question in preparation for the subsequent questions in this section of the questionnaire. The use of a style library of documents is taken to be indicative of an well-ordered approach to process control, and document management. Whilst this is more likely in company main offices a less controlled arrangement may occur on site.

- Company standards/formats for written documents in the company offices has a mode of 'yes' and a response range of sixty-three to seventy-eight percent 'yes' and nineteen to twenty-seven percent 'mostly yes' stated across the sample sectors.
- Company standards/formats for written documents in the site offices has a mode of 'yes' and a response range of forty-seven to sixty-four percent 'yes' and twenty-seven to thirty-six percent 'mostly yes' was stated across the sample sectors.

Q.1.6.2 Does your company use printed proforma and forms for routine documents?

This is a sequential foundation question from the previous one with similar response received.

- Use of printed proforma/documents in the company offices has a mode of 'yes' and a response range of sixty-one to seventy percent 'yes' and twenty to thirty-two percent 'mostly yes' stated across the sample sectors.
- Use of printed proforma/documents in the site offices has a mode of 'yes' and a response range of forty-nine to sixty-four percent 'yes' and twenty-eight to thirty-six percent 'mostly yes' stated across the sample sectors.

Q.1.6.3 Does your company have a procedure/instruction for the filing of all written documents in a logically organised filing system?

This question measures good practice in the company offices and in the site offices. For example, the HKG has published a works Branch Technical Circular No 19/93, (1993) 'Filing practice for works-contracts'. This dictates a hierarchical topic breakdown so that construction documents are always filed in the same file location within the site-office filing system. It makes the discovery of documents easier.

- Company procedure/instruction for the filing of written documents in an organised filing system in the company offices has a mode of 'yes' and a response range of seventy-five to eighty-seven percent 'yes' and thirteen to twenty-one percent 'mostly yes' stated across the sample sectors.
- Company procedure/instruction for the filing of written documents in an organised filing system in the site offices has a mode of 'yes' and a response range of fifty-nine to eighty-four percent 'yes' and fifteen to twenty-eight percent 'mostly yes' stated across the sample sectors.

Q.1.6.4 Is the same document filing system used on all construction sites?

A positive answer indicates an understanding of the need for consistency to suit discovery of information by any staff member. This is the practice of the HKG according to WBTC 19/93 (1993) but may not be commonplace elsewhere.

The mode answer is 'yes' but the median is 'mostly yes' whilst the mean is on the positive side of 'mostly yes'. The range of response is narrow across all sample sectors: forty-four to fifty-two percent for 'yes', thirty-five to forty-five percent for 'mostly yes', five to fourteen percent for 'mostly no', and one to six percent for 'no'.

Q.1.6.5 Does your company use a computer-based document management system to record the location of filed written documents?

Leading on from the previous question. Whilst such computerised techniques are commonplace in the legal profession and encouraged on public works by HKG's Works Branch Technical Circular No 8/95 (1995) 'Computer aided document management system for works contracts', their prevalence needs to be measured across a broader sample of Hong Kong Contractors. The researcher has reported on

the results achieved in this aspect of project-information-management systems (PIMS) used by the HKG in the management of their airport-core-programme of projects (ACP)^{1,2,3}. It is argued in these case-studies that the use of computer aided 'discovery' was a fundamental benefit to the resolution of construction disputes.

- Company uses a computer-based document management system to record the location of filed written documents in the company offices has a mode of 'no' for the total response with a median of 'mostly no' and mean on the positive side of 'mostly no'. This picture changes in the sample sectors.
 - Group A contractors have a mode of 'yes' with a median of 'mostly yes' and a mean on the positive side of 'mostly no'.
 - Group B contractors have a mode of 'no' and median and mean of 'mostly no'.
 - Group C contractors and contractors 'with ISO9000' certification have a mode of 'mostly no', a median of 'mostly no', whilst the mean is on the positive side of 'mostly no'.
 - Contractors 'without ISO9000' have a mode of 'no', a median of 'mostly no', and a mean on the positive side of 'mostly no'.
- Company uses a computer-based document management system to record the location of filed written documents in the site offices has a mode of 'no' for the total response with a median and mean of 'mostly no'. As before, this picture changes in the sample sectors although it is more consistently a negative response.
 - Group A, Group B, and contractors 'without ISO9000' have a mode of 'no' with a median and mean of 'mostly no'.
 - Group C and contractors 'with ISO9000' have a mode of 'no', a median of 'mostly no' and a mean on the positive side of 'mostly no'.

Q.1.6.6 Does your company use a system of keywords to record the contents of written documents and to find them in the future?

This question measures the extent that a sophisticated approach to document management is used.

- In the company offices has a mode of 'yes', a median of 'mostly yes' and a mean on the negative side of 'mostly yes' for all sample sectors.
- In the site offices has a mode of 'no', a median of 'mostly no' and a mean on the positive side of 'mostly no' for all sample sectors.

Q.1.6.7 Does your company employ staff to organise and maintain a filing system of written documents?

This is thought to be likely in company main offices but less likely in the site offices unless the project is very large and managed by a major contractor.

- In the company offices has a mode and a median of 'yes', with a mean on the positive side of 'mostly yes' for all sample sectors.
- In the site offices has a mode of 'yes', a median of 'mostly yes' and a mean on the positive side of 'mostly no' for sample sectors: 'All, and Contractor Groups A and B. Group C Contractors and Contractors with ISO9000 have a mode and median of 'yes' and a mean on the positive side of 'mostly yes'.

Q.1.6.8 Does your company employ someone as an 'information manager' to organise and maintain the filing system of written documents and their contents, and also their distribution and use?

Recent developments on government sites have shown that this is a positive benefit. Testing for evidence elsewhere is helpful in measuring the widespread acceptance of this relatively new concept in Hong Kong. Use of an 'information manager' in the company offices and on site has a mode of 'no'. The Group C contractors and contractors with ISO9000 certification has a range of fifteen to sixteen percent for 'yes' compared to a range of eleven to thirteen percent in the case of Group A and Group A contractors. It is fourteen percent for the entire response.

Questionnaire Section 1.7, Electronic communication

Q.1.7.1 Does your company use electronic-mail for communication?

The question is the obvious indicator of the prevalence of computer-based IT used for communication purposes.

- E-mail in the company offices has a mode of 'no'. The percent response varies within the sample sectors.
 - Group A contractors have an eighty-one percent 'no' response.
 - Group B contractors have a seventy percent 'no' response.
 - Group C contractors and contractors 'with ISO9000' certification have a twenty-five to twenty-two percent 'yes' response with a fifty-five to fifty-eight percent 'no'
- E-mail in the site offices has a mode of 'no'. The percent response varies within the sample sectors.
 - Group A contractors have an eighty-seven percent 'no' response.
 - Group B contractors have a ninety percent 'no' response.
 - Group C contractors and contractors 'with ISO9000' certification have a nine to seven percent 'yes' response with a sixty-seven to seventy-one percent 'no'
- E-mail via modems has a mode of 'no' except for Group C contractors and contractors with ISO9000 certification. The response in these cases are a mode on 'no' with a median of 'mostly no' and mean on the positive side of 'mostly no'. The percent response varies within the sample sectors.
 - Group A contractors have a seventy-six percent 'no' response.
 - Group B contractors have a sixty-five percent 'no' response.
 - Group C contractors and contractors 'with ISO9000' certification have a twenty-six to twenty-two percent 'yes' response with a forty-one to forty percent 'no'
- E-mail via the Internet has a similar response. A mode of 'no' except for Group C contractors and contractors with ISO9000 certification. The response in these cases are a mode on 'no' with a median of 'mostly no' and mean on the positive side of 'mostly no'. The percent response varies within the sample sectors.
 - Group A contractors have a seventy-eight percent 'no' response.
 - Group B contractors have a sixty-nine percent 'no' response.

- Group C contractors and contractors 'with ISO9000' certification have a twenty-four to twenty-one percent 'yes' response with a forty-three to forty-four percent 'no'

Q.1.7.2 Does your company provide electronic-mail for communication for various categories of staff?

The question provides a measure of the prevalence of this technology by category of construction management staff.

- E-mail provided for office-based managerial staff has a mode of 'no' but the percent response varies within the sample sectors.
 - Group A contractors have a seventy-eight percent 'no' response.
 - Group B contractors have a fifty-seven percent 'no' response with a twenty-one percent 'yes'.
 - Group C contractors and contractors 'with ISO9000' certification have a thirty-eight to thirty-six percent 'no' response with a thirty-seven percent 'yes'. The mode is finely balanced between the 'yes' and 'no' response. It is 'yes' in one case and 'no' in the other, however the median of 'mostly yes' and the mean on the positive side of 'mostly no' are consistent.
- E-mail provided for office-based professional staff has a mode of 'no' but the percent response varies within the sample sectors.
 - Group A contractors have a seventy-six percent 'no' response.
 - Group B contractors have a sixty-five percent 'no' response with an eighteen percent 'yes'.
 - Group C contractors and contractors 'with ISO9000' certification have a forty-six to forty-five percent 'no' response with a twenty-eight to twenty-nine percent 'yes'. The mode is 'no', however the median is 'mostly no' and the mean is on the positive side of 'mostly no'.
- E-mail provided for office-based supervisory staff has a mode of 'no' with a range of response within the sample sectors.
 - Group A contractors have an eighty-two percent 'no' response.
 - Group B contractors have a sixty-nine percent 'no' response with an eight percent 'yes'.
 - Group C contractors and contractors 'with ISO9000' certification have a fifty-five to fifty-three percent 'no' response with an eighteen to nineteen percent 'yes'.
- E-mail provided for office-based clerical staff has a mode of 'no' with a range of response within the sample sectors.
 - Group A contractors have an eighty-seven percent 'no' response.
 - Group B contractors have a seventy-six percent 'no' response with a seven percent 'yes'.
 - Group C contractors and contractors 'with ISO9000' certification have a sixty-four to sixty-six percent 'no' response with a fifteen to thirteen percent 'yes'.
- E-mail provided for site-based managerial staff has a mode of 'no' but the percent response varies within the sample sectors.
 - Group A contractors have a ninety percent 'no' response.
 - Group B contractors have a eighty-five percent 'no' response with a one percent 'yes'.

- Group C contractors and contractors 'with ISO9000' certification have a fifty-eight to sixty percent 'no' response with a twelve to ten percent 'yes'.
- E-mail provided for site-based professional staff has a mode of 'no' but the percent response varies within the sample sectors.
 - Group A contractors have a ninety percent 'no' response.
 - Group B contractors have a eighty-six percent 'no' response with a one percent 'yes'.
 - Group C contractors and contractors 'with ISO9000' certification have a sixty-one to sixty-three percent 'no' response with an eleven to nine percent 'yes'.
- E-mail provided for site-based supervisory staff has a mode of 'no' with a range of seventy-two to ninety-two 'no' response within the sample sectors.
- E-mail provided for site-based clerical staff has a mode of 'no' with a range of response of seventy-three to ninety-three percent within the sample sectors.

Q.1.7.3 Does your company employ staff to administer your information technology?

As the level of investment in IT increases, so the complexity is likely to increase. Systems administration then becomes a necessity. Rather than count the number of PC's used within a company: measurement of the level-of-user support is more indicative of technology deployment. It indicated the level of user-support recognised, by the company, to be worthwhile - if not essential - within the company.

- Are staff employed to administer IT in company offices has a mode of 'no', a median of 'mostly no' and a mean on the positive side of 'mostly no' for the overall response but the response varies within the sample sectors.
 - Group A contractors have a mode on 'no' with sixty percent 'no' response. The mean is on the negative side of 'mostly no'.
 - Group B contractors have a mode of 'no' but a median of mostly no'. forty-nine percent response says 'no', twenty-two percent response says 'yes'.
 - Group C contractors have a thirty-nine percent 'no' response with a thirty-five percent 'yes'. The mode is finely balanced between 'yes' and 'no' response. The median is 'mostly no' and the mean is on the positive side of 'mostly no'.
 - Contractors with ISO9000 certification have a mode of 'yes', a median of 'mostly yes' and a mean on the positive side of 'mostly no'. Thirty-five percent say 'no', thirty-six percent say 'yes'.
- Are staff employed to administer IT in site offices has a mode of 'no', but the response varies within the sample sectors.
 - Group A and B contractors have a mode on 'no' with a range of sixty to sixty-one percent 'no' response. The mean is on the negative side of 'mostly no'.
 - Group C contractors and contractors 'with ISO9000 certification' have a range of forty-six to forty-four percent 'no' response with a twenty to twenty-two percent 'yes'. The mode is a 'no' response. The median is 'mostly no' and the mean is on the positive side of 'mostly no'.

Q.1.7.4 What is the highest level of management of information technology, in the company?

The question is a key indicator of the relative importance of IT within the company. The question asks for the 'highest' level of IT management in the company, which is shown in Table 5-2.

Table 5-2 The highest level of IT management in the contractor firms.

- Twenty-seven percent of the total response states 'no' IT management, but thirty-seven percent has the highest level of IT management at Director level (19% full-time, 18% part-time). Eighteen percent has the highest level at a Manager level (11% full-time, 7% part-time).
- Thirty-seven percent of the Group A contractors have 'no' IT management, but thirty-six percent has the highest level of IT management at Director level (22% full-time, 14% part-time). Twelve percent has the highest level at a Manager level (6% full-time, 6% part-time).
- Twenty percent of the Group B contractors have 'no' IT management, but thirty-eight percent has the highest level of IT management at Director level (20% full-time, 18% part-time). Thirteen percent has the highest level at a Manager level (13% full-time, 0% part-time).
- Twenty-six percent of the Group C contractors have 'no' IT management, but forty-two percent has the highest level of IT management at Director level (14% full-time, 18% part-time). Twenty-two percent has the highest level at a Manager level (10% full-time, 12% part-time).
- Twenty-two percent of the contractors 'with ISO9000 certification' have 'no' IT management, but thirty-one percent has the highest level of IT management at Director level (11% full-time, 20% part-time). Twenty-five percent has the highest level at a Manager level (10% full-time, 15% part-time).
- Thirty-two percent of the contractors 'without ISO9000 certification' have 'no' IT management, but forty-two percent has the highest level of IT management at

Director level (22% full-time, 18% part-time). Twelve percent has the highest level at a Manager level (7% full-time, 5% part-time).

In general, a higher percent of the Group A contractors (37%) have no IT management than Group B (20%) or Group C (26%). Director-level IT management is at forty-two percent for Group B and Group C, whereas Group A has thirty-six percent director-level IT management. The use of Manager-level personnel for the highest level of IT management in the firm is twelve percent for Group A, seventeen percent for Group B, and twenty-two percent for Group C.

Q.1.7.5 Does your company use electronic mail in company offices for the following purposes?

This question measures the use of electronic-mail as an increasingly sophisticated means of information distribution and also indicates if work-groups exist within the main company offices.

- Use of E-mail in company offices for sending written messages has a mode of 'no' but the percent response varies within the sample sectors.
 - Group A contractors have a seventy-one percent 'no' response.
 - Group B contractors have a sixty-eight percent 'no' response with a ten percent 'yes'.
 - Group C contractors and contractors 'with ISO9000' certification have a forty-six to forty-nine percent 'no' response with a twenty-two percent 'yes'. The mode is 'no', the median is 'mostly no' and the mean is on the positive side of 'mostly no'.
- Use of E-mail in company offices for agreeing drafting text of written messages has a mode of 'no' but the percent response varies within the sample sectors.
 - Group A contractors have a eighty-seven percent 'no' response.
 - Group B contractors have a seventy-eight percent 'no' response with a three percent 'yes'.
 - Group C contractors and contractors 'with ISO9000' certification have a fifty-seven to fifty-nine percent 'no' response with a fourteen to twelve percent 'yes'. The mode is 'no' and the median is 'no' and the mean is on the positive side of 'mostly no'.
- Use of E-mail in company offices for marking up/amending written messages of others has a mode of 'no' with a range of response within the sample sectors.
 - Group A contractors have an eighty-six percent 'no' response.
 - Group B contractors have a seventy-eight percent 'no' response with a four percent 'yes'.
 - Group C contractors and contractors 'with ISO9000' certification have a fifty-five to fifty-nine percent 'no' response with an thirteen to eleven percent 'yes'.
- Use of E-mail in company offices for attaching other written messages to written messages has a mode of 'no' with a range of response within the sample sectors.
 - Group A contractors have an eighty-six percent 'no' response.
 - Group B contractors have a seventy-six percent 'no' response with a four percent 'yes'.
 - Group C contractors and contractors 'with ISO9000' certification have a fifty to fifty-two percent 'no' response with an eighteen percent 'yes'.

- Use of E-mail in company offices for attaching drawing files to written messages has a mode of 'no' but the percent response varies within the sample sectors.
 - Group A contractors have a eighty-nine percent 'no' response.
 - Group B contractors have a seventy-nine percent 'no' response with a one percent 'yes'.
 - Group C contractors and contractors 'with ISO9000' certification have a fifty-seven to sixty percent 'no' response with an eight to seven percent 'yes'.
- Use of E-mail in company offices for attaching digital photographs to written messages has a mode of 'no' but the percent response varies within the sample sectors.
 - Group A contractors have a ninety-one percent 'no' response.
 - Group B contractors have a eighty-three percent 'no' response with a nought percent 'yes'.
 - Group C contractors and contractors 'with ISO9000' certification have a sixty-three to sixty-five percent 'no' response with an four to three percent 'yes'.
- Use of E-mail in company offices for attaching video images to written messages has a mode of 'no' with a range of ninety-four to seventy-seven percent 'no' response within the sample sectors.
- Use of E-mail in company offices for attaching digital sound files to written messages has a mode of 'no' with a range of response of ninety-four to seventy-three within the sample sectors.
- Use of E-mail in company offices for assigning/delegating an action has a mode of 'no' but the percent response varies within the sample sectors.
 - Group A contractors have a ninety-three percent 'no' response.
 - Group B contractors have an eighty-six percent 'no' response with a nought percent 'yes'.
- Group C contractors and contractors 'with ISO9000' certification have a sixty-five to sixty-eight percent 'no' response with an eight to seven percent 'yes'.

Q.1.7.6 Does your company use electronic mail on construction sites for the following purposes?

Measures the extent that an IT approach to work-group techniques are being repeated on the construction sites.

- Use of E-mail in site offices for sending written messages has a mode of 'no' but the percent response varies within the sample sectors.
 - Group A contractors have a ninety-three percent 'no' response.
 - Group B contractors have a eighty-six percent 'no' response with a three percent 'yes'.
 - Group C contractors and contractors 'with ISO9000' certification have a sixty to sixty-three percent 'no' response with a eleven percent 'yes'. The mode is 'no', the median is 'no' and the mean is on the positive side of 'no'.
- Use of E-mail in site offices for agreeing drafting text of written messages has a mode of 'no' with a range of response of sixty-six to ninety-three percent response. Group C contractors and contractors 'with ISO9000' certification have a sixty-six to seventy-one percent 'no' response with a twelve percent 'yes'.
- Use of E-mail in site offices for marking up/amending written messages of others has a mode of 'no' with a range of response of sixty-seven to ninety-three percent

response. Group C contractors and contractors 'with ISO9000' certification have a sixty-four to seventy-two percent 'no' response with a seven percent 'yes'.

- Use of E-mail in site offices for attaching other written messages to written messages has a mode of 'no' with a range of response of sixty-six to ninety-two percent response. Group C contractors and contractors 'with ISO9000' certification have a sixty-six to sixty-eight percent 'no' response with a ten percent 'yes'.
- Use of E-mail in site offices for attaching drawing files to written messages has a mode of 'no' with a range of response of sixty-nine to ninety-three percent response. Group C contractors and contractors 'with ISO9000' certification have a sixty-nine to seventy-two percent 'no' response with a six percent 'yes'.
- Use of E-mail in site offices for attaching digital photographs to written messages has a mode of 'no' with a range of response of seventy-two to ninety-four percent response. Group C contractors and contractors 'with ISO9000' certification have a seventy-two to seventy-five percent 'no' response with a three percent 'yes'.
- Use of E-mail in site offices for attaching video images to written messages has a mode of 'no' with a range of eighty-one to eighty-five percent 'no' response within the sample sectors.
- Use of E-mail in site offices for attaching digital sound files to written messages has a mode of 'no' with a range of response of eighty-four to eighty-seven percent 'no' within the sample sectors.
- Use of E-mail in site offices for assigning/delegating an action has a mode of 'no' with a range of response of seventy-seven to eighty percent 'no' within the sample sectors.

Q.1.7.7 Does your company have a homepage on the Internet?

Used as an indicator of IT awareness. Has a mode of 'no' with a range of response of seventy-eight to ninety-six percent 'no' within the sample sectors.

Q.1.7.8 Does your company have it's own Internet server?

This question is used as an indicator of greater IT sophistication and use than the previous question. Has a mode of 'no' with a range of response of seventy-seven to eighty-eight percent 'no' within the sample sectors.

Q.1.7.9 Does your company provide an Internet service for the following categories of staff, for communication purposes?

This measures the extent that Internet services are used as a communication aid. Service costs in Hong Kong are low because of the zero cost of local telephone calls. Internet providers are competitive. These factors make Internet services one of the cheapest forms of communication available.

- Internet services provided to managerial staff has a mode of 'no' overall but the percent response varies within the sample sectors.
 - Group A contractors have a seventy-eight percent 'no' response.
 - Group B contractors have a sixty percent 'no' response with a seventeen percent 'yes'.
 - Group C contractors and contractors 'with ISO9000' certification have a mode of 'yes', median of 'mostly yes' and a mean on the positive side of 'mostly

no'. The mode is finely balanced between the 'yes' and 'no' response. Thirty-two to thirty-one percent 'no' compared to thirty-four to thirty-two percent 'yes'.

- Internet services provided to professional staff has a mode of 'no' overall but the percent response varies within the sample sectors.
 - Group A contractors have an eighty percent 'no' response.
 - Group B contractors have a sixty-three percent 'no' response with a fourteen percent 'yes'.
 - Group C contractors and contractors 'with ISO9000' certification have a mode of 'no', median of 'mostly no' and a mean on the positive side of 'mostly no'. Forty-six percent 'no' compared to twenty to eighteen percent 'yes'.
- Internet services provided for supervisory staff has a mode of 'no' overall but the percent response varies within the sample sectors.
 - Group A contractors have an eighty-eight percent 'no' response.
 - Group B contractors have a seventy-eight percent 'no' response with a six percent 'yes'.
 - Group C contractors and contractors 'with ISO9000' certification has a mode of 'no'. Sixty-two to sixty-one percent 'no' compared to eleven to ten percent 'yes'.
- Internet services provided for administrative, clerical and other staff has a mode of 'no' with a range of response within the sample sectors.
 - Group A contractors have an ninety percent 'no' response.
 - Group B contractors have a eighty-two percent 'no' response with a three percent 'yes'.
 - Group C contractors and contractors 'with ISO9000' certification have a sixty-eight to sixty-nine percent 'no' response with a five to four percent 'yes'.

Questionnaire Part 2, Purpose of the information technology

Q.2.1 What information technology does your company use to communicate/transmit to head office and vice versa, work-content related data/information?

This question measures the extent that telephone, fax, electronic-mail or hardcopy is used to exchange information on work-content of the project.

- Use of telephone to communicate/transmit work-content related data/information has a mode of 'yes' overall with a range of 'yes' response of seventy-one to ninety percent.
- Use of fax to communicate/transmit work-content related data/information has a mode of 'yes' overall with a range of 'yes' response of seventy-six to eighty-four percent.
- Use of e-mail to communicate/transmit work-content related data/information has a mode of 'no' overall but the percent response varies within the sample sectors.
 - Group A contractors have an seventy-six percent 'no' response.
 - Group B contractors have a sixty-six percent 'no' response with a three percent 'yes'.
 - Group C contractors and contractors 'with ISO9000' certification has a mode of 'no'. Forty-three to forty-two percent 'no' compared to four to three percent 'yes'.

- Use of hardcopy/letter/report/form to communicate/transmit work-content related data/information has a mode of 'yes' overall with a range of 'yes' response of sixty-three to seventy-three percent.

Q.2.2 Does your company communicate/transmit to head office and vice versa, using information technology, data/information on the following list of work-content related topics?

Probes the flow of named, common, work-related data to see if there is a communication of these fundamental data items.

- Transmission of lists of 'activities' (work-content data) using IT has a mode of 'yes' and a median and mean of 'mostly yes' overall but a response of thirty-eight percent 'yes', thirty-two percent 'mostly yes', nineteen percent 'mostly no', and eleven percent 'no'. The percent response varies within the sample sectors.
 - Group A contractors have a forty-two percent 'yes' response compared to eighteen percent 'no'.
 - Group B contractors have a thirty-seven percent 'yes' response with a seven percent 'no'.
 - Group C contractors and contractors 'with ISO9000' certification has a thirty-six percent 'yes', thirty-two to thirty-five percent 'mostly yes', twenty-three percent 'mostly no', and eight percent 'no'.
- Transmission of lists of 'items to be done' (work-content data) using IT has a mode of 'yes' and a median and mean of 'mostly yes' overall, but a response of thirty-six percent 'yes', thirty-four percent 'mostly yes', seventeen percent 'mostly no', and thirteen percent 'no'. The percent response varies within the sample sectors.
 - Group A contractors have a forty percent 'yes' response compared to eighteen percent 'no'.
 - Group B contractors have a thirty-six percent 'yes' response with a ten percent 'no'.
 - Group C contractors and contractors 'with ISO9000' certification has a thirty-two percent 'yes', thirty-three percent 'mostly yes', twenty-two percent 'mostly no', and twelve percent 'no'.
- Transmission of lists of 'variations and their status' (work-content data) using IT has a mode of 'yes' and a median and mean of 'mostly yes' overall, but a response of thirty-five percent 'yes', thirty-two percent 'mostly yes', twenty-one percent 'mostly no', and twelve percent 'no'. The percent response varies within the sample sectors.
 - Group A contractors have a thirty-nine percent 'yes' response compared to eighteen percent 'no'.
 - Group B contractors have a thirty-three percent 'yes' response with a nine percent 'no'.
 - Group C contractors and contractors 'with ISO9000' certification has a thirty-four to thirty-two percent 'yes', thirty-three percent 'mostly yes', twenty-four percent 'mostly no', and nine percent 'no'.
- Transmission of lists of 'disputes and their status' (work-content data) using IT has a mode of 'yes' and a median and mean of 'mostly yes' overall, but a response of thirty-four percent 'yes', twenty-seven percent 'mostly yes', twenty-five

percent ‘mostly no’, and fourteen percent ‘no’. The percent response varies within the sample sectors.

- Group A contractors have a thirty-seven percent ‘yes’ response compared to nineteen percent ‘no’.
- Group B contractors have a twenty-seven percent ‘yes’ response with a eleven percent ‘no’.
- Group C contractors and contractors ‘with ISO9000’ certification has a thirty-six to thirty-one percent ‘yes’, twenty-three to twenty-nine percent ‘mostly yes’, twenty-seven to twenty-four percent ‘mostly no’, and twelve percent ‘no’.

Q.2.3 What information technology does your company use to communicate/transmit to head office and vice versa, time related data/information?

Measures the means that items of time related data/information is communicated.

- Use of telephone to communicate/transmit time related data/information has a mode of ‘yes’ overall with a range of ‘yes’ response of sixty-seven to seventy-nine percent.
- Use of fax to communicate/transmit time related data/information has a mode of ‘yes’ overall with a range of ‘yes’ response of seventy-one to seventy-six percent.
- Use of e-mail to communicate/transmit time related data/information has a mode of ‘no’ overall but the percent response varies within the sample sectors.
 - Group A contractors have a seventy-nine percent ‘no’ response.
 - Group B contractors have a sixty-seven percent ‘no’ response with a three percent ‘yes’.
 - Group C contractors and contractors ‘with ISO9000’ certification has a mode of ‘no’. Forty-three to forty-four percent ‘no’ compared to twelve to ten percent ‘yes’.
- Use of hardcopy/letter/report/form to communicate/transmit time related data/information has a mode of ‘yes’ overall with a range of ‘yes’ response of fifty-seven to sixty-two percent.

Q.2.3 Does your company communicate/transmit to head office and vice versa, using information technology, data/information on the following list of time related topics?

The same line of questioning as Q.2.1, but for time related data. It is assumed that the project work-scheduling process is not duplicated in each location.

- Transmission of ‘work schedule of activities’ (time-content data) using IT has a mode of ‘yes’ and a median and mean of ‘mostly yes’ overall but a response of thirty-nine percent ‘yes’, thirty-nine percent ‘mostly yes’, fifteen percent ‘mostly no’, and seven percent ‘no’. The percent response varies within the sample sectors.
 - Group A contractors have a thirty-nine percent ‘yes’ response compared to seven percent ‘no’.
 - Group B contractors have a thirty-eight percent ‘yes’ response with a eleven percent ‘no’.
 - Group C contractors and contractors ‘with ISO9000’ certification has a forty to forty-one percent ‘yes’, thirty-nine percent ‘mostly yes’, thirteen percent ‘mostly no’, and seven percent ‘no’.

- Transmission of ‘% work done’ (time-content data) using IT has a mode of ‘mostly yes’ overall, but a response of thirty-five percent ‘yes’, thirty-nine percent ‘mostly yes’, eighteen percent ‘mostly no’, and seven percent ‘no’. The percent response varies within the sample sectors.
 - Group A contractors have a thirty-eight percent ‘yes’ response compared to eleven percent ‘no’.
 - Group B contractors have a thirty-three percent ‘yes’ response with a four percent ‘no’.
 - Group C contractors and contractors ‘with ISO9000’ certification has a thirty-six to thirty-eight percent ‘yes’, forty percent ‘mostly yes’, seventeen percent ‘mostly no’, and seven percent ‘no’.
- Transmission of ‘% work to be done’ (time-content data) using IT has a mode, median and mean of ‘mostly yes’ overall, but a response of thirty-four percent ‘yes’, thirty-seven percent ‘mostly yes’, twenty-two percent ‘mostly no’, and eighteen percent ‘no’. The percent response varies within the sample sectors.
 - Group A contractors have a thirty-eight percent ‘yes’ response compared to twelve percent ‘no’.
 - Group B contractors have a thirty-one percent ‘yes’ response with a four percent ‘no’.
 - Group C contractors and contractors ‘with ISO9000’ certification has a thirty-four to thirty-seven percent ‘yes’, thirty-eight percent ‘mostly yes’, twenty-one to nineteen percent ‘mostly no’, and seven percent ‘no’.
- Transmission of lists of ‘replanned work’ (time-content data) using IT has a mode, median and mean of ‘mostly yes’ overall, but a response of thirty-two percent ‘yes’, thirty-eight percent ‘mostly yes’, twenty percent ‘mostly no’, and nine percent ‘no’. The percent response varies within the sample sectors.
 - Group A contractors have a thirty-eight percent ‘yes’ response compared to fifteen percent ‘no’.
 - Group B contractors have a twenty-seven percent ‘yes’ response with a six percent ‘no’.
 - Group C contractors and contractors ‘with ISO9000’ certification has a thirty-three to thirty-five percent ‘yes’, thirty-eight percent ‘mostly yes’, twenty-one percent ‘mostly no’, and eight percent ‘no’.

Q.2.5 Does your company communicate/transmit to head office and vice versa, using information technology, data/information on the following list of cost related topics?

The same line of questioning as Q.2.1, but for cost related data. This is thought to be the most prevalent indicator of project performance and the measure that can be most easily combined together to gauge overall performance.

- Use of telephone to communicate/transmit cost related data/information has a mode of ‘yes’ overall with a range of ‘yes’ response of fifty-eight to sixty-eight percent.
- Use of fax to communicate/transmit cost related data/information has a mode of ‘yes’ overall with a range of ‘yes’ response of sixty-six to seventy-two percent.
- Use of e-mail to communicate/transmit cost related data/information has a mode of ‘no’ overall but the percent response varies within the sample sectors.
 - Group A contractors have a seventy-eight percent ‘no’ response.

- Group B contractors have a sixty-eight percent 'no' response with a three percent 'yes'.
- Group C contractors and contractors 'with ISO9000' certification has a mode of 'no'. Fifty-one to forty-nine percent 'no' compared to nine to ten percent 'yes'.
- Use of hardcopy/letter/report/form to communicate/transmit cost related data/information has a mode of 'yes' overall with a range of 'yes' response of fifty-seven to sixty-six percent.

Q.2.6 What information technology does your company use to communicate/transmit to head office and vice versa, cost related data/information?

Measures the means that the data in Q2.5 is communicated

- Transmission of 'value of work done' (cost-content data) using IT has a mode of 'yes' and a median and mean of 'mostly yes' overall with a response of forty-eight percent 'yes', twenty-nine percent 'mostly yes', seventeen percent 'mostly no', and six percent 'no'. The percent response varies within the sample sectors.
 - Group A contractors have a forty-eight percent 'yes' response compared to six percent 'no'.
 - Group B contractors have a thirty-nine percent 'yes' response with a four percent 'no'.
 - Group C contractors and contractors 'with ISO9000' certification has a fifty-seven to fifty-three percent 'yes', twenty-six to thirty percent 'mostly yes', twelve to fourteen percent 'mostly no', and five to three percent 'no'.
- Transmission of 'cost of work to be done' (cost-content data) using IT has a mode of 'yes', median and mean of 'mostly yes' overall. The response is: forty-one percent 'yes', twenty-nine percent 'mostly yes', twenty-two percent 'mostly no', and eight percent 'no'. The percent response varies within the sample sectors.
 - Group A contractors have a forty-three percent 'yes' response compared to twelve percent 'no'.
 - Group B contractors have a thirty-three percent 'yes' response with a six percent 'no'.
 - Group C contractors and contractors 'with ISO9000' certification has a forty-five to forty-two percent 'yes', twenty-six to thirty-two percent 'mostly yes', twenty-two percent 'mostly no', and six to four percent 'no'.
- Transmission of 'value of materials delivered' (cost-content data) using IT has a mode of 'yes', median and mean of 'mostly yes' overall. The response are: forty-two percent 'yes', thirty-one percent 'mostly yes', eighteen percent 'mostly no', and nine percent 'no'. The percent response varies within the sample sectors.
 - Group A contractors have a fifty percent 'yes' response compared to nine percent 'no'.
 - Group B contractors have a thirty-nine percent 'yes' response with a nine percent 'no'.
 - Group C contractors and contractors 'with ISO9000' certification has a thirty-nine to forty-one percent 'yes', thirty-one percent 'mostly yes', twenty-one percent 'mostly no', and eight to seven percent 'no'.
- Transmission of lists of 'value of materials ordered' (cost-content data) using IT has a mode of 'yes', median and mean of 'mostly yes' overall. The response are:

thirty-nine percent 'yes', thirty-two percent 'mostly yes', nineteen percent 'mostly no', and nine percent 'no'. The percent response varies within the sample sectors.

- Group A contractors have a forty-eight percent 'yes' response compared to ten percent 'no'.
- Group B contractors have a thirty-six percent 'yes' response with a ten percent 'no'.
- Group C contractors and contractors 'with ISO9000' certification has a thirty-six to thirty-nine percent 'yes', thirty-one percent 'mostly yes', thirty-one percent 'mostly no', and eight to seven percent 'no'.
- Transmission of 'value of variations' (cost-content data) using IT has a mode of 'yes' and a median and mean of 'mostly yes' overall with a response of forty percent 'yes', thirty-one percent 'mostly yes', eighteen percent 'mostly no', and ten percent 'no'. The percent response varies within the sample sectors.
 - Group A contractors have a forty-six percent 'yes' response compared to nine percent 'no'.
 - Group B contractors have a twenty-nine percent 'yes' and forty-two percent 'mostly yes' response, with a twelve percent 'no'.
 - Group C contractors and contractors 'with ISO9000' certification has a forty-five to forty-two percent 'yes', twenty-eight to thirty-three percent 'mostly yes', eighteen to seventeen percent 'mostly no', and nine to eight percent 'no'.
- Transmission of 'value of disputes' (cost-content data) using IT has a mode, median and mean of 'mostly yes' overall. The response are: thirty-three percent 'yes', thirty-three percent 'mostly yes', twenty-two percent 'mostly no', and twelve percent 'no'. The percent response varies within the sample sectors.
 - Group A contractors have a thirty-seven percent 'yes' response compared to twelve percent 'no'.
 - Group B contractors have a twenty-two percent 'yes', forty-three percent 'mostly yes' response, with a fifteen percent 'no'.
 - Group C contractors and contractors 'with ISO9000' certification has a thirty-seven to thirty-four percent 'yes', thirty to thirty-six percent 'mostly yes', twenty-three to twenty-two percent 'mostly no', and nine to ten percent 'no'.
- Transmission of 'money received' (cost-content data) using IT has a mode of 'yes', median and mean of 'mostly yes' overall. The response is: forty-four percent 'yes', twenty-four percent 'mostly yes', nineteen percent 'mostly no', and fourteen percent 'no'. The percent response varies within the sample sectors.
 - Group A contractors have a fifty-two percent 'yes' response compared to fourteen percent 'no'.
 - Group B contractors have a twenty-eight percent 'yes', thirty-seven percent 'mostly yes' response, with an eighteen percent 'no'.
 - Group C contractors and contractors 'with ISO9000' certification has a forty-nine to forty-eight percent 'yes', twenty-one to twenty-two percent 'mostly yes', eighteen to seventeen percent 'mostly no', and eleven percent 'no'.
- Transmission of lists of 'money owed' (cost-content data) using IT has a mode of 'yes', median and mean of 'mostly yes' overall. The response is: thirty-eight percent 'yes', twenty-five percent 'mostly yes', twenty-one percent 'mostly no', and fifteen percent 'no'. The percent response varies within the sample sectors.

- Group A contractors have a forty-six percent 'yes' response compared to fifteen percent 'no'.
- Group B contractors have a twenty-three percent 'yes', thirty-eight percent 'mostly yes' response, with a nineteen percent 'no'.
- Group C contractors and contractors 'with ISO9000' certification has a forty-four to forty-three percent 'yes', twenty-one to twenty-four percent 'mostly yes', twenty-one to twenty percent 'mostly no', and thirteen percent 'no'.

Q.2.7 What information technology does your company use to communicate/transmit to head office and vice versa, resource related data/information?

As before, this question measures the manner in which the data is communicated.

- Use of telephone to communicate/transmit resource related data/information has a mode of 'yes' overall with a range of 'yes' response of sixty-four to seventy-five percent.
- Use of fax to communicate/transmit cost related data/information has a mode of 'yes' overall with a range of 'yes' response of sixty-five to sixty-eight percent.
- Use of e-mail to communicate/transmit cost related data/information has a mode of 'no' overall but the percent response varies within the sample sectors.
 - Group A contractors have a seventy-eight percent 'no' response.
 - Group B contractors have a seventy-one percent 'no' response with a one percent 'yes'.
 - Group C contractors and contractors 'with ISO9000' certification has a mode of 'no'. Fifty-two to fifty percent 'no' compared to seven percent 'yes'.
- Use of hardcopy/letter/report/form to communicate/transmit cost related data/information has a mode of 'yes' overall with a range of 'yes' response of fifty-two to sixty-two percent.

Q.2.8 Does your company communicate/transmit to head office and vice versa, using information technology, data/information on the following list of resource related topics?

Questions the flow of resource-related information.

- Transmission of 'labour deployed' (resource-content data) using IT has a mode of 'mostly yes' overall with a response of thirty-three percent 'yes', thirty-six percent 'mostly yes', twenty-one percent 'mostly no', and ten percent 'no'. The percent response varies within the sample sectors.
 - Group A contractors have a thirty-five percent 'yes' response compared to sixteen percent 'no'.
 - Group B contractors have a twenty-nine percent 'yes' response with a six percent 'no'.
 - Group C contractors and contractors 'with ISO9000' certification has a thirty-three to thirty-five percent 'yes', thirty-three percent 'mostly yes', twenty-four percent 'mostly no', and nine to eight percent 'no'.
- Transmission of 'labour required' (resource-content data) using IT has a mode of 'yes', median and mean of 'mostly yes' overall. The response is: thirty-two

percent 'yes', thirty-seven percent 'mostly yes', twenty-four percent 'mostly no', and eight percent 'no'. The percent response varies within the sample sectors.

- Group A contractors have a thirty-five percent 'yes' response compared to ten percent 'no'.
- Group B contractors have a twenty-nine percent 'yes', forty-four 'mostly yes' response, with a six percent 'no'.
- Group C contractors and contractors 'with ISO9000' certification has a thirty to thirty-three percent 'yes', thirty-five to thirty-four percent 'mostly yes', twenty-seven percent 'mostly no', and seven percent 'no'.
- Transmission of 'plant deployed' (resource-content data) using IT has a mode, median, and mean of 'mostly yes' overall. The response is: thirty-two percent 'yes', thirty-three percent 'mostly yes', twenty-four percent 'mostly no', and eleven percent 'no'. The percent response varies within the sample sectors.
 - Group A contractors have a thirty-one percent 'yes' response compared to fifteen percent 'no'.
 - Group B contractors have a thirty-one percent 'yes' response with a seven percent 'no'.
 - Group C contractors and contractors 'with ISO9000' certification has a thirty-four to thirty-five percent 'yes', thirty-two to thirty percent 'mostly yes', twenty-eight to twenty-seven percent 'mostly no', and seven to eight percent 'no'.
- Transmission of lists of 'plant required' (resource-content data) using IT has a mode, median, and mean of 'mostly yes' overall. The response is: thirty-two percent 'yes', thirty-eight percent 'mostly yes', twenty-one percent 'mostly no', and nine percent 'no'. The percent response varies within the sample sectors.
 - Group A contractors have a thirty-two percent 'yes' response compared to twelve percent 'no'.
 - Group B contractors have a thirty-one percent 'yes' response with a nine percent 'no'.
 - Group C contractors and contractors 'with ISO9000' certification has a thirty-two to thirty-four percent 'yes', thirty-eight percent 'mostly yes', twenty-two to twenty-one percent 'mostly no', and seven to eight percent 'no'.
- Transmission of lists of 'sub-contractors hired' (resource-content data) using IT has a mode of 'yes' and a median and mean of 'mostly yes' overall with a response of thirty-eight percent 'yes', thirty-three percent 'mostly yes', twenty-one percent 'mostly no', and seven percent 'no'. The percent response varies within the sample sectors.
 - Group A contractors have a thirty-eight percent 'yes' response compared to nine percent 'no'.
 - Group B contractors have a thirty-five percent 'yes' and forty percent 'mostly yes' response, with a seven percent 'no'.
 - Group C contractors and contractors 'with ISO9000' certification has a thirty-nine to thirty-six percent 'yes', twenty-nine to thirty-five percent 'mostly yes', twenty-five to twenty-three percent 'mostly no', and six to seven percent 'no'.
- Transmission of lists of 'purchasing services required' (resource-content data) using IT has a mode, median and mean of 'mostly yes' overall. The response is: forty-one percent 'yes', thirty-two percent 'mostly yes', twenty-one percent 'mostly no', and seven percent 'no'. The percent response varies within the sample sectors.

- Group A contractors have a thirty-seven percent 'yes' response compared to ten percent 'no'.
- Group B contractors have a forty-seven percent 'yes', thirty-five percent 'mostly yes' response, with a six percent 'no'.
- Group C contractors and contractors 'with ISO9000' certification has a thirty-eight to forty-one percent 'yes', thirty to thirty-three percent 'mostly yes', twenty-six to twenty-two percent 'mostly no', and five to six percent 'no'.
- Transmission of lists of 'QS service required' (resource-content data) using IT has a mode, median and mean of 'mostly yes' overall. The response are: thirty percent 'yes', thirty-nine percent 'mostly yes', twenty-four percent 'mostly no', and eight percent 'no'. The percent response varies within the sample sectors.
 - Group A contractors have a thirty percent 'yes', thirty-four percent 'mostly yes' response, compared to thirteen percent 'no'.
 - Group B contractors have a twenty-six percent 'yes', forty-four percent 'mostly yes' response, with a seven percent 'no'.
 - Group C contractors and contractors 'with ISO9000' certification has a thirty-one to thirty percent 'yes', thirty-seven to thirty-eight percent 'mostly yes', twenty-six percent 'mostly no', and five to six percent 'no'.
- Transmission of lists of 'legal services required' (resource-content data) using IT has a mode of 'mostly no', median and mean of 'mostly yes' overall. The response is: twenty-seven percent 'yes', twenty-seven percent 'mostly yes', thirty-five percent 'mostly no', and eleven percent 'no'. The percent response varies within the sample sectors.
 - Group A contractors have a twenty-five percent 'yes' response compared to sixteen percent 'no'.
 - Group B contractors have a twenty-five percent 'yes', thirty-two percent 'mostly yes' response, with a nine percent 'no'.
 - Group C contractors and contractors 'with ISO9000' certification has a thirty to twenty-nine percent 'yes', twenty-six percent 'mostly yes', thirty-four to thirty-six percent 'mostly no', and nine to eleven percent 'no'.
- Transmission of lists of 'management services required' (resource-content data) using IT has a mode, median and mean of 'mostly yes' overall. The response range is : twenty-five to thirty-three percent 'yes', twenty-four to thirty-five percent 'mostly yes', twenty-five to thirty-four percent 'mostly no', and seven to fifteen percent 'no'.
- Transmission of lists of 'administrative services required' (resource-content data) using IT has a mode, median and mean of 'mostly yes' overall. The response range is : twenty-five to thirty-two percent 'yes', twenty-five to forty percent 'mostly yes', twenty to thirty-two percent 'mostly no', and nine to fifteen percent 'no'.
- Transmission of lists of 'professional services required' (resource-content data) using IT has a mode, median and mean of 'mostly yes' overall. The response range is : twenty-two to thirty-one percent 'yes', twenty-eight to forty-six percent 'mostly yes', twenty-five to twenty-eight percent 'mostly no', and seven to sixteen percent 'no'.

Q.2.9.What five items of data/information is most important in your company for assessing the performance of a construction project?

This question allows the respondent to state, in order of importance, their indicators of performance. Table 5-3 states the level of response to this question.

	Pop. Sample	Max Response Possible	Actual Response	Response %
All Contractors	238	1190	954	80%
Group A Contractors	67	335	262	78%
Group B Contractors	72	360	301	84%
Group C Contractors	99	495	391	79%
Contractors with ISO9000	105	525	425	81%
Contractors w/o ISO9000	133	665	529	80%

Table 5-3 Level of response from HK contractors regarding data/information for assessing project performance

After the removal of unclear responses and semantic differences, 142 unique responses were listed. The ratio of the number of unique response to the actual number of responses is taken as a measure of the variability in the level of response received. In this case the variability is 15%. A summary table of the results of the frequency analysis is in Section 5.6. Twenty-three keywords were derived from the one hundred and forty two unique responses. The dendrogram listing the twenty-three keywords and their derivatives is in Section 5.7. More than eighty-six percent of the response is within the ten most frequent responses. These responses are consistent across all six groupings of the contractor population sample. The weighted-frequency analysis causes a minor change to the order at the bottom-end of the ten most frequent responses where there are a few differences in the results. The significant keywords for each of the groups of Contractors in the population sample and their frequency order are listed on Table 5-4.

Keyword	Contractor Groups					
	All	GrpA	GrpB	GrpC	W ISO	W/oISO
Value	1	1	1	1	1	1
Work schedule	2	2	2	2	2	2
Financing	3	4	4	3	3	4
Resources	4	3	3	5	4	3
Quality	5	6	6	4	5	7
Safety	6	7	5	7	6	6
Cost-actuals	7	5	7	6	7	5
Variation	8	8	8	8	8	8
Employer-feedback	9	9	9	9	9	9
Performance	10					
Risk-analysis		10				10
Documentation			10			
Forecast				10	10	

Table 5-4 Priority order of the ten most important project performance data/information for HK contractors.

These project-performance items for each construction project are the most important elements of data/information used by HK contractors to assess the performance of each project.

Q.2.10. What information technology does your company use to communicate/transmit to head office and vice versa, the five items of data/information stated in 2.9?

Measures the use of the telephone, fax, electronic-mail, or hardcopy to communicate the items named by the respondent in the open-ended question Q2.9.

- Use of telephone to communicate/transmit the five most important items of data/information has a mode of 'yes' overall with a range of 'yes' response of fifty-nine to sixty-four percent.
- Use of fax to communicate/transmit the five most important items of data/information has a mode of 'yes' overall with a range of 'yes' response of sixty-two to sixty-six percent.
- Use of e-mail to communicate/transmit the five most important items of related data/information has a mode of 'no' overall but the percent response varies within the sample sectors.
 - Group A contractors have a seventy-eight percent 'no' response.
 - Group B contractors have a sixty-five percent 'no' response with a five percent 'yes'.
 - Group C contractors and contractors 'with ISO9000' certification has a mode of 'no'. Fifty-two to forty-seven percent 'no' compared to four to six percent 'yes'.
- Use of hardcopy/letter/report/form to communicate/transmit the five most important items of data/information has a mode of 'yes' overall with a range of 'yes' response of fifty-eight to seventy-three percent.

*Q.2.11.. Does your company communicate/transmit to head office and vice versa, using information technology, the following **issue related** data/information items?*

Questions the flow of issue-related information.

- Transmission of 'variation quotations' (issue-related data) using IT has a mode of 'yes', and a median and mean of 'mostly yes' overall with a range of response of forty to fifty-seven percent 'yes', twenty-five to thirty-eight percent 'mostly yes', twelve to nineteen percent 'mostly no', and five to six percent 'no'.
- Transmission of 'change order proposals' (issue-content data) using IT has a mode of 'yes', median and mean of 'mostly yes' overall. The range of response is: thirty-four to forty-six percent 'yes', thirty-two to forty-one percent 'mostly yes', ten to twenty-three percent 'mostly no', and five to nine percent 'no'.
- Transmission of lists of 'accident/safety reports' (issue-content data) using IT has a mode of 'yes', a median and mean of 'mostly yes' overall. The range of response is: forty-one to forty-eight percent 'yes', twenty-five to thirty-five percent 'mostly yes', eighteen to twenty-four percent 'mostly no', and five to seven percent 'no'.
- Transmission of lists of 'quality conformance' (issue-content data) using IT has a mode, median, and mean of 'mostly yes' overall. The range of response is: twenty-eight to thirty-five percent 'yes', thirty-three to forty-six percent 'mostly

yes', nineteen to twenty-seven percent 'mostly no', and five to seven percent 'no'.

- Transmission of lists of 'approvals' (issue-content data) using IT has a mode of 'yes' and a median and mean of 'mostly yes' overall with a range of response of forty-six to fifty-one percent 'yes', twenty-five to thirty-two percent 'mostly yes', fifteen to twenty-two percent 'mostly no', and three to seven percent 'no'.

*Q.2.12..What information technology does your company use to communicate/transmit to head office and vice versa, the **issue-related** items of data/information stated in 2.11?*

As earlier, this question measures the manner in which the data is communicated.

- Use of telephone to communicate/transmit issue-related items of data/information has a mode of 'yes' overall with a range of 'yes' response of fifty-four to sixty-four percent.
- Use of fax to communicate/transmit issue-related data/information has a mode of 'yes' overall with a range of 'yes' response of sixty-four to seventy percent.
- Use of e-mail to communicate/transmit issue-related data/information has a mode of 'no' overall with a range of 'no' response of fifty-four to seventy-seven percent.
- Use of hardcopy/letter/report/form to communicate/transmit issue-related data/information has a mode of 'yes' overall with a range of 'yes' response of fifty-seven to seventy-six percent.

*Q.2.13 Does your company communicate/transmit to head office and vice versa, using information technology, the following **company-related** data/information items?*

Questions the flow of company-related information.

- Transmission of 'names and addresses' (company-related data) using IT has a mode of 'yes', and a median and mean of 'mostly yes' overall with a range of response of forty-three to fifty-three percent 'yes', twenty-nine to thirty-seven percent 'mostly yes', seven to twenty-one percent 'mostly no', and four to seven percent 'no'.
- Transmission of 'telephone directories' (company-related data) using IT has a mode, median and mean of 'mostly yes' overall. The range of response is: twenty-six to thirty percent 'yes', twenty-nine to thirty-five percent 'mostly yes', twenty-nine to thirty-two percent 'mostly no', and six to twelve percent 'no'.
- Transmission of 'shared facilities eg meeting rooms' (company-related data) using IT has a mode, median and mean of 'mostly no' overall. The range of response is: thirteen to nineteen percent 'yes', twenty-two to twenty-eight percent 'mostly yes', thirty-one to forty-one percent 'mostly no', and fourteen to twenty-five percent 'no'.
- Transmission of 'information registers' (company-related data) using IT has a mode, median, and mean of 'mostly no' overall. The range of response is: sixteen to twenty-one percent 'yes', twenty-four to thirty-two percent 'mostly yes', thirty-four to forty percent 'mostly no', and twelve to twenty-two percent 'no'.

*Q.2.14..What information technology does your company use to communicate/transmit to head office and vice versa, the **company-related** items of data/information stated in 2.13?*

As earlier, this question measures the manner in which the data is communicated.

- Use of telephone to communicate/transmit company-related items of data/information has a mode of 'yes' overall with a range of 'yes' response of fifty-eight to seventy-two percent.
- Use of fax to communicate/transmit company-related data/information has a mode of 'yes' overall with a range of 'yes' response of sixty-four to sixty-eight percent.
- Use of e-mail to communicate/transmit company-related data/information has a mode of 'no' overall with a range of 'no' response of fifty-two to seventy-six percent.
- Use of hardcopy/letter/report/form to communicate/transmit company-related data/information has a mode of 'no' overall with a range of 'yes' response of eighty-three to sixty-seven percent.

Questionnaire Part 3, Use of the information technology

Q.3.1..How does your company use information technology to combine together data/information relating to the work-content of your construction projects, to get an overview of performance?

This question measures the method for combination of work-content project information.

- Use of individual review of work-content data to combine together a portfolio view of projects has a mode of 'mostly yes' overall but the percent response varies within the sample sectors.
 - Group A contractors have a thirty-six percent 'yes' and forty-one percent 'mostly yes' response.
 - Group B contractors have a thirty-six percent 'yes' and a forty-four percent 'mostly yes' response.
 - Group C contractors and contractors 'with ISO9000' certification has a mode of 'yes' but a median and mean of 'mostly yes'. Forty-five to forty-one percent 'yes', thirty-five to thirty-nine percent 'mostly yes' response compared to two to three percent 'no'.
- Use of spreadsheets of numeric and date data of work-content to combine together a portfolio view of projects has a mode of 'mostly yes' overall but the percent response varies within the sample sectors.
 - Group A contractors have a twenty-eight percent 'yes' and thirty-seven percent 'mostly yes' response.
 - Group B contractors have a twenty-five percent 'yes' and a forty-two percent 'mostly yes' response.

- Group C contractors and contractors 'with ISO9000' certification has a mode of 'mostly yes'. Thirty-three to thirty percent 'yes', forty-five to fifty percent 'mostly yes' response compared to five percent 'no'.
- Use of database of alpha-numeric data of work-content to combine together a portfolio view of projects has a mode of 'mostly no' overall but the percent response varies within the sample sectors.
 - Group A contractors have a twenty-three percent 'no' and thirty percent 'mostly no' compared to an eighteen percent 'yes' response.
 - Group B contractors have a twenty-seven percent 'no' and a thirty-four percent 'mostly no' compared to eleven percent 'yes' response.
 - Group C contractors and contractors 'with ISO9000' certification has a mode of 'mostly no' but a median of 'mostly yes' with a mean on the positive side of 'mostly no'. Twenty to seventeen percent 'yes', thirty-one to thirty-two percent 'mostly yes', thirty-nine to thirty-seven percent 'mostly no' and ten to fourteen percent 'no' response.

Q.3.2..What five, work-content related, criterion are most important in your company for assessing the overall performance of several construction projects?

This question invites respondent to state, in order of importance, the five items of information for summary into an overall view of performance. Table 5-5 states the level of response to this question.

	Pop. Sample	Max Response Possible	Actual Response	Response %
All Contractors	238	1190	656	55%
Group A Contractors	67	335	166	50%
Group B Contractors	72	360	207	58%
Group C Contractors	99	495	283	57%
Contractors with ISO9000	105	525	325	62%
Contractors w/o ISO9000	133	665	331	50%

Table 5-5 Level of response from HK contractors regarding work-content related criteria for assessing the performance of several construction projects

After the removal of unclear responses and semantic differences, 182 unique responses were listed. The ratio of the number of unique response to the actual number of responses is taken as a measure of the variability in the level of response received. In this case the variability is 28%. Thirty-seven response-keywords were derived from the one hundred and eighty two unique responses. The dendrogram of keywords and their derivatives is in Section 5.8. A summary table of the results of the frequency analysis is found within Section 5.6. More than seventy-six percentile of the response is within the fifteen most frequent keyword-responses. These responses are consistent across all six groupings of the contractor population sample. The weighted-frequency analysis causes a minor change to the order at the bottom-end of the fifteen most frequent responses. The significant keywords for each of the groups of Contractors in the population sample and their frequency order are listed on Table 5-6.

Keyword	Contractor Groups					
	All	GrpA	GrpB	GrpC	W ISO	W/oISO
Quality	1	1	3	1	2	1
Activity-schedules	2	10	1	2	1	5
Variations	3		2	3	4	4
Performance/progress	4	4	4	5	5	2
Safety	5	3	8	4	3	7
Construction-issues	6	5	5	7	8	6
Costs	7	2	12	12	9	3
Work schedule	8	13	7	6	6	12
Value	9	7	10	15	12	8
Disputes	10		6	8	7	13
Material use	11		9	13	11	15
Timing	12	6		14	15	11
Work achieved	13	12	11			10
Management of work	14	11		11	13	14
Quantity	15			9	14	
Labour		8	14			9
Resources		9	15			
Client involvement		14		10	10	
Profit		15				
Payments			13			

Table 5-6 Priority order of the fifteen most important work-content related performance criteria used by HK contractors to assess several construction projects.

There is consistency in the top fifteen response-keywords in all groups except for Group A Contractors. They include response-keywords ‘labour’, ‘resources’, ‘client-involvement’, and ‘profit’ in the high frequency list instead of ‘variations’, ‘disputes’, and ‘material-use’. Group B contractors include ‘payments’, ‘labour’, and ‘resources’. Group C contractors and contractors with ISO9000 accreditation include ‘client-involvement instead of ‘work achieved’.

The measurement of the items listed in Table 5-6, are the most important elements of data/information used by HK contractors to assess the overall performance of several projects.

Q.3.3..How does your company use information technology to combine together data/information relating to the time aspects of your construction projects, to get an overview of performance?

Similar question to Q3.1 but for time-related information.

- Use of individual review of time aspects data to combine together a portfolio view of projects has a mode of ‘mostly yes’ overall but the percent response varies within the sample sectors.
 - Group A contractors have a thirty-three percent ‘yes’ and forty-three percent ‘mostly yes’ response.
 - Group B contractors have a thirty-four percent ‘yes’ and a forty-seven percent ‘mostly yes’ response.

- Group C contractors and contractors 'with ISO9000' certification has a mode of 'mostly yes'. Forty-one to thirty-eight percent 'yes', forty-one to forty-six percent 'mostly yes' response compared to two to three percent 'no'.
- Use of spreadsheets of numeric and date data of time aspects data to combine together a portfolio view of projects has a mode of 'mostly yes' overall but the percent response varies within the sample sectors.
 - Group A contractors have a twenty-four percent 'yes' and thirty-six percent 'mostly yes' response.
 - Group B contractors have a twenty-six percent 'yes' and a forty-four percent 'mostly yes' response.
 - Group C contractors and contractors 'with ISO9000' certification has a mode of 'mostly yes'. Twenty-eight to twenty-seven percent 'yes', forty-eight to fifty-one percent 'mostly yes' response compared to eight to seven percent 'no'.
- Use of database of alpha-numeric data of time aspects data to combine together a portfolio view of projects has a mode of 'mostly no' overall but the percent response varies within the sample sectors.
 - Group A contractors have a forty-one percent 'no' and eighteen percent 'mostly no' compared to an eighteen percent 'yes' response.
 - Group B contractors have a twenty-four percent 'no' and a thirty-six percent 'mostly no' compared to eleven percent 'yes' response.
 - Group C contractors and contractors 'with ISO9000' certification has a mode of 'mostly no'. Sixteen to thirteen percent 'yes', thirty-one to thirty percent 'mostly yes', thirty-eight to forty percent 'mostly no' and sixteen to seventeen percent 'no' response.

Q.3.4..What five, time-related, criterion are most important in your company for assessing the overall performance of several construction projects?

This question invites respondent to state, in order of importance, the five items of time information for summary into an overall view of performance. Table 5-7 states the level of response to this question.

	Pop. Sample	Max Response Possible	Actual Response	Response %
All Contractors	238	1190	606	51%
Group A Contractors	67	335	167	50%
Group B Contractors	72	360	166	46%
Group C Contractors	99	495	273	55%
Contractors with ISO9000	105	525	312	59%
Contractors w/o ISO9000	133	665	294	44%

Table 5-7 Level of response from HK contractors regarding time-related criteria for assessing the performance of several construction projects.

After the removal of unclear responses and semantic differences, 266 unique responses were listed. The ratio of the number of unique response to the actual number of responses is taken as a measure of the variability in the level of response received. In this case the variability is 44%. Forty-three response-keywords were derived from the two hundred and sixty-six unique responses. The dendrograph of response-keywords and their derivatives is in Section 5.9. A summary table of the

results of the frequency analysis is in Section 5.6. More than seventy percent of the response is within the fifteen most frequent keyword-responses. These responses are consistent across all six groupings of the contractor population sample. The weighted-frequency analysis causes a minor change to the order at the bottom-end of the fifteen most frequent responses. The significant keywords for each of the groups of Contractors in the population sample and their frequency order are listed on Table 5-8.

Keyword	Contractor Groups					
	All	GrpA	GrpB	GrpC	W ISO	W/oISO
Work-schedule	1	1	1	1	1	1
Percent progress	2	7	2	2	2	2
Progress	3	10	3	3	3	3
Progress vs schedule	4	3	4	4	4	4
<i>End-date issues</i>	5	2	13	6	6	6
Extension of time	6	9	12	5	5	11
Time management	7	4	15	11	9	7
<i>Approvals</i>	8	8		8	10	9
<i>Material issues</i>	9	5	7	15		5
<i>Delays</i>	10		9	12	12	10
<i>Replanned work</i>	11		6	9	8	15
<i>Site related issues</i>	12	6	11		15	8
Valuation	13	11		7	7	
Project data	14		5	10	11	13
<i>Labour issues</i>	15			14	14	
<i>Communications</i>		12				
Performance		13				
Duration		14				
Deliveries		15	14			12
<i>Management</i>			8			14
Variation			10			
Costs				13	13	

Table 5-8 Priority order of the fifteen most important time-related performance criteria used by HK contractors to assess several construction projects.

There is consistency in the top fifteen response-keywords but substitutions and changed order occurs in all groups.

- Group A contractors include in the fifteen most frequent list: ‘communication’, ‘performance’, ‘duration’, and ‘deliveries’, but omit: ‘delays’, ‘re-planned work’, ‘project data’ and ‘labour issues’.
- Group B contractors include in the fifteen most frequent list: ‘management’, ‘variation’ and ‘deliveries’, but omit: ‘approvals’, ‘valuation’ and ‘labour issues’.
- Group C contractors include ‘costs’ in the fifteen most frequent list but omit ‘site-related issues’.
- Contractors with ISO9000 include ‘costs’ in the fifteen most frequent list but omit ‘materials issues’.
- Contractors without ISO9000 include ‘deliveries’ and ‘management’ in the fifteen most frequent list but omit ‘valuation’ and ‘labour-issues’.

The measurement of the items listed in Table 5-8 are the most important elements of time-related data/information used by HK contractors to assess the overall performance of several projects.

Q.3.5 How does your company use information technology to combine together data/information relating to the cost aspects of your construction projects, to get an overview of performance?

Measures the frequency of technique for combining this information

- Use of individual review of cost aspects data to combine together a portfolio view of projects has a mode of 'yes', median of 'mostly yes' and mean on the positive side of 'mostly yes' overall, but the percent response varies within the sample sectors.
 - Group A contractors have a forty-six percent 'yes' and thirty-eight percent 'mostly yes' response.
 - Group B contractors have a thirty-five percent 'yes' and a forty-eight percent 'mostly yes' response.
 - Group C contractors and contractors 'with ISO9000' certification has a mode of 'yes', but a median of 'mostly yes' and a mean on the positive side of 'mostly yes'. Fifty-two to forty-seven percent 'yes', thirty-one to thirty-six percent 'mostly yes' response compared to three to four percent 'no'.
- Use of spreadsheets of numeric and date data of cost aspects data to combine together a portfolio view of projects has a mode of 'mostly yes' overall but the percent response varies within the sample sectors.
 - Group A contractors have a twenty-nine percent 'yes' and thirty-seven percent 'mostly yes' response.
 - Group B contractors have a twenty-nine percent 'yes' and a forty-five percent 'mostly yes' response.
 - Group C contractors and contractors 'with ISO9000' certification has a mode of 'mostly yes'. Forty to thirty-six percent 'yes', forty-two to forty-six percent 'mostly yes' response compared to eight to seven percent 'no'.
- Use of database of alpha-numeric data of cost aspects data to combine together a portfolio view of projects has a mode of 'mostly no' overall but the percent response varies within the sample sectors.
 - Group A contractors have a thirty-five percent 'no' and twenty-one percent 'mostly no' compared to a sixteen percent 'yes' response.
 - Group B contractors have a twenty-two percent 'no' and a thirty-six percent 'mostly no' compared to thirteen percent 'yes' response.
 - Group C contractors and contractors 'with ISO9000' certification has a mode of 'mostly no'. Twenty to sixteen percent 'yes', twenty-nine to thirty-two percent 'mostly yes', thirty-three to thirty-four percent 'mostly no' and eighteen to nineteen percent 'no' response.

Q.3.6 What cost-related, criterion are most important in your company for assessing the overall performance of several construction projects?

Invites respondent to state, in order of importance, the five items of cost information for summary into an overall view of performance. Table 5-9 states the level of response to this question.

	Pop. Sample	Max Response Possible	Actual Response	Response %
All Contractors	238	1190	645	54%
Group A Contractors	67	335	170	51%
Group B Contractors	72	360	182	46%
Group C Contractors	99	495	293	51%
Contractors with ISO9000	105	525	338	64%
Contractors w/o ISO9000	133	665	307	46%

Table 5-9 Level of response from HK contractors regarding cost-related criteria for assessing the performance of several construction projects.

After the removal of unclear responses and semantic differences, 247 unique responses were listed. The ratio of the number of unique response to the actual number of responses is taken as a measure of the variability in the level of response received. In this case the variability is 38%. Forty response-keywords were derived from the two hundred and forty-seven unique responses. The dendrogram of response-keywords is in Section 5.10. A summary table of the results of the frequency analysis is in Section 5.6. More than eighty-two percent of the response is within the fifteen most frequent keyword-responses. These responses are consistent across all six groupings of the contractor population sample. The weighted-frequency analysis causes a minor change to the order at the bottom-end of the fifteen most frequent responses. The significant keywords for each of the groups of Contractors in the population sample and their frequency order are on Table 5-10.

Keyword	Contractor Groups					
	All	GrpA	GrpB	GrpC	W ISO	W/oISO
Categories-of-value	1	1	1	1	1	1
Categories-of-cost	2	2	2	2	2	2
Payments	3	3	3	3	3	3
<i>Management</i>	4	4	5	5	6	4
Variation	5	8	4	7	4	6
<i>Cost management</i>	6	5	8	6	7	5
Cash flow	7	7		4	5	8
Material	8	6	11	10	12	7
Expenditure	9	11	6	9	9	9
Profit/loss	10	14		8	8	13
Budget	11	9	9	12	11	11
Subcontractor	12		7		13	10
Overhead	13	13	15	11	10	14
Labour	14	12	10		15	12
Work schedule	15	10				
Time		15				
<i>Resource</i>			12			15
<i>Site</i>			13			
Finance			14			
Claims				13	14	
<i>Quality</i>				14		
Safety				15		

Table 5-10 Priority order of the fifteen most important cost-related performance criteria used by HK contractors to assess several construction projects.

There is consistency in the top fifteen response-keywords but substitutions and changed order occurs in all groups.

- Group A contractors includes ‘time’ in the fifteen most frequent list but omits ‘subcontractor’.
- Group B contractors include in the fifteen most frequent list: ‘resource’, ‘site’, and ‘finance’, but omit : ‘cashflow’, ‘profit/loss’, and ‘work-schedule’.
- Group C contractors include in the fifteen most frequent list: ‘claims’, ‘quality’, and ‘safety, but omit ‘subcontractor’, ‘labour’ and ‘work-schedule’.
- Contractors with ISO9000 include ‘claims’ in the fifteen most frequent list but omit ‘work schedule’.
- Contractors without ISO9000 include ‘resources’ in the fifteen most frequent list but omit ‘work schedule’.

The measurement of the items listed in Table 5-10, are the most important elements of cost-related data/information used by HK contractors to assess the overall performance of several projects.

Q.3.7 How does your company use information technology to combine together data/information relating to the resource aspects of your construction projects, to get an overview of performance?

Measures the frequency of the fundamental methods of combining the resource information.

- Use of individual review of resource aspects data to combine together a portfolio view of projects has a mode and median of 'mostly yes' and mean on the positive side of 'mostly yes' overall, but the percent response varies within the sample sectors.
 - Group A contractors have a thirty-eight-six percent 'yes' and forty-two percent 'mostly yes' response.
 - Group B contractors have a thirty-four percent 'yes' and a forty-nine percent 'mostly yes' response.
 - Group C contractors and contractors 'with ISO9000' certification has a mode of 'yes', but a median of 'mostly yes' and a mean on the positive side of 'mostly yes'. Forty-six to forty-three percent 'yes', thirty-four to thirty-nine percent 'mostly yes' response compared to five to four percent 'no'.
- Use of spreadsheets of numeric and date data of resource aspects data to combine together a portfolio view of projects has a mode of 'mostly yes' overall but the percent response varies within the sample sectors.
 - Group A contractors have a twenty-five percent 'yes' and thirty-three percent 'mostly yes' response.
 - Group B contractors have a twenty-one percent 'yes' and a forty-eight percent 'mostly yes' response.
 - Group C contractors and contractors 'with ISO9000' certification has a mode of 'mostly yes'. Twenty-eight to twenty-four percent 'yes', forty-eight to fifty-three percent 'mostly yes' response compared to nine to seven percent 'no'.
- Use of database of alpha-numeric data of resource aspects data to combine together a portfolio view of projects has a mode of 'mostly yes', median of 'mostly no' and a mean on the positive side of 'mostly no' overall but the percent response varies within the sample sectors.
 - Group A contractors have a thirty-nine percent 'no' and nineteen percent 'mostly no' compared to a seventeen percent 'yes' response.
 - Group B contractors have a twenty-three percent 'no' and a thirty-four percent 'mostly no' compared to ten percent 'yes' response.
 - Group C contractors and contractors 'with ISO9000' certification has a mode of 'mostly yes' with a median of 'mostly no' and a mean on the positive side of 'mostly no'. Sixteen to twelve percent 'yes', thirty-two to thirty-five percent 'mostly yes', thirty-one to thirty-two percent 'mostly no' and twenty-one to twenty-two percent 'no' response.

Q.3.8 What five, resource-related, criterion are most important in your company for assessing the overall performance of several construction projects?

Invites respondent to state, in order of importance, the five items of resource information for summary into an overall view of performance. Table 5-11 states the level of response to this question.

	Pop. Sample	Max Response Possible	Actual Response	Response %
All Contractors	238	1190	620	52%
Group A Contractors	67	335	173	52%
Group B Contractors	72	360	166	46%
Group C Contractors	99	495	281	57%
Contractors with ISO9000	105	525	330	63%
Contractors w/o ISO9000	133	665	290	44%

Table 5-11 Level of response from HK contractors regarding resource-related criteria for assessing the performance of several construction projects.

After the removal of unclear responses and semantic differences, 230 unique responses were listed. The ratio of the number of unique response to the actual number of responses is taken as a measure of the variability in the level of response received. In this case the variability is 37%. Twenty-one response-keywords were derived from the two hundred and thirty unique responses. The dendrogram of response-keywords and their derivatives is in Section 5.11. A summary table of the results of the frequency analysis is in Section 5.6. More than eighty-two percent of the response is within the ten most frequent keyword-responses. These responses are consistent across all six groupings of the contractor population sample. The weighted-frequency analysis causes a minor change to the order at the bottom-end of the ten most frequent responses. The significant keywords for each of the groups of Contractors in the population sample and their frequency order are listed on Table 5-12.

Keyword	Contractor Groups					
	All	GrpA	GrpB	GrpC	W ISO	W/oISO
Manpower resources	1	1	1	1	1	1
Plant	2	2	2	2	2	2
Management resources	3	4	3	3	3	3
Material resources	4	3	5	4	4	4
Subcontractor	5	5	4	5	5	5
Cost of resources	6	7	6	7	6	6
Resources	7	9		6	7	9
Information	8	6	10			7
QS	9		9	8	8	
Production	10	8		9	10	10
Finance		10				
Work schedule			7			8
Reports			8			
Value				10	9	

Table 5-12 Priority order of the ten most important resource-related performance criteria used by HK contractors to assess several construction projects.

There is consistency in the top ten response-keywords but substitutions and changed order occurs in all groups.

- Group A contractors includes 'finance' in the ten most frequent list but omit 'QS'.
- Group B contractors include 'work schedule' and 'reports' in the ten most frequent list but omit: 'resources' and 'production'.
- Group C contractors include 'value' in the ten most frequent list but omit 'information'.
- Contractors with ISO9000 include 'value' in the ten most frequent list but omit 'information'.
- Contractors without ISO9000 include 'work schedule' in the ten most frequent list but omit 'QS'.

The measurement of the items listed in Table 5-12, are the most important elements of resource-related data/information used by HK contractors to assess the overall performance of several projects.

Questionnaire Part 4, Strategic use of information technology

Competition and business strategy

Q.4.1.1 Does IT support your core capabilities?

The response has a mode of 'IT offers some support to our capabilities', but the percent response varies within the sample sectors.

- Group A contractors: sixty-five percent respond that 'IT offers some support to our capabilities' and twenty-four percent 'IT is critical to our core capabilities'.
- Group B contractors: seventy-one percent respond that 'IT offers some support to our capabilities' and twenty-nine percent 'IT is critical to our core capabilities'.
- Group C contractors and contractors 'with ISO9000' certification: fifty-one to fifty-three percent respond that 'IT offers some support to our capabilities', thirty-two to thirty-three percent 'IT is critical to our core capabilities', and one to two percent say that 'our core capabilities are our IT systems'.

Q.4.1.2 How do you think IT could help you to compete?

The response mode is 'changing our competitive behaviour and supporting our capabilities'. The response is consistent within a range of 5% percent except for the Group A contractors sample sector.

- Group A contractors: forty percent respond that 'changing our competitive behaviour and supporting our capabilities', thirty-seven percent say the same plus '... enabling strategic alliances with others', and ten percent say all of this plus '... achieving an unassailable market position'.
- Group B contractors, Group C contractors and contractors 'with ISO9000' certification: fifty-one to fifty-five percent respond that 'changing our competitive behaviour and supporting our capabilities', thirty-three to thirty-two percent say

the same plus ‘. . .enabling strategic alliances with others’, and nine to eleven percent say all of this plus ‘. . . achieving an unassailable market position’.

Q.4.1.3 What is the impact of IT on your corporate goals and objectives?

The mode response is, ‘IT supports our corporate objectives through business efficiency and cost reduction’, but the percent response varies within the sample sectors.

- Group A contractors: forty-five percent respond that ‘IT has some positive impact’, forty-five percent say ‘IT supports our corporate objectives through business efficiency and cost reduction’, and five percent say that ‘IT is critical to business efficiency, financial gains, engineering excellence, R&D and innovation’.
- Group B contractors: thirty-nine percent respond that ‘IT has some positive impact’, fifty-three percent say ‘IT supports our corporate objectives through business efficiency and cost reduction’, and three percent say that ‘IT is critical to business efficiency, financial gains, engineering excellence, R&D and innovation’.
- Group C contractors and contractors ‘with ISO9000’ certification: thirty-two to thirty percent respond that ‘IT has some positive impact’, fifty-six to sixty percent say ‘IT supports our corporate objectives through business efficiency and cost reduction’, and eight percent say that ‘IT is critical to business efficiency, financial gains, engineering excellence, R&D and innovation’.

Q.4.1.4 With regard to IT, what is your position compared to your competitor?

The response mode is ‘the same level as other companies’. The response is consistent within a range of 5% percent except for the Group A contractor sample sector.

- Group A contractors: twenty-three percent say that they are ‘12 months behind others’, thirty-one say they are ‘6 months behind’, forty-four percent say they are at the ‘same level as others’, and three percent say that they are ‘ahead of the others’.
- Group B contractors, Group C contractors and contractors ‘with ISO9000’ certification: sixteen to eleven percent say that they are ‘12 months behind others’, twenty-three to twenty-one percent say they are ‘6 months behind’, fifty-six percent say they are at the ‘same level as others’, and five percent Group B, eleven percent Group A say that they are ‘ahead of the others’.

Q.4.1.5 What is the impact of your use of IT on your clients?

The response mode is ‘IT is good for presentation and communication to clients’. The response is mostly consistent within a range of 5% percent for a sample sector.

- Five to eleven percent say ‘IT does not have any impact’
- Twenty-three to thirty-two percent say ‘IT is important to some clients’
- Fifty-three to fifty-eight percent say ‘IT is good for presentation and communication to clients’
- Eight to twelve percent say ‘IT is essential for meeting clients requirements’.

Q.4.1.6 Do you think your company IT expertise will help it to win work?

The mode response is 'IT is good for presentation', but the percent response varies within the sample sectors.

- Group A contractors: nineteen percent respond that 'IT has no influence on winning work', fifty percent say 'IT is good for presentation', twenty-seven say that 'IT can be instrumental in winning work', and three percent say 'IT is critical to winning work'.
- Group B contractors: seventeen percent respond that 'IT has no influence on winning work', fifty-eight percent say 'IT is good for presentation', twenty percent say that 'IT can be instrumental in winning work', and five percent say 'IT is critical to winning work'.
- Group C contractors and contractors 'with ISO9000' certification: thirteen to ten percent respond that 'IT has no influence on winning work', forty-five to forty-seven percent say 'IT is good for presentation', thirty-two to thirty-three percent say that 'IT can be instrumental in winning work', and ten and nine percent say 'IT is critical to winning work'.

Q.4.1.7 How is IT used as a part of strategic/business alliances?

The response mode is 'business efficiency'. The response is mostly consistent within a range of 5% percent for all sample sectors.

- Two to six percent say 'spreading the costs and risks' although fifteen percent of Group A contractors have this response.
- Sixty-three to sixty-six percent say 'business efficiency'.
- Twenty-one to twenty-four percent say 'improving combined competitive behaviour' although thirty-one percent Group B contractors have this response.
- Five to eleven percent say 'to gain combined competitive behaviour', although two percent of Group B contractors have this response.

The role of IT

Q.4.2.1 How do you currently use IT in your company?

The mode response is 'we use IT but let the technology finds its own way within the organisation', but the percent response varies within the sample sectors.

- Group A contractors: twenty-six percent respond that 'IT is not seen as an important part of the business', fifty-two percent say 'we use IT but let the technology finds its own way within the organisation', eighteen percent say that 'we use IT after proven and satisfactory results from others . . .', and five percent say 'we pro-actively seek to use IT as part of a well thought through strategy. . .'.
- Group B contractors: eight percent respond that 'IT is not seen as an important part of the business', fifty-three percent say 'we use IT but let the technology finds its own way within the organisation', thirty-three percent say that 'we use IT after proven and satisfactory results from others . . .', and six percent say 'we pro-actively seek to use IT as part of a well thought through strategy. . .'.
- Group C contractors and contractors 'with ISO9000' certification: nine to five percent respond that 'IT is not seen as an important part of the business', forty-

eight to fifty-one percent say ‘we use IT but let the technology find its own way within the organisation’, thirty to thirty-two percent say that ‘we use IT after proven and satisfactory results from others . . .’, and thirteen and twelve percent say ‘we pro-actively seek to use IT as part of a well thought through strategy. . .’.

Q.4.2.2 How would you describe the relationship between IT and your business strategy?

The response mode is ‘IT is indirectly addressed through its supportive role’. The response is mostly consistent within a range of 8% percent for all sample sectors.

- Seven to eleven percent say ‘they are separate entities’, although eighteen percent of Group A contractors have this response.
- Sixty to sixty-seven percent say ‘IT is indirectly addressed through its supportive role’.
- Nineteen to twenty-seven percent say ‘IT plays a central role in our business strategy’.
- Three percent say ‘IT is a critical-success-factor for local and overseas business strategies’.

Q.4.2.3 What is the level of participation of your IT people in the development of your overall business strategy?

The mode response is ‘IT people simply informed of the business strategy’, but the percent response varies within the sample sectors.

- Group A contractors: thirty-seven percent respond that ‘no participation’, fifty-three percent say ‘IT people simply informed of the business strategy’, ten percent say ‘Main Board IT Director responds to business strategy proposals’, and three percent say ‘say ‘Main Board IT Director has part of the responsibility to suggest new business strategies.’
- Group B contractors: thirty percent respond that ‘no participation’, fifty-eight percent say ‘IT people simply informed of the business strategy’, thirteen percent say ‘Main Board IT Director responds to business strategy proposals’, and zero percent say ‘say ‘Main Board IT Director has part of the responsibility to suggest new business strategies.’
- Group C contractors and contractors ‘with ISO9000’ certification: twenty-seven and twenty-four percent respond that ‘no participation’, sixty and sixty-three percent say ‘IT people simply informed of the business strategy’, eleven and ten percent say ‘Main Board IT Director responds to business strategy proposals’, and two percent say ‘say ‘Main Board IT Director has part of the responsibility to suggest new business strategies.’

Q.4.2.4 Does IT have an impact on your operational strategy?

The response mode is ‘IT helps to reduce costs through speed and efficiency’. The response is mostly consistent within a range of 8% percent for all sample sectors.

- Twenty to twenty-seven percent say ‘IT supports operational strategy’.
- Forty-seven to fifty-three percent say ‘IT helps to reduce costs through speed and efficiency’.

- Twenty-one to thirty percent say 'IT assists us to improve quality to meet client's requirements within budget'.
- Zero to four percent say 'IT enables us to provide products and services that are better than anyone else'.

Q.4.2.5 Does IT have any influence on the delivery of your marketing?

The mode response is 'IT has some impact on marketing strategy', but the percent response varies within the sample sectors.

- Group A contractors: forty-two percent respond that 'IT has nothing to do with our marketing strategy', forty-four percent say 'IT has some impact . . .', thirteen percent say 'IT is important to the success of marketing strategy', and two percent say 'IT is critical to our marketing strategy'.
- Group B contractors: twenty-three percent respond that 'IT has nothing to do with our marketing strategy', fifty-nine percent say 'IT has some impact . . .', seventeen percent say 'IT is important to the success of marketing strategy', and zero percent say 'IT is critical to our marketing strategy'.
- Group C contractors and contractors 'with ISO9000' certification: nineteen and fifteen percent respond that 'IT has nothing to do with our marketing strategy', fifty-six and sixty-three percent say 'IT has some impact . . .', twenty-three and twenty-one percent say 'IT is important to the success of marketing strategy', and two to one percent say 'IT is critical to our marketing strategy'.

IT strategy

Q.4.3.1 How would you describe the use of IT systems in your company?

The mode response is 'mainly functional applications with some integrated systems', but the percent response varies within the sample sectors.

- Group A contractors: forty-five percent respond that 'mainly functional applications', forty percent say 'mainly functional applications with some integrated systems', eight percent say 'mainly integrated systems', and six percent say 'process support tools with full information sharing'.
- Group B contractors: thirty-six percent respond that 'mainly functional applications', fifty-six percent say 'mainly functional applications with some integrated systems', six percent say 'mainly integrated systems', and two percent say 'process support tools with full information sharing'.
- Group C contractors and contractors 'with ISO9000' certification: thirty-nine to thirty five percent respond that 'mainly functional applications', forty-two to forty-eight percent say 'mainly functional applications with some integrated systems', thirteen and twelve percent say 'mainly integrated systems', and four to five percent say 'process support tools with full information sharing'.

Q.4.3.2 What are the objectives of your IT strategy?

The mode response is 'business efficiency, improving quality and improving communications with internal and external stakeholders' but the percent response varies within the sample sectors.

- Group A contractors: thirty-five percent respond 'business efficiency', forty-seven percent say 'business efficiency, improving quality and improving

communications with internal and external stakeholders’, fifteen percent say ‘providing support for business strategy’, and three percent say ‘delivery of business strategy’.

- Group B contractors: thirty-three percent respond ‘business efficiency’, forty-one percent say ‘business efficiency, improving quality and improving communications with internal and external stakeholders’, twenty-three percent say ‘providing support for business strategy’, and three percent say ‘delivery of business strategy’.
- Group C contractors and contractors ‘with ISO9000’ certification: thirty-two and twenty-nine percent respond ‘business efficiency’, thirty-eight to forty-two percent say ‘business efficiency, improving quality and improving communications with internal and external stakeholders’, thirty-one to twenty-nine percent say ‘providing support for business strategy’, and zero percent say ‘delivery of business strategy’.

Q.4.3.3 What is the thrust of your IT strategy?

The mode response is ‘competent IT skill level within the company and required IT facilities’ but the percent response varies within the sample sectors.

- Group A contractors: thirty-nine percent respond ‘up-to-date IT facilities’, thirty percent say ‘competent IT skill level within the company and required IT facilities’, twenty-eight percent say ‘support for business strategy and user participation and empowerment’, and three percent say ‘exploiting IT for competitive advantage’.
- Group B contractors: thirty-three percent respond ‘up-to-date IT facilities’, forty-four percent say ‘competent IT skill level within the company and required IT facilities’, nineteen percent say ‘support for business strategy and user participation and empowerment’, and three percent say ‘exploiting IT for competitive advantage’.
- Group C contractors and contractors ‘with ISO9000’ certification: twenty-eight to twenty-four percent respond ‘up-to-date IT facilities’, forty to forty-six percent say ‘competent IT skill level within the company and required IT facilities’, twenty-two and twenty-one percent say ‘support for business strategy and user participation and empowerment’, and nine to eight percent say ‘exploiting IT for competitive advantage’.

Q.4.3.4 How do you intend to manage IT in the future?

The mode response is ‘to do much the same as other companies at about the same time as them’ but the percent response varies within the sample sectors.

- Group A contractors: twenty-nine percent respond ‘follow other companies after assessing their experience’, thirty-nine percent say ‘to experiment and develop the technology’, twenty-nine percent say ‘support for business strategy and user participation and empowerment’, and three percent say ‘to have advanced technology developed as a key part of the business’.
- Group B contractors: thirty-one percent respond ‘follow other companies after assessing their experience’, forty-two percent say ‘to experiment and develop the technology’, twenty percent say ‘support for business strategy and user

participation and empowerment', and six percent say 'to have advanced technology developed as a key part of the business'.

- Group C contractors and contractors 'with ISO9000' certification: nineteen to seventeen percent respond 'follow other companies after assessing their experience', forty-two percent say 'to experiment and develop the technology', thirty to thirty-two percent say 'support for business strategy and user participation and empowerment', and nine and eight percent say 'to have advanced technology developed as a key part of the business'.

Q.4.3.5 What are the critical success factors for sustainable competitive advantage achieved through IT in your company?

The mode response is 'acquisition of the right technology' but the percent response varies within the sample sectors.

- Group A contractors: thirty-four percent respond 'we do not seek a sustainable competitive advantage through IT', forty-four percent say 'acquisition of the right technology', fifteen percent say 'to use the strategic and innovative IT opportunities that arise', and eight percent say 'continuous R&D programmes and seeking innovative solutions to construction problems'.
- Group B contractors: fourteen percent respond 'we do not seek a sustainable competitive advantage through IT', sixty-four percent say 'acquisition of the right technology', twenty percent say 'to use the strategic and innovative IT opportunities that arise', and two percent say 'continuous R&D programmes and seeking innovative solutions to construction problems'.
- Group C contractors and contractors 'with ISO9000' certification: thirteen and twelve percent respond 'we do not seek a sustainable competitive advantage through IT', fifty-three to fifty-seven percent say 'acquisition of the right technology', twenty-four to twenty-two percent say 'to use the strategic and innovative IT opportunities that arise', and nine percent say 'continuous R&D programmes and seeking innovative solutions to construction problems'.

Q.4.3.6 How do you intend to manage IT projects and innovations?

The mode response is 'outsourcing' for the overall sample, but the mode and percent response varies within the sample sectors.

- Group A contractors has a forty-five percent response and a mode of 'we are not concerned with IT innovation'. Thirty-five percent say 'outsourcing', sixteen percent say 'IT professionals and external facilitators', and three percent say 'IT professionals, appropriate management, user group committees, strategic alliances, internal and external facilitators'.
- Group B contractors has a mode of 'outsourcing'. Twenty percent say 'of 'we are not concerned with IT innovation', fifty-two percent respond 'outsourcing', twenty-five percent say 'IT professionals and external facilitators', and three percent say 'IT professionals, appropriate management, user group committees, strategic alliances, internal and external facilitators'.
- Group C contractors and contractors 'with ISO9000' certification have a mode of 'IT professionals and external facilitators'. Nineteen and eighteen percent say 'we are not concerned with IT innovation', thirty-one to thirty-two percent respond

‘outsourcing’, thirty-seven to thirty-nine percent say ‘IT professionals and external facilitators’, and thirteen to ten percent say IT professionals, appropriate management, user group committees, strategic alliances, internal and external facilitators’.

Q.4.3.7 What is the level of R&D regarding IT in your company?

The mode response is ‘no interest’, but the percent response varies within the sample sectors.

- Group A contractors: fifty-eight percent ‘no interest’, twenty-five percent say ‘planned R&D’, ten percent state ‘R&D aimed at new future markets’, and seven percent ‘R&D focus aimed at new future markets, and the achievement of a sustainable competitive advantage’.
- Group B contractors: fifty-two percent say ‘no interest’, thirty-six percent say ‘planned R&D’, eleven percent state ‘R&D aimed at new future markets’, and two percent respond ‘R&D focus aimed at new future markets, and the achievement of a sustainable competitive advantage’.
- Group C contractors and contractors ‘with ISO9000’ certification: forty-four and forty-three percent say ‘no interest’, thirty-two and thirty-six percent say ‘planned R&D’, fourteen and thirteen percent state ‘R&D aimed at new future markets’, seven and six percent respond, ‘R&D focus aimed at new future markets, and the achievement of a sustainable competitive advantage’.

Q.4.3.8 What is the nature of your IT department?

The mode response is ‘small technical providing group technical services’. The response is consistent with eighty-two percent overall stating this response. Twenty-two percent of Group contractors say a ‘large technical group providing technical services’.

Q.4.3.9 How much importance do you attach to IT skills within your company?

The mode response is ‘provide IT training when required’, but the percent response varies within the sample sectors.

- Group A contractors: forty percent ‘low cost IT training initiatives’, forty-eight percent say ‘provide IT training when required’, eight percent state ‘seeking and upgrading the quality of IT training in our company’, and three percent ‘develop intensive education and training programme for all IT users including senior management’.
- Group B contractors: thirty percent ‘low cost IT training initiatives’, sixty percent say ‘provide IT training when required’, ten percent state ‘seeking and upgrading the quality of IT training in our company’, and zero percent ‘develop intensive education and training programme for all IT users including senior management’.
- Group C contractors and contractors ‘with ISO9000’ certification: twenty-six and thirty-one percent ‘low cost IT training initiatives’, forty-four and forty-two percent say ‘provide IT training when required’, twenty-four and twenty-one percent state ‘seeking and upgrading the quality of IT training in our company’, and seven and six percent ‘develop intensive education and training programme for all IT users including senior management’.

Q.4.3.10 Who is aware of your IT strategy?

The response mode is 'business managers'. The response is mostly consistent within a range of 10% percent for all sample sectors.

- Twenty-five to thirty-four percent say 'technical staff'.
- Twenty-two to twenty-eight percent say 'IT professionals and users'.
- Twenty-four to thirty-five percent say 'business managers'.
- Eleven to eighteen percent say 'all key internal and external personnel'.

Q.4.3.11 What is the extent and nature on involvement of IT users in the development and implementation of your IT?

The mode response is IT users are 'involved when required', but the percent response varies within the sample sectors.

- Group A contractors: twenty-three percent 'no user involvement', sixty-eight percent say 'involved when required', six percent state 'involved at the early stages', and three percent 'involved throughout the whole process'.
- Group B contractors: six percent say 'no user involvement', eighty percent say 'involved when required', six percent state 'involved at the early stages', and eight percent 'involved throughout the whole process'.
- Group C contractors and contractors 'with ISO9000' certification: twelve percent 'no user involvement', sixty-seven and seventy percent say 'involved when required', eleven percent state 'involved at the early stages', and nine and six percent 'involved throughout the whole process'.

Q.4.3.12 What do you consider to be the risks associated with the implementation of your IT strategy?

The response mode is 'technological risk'. The response is consistent within a range of 10% percent except for the Group A contractor sample sector.

- Group A contractors: forty-eight percent say 'financial risks', forty-four say they are 'technological risks', five percent say 'business and environment risks', and three percent say 'strategic risks'.
- Group B contractors, Group C contractors and contractors 'with ISO9000' certification: thirty-two to thirty-seven percent say 'financial risks', thirty-two to thirty-eight percent say they are 'technological risks', twenty-one to twenty-seven percent say 'business and environment risks', and five to six percent say 'strategic risks'.

Q.4.3.13 How often do you review your IT strategy?

The mode response is 'every year' for the sample overall and the Group A and B contractors sample sectors. For Group C and those with ISO9000 certification the mode is 'reviewed continuously'. The percent response varies within the sample sectors.

- Group A contractors: twenty-five percent say 'every five years', thirty percent say 'every three years', thirty-two percent state 'every year', and thirteen percent say 'reviewed continuously'.

- Group B contractors: ten percent say ‘every five years’, twenty-eight percent say ‘every three years’, thirty-three percent state ‘every year’, and thirty percent say ‘reviewed continuously’.
- Group C contractors and contractors ‘with ISO9000’ certification: fifteen and eleven percent say ‘every five years’, fourteen to fifteen percent say ‘every three years’, thirty-four and thirty-five percent state ‘every year’, and thirty-eight and thirty-nine percent say ‘reviewed continuously’.

Q.4.3.14 How do you measure the IT performance of your company?

The response mode is ‘cost-reducing aspects of the IT’. The response is mostly consistent within a range of 10% percent for all sample sectors.

- Eleven to twenty-three percent say ‘short-term payback’.
- Forty-eight to fifty-seven percent say ‘cost-reducing aspects of the IT’.
- Twenty-two to twenty-seven percent say ‘value-adding properties of IT’.
- Five to ten percent say ‘strategic opportunities provided by the IT’.

Q.4.3.15 What are the characteristics of your IT strategy?

The mode response is ‘IT is driven from the bottom-up’ for all the sample sectors except for the Group A contractor sample sector, which has a mode of ‘financial issues dominate IT’. The percent response varies within the sample sectors.

- Group A contractors: thirty-two percent say ‘financial issues dominate IT’, fifteen percent say ‘IT is driven from the bottom-up’, twenty-nine percent state ‘IT is driven by middle-managers’, and twenty-four percent say ‘IT is managed from the top’.
- Group B contractors: twenty-three percent say ‘financial issues dominate IT’, twenty-six percent say ‘IT is driven from the bottom-up’, twenty-seven percent state ‘IT is driven by middle-managers’, and twenty-four percent say ‘IT is managed from the top’.
- Group C contractors and contractors ‘with ISO9000’ certification: seventeen and sixteen percent say ‘financial issues dominate IT’, fifteen and thirteen percent say ‘IT is driven from the bottom-up’, thirty-eight and forty-four percent state ‘IT is driven by middle-managers’, and twenty-nine and twenty-seven percent say ‘IT is managed from the top’.

Q.4.3.16 Who are the champions for IT projects in your company?

The mode response for the overall sample is ‘senior management’ but the median and the mean are ‘functional managers’. The percent response varies within the sample sectors.

- Group A contractors has a mode of ‘technical staff’, and a mean and median of ‘functional managers: thirty-six percent say ‘technical staff’, twenty-six percent say ‘functional managers’, five percent state ‘IT Director’, and thirty-three percent say ‘senior management’.
- Group B contractors has a mode of ‘senior management’, and a mean and median of ‘functional managers: twenty-seven percent say ‘technical staff’, twenty-nine percent say ‘functional managers’, five percent state ‘IT Director’, and thirty-nine percent say ‘senior management’.

- Group C contractors and contractors 'with ISO9000' have a mode, mean and median of 'functional managers': twenty-five and twenty-six percent say 'technical staff', thirty-four and thirty-six percent say 'functional managers', eight and six percent state 'IT Director', and thirty-three and thirty-two percent say 'senior management'.

5.5 Summary tabulated statistical attributes of the analysis in terms of strata of the population sample – tick-it questions – taken from ‘Appendices-datafile.xls’.

Please refer to the following pages.

**Summary of the tabulated statistical attributes of the analysis
in terms of strata of the population sample
from the 'tick-it' questions of the postal survey of Hong Kong contractor firms**

Part	Part 1 Use of IT to assist project communication																
Topic	Telephone communication																
Subject	Managers access to telephones																
Q.1.1.1.a	Response										Distribution Statistics						
Sample Sector	Nos	% o/a	No '4'	% '4'	No '3'	% '3'	No '2'	% '2'	No '1'	% '1'	H	L	Median	Mode	Mean	SD	Corr
All	238	75%	221	93%	15	6%	1	0%	1	0%	4	1	4	4	3.92	0.33	0.02
Group A	68	22%	60	88%	7	10%	0	0%	1	1%	4	1	4	4	3.85	0.47	0.07
Group B	72	23%	68	94%	4	6%	0	0%	0	0%	4	3	4	4	3.94	0.23	-0
Group C	99	31%	94	95%	4	4%	1	1%	0	0%	4	2	4	4	3.94	0.28	0.01
With ISO9000	105	33%	98	93%	6	6%	1	1%	0	0%	4	2	4	4	3.92	0.30	0.03
Without ISO9000	134	42%	124	93%	9	7%	0	0%	1	1%	4	1	4	4	3.91	0.36	0.03
Grp A w ISO9000	3	1%	3	100%	0	0%	0	0%	0	0%	4	4	4	4	4.00	0.00	nil
Grp A w/o ISO9000	68	22%	60	88%	7	10%	0	0%	1	1%	4	1	4	4	3.85	0.47	0.07
Grp B w ISO9000	15	5%	13	87%	2	13%	0	0%	0	0%	4	3	4	4	3.87	0.35	0.32
Grp B w/o ISO9000	57	18%	55	96%	2	4%	0	0%	0	0%	4	3	4	4	3.96	0.19	-0.1
Grp C w ISO9000	87	28%	82	94%	4	5%	1	1%	0	0%	4	2	4	4	3.93	0.30	0.02
Grp C w/o ISO9000	12	4%	12	100%	0	0%	0	0%	0	0%	4	4	4	4	4.00	0.00	nil

Part	Part 1 Use of IT to assist project communication																
Topic	Telephone communication																
Subject	Professionals access to telephones																
Q.1.1.1.b	Response										Distribution Statistics						
Sample Sector	Nos	% o/a	No '4'	% '4'	No '3'	% '3'	No '2'	% '2'	No '1'	% '1'	H	L	Median	Mode	Mean	SD	Corr
All	235	74%	210	89%	22	9%	1	0%	2	1%	4	1	4	4	3.87	0.41	0.03
Group A	68	22%	58	85%	9	13%	0	0%	1	1%	4	1	4	4	3.82	0.49	0.11
Group B	71	22%	65	92%	6	8%	0	0%	0	0%	4	3	4	4	3.92	0.28	-0
Group C	97	31%	87	90%	8	8%	1	1%	1	1%	4	1	4	4	3.87	0.45	0.05
With ISO9000	104	33%	91	88%	11	11%	1	1%	1	1%	4	1	4	4	3.85	0.46	0.06
Without ISO9000	132	42%	119	90%	12	9%	0	0%	1	1%	4	1	4	4	3.89	0.38	0.04
Grp A w ISO9000	3	1%	3	100%	0	0%	0	0%	0	0%	4	4	4	4	4.00	0.00	nil
Grp A w/o ISO9000	68	22%	58	85%	9	13%	0	0%	1	1%	4	1	4	4	3.82	0.49	0.11
Grp B w ISO9000	15	5%	13	87%	2	13%	0	0%	0	0%	4	3	4	4	3.87	0.35	0.32
Grp B w/o ISO9000	57	18%	55	96%	2	4%	0	0%	0	0%	4	3	4	4	3.96	0.19	-0.1
Grp C w ISO9000	86	27%	76	88%	8	9%	1	1%	1	1%	4	1	4	4	3.85	0.47	0.06
Grp C w/o ISO9000	11	3%	11	100%	0	0%	0	0%	0	0%	4	4	4	4	4.00	0.00	nil

Results of the 1998 postal survey of Hong Kong Public Works Contractors.

Part	Part 1 Use of IT to assist project communication																
Q.1.1.1.c	Telephone communication																
Subject	Supervisory staff access to telephones																
	Response										Distribution Statistics						
Sample Sector	Nos	% o/a	No '4'	% '4'	No '3'	% '3'	No '2'	% '2'	No '1'	% '1'	H	L	Median	Mode	Mean	SD	Corr
All	236	75%	152	64%	77	33%	5	2%	2	1%	4	1	4	4	3.61	0.58	-0
Group A	68	22%	50	74%	15	22%	1	1%	2	3%	4	1	4	4	3.66	0.66	-0.1
Group B	71	22%	46	65%	24	34%	1	1%	0	0%	4	2	4	4	3.63	0.51	-0
Group C	98	31%	57	58%	38	39%	3	3%	0	0%	4	2	4	4	3.55	0.56	-0
With ISO9000	105	33%	60	57%	41	39%	4	4%	0	0%	4	2	4	4	3.53	0.57	-0
Without ISO9000	132	42%	93	70%	36	27%	1	1%	2	2%	4	1	4	4	3.67	0.58	-0.1
Grp A w ISO9000	3	1%	2	67%	0	0%	1	33%	0	0%	4	2	4	4	3.33	1.15	-0.7
Grp A w/o ISO9000	68	22%	50	74%	15	22%	1	1%	2	3%	4	1	4	4	3.66	0.66	-0.1
Grp B w ISO9000	15	5%	12	80%	3	20%	0	0%	0	0%	4	3	4	4	3.80	0.41	0.18
Grp B w/o ISO9000	56	18%	38	68%	17	30%	1	2%	0	0%	4	2	4	4	3.66	0.51	-0.1
Grp C w ISO9000	87	28%	50	57%	34	39%	3	3%	0	0%	4	2	4	4	3.54	0.57	-0
Grp C w/o ISO9000	11	3%	7	64%	4	36%	0	0%	0	0%	4	3	4	4	3.64	0.50	-0.4

Part	Part 1 Use of IT to assist project communication																
Topic	Telephone communication																
Subject	Labour access to telephones																
Q.1.1.1.d	Response										Distribution Statistics						
Sample Sector	Nos	% o/a	No '4'	% '4'	No '3'	% '3'	No '2'	% '2'	No '1'	% '1'	H	L	Median	Mode	Mean	SD	Corr
All	234	74%	20	9%	54	23%	78	33%	82	35%	4	1	2	1	2.05	0.96	-0
Group A	67	21%	5	7%	17	25%	13	19%	32	48%	4	1	2	1	1.93	1.02	-0.1
Group B	71	22%	6	8%	14	20%	27	38%	24	34%	4	1	2	2	2.03	0.94	-0
Group C	97	31%	9	9%	23	24%	38	39%	27	28%	4	1	2	2	2.14	0.94	-0.1
With ISO9000	103	33%	9	9%	26	25%	39	38%	29	28%	4	1	2	2	2.15	0.93	-0.1
Without ISO9000	132	42%	11	8%	28	21%	39	30%	54	41%	4	1	2	1	1.97	0.98	-0
Grp A w ISO9000	3	1%	0	0%	2	67%	0	0%	1	33%	3	1	3	3	2.33	1.15	-0.7
Grp A w/o ISO9000	67	21%	5	7%	17	25%	13	19%	32	48%	4	1	2	1	1.93	1.02	-0.1
Grp B w ISO9000	15	5%	8	53%	7	47%	0	0%	0	0%	4	3	4	4	3.53	0.52	0.34
Grp B w/o ISO9000	56	18%	4	7%	11	20%	20	36%	21	38%	4	1	2	1	1.96	0.93	-0.1
Grp C w ISO9000	85	27%	7	8%	21	25%	32	38%	25	29%	4	1	2	2	2.12	0.93	-0.1
Grp C w/o ISO9000	12	4%	2	17%	2	17%	6	50%	2	17%	4	1	2	2	2.33	0.98	-0

Results of the 1998 postal survey of Hong Kong Public Works Contractors.

Part	Part 1 Use of IT to assist project communication																
Topic	Telephone communication																
Subject	Use of public telephone services																
Q.1.1.2.a	Response										Distribution Statistics						
Sample Sector	Nos	% o/a	No '4'	% '4'	No '3'	% '3'	No '2'	% '2'	No '1'	% '1'	H	L	Median	Mode	Mean	SD	Corr
All	222	70%	164	74%	2	1%	22	10%	34	15%	4	1	4	4	3.33	1.16	0.1
Group A	65	21%	43	66%	0	0%	11	17%	11	17%	4	1	4	4	3.15	1.23	0.11
Group B	65	21%	50	77%	1	2%	4	6%	10	15%	4	1	4	4	3.40	1.14	-0
Group C	93	29%	72	77%	1	1%	7	8%	13	14%	4	1	4	4	3.42	1.12	0.13
With ISO9000	98	31%	78	80%	1	1%	8	8%	11	11%	4	1	4	4	3.49	1.05	0.12
Without ISO9000	125	40%	87	70%	1	1%	14	11%	23	18%	4	1	4	4	3.22	1.23	0.04
Grp A w ISO9000	3	1%	3	100%	0	0%	0	0%	0	0%	4	4	4	4	4.00	0.00	nil
Grp A w/o ISO9000	65	21%	43	66%	0	0%	11	17%	11	17%	4	1	4	4	3.15	1.23	0.11
Grp B w ISO9000	15	5%	2	13%	3	20%	7	47%	3	20%	4	1	2	2	2.27	0.96	0.13
Grp B w/o ISO9000	52	16%	39	75%	1	2%	2	4%	10	19%	4	1	4	4	3.33	1.22	-0
Grp C w ISO9000	82	26%	64	78%	1	1%	6	7%	11	13%	4	1	4	4	3.44	1.10	0.14
Grp C w/o ISO9000	11	3%	8	73%	0	0%	1	9%	2	18%	4	1	4	4	3.27	1.27	0.17

Part	Part 1 Use of IT to assist project communication																
Topic	Telephone communication																
Subject	Use of telephone leased line services																
Q.1.1.2.b	Response										Distribution Statistics						
Sample Sector	Nos	% o/a	No '4'	% '4'	No '3'	% '3'	No '2'	% '2'	No '1'	% '1'	H	L	Median	Mode	Mean	SD	Corr
All	221	70%	109	49%	1	0%	40	18%	71	32%	4	1	2	4	2.67	1.36	-0
Group A	65	21%	38	58%	0	0%	10	15%	17	26%	4	1	4	4	2.91	1.34	-0.3
Group B	63	20%	29	46%	0	0%	10	16%	24	38%	4	1	2	4	2.54	1.40	0.17
Group C	94	30%	42	45%	1	1%	20	21%	31	33%	4	1	2	4	2.57	1.35	-0.1
With ISO9000	100	32%	43	43%	1	1%	23	23%	33	33%	4	1	2	4	2.54	1.34	-0
Without ISO9000	122	39%	66	54%	0	0%	17	14%	39	32%	4	1	4	4	2.76	1.39	-0
Grp A w ISO9000	2	1%	0	0%	0	0%	0	0%	2	100%	1	1	1	1	1.00	0.00	nil
Grp A w/o ISO9000	65	21%	38	58%	0	0%	10	15%	17	26%	4	1	4	4	2.91	1.34	-0.3
Grp B w ISO9000	13	4%	11	85%	0	0%	2	15%	0	0%	4	2	4	4	3.69	0.75	-0.2
Grp B w/o ISO9000	49	16%	23	47%	0	0%	6	12%	20	41%	4	1	2	4	2.53	1.43	0.16
Grp C w ISO9000	84	27%	37	44%	1	1%	19	23%	27	32%	4	1	2	4	2.57	1.34	-0.1
Grp C w/o ISO9000	10	3%	5	50%	0	0%	1	10%	4	40%	4	1	3	4	2.60	1.51	-0.1

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Part	Part 1 Use of IT to assist project communication																
Topic	Telephone communication																
Subject	Use of radio telephone services																
Q.1.1.2.c	Response										Distribution Statistics						
Sample Sector	Nos	% o/a	No '4'	% '4'	No '3'	% '3'	No '2'	% '2'	No '1'	% '1'	H	L	Median	Mode	Mean	SD	Corr
All	217	69%	48	22%	1	0%	60	28%	108	50%	4	1	2	1	1.95	1.18	0.16
Group A	67	21%	14	21%	0	0%	17	25%	36	54%	4	1	1	1	1.88	1.17	0.11
Group B	61	19%	17	28%	0	0%	18	30%	26	43%	4	1	2	1	2.13	1.24	0.02
Group C	90	28%	17	19%	1	1%	25	28%	47	52%	4	1	1	1	1.87	1.13	0.29
With ISO9000	95	30%	20	21%	1	1%	28	29%	46	48%	4	1	2	1	1.95	1.16	0.26
Without ISO9000	123	39%	28	23%	0	0%	32	26%	63	51%	4	1	1	1	1.94	1.20	0
Grp A w ISO9000	2	1%	1	50%	0	0%	0	0%	1	50%	4	1	2.5	nil	2.50	2.12	1
Grp A w/o ISO9000	67	21%	14	21%	0	0%	17	25%	36	54%	4	1	1	1	1.88	1.17	0.11
Grp B w ISO9000	14	4%	6	43%	0	0%	4	29%	4	29%	4	1	2	4	2.57	1.34	0.18
Grp B w/o ISO9000	48	15%	14	29%	0	0%	13	27%	21	44%	4	1	2	1	2.15	1.27	0.04
Grp C w ISO9000	80	25%	16	20%	1	1%	23	29%	40	50%	4	1	1.5	1	1.91	1.15	0.29
Grp C w/o ISO9000	10	3%	1	10%	0	0%	2	20%	7	70%	4	1	1	1	1.50	0.97	-0.1

Part	Part 1 Use of IT to assist project communication																
Topic	Telephone communication																
Subject	Provide/use mobile telephones by managerial staff																
Q.1.1.3.a	Response										Distribution Statistics						
Sample Sector	Nos	% o/a	No '4'	% '4'	No '3'	% '3'	No '2'	% '2'	No '1'	% '1'	H	L	Median	Mode	Mean	SD	Corr
All	236	75%	178	75%	47	20%	6	3%	5	2%	4	1	4	4	3.69	0.63	-0
Group A	68	22%	59	87%	7	10%	0	0%	2	3%	4	1	4	4	3.81	0.58	0.08
Group B	71	22%	51	72%	17	24%	2	3%	1	1%	4	1	4	4	3.66	0.61	-0.2
Group C	98	31%	69	70%	23	23%	4	4%	2	2%	4	1	4	4	3.62	0.67	-0
With ISO9000	105	33%	73	70%	29	28%	2	2%	1	1%	4	1	4	4	3.66	0.57	0
Without ISO9000	132	42%	106	80%	18	14%	4	3%	4	3%	4	1	4	4	3.71	0.67	-0.3
Grp A w ISO9000	3	1%	2	67%	1	33%	0	0%	0	0%	4	3	4	4	3.67	0.58	-0.7
Grp A w/o ISO9000	68	22%	59	87%	7	10%	0	0%	2	3%	4	1	4	4	3.81	0.58	0.08
Grp B w ISO9000	13	4%	3	23%	0	0%	5	38%	5	38%	4	1	2	1	2.08	1.19	-0
Grp B w/o ISO9000	56	18%	42	75%	11	20%	2	4%	1	2%	4	1	4	4	3.68	0.64	-0.3
Grp C w ISO9000	87	28%	62	71%	22	25%	2	2%	1	1%	4	1	4	4	3.67	0.58	-0
Grp C w/o ISO9000	11	3%	7	64%	1	9%	2	18%	1	9%	4	1	4	4	3.27	1.10	-0.4

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Part	Part 1 Use of IT to assist project communication																
Topic	Telephone communication																
Subject	Provide/use mobile telephones by professional staff																
Q.1.1.3.b	Response										Distribution Statistics						
Sample Sector	Nos	% o/a	No '4'	% '4'	No '3'	% '3'	No '2'	% '2'	No '1'	% '1'	H	L	Median	Mode	Mean	SD	Corr
All	236	75%	133	56%	72	31%	16	7%	15	6%	4	1	4	4	3.37	0.87	-0.2
Group A	68	22%	48	71%	16	24%	0	0%	4	6%	4	1	4	4	3.59	0.78	-0
Group B	71	22%	47	66%	20	28%	2	3%	2	3%	4	1	4	4	3.58	0.69	-0.2
Group C	98	31%	38	39%	37	38%	14	14%	9	9%	4	1	3	4	3.06	0.95	-0.1
With ISO9000	105	33%	45	43%	42	40%	11	10%	7	7%	4	1	3	4	3.19	0.88	-0.2
Without ISO9000	132	42%	88	67%	31	23%	5	4%	8	6%	4	1	4	4	3.51	0.83	-0.2
Grp A w ISO9000	3	1%	1	33%	2	67%	0	0%	0	0%	4	3	3	3	3.33	0.58	0.21
Grp A w/o ISO9000	68	22%	48	71%	16	24%	0	0%	4	6%	4	1	4	4	3.59	0.78	-0
Grp B w ISO9000	15	5%	9	60%	6	40%	0	0%	0	0%	4	3	4	4	3.60	0.51	0.18
Grp B w/o ISO9000	56	18%	38	68%	14	25%	2	4%	2	4%	4	1	4	4	3.57	0.74	-0.2
Grp C w ISO9000	87	28%	35	40%	34	39%	11	13%	7	8%	4	1	3	4	3.11	0.92	-0.2
Grp C w/o ISO9000	11	3%	3	27%	3	27%	3	27%	2	18%	4	1	3	3	2.64	1.12	-0.1

Part	Part 1 Use of IT to assist project communication																
Topic	Telephone communication																
Subject	Provide/use mobile telephones by supervisory staff																
Q.1.1.3.c	Response										Distribution Statistics						
Sample Sector	Nos	% o/a	No '4'	% '4'	No '3'	% '3'	No '2'	% '2'	No '1'	% '1'	H	L	Median	Mode	Mean	SD	Corr
All	236	75%	82	35%	90	38%	40	17%	24	10%	4	1	3	3	2.97	0.96	-0.1
Group A	68	22%	36	53%	25	37%	2	3%	5	7%	4	1	4	4	3.35	0.86	0.15
Group B	72	23%	24	33%	35	49%	9	13%	4	6%	4	1	3	3	3.10	0.82	-0.3
Group C	97	31%	23	24%	30	31%	29	30%	15	15%	4	1	3	3	2.63	1.01	-0
With ISO9000	105	33%	45	43%	42	40%	11	10%	7	7%	4	1	3	4	3.19	0.88	-0.2
Without ISO9000	132	42%	88	67%	31	23%	5	4%	8	6%	4	1	4	4	3.51	0.83	-0.2
Grp A w ISO9000	3	1%	1	33%	2	67%	0	0%	0	0%	4	3	3	3	3.33	0.58	0.21
Grp A w/o ISO9000	68	22%	36	53%	25	37%	2	3%	5	7%	4	1	4	4	3.35	0.86	0.15
Grp B w ISO9000	15	5%	9	60%	6	40%	0	0%	0	0%	4	3	4	4	3.60	0.51	-0.2
Grp B w/o ISO9000	57	18%	21	37%	27	47%	5	9%	4	7%	4	1	3	3	3.14	0.85	-0.2
Grp C w ISO9000	86	27%	21	24%	28	33%	25	29%	12	14%	4	1	3	3	2.67	1.00	-0
Grp C w/o ISO9000	11	3%	2	18%	2	18%	4	36%	3	27%	4	1	2	2	2.27	1.10	-0.3

Results of the 1998 postal survey of Hong Kong Public Works Contractors.

Part	Part 1 Use of IT to assist project communication																
Topic	Telephone communication																
Subject	Provide/use mobile telephones by labour																
Q.1.1.3.d	Response										Distribution Statistics						
Sample Sector	Nos	% o/a	No '4'	% '4'	No '3'	% '3'	No '2'	% '2'	No '1'	% '1'	H	L	Median	Mode	Mean	SD	Corr
All	231	73%	7	3%	13	6%	57	25%	154	67%	4	1	1	1	1.45	0.74	-0.1
Group A	67	21%	2	3%	6	9%	21	31%	38	57%	4	1	1	1	1.58	0.78	-0.1
Group B	68	22%	2	3%	3	4%	17	25%	46	68%	4	1	1	1	1.43	0.72	-0.1
Group C	97	31%	3	3%	4	4%	20	21%	70	72%	4	1	1	1	1.38	0.71	-0.1
With ISO9000	104	33%	25	24%	38	37%	29	28%	12	12%	4	1	3	3	2.73	0.96	-0
Without ISO9000	133	42%	58	44%	52	39%	11	8%	12	9%	4	1	3	4	3.17	0.93	-0.2
Grp A w ISO9000	3	1%	0	0%	1	33%	1	33%	1	33%	3	1	2	nil	2.00	1.00	-1
Grp A w/o ISO9000	67	21%	2	3%	6	9%	21	31%	38	57%	4	1	1	1	1.58	0.78	-0.1
Grp B w ISO9000	15	5%	3	20%	8	53%	4	27%	0	0%	4	2	3	3	2.93	0.70	-0.5
Grp B w/o ISO9000	53	17%	2	4%	3	6%	11	21%	37	70%	4	1	1	1	1.43	0.77	-0.1
Grp C w ISO9000	86	27%	3	3%	4	5%	16	19%	63	73%	4	1	1	1	1.38	0.74	-0.1
Grp C w/o ISO9000	11	3%	0	0%	0	0%	4	36%	7	64%	2	1	1	1	1.36	0.50	-0.2

Part	Part 1 Use of IT to assist project communication																
Topic	Telephone communication																
Subject	Use of mobile telephone message services																
Q.1.1.4.a	Response										Distribution Statistics						
Sample Sector	Nos	% o/a	No '4'	% '4'	No '3'	% '3'	No '2'	% '2'	No '1'	% '1'	H	L	Median	Mode	Mean	SD	Corr
All	232	73%	106	46%	3	1%	78	34%	45	19%	4	1	2	4	2.73	1.23	-0.1
Group A	67	21%	28	42%	0	0%	23	34%	16	24%	4	1	2	4	2.60	1.26	0.13
Group B	70	22%	35	50%	1	1%	21	30%	13	19%	4	1	3.5	4	2.83	1.24	-0.1
Group C	96	30%	43	45%	2	2%	34	35%	17	18%	4	1	2	4	2.74	1.21	-0.2
With ISO9000	104	33%	3	3%	5	5%	23	22%	73	70%	4	1	1	1	1.40	0.72	-0.1
Without ISO9000	128	41%	4	3%	8	6%	35	27%	81	63%	4	1	1	1	1.49	0.75	-0.1
Grp A w ISO9000	3	1%	1	33%	0	0%	2	67%	0	0%	4	2	2	2	2.67	1.15	0.21
Grp A w/o ISO9000	67	21%	28	42%	0	0%	23	34%	16	24%	4	1	2	4	2.60	1.26	0.13
Grp B w ISO9000	15	5%	0	0%	0	0%	6	40%	9	60%	2	1	1	1	1.40	0.51	-0.2
Grp B w/o ISO9000	55	17%	26	47%	1	2%	17	31%	11	20%	4	1	2	4	2.76	1.25	-0.1
Grp C w ISO9000	84	27%	36	43%	2	2%	31	37%	15	18%	4	1	2	4	2.70	1.20	-0.2
Grp C w/o ISO9000	12	4%	7	58%	0	0%	3	25%	2	17%	4	1	4	4	3.00	1.28	-0.2

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Part	Part 1 Use of IT to assist project communication																
Topic	Telephone communication																
Subject	Use of mobile telephone call forwarding services																
Q.1.1.4.b	Response								Distribution Statistics								
Sample Sector	Nos	% o/a	No '4'	% '4'	No '3'	% '3'	No '2'	% '2'	No '1'	% '1'	H	L	Median	Mode	Mean	SD	Corr
All	233	74%	126	54%	3	1%	67	29%	37	16%	4	1	4	4	2.94	1.21	-0
Group A	67	21%	41	61%	0	0%	14	21%	12	18%	4	1	4	4	3.04	1.25	0.02
Group B	70	22%	40	57%	1	1%	20	29%	9	13%	4	1	4	4	3.03	1.18	-0.1
Group C	97	31%	46	47%	2	2%	33	34%	16	16%	4	1	2	4	2.80	1.20	0
With ISO9000	102	32%	46	45%	2	2%	37	36%	17	17%	4	1	2	4	2.75	1.20	-0.1
Without ISO9000	131	41%	60	46%	1	1%	41	31%	29	22%	4	1	2	4	2.70	1.26	-0.1
Grp A w ISO9000	3	1%	2	67%	0	0%	1	33%	0	0%	4	2	4	4	3.33	1.15	-0.7
Grp A w/o ISO9000	67	21%	41	61%	0	0%	14	21%	12	18%	4	1	4	4	3.04	1.25	0.02
Grp B w ISO9000	15	5%	9	60%	0	0%	4	27%	2	13%	4	1	4	4	3.07	1.22	0.11
Grp B w/o ISO9000	55	17%	29	53%	1	2%	18	33%	7	13%	4	1	4	4	2.95	1.18	-0
Grp C w ISO9000	86	27%	39	45%	2	2%	32	37%	13	15%	4	1	2	4	2.78	1.18	-0
Grp C w/o ISO9000	11	3%	7	64%	0	0%	1	9%	3	27%	4	1	4	4	3.00	1.41	0.24

Part	Part 1 Use of IT to assist project communication																
Topic	Telephone communication																
Subject	Company policy /instruction to record important telephone communications																
Q.1.1.5.	Response								Distribution Statistics								
Sample Sector	Nos	% o/a	No '4'	% '4'	No '3'	% '3'	No '2'	% '2'	No '1'	% '1'	H	L	Median	Mode	Mean	SD	Corr
All	235	74%	54	23%	0	0%	53	23%	128	54%	4	1	1	1	1.91	1.21	0.08
Group A	67	21%	18	27%	0	0%	12	18%	37	55%	4	1	1	1	1.99	1.29	-0.1
Group B	71	22%	14	20%	0	0%	23	32%	34	48%	4	1	2	1	1.92	1.13	0.02
Group C	98	31%	23	23%	0	0%	18	18%	57	58%	4	1	1	1	1.89	1.23	0.13
With ISO9000	103	33%	23	22%	0	0%	20	19%	60	58%	4	1	1	1	1.86	1.21	0.13
Without ISO9000	133	42%	32	24%	0	0%	33	25%	68	51%	4	1	1	1	1.97	1.22	0.04
Grp A w ISO9000	3	1%	1	33%	0	0%	0	0%	2	67%	4	1	1	1	2.00	1.73	0.21
Grp A w/o ISO9000	67	21%	18	27%	0	0%	12	18%	37	55%	4	1	1	1	1.99	1.29	-0.1
Grp B w ISO9000	14	4%	3	21%	0	0%	4	29%	7	50%	4	1	1.5	1	1.93	1.21	-0.3
Grp B w/o ISO9000	57	18%	11	19%	0	0%	19	33%	27	47%	4	1	2	1	1.91	1.12	0.11
Grp C w ISO9000	86	27%	19	22%	0	0%	16	19%	51	59%	4	1	1	1	1.85	1.21	0.15
Grp C w/o ISO9000	12	4%	4	33%	0	0%	2	17%	6	50%	4	1	1.5	1	2.17	1.40	0.04

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Part	Part 1 Use of IT to assist project communication																
Topic	Telephone communication																
Subject	Telephone communications recorded on message recording services/facilities																
Q.1.1.6.a	Response										Distribution Statistics						
Sample Sector	Nos	% o/a	No '4'	% '4'	No '3'	% '3'	No '2'	% '2'	No '1'	% '1'	H	L	Median	Mode	Mean	SD	Corr
All	226	72%	18	8%	0	0%	31	14%	177	78%	4	1	1	1	1.38	0.85	0.03
Group A	65	21%	2	3%	0	0%	9	14%	54	83%	4	1	1	1	1.23	0.61	-0.1
Group B	68	22%	4	6%	0	0%	12	18%	52	76%	4	1	1	1	1.35	0.77	0.05
Group C	94	30%	12	13%	0	0%	10	11%	72	77%	4	1	1	1	1.49	1.01	0
With ISO9000	102	32%	11	11%	0	0%	10	10%	81	79%	4	1	1	1	1.42	0.95	0.02
Without ISO9000	125	40%	7	6%	0	0%	21	17%	97	78%	4	1	1	1	1.34	0.75	0.1
Grp A w ISO9000	3	1%	0	0%	0	0%	0	0%	3	100%	1	1	1	1	1.00	0.00	nil
Grp A w/o ISO9000	65	21%	2	3%	0	0%	9	14%	54	83%	4	1	1	1	1.23	0.61	-0.1
Grp B w ISO9000	15	5%	1	7%	0	0%	1	7%	13	87%	4	1	1	1	1.27	0.80	0.1
Grp B w/o ISO9000	53	17%	3	6%	0	0%	11	21%	39	74%	4	1	1	1	1.38	0.77	0.05
Grp C w ISO9000	84	27%	10	12%	0	0%	9	11%	65	77%	4	1	1	1	1.46	0.99	0.01
Grp C w/o ISO9000	10	3%	2	20%	0	0%	1	10%	7	70%	4	1	1	1	1.70	1.25	0.12

Part	Part 1 Use of IT to assist project communication																
Topic	Telephone communication																
Subject	Telephone communications recorded of speaker phone																
Q.1.1.6.b	Response										Distribution Statistics						
Sample Sector	Nos	% o/a	No '4'	% '4'	No '3'	% '3'	No '2'	% '2'	No '1'	% '1'	H	L	Median	Mode	Mean	SD	Corr
All	224	71%	7	3%	0	0%	12	5%	205	92%	4	1	1	1	1.15	0.56	0.07
Group A	66	21%	1	2%	0	0%	3	5%	62	94%	4	1	1	1	1.09	0.42	-0.1
Group B	65	21%	2	3%	0	0%	3	5%	60	92%	4	1	1	1	1.14	0.56	0.09
Group C	94	30%	4	4%	0	0%	6	6%	84	89%	4	1	1	1	1.19	0.64	0.08
With ISO9000	102	32%	4	4%	0	0%	4	4%	94	92%	4	1	1	1	1.16	0.61	0.09
Without ISO9000	123	39%	3	2%	0	0%	8	7%	112	91%	4	1	1	1	1.14	0.52	0.06
Grp A w ISO9000	3	1%	0	0%	0	0%	0	0%	3	100%	1	1	1	1	1.00	0.00	nil
Grp A w/o ISO9000	66	21%	1	2%	0	0%	3	5%	62	94%	4	1	1	1	1.09	0.42	-0.1
Grp B w ISO9000	15	5%	0	0%	0	0%	0	0%	15	100%	1	1	1	1	1.00	0.00	na
Grp B w/o ISO9000	50	16%	2	4%	0	0%	3	6%	45	90%	4	1	1	1	1.18	0.63	0.14
Grp C w ISO9000	84	27%	4	5%	0	0%	4	5%	76	90%	4	1	1	1	1.19	0.67	0.08
Grp C w/o ISO9000	10	3%	0	0%	0	0%	2	20%	8	80%	2	1	1	1	1.20	0.42	-0.1

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Part	Part 1 Use of IT to assist project communication																
Topic	Telephone communication																
Subject	Telephone communications recorded on a written note																
Q.1.1.6.c	Response										Distribution Statistics						
Sample Sector	Nos	% o/a	No '4'	% '4'	No '3'	% '3'	No '2'	% '2'	No '1'	% '1'	H	L	Median	Mode	Mean	SD	Corr
All	233	74%	163	70%	1	0%	56	24%	13	6%	4	1	4	4	3.35	1.02	-0
Group A	68	22%	53	78%	1	1%	11	16%	3	4%	4	1	4	4	3.53	0.92	-0
Group B	70	22%	51	73%	0	0%	16	23%	3	4%	4	1	4	4	3.41	0.99	-0.3
Group C	96	30%	60	63%	0	0%	29	30%	7	7%	4	1	4	4	3.18	1.10	0.06
With ISO9000	103	33%	65	63%	0	0%	30	29%	8	8%	4	1	4	4	3.18	1.10	0.04
Without ISO9000	131	41%	99	76%	1	1%	26	20%	5	4%	4	1	4	4	3.48	0.94	0.01
Grp A w ISO9000	3	1%	3	100%	0	0%	0	0%	0	0%	4	4	4	4	4.00	0.00	nil
Grp A w/o ISO9000	68	22%	53	78%	1	1%	11	16%	3	4%	4	1	4	4	3.53	0.92	-0
Grp B w ISO9000	15	5%	9	60%	0	0%	5	33%	1	7%	4	1	4	4	3.13	1.13	-0.7
Grp B w/o ISO9000	55	17%	42	76%	0	0%	11	20%	2	4%	4	1	4	4	3.49	0.94	-0.1
Grp C w ISO9000	85	27%	53	62%	0	0%	25	29%	7	8%	4	1	4	4	3.16	1.11	0.06
Grp C w/o ISO9000	11	3%	7	64%	0	0%	4	36%	0	0%	4	2	4	4	3.27	1.01	0.28

Part	Part 1 Use of IT to assist project communication																
Topic	Fax communication																
Subject	Use of fax in Head Office																
Q.1.2.1.a	Response										Distribution Statistics						
Sample Sector	Nos	% o/a	No '4'	% '4'	No '3'	% '3'	No '2'	% '2'	No '1'	% '1'	H	L	Median	Mode	Mean	SD	Corr
All	238	75%	229	96%	5	2%	0	0%	4	2%	4	1	4	4	3.93	0.41	0.03
Group A	68	22%	65	96%	1	1%	0	0%	2	3%	4	1	4	4	3.90	0.52	-0.1
Group B	72	23%	72	100%	0	0%	0	0%	0	0%	4	4	4	4	4.00	0.00	0
Group C	99	31%	93	94%	4	4%	0	0%	2	2%	4	1	4	4	3.90	0.46	0.05
With ISO9000	105	33%	99	94%	4	4%	0	0%	2	2%	4	1	4	4	3.90	0.45	0.05
Without ISO9000	134	42%	131	98%	1	1%	0	0%	2	1%	4	1	4	4	3.95	0.37	0.02
Grp A w ISO9000	3	1%	3	100%	0	0%	0	0%	0	0%	4	4	4	4	4.00	0.00	nil
Grp A w/o ISO9000	68	22%	65	96%	1	1%	0	0%	2	3%	4	1	4	4	3.90	0.52	-0.1
Grp B w ISO9000	15	5%	15	100%	0	0%	0	0%	0	0%	4	4	4	4	4.00	0.00	nil
Grp B w/o ISO9000	57	18%	57	100%	0	0%	0	0%	0	0%	4	4	4	4	4.00	0.00	nil
Grp C w ISO9000	87	28%	81	93%	4	5%	0	0%	2	2%	4	1	4	4	3.89	0.49	0.06
Grp C w/o ISO9000	12	4%	12	100%	0	0%	0	0%	0	0%	4	4	4	4	4.00	0.00	nil

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Part	Part 1 Use of IT to assist project communication																
Topic	Fax communication																
Subject	Use of fax in other company offices																
Q.1.2.1.b	Response										Distribution Statistics						
Sample Sector	Nos	% o/a	No '4'	% '4'	No '3'	% '3'	No '2'	% '2'	No '1'	% '1'	H	L	Median	Mode	Mean	SD	Corr
All	225	71%	165	73%	22	10%	4	2%	34	15%	4	1	4	4	3.41	1.09	0.12
Group A	63	20%	33	52%	11	17%	3	5%	16	25%	4	1	4	4	2.97	1.27	0.19
Group B	66	21%	49	74%	5	8%	1	2%	11	17%	4	1	4	4	3.39	1.14	0.2
Group C	96	30%	83	86%	6	6%	0	0%	7	7%	4	1	4	4	3.72	0.80	0.1
With ISO9000	102	32%	87	85%	9	9%	0	0%	6	6%	4	1	4	4	3.74	0.74	0.1
Without ISO9000	123	39%	78	63%	13	11%	4	3%	28	23%	4	1	4	4	3.15	1.25	0.15
Grp A w ISO9000	2	1%	1	50%	1	50%	0	0%	0	0%	4	3	3.5	nil	3.50	0.71	1
Grp A w/o ISO9000	63	20%	33	52%	11	17%	3	5%	16	25%	4	1	4	4	2.97	1.27	0.19
Grp B w ISO9000	15	5%	12	80%	2	13%	0	0%	1	7%	4	1	4	4	3.67	0.82	0.27
Grp B w/o ISO9000	51	16%	37	73%	3	6%	1	2%	10	20%	4	1	4	4	3.31	1.21	0.16
Grp C w ISO9000	85	27%	74	87%	6	7%	0	0%	5	6%	4	1	4	4	3.75	0.74	0.1
Grp C w/o ISO9000	11	3%	9	82%	0	0%	0	0%	2	18%	4	1	4	4	3.45	1.21	0.17

Part	Part 1 Use of IT to assist project communication																
Topic	Fax communication																
Subject	Use of fax in site offices																
Q.1.2.1.c	Response										Distribution Statistics						
Sample Sector	Nos	% o/a	No '4'	% '4'	No '3'	% '3'	No '2'	% '2'	No '1'	% '1'	H	L	Median	Mode	Mean	SD	Corr
All	234	74%	184	79%	31	13%	6	3%	13	6%	4	1	4	4	3.65	0.78	0.09
Group A	68	22%	42	62%	14	21%	3	4%	9	13%	4	1	4	4	3.31	1.05	0.2
Group B	71	22%	57	80%	11	15%	3	4%	0	0%	4	2	4	4	3.76	0.52	0.12
Group C	96	30%	86	90%	6	6%	0	0%	4	4%	4	1	4	4	3.81	0.64	0.09
With ISO9000	102	32%	89	87%	10	10%	0	0%	3	3%	4	1	4	4	3.81	0.58	0.09
Without ISO9000	133	42%	96	72%	21	16%	6	5%	10	8%	4	1	4	4	3.53	0.89	0.13
Grp A w ISO9000	3	1%	2	67%	1	33%	0	0%	0	0%	4	3	4	4	3.67	0.58	0.95
Grp A w/o ISO9000	68	22%	42	62%	14	21%	3	4%	9	13%	4	1	4	4	3.31	1.05	0.2
Grp B w ISO9000	15	5%	12	80%	3	20%	0	0%	0	0%	4	3	4	4	3.80	0.41	0.17
Grp B w/o ISO9000	56	18%	45	80%	8	14%	3	5%	0	0%	4	2	4	4	3.75	0.55	0.11
Grp C w ISO9000	84	27%	75	89%	6	7%	0	0%	3	4%	4	1	4	4	3.82	0.60	0.09
Grp C w/o ISO9000	12	4%	11	92%	0	0%	0	0%	1	8%	4	1	4	4	3.75	0.87	0.12

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Part	Part 1 Use of IT to assist project communication																
Topic	Fax communication																
Subject	Use of fax to PC's																
Q.1.2.2.a	Response										Distribution Statistics						
Sample Sector	Nos	% o/a	No '4'	% '4'	No '3'	% '3'	No '2'	% '2'	No '1'	% '1'	H	L	Median	Mode	Mean	SD	Corr
All	237	75%	15	6%	17	7%	58	24%	147	62%	4	1	1	1	1.58	0.88	0.1
Group A	68	22%	6	9%	3	4%	14	21%	45	66%	4	1	1	1	1.56	0.94	0.08
Group B	72	23%	5	7%	3	4%	16	22%	48	67%	4	1	1	1	1.51	0.87	-0
Group C	98	31%	5	5%	11	11%	28	29%	54	55%	4	1	1	1	1.66	0.87	0.13
With ISO9000	104	33%	4	4%	12	12%	33	32%	55	53%	4	1	1	1	1.66	0.83	0.12
Without ISO9000	134	42%	12	9%	5	4%	25	19%	92	69%	4	1	1	1	1.53	0.93	0.04
Grp A w ISO9000	3	1%	0	0%	0	0%	2	67%	1	33%	2	1	2	2	1.67	0.58	-0.7
Grp A w/o ISO9000	68	22%	6	9%	3	4%	14	21%	45	66%	4	1	1	1	1.56	0.94	0.08
Grp B w ISO9000	15	5%	1	7%	1	7%	5	33%	8	53%	4	1	1	1	1.67	0.90	-0.2
Grp B w/o ISO9000	57	18%	4	7%	2	4%	11	19%	40	70%	4	1	1	1	1.47	0.87	-0
Grp C w ISO9000	86	27%	3	3%	11	13%	26	30%	46	53%	4	1	1	1	1.66	0.83	0.14
Grp C w/o ISO9000	12	4%	2	17%	0	0%	2	17%	8	67%	4	1	1	1	1.67	1.15	0.14

Part	Part 1 Use of IT to assist project communication																
Topic	Fax communication																
Subject	Use of PC's to fax																
Q.1.2.1.b	Response										Distribution Statistics						
Sample Sector	Nos	% o/a	No '4'	% '4'	No '3'	% '3'	No '2'	% '2'	No '1'	% '1'	H	L	Median	Mode	Mean	SD	Corr
All	225	71%	165	73%	22	10%	4	2%	34	15%	4	1	4	4	3.41	1.09	0.12
Group A	63	20%	33	52%	11	17%	3	5%	16	25%	4	1	4	4	2.97	1.27	0.19
Group B	66	21%	49	74%	5	8%	1	2%	11	17%	4	1	4	4	3.39	1.14	0.2
Group C	96	30%	83	86%	6	6%	0	0%	7	7%	4	1	4	4	3.72	0.80	0.1
With ISO9000	102	32%	87	85%	9	9%	0	0%	6	6%	4	1	4	4	3.74	0.74	0.1
Without ISO9000	123	39%	78	63%	13	11%	4	3%	28	23%	4	1	4	4	3.15	1.25	0.15
Grp A w ISO9000	2	1%	1	50%	1	50%	0	0%	0	0%	4	3	3.5	nil	3.50	0.71	1
Grp A w/o ISO9000	63	20%	33	52%	11	17%	3	5%	16	25%	4	1	4	4	2.97	1.27	0.19
Grp B w ISO9000	15	5%	12	80%	2	13%	0	0%	1	7%	4	1	4	4	3.67	0.82	0.27
Grp B w/o ISO9000	51	16%	37	73%	3	6%	1	2%	10	20%	4	1	4	4	3.31	1.21	0.16
Grp C w ISO9000	85	27%	74	87%	6	7%	0	0%	5	6%	4	1	4	4	3.75	0.74	0.1
Grp C w/o ISO9000	11	3%	9	82%	0	0%	0	0%	2	18%	4	1	4	4	3.45	1.21	0.17

Results of the 1998 postal survey of Hong Kong Public Works Contractors.

Part	Part 1 Use of IT to assist project communication																
Topic	Meetings for communication																
Subject	Use of formal meetings for project communication in head office																
Q.1.3.1.a	Response										Distribution Statistics						
Sample Sector	Nos	% o/a	No '4'	% '4'	No '3'	% '3'	No '2'	% '2'	No '1'	% '1'	H	L	Median	Mode	Mean	SD	Corr
All	237	75%	169	71%	54	23%	8	3%	6	3%	4	1	4	4	3.63	0.67	0.01
Group A	67	21%	43	64%	16	24%	6	9%	2	3%	4	1	4	4	3.49	0.79	-0.1
Group B	72	23%	52	72%	17	24%	1	1%	2	3%	4	1	4	4	3.65	0.65	-0.2
Group C	99	31%	75	76%	21	21%	1	1%	2	2%	4	1	4	4	3.71	0.59	-0
With ISO9000	105	33%	76	72%	25	24%	1	1%	3	3%	4	1	4	4	3.66	0.65	0.02
Without ISO9000	133	42%	94	71%	29	22%	7	5%	3	2%	4	1	4	4	3.61	0.69	-0.1
Grp A w ISO9000	3	1%	2	67%	1	33%	0	0%	0	0%	4	3	4	4	3.67	0.58	0.95
Grp A w/o ISO9000	67	21%	43	64%	16	24%	6	9%	2	3%	4	1	4	4	3.49	0.79	-0.1
Grp B w ISO9000	15	5%	10	67%	4	27%	0	0%	1	7%	4	1	4	4	3.53	0.83	-0.2
Grp B w/o ISO9000	57	18%	42	74%	13	23%	1	2%	1	2%	4	1	4	4	3.68	0.60	-0.1
Grp C w ISO9000	87	28%	64	74%	20	23%	1	1%	2	2%	4	1	4	4	3.68	0.62	0.02
Grp C w/o ISO9000	12	4%	11	92%	1	8%	0	0%	0	0%	4	3	4	4	3.92	0.29	-1

Part	Part 1 Use of IT to assist project communication																
Topic	Meetings for communication																
Subject	Use of formal meetings for project communication in other company offices																
Q.1.3.1.b	Response										Distribution Statistics						
Sample Sector	Nos	% o/a	No '4'	% '4'	No '3'	% '3'	No '2'	% '2'	No '1'	% '1'	H	L	Median	Mode	Mean	SD	Corr
All	227	72%	114	50%	68	30%	20	9%	25	11%	4	1	4	4	3.19	1.00	0.07
Group A	64	20%	23	36%	24	38%	6	9%	11	17%	4	1	3	3	2.92	1.07	0.13
Group B	67	21%	32	48%	17	25%	8	12%	10	15%	4	1	3	4	3.06	1.10	0.04
Group C	96	30%	59	61%	27	28%	6	6%	4	4%	4	1	4	4	3.47	0.79	0.03
With ISO9000	102	32%	61	60%	31	30%	5	5%	5	5%	4	1	4	4	3.45	0.80	0.03
Without ISO9000	125	40%	53	42%	37	30%	15	12%	20	16%	4	1	3	4	2.98	1.09	0.03
Grp A w ISO9000	2	1%	1	50%	1	50%	0	0%	0	0%	4	3	3.5	nil	3.50	0.71	1
Grp A w/o ISO9000	64	20%	23	36%	24	38%	6	9%	11	17%	4	1	3	3	2.92	1.07	0.13
Grp B w ISO9000	15	5%	8	53%	5	33%	0	0%	2	13%	4	1	4	4	3.27	1.03	-0.1
Grp B w/o ISO9000	52	16%	24	46%	12	23%	8	15%	8	15%	4	1	3	4	3.00	1.12	0.06
Grp C w ISO9000	85	27%	52	61%	25	29%	5	6%	3	4%	4	1	4	4	3.48	0.77	0.03
Grp C w/o ISO9000	11	3%	7	64%	2	18%	1	9%	1	9%	4	1	4	4	3.36	1.03	-0.1

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Part	Part 1 Use of IT to assist project communication																
Topic	Meetings for communication																
Subject	Use of formal meetings for project communication in site offices																
Q.1.3.1.c	Response										Distribution Statistics						
Sample Sector	Nos	% o/a	No '4'	% '4'	No '3'	% '3'	No '2'	% '2'	No '1'	% '1'	H	L	Median	Mode	Mean	SD	Corr
All	236	75%	156	66%	73	31%	1	0%	6	3%	4	1	4	4	3.61	0.63	0.02
Group A	68	22%	40	59%	26	38%	1	1%	1	1%	4	1	4	4	3.54	0.61	0
Group B	72	23%	46	64%	24	33%	0	0%	2	3%	4	1	4	4	3.58	0.64	-0.2
Group C	97	31%	71	73%	23	24%	0	0%	3	3%	4	1	4	4	3.67	0.64	0.02
With ISO9000	103	33%	72	70%	27	26%	0	0%	4	4%	4	1	4	4	3.62	0.69	0.04
Without ISO9000	134	42%	85	63%	46	34%	1	1%	2	1%	4	1	4	4	3.60	0.59	-0.1
Grp A w ISO9000	3	1%	2	67%	1	33%	0	0%	0	0%	4	3	4	4	3.67	0.58	0.95
Grp A w/o ISO9000	68	22%	40	59%	26	38%	1	1%	1	1%	4	1	4	4	3.54	0.61	0
Grp B w ISO9000	15	5%	8	53%	6	40%	0	0%	1	7%	4	1	4	4	3.40	0.83	-0.3
Grp B w/o ISO9000	57	18%	38	67%	18	32%	0	0%	1	2%	4	1	4	4	3.63	0.59	-0.1
Grp C w ISO9000	85	27%	62	73%	20	24%	0	0%	3	4%	4	1	4	4	3.66	0.66	0.04
Grp C w/o ISO9000	12	4%	9	75%	3	25%	0	0%	0	0%	4	3	4	4	3.75	0.45	-0.5

Part	Part 1 Use of IT to assist project communication																
Topic	Meetings for communication																
Subject	Use of formal meetings for project communication between site offices and other offices																
Q.1.3.1.d	Response										Distribution Statistics						
Sample Sector	Nos	% o/a	No '4'	% '4'	No '3'	% '3'	No '2'	% '2'	No '1'	% '1'	H	L	Median	Mode	Mean	SD	Corr
All	231	73%	95	41%	84	36%	32	14%	20	9%	4	1	3	4	3.10	0.94	0.06
Group A	65	21%	21	32%	29	45%	7	11%	8	12%	4	1	3	3	2.97	0.97	0.01
Group B	70	22%	27	39%	25	36%	10	14%	8	11%	4	1	3	4	3.01	1.00	0.05
Group C	96	30%	47	49%	30	31%	15	16%	4	4%	4	1	3	4	3.25	0.87	0.05
With ISO9000	103	33%	50	49%	33	32%	15	15%	5	5%	4	1	3	4	3.24	0.88	0.06
Without ISO9000	128	41%	45	35%	51	40%	17	13%	15	12%	4	1	3	3	2.98	0.98	-0
Grp A w ISO9000	3	1%	0	0%	3	100%	0	0%	0	0%	3	3	3	3	3.00	0.00	nil
Grp A w/o ISO9000	65	21%	21	32%	29	45%	7	11%	8	12%	4	1	3	3	2.97	0.97	0.01
Grp B w ISO9000	15	5%	7	47%	5	33%	2	13%	1	7%	4	1	3	4	3.20	0.94	-0.1
Grp B w/o ISO9000	55	17%	20	36%	20	36%	8	15%	7	13%	4	1	3	3	2.96	1.02	0.08
Grp C w ISO9000	85	27%	43	51%	25	29%	13	15%	4	5%	4	1	4	4	3.26	0.89	0.07
Grp C w/o ISO9000	11	3%	4	36%	5	45%	2	18%	0	0%	4	2	3	3	3.18	0.75	-0.5

Results of the 1998 postal survey of Hong Kong Public Works Contractors.

Part	Part 1 Use of IT to assist project communication																
Topic	Meetings for communication																
Subject	Company policy/instruction that notes/minutes of meetings are recorded																
Q.1.3.2.a	Response										Distribution Statistics						
Sample Sector	Nos	% o/a	No '4'	% '4'	No '3'	% '3'	No '2'	% '2'	No '1'	% '1'	H	L	Median	Mode	Mean	SD	Corr
All	238	75%	136	57%	80	34%	15	6%	7	3%	4	1	4	4	3.45	0.74	0.07
Group A	68	22%	35	51%	24	35%	6	9%	3	4%	4	1	4	4	3.34	0.82	-0.1
Group B	72	23%	36	50%	29	40%	5	7%	2	3%	4	1	3.5	4	3.38	0.74	0.17
Group C	99	31%	66	67%	27	27%	4	4%	2	2%	4	1	4	4	3.59	0.67	0.05
With ISO9000	105	33%	67	64%	33	31%	3	3%	2	2%	4	1	4	4	3.57	0.65	0.05
Without ISO9000	134	42%	70	52%	47	35%	12	9%	5	4%	4	1	4	4	3.36	0.80	0.11
Grp A w ISO9000	3	1%	2	67%	1	33%	0	0%	0	0%	4	3	4	4	3.67	0.58	-0.7
Grp A w/o ISO9000	68	22%	35	51%	24	35%	6	9%	3	4%	4	1	4	4	3.34	0.82	-0.1
Grp B w ISO9000	15	5%	7	47%	8	53%	0	0%	0	0%	4	3	3	3	3.47	0.52	0.13
Grp B w/o ISO9000	57	18%	29	51%	21	37%	5	9%	2	4%	4	1	4	4	3.35	0.79	0.17
Grp C w ISO9000	87	28%	58	67%	24	28%	3	3%	2	2%	4	1	4	4	3.59	0.67	0.05
Grp C w/o ISO9000	12	4%	8	67%	3	25%	1	8%	0	0%	4	2	4	4	3.58	0.67	0.22

Part	Part 1 Use of IT to assist project communication																
Topic	Meetings for communication																
Subject	Use of hand-written notes/minutes of meetings																
Q.1.3.3.a	Response										Distribution Statistics						
Sample Sector	Nos	% o/a	No '4'	% '4'	No '3'	% '3'	No '2'	% '2'	No '1'	% '1'	H	L	Median	Mode	Mean	SD	Corr
All	236	75%	138	58%	56	24%	24	10%	18	8%	4	1	4	4	3.33	0.94	-0.1
Group A	67	21%	40	60%	16	24%	4	6%	7	10%	4	1	4	4	3.33	0.99	-0.2
Group B	72	23%	45	63%	18	25%	5	7%	4	6%	4	1	4	4	3.44	0.85	0.01
Group C	98	31%	54	55%	22	22%	15	15%	7	7%	4	1	4	4	3.26	0.97	-0.2
With ISO9000	105	33%	59	56%	22	21%	16	15%	8	8%	4	1	4	4	3.26	0.98	-0.1
Without ISO9000	132	42%	80	61%	34	26%	8	6%	10	8%	4	1	4	4	3.39	0.91	-0.1
Grp A w ISO9000	3	1%	2	67%	0	0%	1	33%	0	0%	4	2	4	4	3.33	1.15	-0.7
Grp A w/o ISO9000	67	21%	40	60%	16	24%	4	6%	7	10%	4	1	4	4	3.33	0.99	-0.2
Grp B w ISO9000	15	5%	8	53%	5	33%	1	7%	1	7%	4	1	4	4	3.33	0.90	0.13
Grp B w/o ISO9000	57	18%	37	65%	13	23%	4	7%	3	5%	4	1	4	4	3.47	0.85	-0
Grp C w ISO9000	87	28%	49	56%	17	20%	14	16%	7	8%	4	1	4	4	3.24	1.00	-0.1
Grp C w/o ISO9000	11	3%	5	45%	5	45%	1	9%	0	0%	4	2	3	3	3.36	0.67	-0.7

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Part	Part 1 Use of IT to assist project communication																
Topic	Meetings for communication																
Subject	Use of tape recorder to record notes/minutes of meetings																
Q.1.3.3.b	Response										Distribution Statistics						
Sample Sector	Nos	% o/a	No '4'	% '4'	No '3'	% '3'	No '2'	% '2'	No '1'	% '1'	H	L	Median	Mode	Mean	SD	Corr
All	228	72%	6	3%	20	9%	47	21%	155	68%	4	1	1	1	1.46	0.76	0.02
Group A	65	21%	0	0%	7	11%	7	11%	51	78%	3	1	1	1	1.32	0.66	-0
Group B	67	21%	2	3%	6	9%	11	16%	48	72%	4	1	1	1	1.43	0.78	0.02
Group C	97	31%	4	4%	7	7%	29	30%	57	59%	4	1	1	1	1.57	0.80	-0
With ISO9000	104	33%	3	3%	8	8%	28	27%	65	63%	4	1	1	1	1.51	0.76	0.01
Without ISO9000	125	40%	3	2%	12	10%	19	15%	91	73%	4	1	1	1	1.42	0.76	0.07
Grp A w ISO9000	3	1%	0	0%	0	0%	1	33%	2	67%	2	1	1	1	1.33	0.58	-1
Grp A w/o ISO9000	65	21%	0	0%	7	11%	7	11%	51	78%	3	1	1	1	1.32	0.66	-0
Grp B w ISO9000	15	5%	0	0%	1	7%	3	20%	11	73%	3	1	1	1	1.33	0.62	0.1
Grp B w/o ISO9000	52	16%	2	4%	5	10%	8	15%	37	71%	4	1	1	1	1.46	0.83	0.02
Grp C w ISO9000	86	27%	3	3%	7	8%	24	28%	52	60%	4	1	1	1	1.55	0.79	-0
Grp C w/o ISO9000	11	3%	1	9%	0	0%	5	45%	5	45%	4	1	2	2	1.73	0.90	0.09

Part	Part 1 Use of IT to assist project communication																
Topic	Meetings for communication																
Subject	Use of word-processor to record notes/minutes of meetings																
Q.1.3.3.c	Response										Distribution Statistics						
Sample Sector	Nos	% o/a	No '4'	% '4'	No '3'	% '3'	No '2'	% '2'	No '1'	% '1'	H	L	Median	Mode	Mean	SD	Corr
All	226	72%	67	30%	51	23%	27	12%	81	36%	4	1	3	1	2.46	1.25	0.15
Group A	64	20%	12	19%	16	25%	8	13%	28	44%	4	1	2	1	2.19	1.19	0.21
Group B	66	21%	20	30%	11	17%	6	9%	29	44%	4	1	2	1	2.33	1.32	0.33
Group C	97	31%	35	36%	24	25%	13	13%	25	26%	4	1	3	4	2.71	1.21	0.16
With ISO9000	103	33%	37	36%	27	26%	13	13%	26	25%	4	1	3	4	2.73	1.20	0.15
Without ISO9000	124	39%	30	24%	24	19%	14	11%	56	45%	4	1	2	1	2.23	1.25	0.19
Grp A w ISO9000	3	1%	0	0%	2	67%	0	0%	1	33%	3	1	3	3	2.33	1.15	-0.2
Grp A w/o ISO9000	64	20%	12	19%	16	25%	8	13%	28	44%	4	1	2	1	2.19	1.19	0.21
Grp B w ISO9000	15	5%	5	33%	4	27%	1	7%	5	33%	4	1	3	4	2.60	1.30	0.47
Grp B w/o ISO9000	51	16%	15	29%	7	14%	5	10%	24	47%	4	1	2	1	2.25	1.32	0.28
Grp C w ISO9000	85	27%	32	38%	21	25%	12	14%	20	24%	4	1	3	4	2.76	1.19	0.16
Grp C w/o ISO9000	12	4%	3	25%	3	25%	1	8%	5	42%	4	1	2.5	1	2.33	1.30	0.2

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Part	Part 1 Use of IT to assist project communication																
Topic	Meetings for communication																
Subject	Use of electronic notice board to record minutes/notes of meetings																
Q.1.3.3.b	Response										Distribution Statistics						
Sample Sector	Nos	% o/a	No '4'	% '4'	No '3'	% '3'	No '2'	% '2'	No '1'	% '1'	H	L	Median	Mode	Mean	SD	Corr
All	225	71%	0	0%	8	4%	25	11%	192	85%	3	1	1	1	1.18	0.47	0.01
Group A	65	21%	0	0%	3	5%	6	9%	56	86%	3	1	1	1	1.18	0.50	0.16
Group B	64	20%	0	0%	0	0%	7	11%	57	89%	2	1	1	1	1.11	0.31	0.15
Group C	97	31%	0	0%	5	5%	12	12%	80	82%	3	1	1	1	1.23	0.53	-0
With ISO9000	104	33%	0	0%	4	4%	13	13%	87	84%	3	1	1	1	1.20	0.49	-0
Without ISO9000	122	39%	0	0%	4	3%	12	10%	106	87%	3	1	1	1	1.16	0.45	0.02
Grp A w ISO9000	3	1%	0	0%	1	33%	0	0%	2	67%	3	1	1	1	1.67	1.15	0.21
Grp A w/o ISO9000	65	21%	0	0%	3	5%	6	9%	56	86%	3	1	1	1	1.18	0.50	0.16
Grp B w ISO9000	15	5%	0	0%	0	0%	1	7%	14	93%	2	1	1	1	1.07	0.26	-0.2
Grp B w/o ISO9000	49	16%	0	0%	0	0%	6	12%	43	88%	2	1	1	1	1.12	0.33	0.27
Grp C w ISO9000	86	27%	0	0%	3	3%	12	14%	71	83%	3	1	1	1	1.21	0.49	-0
Grp C w/o ISO9000	11	3%	0	0%	2	18%	0	0%	9	82%	3	1	1	1	1.36	0.81	-0.2

Part	Part 1 Use of IT to assist project communication																	
Topic	Video-conferencing for communication																	
Subject	Use of video-conferencing for communication within Hong Kong																	
Q.1.4.1.a	Response										Distribution Statistics							
Sample Sector	Nos	% o/a	No '4'	% '4'	No '3'	% '3'	No '2'	% '2'	No '1'	% '1'	H	L	Median	Mode	Mean	SD	Corr	
All	237	75%	1	0%	2	1%	14	6%	220	93%	4	1	1	1	1.09	0.35	-0	
Group A	67	21%	1	1%	2	3%	3	4%	61	91%	4	1	1	1	1.15	0.53	0.02	
Group B	72	23%	0	0%	0	0%	5	7%	67	93%	2	1	1	1	1.07	0.26	0.02	
Group C	99	31%	0	0%	0	0%	6	6%	93	94%	2	1	1	1	1.06	0.24	0.01	
With ISO9000	105	33%	0	0%	0	0%	7	7%	98	93%	2	1	1	1	1.07	0.25	0.01	
Without ISO9000	133	42%	1	1%	2	2%	7	5%	123	92%	4	1	1	1	1.11	0.41	-0	
Grp A w ISO9000	3	1%	0	0%	0	0%	0	0%	3	100%	1	1	1	1	1.00	0.00	nil	
Grp A w/o ISO9000	67	21%	1	1%	2	3%	3	4%	61	91%	4	1	1	1	1.15	0.53	0.02	
Grp B w ISO9000	15	5%	0	0%	0	0%	1	7%	14	93%	2	1	1	1	1.07	0.26	0.23	
Grp B w/o ISO9000	57	18%	0	0%	0	0%	4	7%	53	93%	2	1	1	1	1.07	0.26	-0	
Grp C w ISO9000	87	28%	0	0%	0	0%	6	7%	81	93%	2	1	1	1	1.07	0.25	0	
Grp C w/o ISO9000	12	4%	0	0%	0	0%	0	0%	12	100%	1	1	1	1	1.00	0.00	nil	

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Part	Part 1 Use of IT to assist project communication																
Topic	Video-conferencing for communication																
Subject	Use of video-conferencing for international communication																
Q.1.4.1.b	Response										Distribution Statistics						
Sample Sector	Nos	% o/a	No '4'	% '4'	No '3'	% '3'	No '2'	% '2'	No '1'	% '1'	H	L	Median	Mode	Mean	SD	Corr
All	238	75%	2	1%	1	0%	14	6%	221	93%	4	1	1	1	1.09	0.38	0.51
Group A	68	22%	1	1%	0	0%	4	6%	63	93%	4	1	1	1	1.10	0.43	-0
Group B	72	23%	0	0%	0	0%	3	4%	69	96%	2	1	1	1	1.04	0.20	0.32
Group C	99	31%	1	1%	1	1%	7	7%	90	91%	4	1	1	1	1.12	0.44	0.68
With ISO9000	105	33%	1	1%	1	1%	6	6%	97	92%	4	1	1	1	1.10	0.41	0.71
Without ISO9000	134	42%	1	1%	0	0%	8	6%	125	93%	4	1	1	1	1.08	0.35	0.07
Grp A w ISO9000	3	1%	0	0%	0	0%	0	0%	3	100%	1	1	1	1	1.00	0.00	nil
Grp A w/o ISO9000	68	22%	1	1%	0	0%	4	6%	63	93%	4	1	1	1	1.10	0.43	-0
Grp B w ISO9000	15	5%	0	0%	0	0%	0	0%	15	100%	1	1	1	1	1.00	0.00	nil
Grp B w/o ISO9000	57	18%	0	0%	0	0%	3	5%	54	95%	2	1	1	1	1.05	0.23	0.41
Grp C w ISO9000	87	28%	1	1%	1	1%	6	7%	79	91%	4	1	1	1	1.13	0.45	0.7
Grp C w/o ISO9000	12	4%	0	0%	0	0%	1	8%	11	92%	2	1	1	1	1.08	0.29	-0.1

Part	Part 1 Use of IT to assist project communication																
Topic	Video-conferencing for communication																
Subject	Use of commercially hired video-conferencing services																
Q.1.4.2.a	Response										Distribution Statistics						
Sample Sector	Nos	% o/a	No '4'	% '4'	No '3'	% '3'	No '2'	% '2'	No '1'	% '1'	H	L	Median	Mode	Mean	SD	Corr
All	229	72%	4	2%	0	0%	9	4%	216	94%	4	1	1	1	1.09	0.43	0.4
Group A	66	21%	1	2%	0	0%	2	3%	63	95%	4	1	1	1	1.08	0.40	-0
Group B	70	22%	0	0%	0	0%	2	3%	68	97%	2	1	1	1	1.03	0.17	0.02
Group C	94	30%	3	3%	0	0%	5	5%	86	91%	4	1	1	1	1.15	0.57	0.46
With ISO9000	100	32%	3	3%	0	0%	4	4%	93	93%	4	1	1	1	1.13	0.54	0.48
Without ISO9000	130	41%	1	1%	0	0%	5	4%	124	95%	4	1	1	1	1.06	0.32	-0
Grp A w ISO9000	3	1%	0	0%	0	0%	0	0%	3	100%	1	1	1	1	1.00	0.00	nil
Grp A w/o ISO9000	66	21%	1	2%	0	0%	2	3%	63	95%	4	1	1	1	1.08	0.40	-0
Grp B w ISO9000	15	5%	0	0%	0	0%	0	0%	15	100%	1	1	1	1	1.00	0.00	nil
Grp B w/o ISO9000	55	17%	0	0%	0	0%	2	4%	53	96%	2	1	1	1	1.04	0.19	0.05
Grp C w ISO9000	82	26%	3	4%	0	0%	4	5%	75	91%	4	1	1	1	1.16	0.60	0.47
Grp C w/o ISO9000	12	4%	0	0%	0	0%	1	8%	11	92%	2	1	1	1	1.08	0.29	-0.1

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Part	Part 1 Use of IT to assist project communication																
Topic	Video-conferencing for communication																
Subject	Use of company-owned private video-conferencing services																
Q.1.4.2.b	Response										Distribution Statistics						
Sample Sector	Nos	% o/a	No '4'	% '4'	No '3'	% '3'	No '2'	% '2'	No '1'	% '1'	H	L	Median	Mode	Mean	SD	Corr
All	229	72%	2	1%	0	0%	11	5%	216	94%	4	1	1	1	1.07	0.35	0.1
Group A	66	21%	1	2%	0	0%	4	6%	61	92%	4	1	1	1	1.11	0.43	-0.1
Group B	70	22%	0	0%	0	0%	2	3%	68	97%	2	1	1	1	1.03	0.17	0.09
Group C	94	30%	1	1%	0	0%	5	5%	88	94%	4	1	1	1	1.09	0.38	0.13
With ISO9000	100	32%	1	1%	0	0%	6	6%	93	93%	4	1	1	1	1.09	0.38	0.13
Without ISO9000	130	41%	1	1%	0	0%	5	4%	124	95%	4	1	1	1	1.06	0.32	-0
Grp A w ISO9000	3	1%	0	0%	0	0%	0	0%	3	100%	1	1	1	1	1.00	0.00	nil
Grp A w/o ISO9000	66	21%	1	2%	0	0%	4	6%	61	92%	4	1	1	1	1.11	0.43	-0.1
Grp B w ISO9000	15	5%	0	0%	0	0%	1	7%	14	93%	2	1	1	1	1.07	0.26	0.23
Grp B w/o ISO9000	55	17%	0	0%	0	0%	1	2%	54	98%	2	1	1	1	1.02	0.13	-0
Grp C w ISO9000	82	26%	1	1%	0	0%	5	6%	76	93%	4	1	1	1	1.10	0.40	0.13
Grp C w/o ISO9000	12	4%	0	0%	0	0%	0	0%	12	100%	1	1	1	1	1.00	0.00	nil

Part	Part 1 Use of IT to assist project communication																
Topic	Video-conferencing for communication																
Subject	Use of the Internet for video-conferencing services																
Q.1.4.2.c	Response										Distribution Statistics						
Sample Sector	Nos	% o/a	No '4'	% '4'	No '3'	% '3'	No '2'	% '2'	No '1'	% '1'	H	L	Median	Mode	Mean	SD	Corr
All	228	72%	6	3%	2	1%	18	8%	202	89%	4	1	1	1	1.18	0.57	0
Group A	65	21%	4	6%	1	2%	4	6%	56	86%	4	1	1	1	1.28	0.78	0.04
Group B	70	22%	2	3%	0	0%	6	9%	62	89%	4	1	1	1	1.17	0.56	0.04
Group C	94	30%	0	0%	1	1%	8	9%	85	90%	3	1	1	1	1.11	0.34	0.07
With ISO9000	100	32%	1	1%	1	1%	7	7%	91	91%	4	1	1	1	1.12	0.43	0.04
Without ISO9000	129	41%	5	4%	1	1%	11	9%	112	87%	4	1	1	1	1.22	0.65	0.02
Grp A w ISO9000	3	1%	0	0%	0	0%	0	0%	3	100%	1	1	1	1	1.00	0.00	nil
Grp A w/o ISO9000	65	21%	4	6%	1	2%	4	6%	56	86%	4	1	1	1	1.28	0.78	0.04
Grp B w ISO9000	15	5%	1	7%	0	0%	1	7%	13	87%	4	1	1	1	1.27	0.80	-0.3
Grp B w/o ISO9000	55	17%	1	2%	0	0%	5	9%	49	89%	4	1	1	1	1.15	0.49	0.18
Grp C w ISO9000	82	26%	0	0%	1	1%	6	7%	75	91%	3	1	1	1	1.10	0.34	0.09
Grp C w/o ISO9000	12	4%	0	0%	0	0%	2	17%	10	83%	2	1	1	1	1.17	0.39	-0.2

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Part	Part 1 Use of IT to assist project communication																
Topic	Images used for communication																
Subject	Use of manual drawing methods in company offices																
Q.1.5.1.a	Response										Distribution Statistics						
Sample Sector	Nos	% o/a	No '4'	% '4'	No '3'	% '3'	No '2'	% '2'	No '1'	% '1'	H	L	Median	Mode	Mean	SD	Corr
All	235	74%	68	29%	81	34%	45	19%	41	17%	4	1	3	3	2.75	1.06	-0.2
Group A	68	22%	26	38%	26	38%	8	12%	8	12%	4	1	3	4	3.03	0.99	-0.1
Group B	70	22%	23	33%	26	37%	12	17%	9	13%	4	1	3	3	2.90	1.01	-0.4
Group C	98	31%	19	19%	29	30%	25	26%	25	26%	4	1	2	3	2.43	1.07	-0.1
With ISO9000	105	33%	21	20%	32	30%	27	26%	25	24%	4	1	3	3	2.47	1.07	-0.1
Without ISO9000	131	41%	47	36%	49	37%	18	14%	17	13%	4	1	3	3	2.96	1.01	-0.3
Grp A w ISO9000	3	1%	0	0%	2	67%	0	0%	1	33%	3	1	3	3	2.33	1.15	0.95
Grp A w/o ISO9000	68	22%	26	38%	26	38%	8	12%	8	12%	4	1	3	4	3.03	0.99	-0.1
Grp B w ISO9000	15	5%	5	33%	5	33%	4	27%	1	7%	4	1	3	4	2.93	0.96	-0.5
Grp B w/o ISO9000	55	17%	18	33%	21	38%	8	15%	8	15%	4	1	3	3	2.89	1.03	-0.3
Grp C w ISO9000	87	28%	16	18%	25	29%	23	26%	23	26%	4	1	2	3	2.39	1.07	-0.1
Grp C w/o ISO9000	11	3%	3	27%	4	36%	2	18%	2	18%	4	1	3	3	2.73	1.10	-0.5

Part	Part 1 Use of IT to assist project communication																
Topic	Images used for communication																
Subject	Use of CAD systems in company offices																
Q.1.5.1.b	Response										Distribution Statistics						
Sample Sector	Nos	% o/a	No '4'	% '4'	No '3'	% '3'	No '2'	% '2'	No '1'	% '1'	H	L	Median	Mode	Mean	SD	Corr
All	233	74%	69	30%	65	28%	29	12%	70	30%	4	1	3	1	2.57	1.20	0.2
Group A	66	21%	14	21%	14	21%	10	15%	28	42%	4	1	2	1	2.21	1.21	0.21
Group B	69	22%	22	32%	19	28%	9	13%	19	28%	4	1	3	4	2.64	1.20	0.31
Group C	99	31%	34	34%	32	32%	10	10%	23	23%	4	1	3	4	2.78	1.16	0.24
With ISO9000	105	33%	38	36%	29	28%	12	11%	26	25%	4	1	3	4	2.75	1.19	0.23
Without ISO9000	129	41%	32	25%	36	28%	17	13%	44	34%	4	1	3	1	2.43	1.20	0.21
Grp A w ISO9000	3	1%	0	0%	1	33%	1	33%	1	33%	3	1	2	nil	2.00	1.00	0.67
Grp A w/o ISO9000	66	21%	14	21%	14	21%	10	15%	28	42%	4	1	2	1	2.21	1.21	0.21
Grp B w ISO9000	15	5%	8	53%	0	0%	2	13%	5	33%	4	1	4	4	2.73	1.44	0.7
Grp B w/o ISO9000	54	17%	14	26%	19	35%	7	13%	14	26%	4	1	3	3	2.61	1.14	0.17
Grp C w ISO9000	87	28%	30	34%	28	32%	9	10%	20	23%	4	1	3	4	2.78	1.16	0.24
Grp C w/o ISO9000	12	4%	4	33%	4	33%	1	8%	3	25%	4	1	3	4	2.75	1.22	0.37

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Part	Part 1 Use of IT to assist project communication																
Topic	Images used for communication																
Subject	Hiring manual drafting services																
Q.1.5.1.c	Response										Distribution Statistics						
Sample Sector	Nos	% o/a	No '4'	% '4'	No '3'	% '3'	No '2'	% '2'	No '1'	% '1'	H	L	Median	Mode	Mean	SD	Corr
All	231	73%	21	9%	32	14%	54	23%	124	54%	4	1	1	1	1.78	1.00	-0.1
Group A	67	21%	13	19%	10	15%	12	18%	32	48%	4	1	2	1	2.06	1.19	-0.2
Group B	68	22%	4	6%	8	12%	17	25%	39	57%	4	1	1	1	1.66	0.91	-0.2
Group C	97	31%	4	4%	14	14%	25	26%	54	56%	4	1	1	1	1.67	0.87	-0.1
With ISO9000	104	33%	5	5%	13	13%	28	27%	58	56%	4	1	1	1	1.66	0.88	-0.1
Without ISO9000	128	41%	16	13%	19	15%	26	20%	67	52%	4	1	1	1	1.88	1.08	-0.2
Grp A w ISO9000	3	1%	0	0%	0	0%	0	0%	3	100%	1	1	1	1	1.00	0.00	nil
Grp A w/o ISO9000	67	21%	13	19%	10	15%	12	18%	32	48%	4	1	2	1	2.06	1.19	-0.2
Grp B w ISO9000	15	5%	1	7%	2	13%	5	33%	7	47%	4	1	2	1	1.80	0.94	-0.2
Grp B w/o ISO9000	53	17%	3	6%	6	11%	12	23%	32	60%	4	1	1	1	1.62	0.90	-0.2
Grp C w ISO9000	86	27%	4	5%	11	13%	23	27%	48	56%	4	1	1	1	1.66	0.88	-0.1
Grp C w/o ISO9000	11	3%	0	0%	3	27%	2	18%	6	55%	3	1	1	1	1.73	0.90	-0.2

Part	Part 1 Use of IT to assist project communication																
Topic	Images used for communication																
Subject	Hiring CAD drafting services																
Q.1.5.1.d	Response										Distribution Statistics						
Sample Sector	Nos	% o/a	No '4'	% '4'	No '3'	% '3'	No '2'	% '2'	No '1'	% '1'	H	L	Median	Mode	Mean	SD	Corr
All	230	73%	20	9%	43	19%	49	21%	118	51%	4	1	1	1	1.85	1.01	0.04
Group A	66	21%	9	14%	10	15%	9	14%	38	58%	4	1	1	1	1.85	1.13	-0.1
Group B	67	21%	6	9%	10	15%	11	16%	40	60%	4	1	1	1	1.73	1.02	-0
Group C	98	31%	5	5%	23	23%	29	30%	41	42%	4	1	2	1	1.92	0.93	0.05
With ISO9000	105	33%	6	6%	25	24%	25	24%	49	47%	4	1	2	1	1.89	0.96	0.06
Without ISO9000	126	40%	14	11%	18	14%	24	19%	70	56%	4	1	1	1	1.81	1.06	-0
Grp A w ISO9000	3	1%	0	0%	1	33%	0	0%	2	67%	3	1	1	1	1.67	1.15	0.21
Grp A w/o ISO9000	66	21%	9	14%	10	15%	9	14%	38	58%	4	1	1	1	1.85	1.13	-0.1
Grp B w ISO9000	15	5%	1	7%	3	20%	1	7%	10	67%	4	1	1	1	1.67	1.05	0.26
Grp B w/o ISO9000	52	16%	5	10%	7	13%	10	19%	30	58%	4	1	1	1	1.75	1.03	-0.1
Grp C w ISO9000	87	28%	5	6%	21	24%	24	28%	37	43%	4	1	2	1	1.93	0.95	0.05
Grp C w/o ISO9000	11	3%	0	0%	2	18%	5	45%	4	36%	3	1	2	2	1.82	0.75	0.08

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Part	Part 1 Use of IT to assist project communication																
Topic	Images used for communication																
Subject	Manual methods in site offices																
Q.1.5.1.e	Response										Distribution Statistics						
Sample Sector	Nos	% o/a	No '4'	% '4'	No '3'	% '3'	No '2'	% '2'	No '1'	% '1'	H	L	Median	Mode	Mean	SD	Corr
All	233	74%	75	32%	90	39%	32	14%	36	15%	4	1	3	3	2.88	1.03	-0.1
Group A	67	21%	31	46%	24	36%	4	6%	8	12%	4	1	3	4	3.16	0.99	-0.2
Group B	71	22%	24	34%	26	37%	10	14%	11	15%	4	1	3	3	2.89	1.05	-0.3
Group C	96	30%	21	22%	40	42%	18	19%	17	18%	4	1	3	3	2.68	1.01	-0.1
With ISO9000	103	33%	25	24%	41	40%	16	16%	21	20%	4	1	3	3	2.68	1.06	-0.1
Without ISO9000	131	41%	51	39%	49	37%	16	12%	15	11%	4	1	3	4	3.04	0.99	-0.2
Grp A w ISO9000	3	1%	1	33%	1	33%	0	0%	1	33%	4	1	3	nil	2.67	1.53	1
Grp A w/o ISO9000	67	21%	31	46%	24	36%	4	6%	8	12%	4	1	3	4	3.16	0.99	-0.2
Grp B w ISO9000	15	5%	6	40%	6	40%	0	0%	3	20%	4	1	3	3	3.00	1.13	-0.7
Grp B w/o ISO9000	56	18%	18	32%	20	36%	10	18%	8	14%	4	1	3	3	2.86	1.03	-0.2
Grp C w ISO9000	85	27%	18	21%	34	40%	16	19%	17	20%	4	1	3	3	2.62	1.03	-0.1
Grp C w/o ISO9000	11	3%	3	27%	6	55%	2	18%	0	0%	4	2	3	3	3.09	0.70	-0.5

Part	Part 1 Use of IT to assist project communication																
Topic	Images used for communication																
Subject	CAD systems in site offices																
Q.1.5.1.f	Response										Distribution Statistics						
Sample Sector	Nos	% o/a	No '4'	% '4'	No '3'	% '3'	No '2'	% '2'	No '1'	% '1'	H	L	Median	Mode	Mean	SD	Corr
All	230	73%	32	14%	52	23%	25	11%	121	53%	4	1	1	1	1.98	1.15	0.28
Group A	66	21%	4	6%	5	8%	12	18%	45	68%	4	1	1	1	1.52	0.88	-0
Group B	68	22%	6	9%	13	19%	6	9%	43	63%	4	1	1	1	1.74	1.06	0.45
Group C	97	31%	22	23%	34	35%	7	7%	34	35%	4	1	3	1	2.45	1.19	0.27
With ISO9000	103	33%	24	23%	32	31%	6	6%	41	40%	4	1	3	1	2.38	1.23	0.28
Without ISO9000	128	41%	8	6%	20	16%	19	15%	81	63%	4	1	1	1	1.65	0.96	0.22
Grp A w ISO9000	3	1%	0	0%	0	0%	1	33%	2	67%	2	1	1	1	1.33	0.58	0.74
Grp A w/o ISO9000	66	21%	4	6%	5	8%	12	18%	45	68%	4	1	1	1	1.52	0.88	-0
Grp B w ISO9000	15	5%	4	27%	2	13%	0	0%	9	60%	4	1	1	1	2.07	1.39	0.75
Grp B w/o ISO9000	53	17%	2	4%	11	21%	6	11%	34	64%	4	1	1	1	1.64	0.94	0.29
Grp C w ISO9000	85	27%	20	24%	30	35%	5	6%	30	35%	4	1	3	1	2.47	1.20	0.28
Grp C w/o ISO9000	12	4%	2	17%	4	33%	2	17%	4	33%	4	1	2.5	3	2.33	1.15	0.21

Results of the 1998 postal survey of Hong Kong Public Works Contractors.

Part	Part 1 Use of IT to assist project communication																
Topic	Images used for communication																
Subject	Distribution of construction drawings as hardcopy																
Q.1.5.2.a	Response										Distribution Statistics						
Sample Sector	Nos	% o/a	No '4'	% '4'	No '3'	% '3'	No '2'	% '2'	No '1'	% '1'	H	L	Median	Mode	Mean	SD	Corr
All	235	74%	169	72%	47	20%	6	3%	13	6%	4	1	4	4	3.58	0.79	0.04
Group A	67	21%	51	76%	11	16%	2	3%	3	4%	4	1	4	4	3.64	0.75	0.11
Group B	71	22%	49	69%	12	17%	4	6%	6	8%	4	1	4	4	3.46	0.94	0.03
Group C	98	31%	70	71%	24	24%	0	0%	4	4%	4	1	4	4	3.63	0.69	0.05
With ISO9000	105	33%	83	79%	19	18%	0	0%	3	3%	4	1	4	4	3.73	0.61	0.02
Without ISO9000	131	41%	87	66%	28	21%	6	5%	10	8%	4	1	4	4	3.47	0.90	-0.1
Grp A w ISO9000	3	1%	3	100%	0	0%	0	0%	0	0%	4	4	4	4	4.00	0.00	nil
Grp A w/o ISO9000	67	21%	51	76%	11	16%	2	3%	3	4%	4	1	4	4	3.64	0.75	0.11
Grp B w ISO9000	15	5%	13	87%	2	13%	0	0%	0	0%	4	3	4	4	3.87	0.35	0.21
Grp B w/o ISO9000	56	18%	36	64%	10	18%	4	7%	6	11%	4	1	4	4	3.36	1.02	-0.1
Grp C w ISO9000	87	28%	67	77%	17	20%	0	0%	3	3%	4	1	4	4	3.70	0.65	0.03
Grp C w/o ISO9000	11	3%	3	27%	7	64%	0	0%	1	9%	4	1	3	3	3.09	0.83	-0

Part	Part 1 Use of IT to assist project communication																
Topic	Images used for communication																
Subject	Distribution of construction drawings as electronic files on disk																
Q.1.5.2.b	Response										Distribution Statistics						
Sample Sector	Nos	% o/a	No '4'	% '4'	No '3'	% '3'	No '2'	% '2'	No '1'	% '1'	H	L	Median	Mode	Mean	SD	Corr
All	231	73%	27	12%	65	28%	53	23%	86	37%	4	1	2	1	2.14	1.05	0.15
Group A	67	21%	9	13%	10	15%	12	18%	36	54%	4	1	1	1	1.88	1.11	0.13
Group B	68	22%	8	12%	15	22%	18	26%	27	40%	4	1	2	1	2.06	1.05	0.32
Group C	97	31%	10	10%	40	41%	23	24%	24	25%	4	1	3	3	2.37	0.97	0.17
With ISO9000	103	33%	10	10%	42	41%	24	23%	27	26%	4	1	3	3	2.34	0.98	0.18
Without ISO9000	129	41%	17	13%	23	18%	29	22%	60	47%	4	1	2	1	1.98	1.09	0.13
Grp A w ISO9000	3	1%	0	0%	2	67%	0	0%	1	33%	3	1	3	3	2.33	1.15	-0.7
Grp A w/o ISO9000	67	21%	9	13%	10	15%	12	18%	36	54%	4	1	1	1	1.88	1.11	0.13
Grp B w ISO9000	15	5%	2	13%	3	20%	4	27%	6	40%	4	1	2	1	2.07	1.10	0.53
Grp B w/o ISO9000	53	17%	6	11%	12	23%	14	26%	21	40%	4	1	2	1	2.06	1.05	0.26
Grp C w ISO9000	85	27%	8	9%	37	44%	20	24%	20	24%	4	1	3	3	2.39	0.95	0.18
Grp C w/o ISO9000	12	4%	2	17%	3	25%	3	25%	4	33%	4	1	2	1	2.25	1.14	-0

Results of the 1998 postal survey of Hong Kong Public Works Contractors.

Part	Part 1 Use of IT to assist project communication																
Topic	Images used for communication																
Subject	Distribution of construction drawings as electronic files across a LAN																
Q.1.5.2.c	Response										Distribution Statistics						
Sample Sector	Nos	% o/a	No '4'	% '4'	No '3'	% '3'	No '2'	% '2'	No '1'	% '1'	H	L	Median	Mode	Mean	SD	Corr
All	231	73%	7	3%	17	7%	39	17%	168	73%	4	1	1	1	1.41	0.76	0.21
Group A	67	21%	1	1%	3	4%	7	10%	56	84%	4	1	1	1	1.24	0.61	-0.1
Group B	68	22%	1	1%	4	6%	12	18%	51	75%	4	1	1	1	1.34	0.66	0.12
Group C	97	31%	5	5%	10	10%	20	21%	62	64%	4	1	1	1	1.57	0.88	0.23
With ISO9000	104	33%	5	5%	10	10%	19	18%	70	67%	4	1	1	1	1.52	0.86	0.25
Without ISO9000	128	41%	2	2%	7	5%	20	16%	99	77%	4	1	1	1	1.31	0.65	0.05
Grp A w ISO9000	3	1%	0	0%	0	0%	0	0%	3	100%	1	1	1	1	1.00	0.00	nil
Grp A w/o ISO9000	67	21%	1	1%	3	4%	7	10%	56	84%	4	1	1	1	1.24	0.61	-0.1
Grp B w ISO9000	15	5%	0	0%	2	13%	2	13%	11	73%	3	1	1	1	1.40	0.74	0.58
Grp B w/o ISO9000	53	17%	1	2%	2	4%	10	19%	40	75%	4	1	1	1	1.32	0.64	-0
Grp C w ISO9000	86	27%	5	6%	8	9%	17	20%	56	65%	4	1	1	1	1.56	0.89	0.25
Grp C w/o ISO9000	11	3%	0	0%	2	18%	3	27%	6	55%	3	1	1	1	1.64	0.81	0.11

Part	Part 1 Use of IT to assist project communication																
Topic	Images used for communication																
Subject	Distribution of construction drawings as electronic files via a modem																
Q.1.5.2.d	Response										Distribution Statistics						
Sample Sector	Nos	% o/a	No '4'	% '4'	No '3'	% '3'	No '2'	% '2'	No '1'	% '1'	H	L	Median	Mode	Mean	SD	Corr
All	231	73%	8	3%	14	6%	39	17%	170	74%	4	1	1	1	1.39	0.76	0.15
Group A	67	21%	3	4%	1	1%	7	10%	56	84%	4	1	1	1	1.27	0.71	-0
Group B	68	22%	1	1%	2	3%	9	13%	56	82%	4	1	1	1	1.24	0.58	0.09
Group C	97	31%	4	4%	11	11%	23	24%	59	61%	4	1	1	1	1.59	0.85	0.14
With ISO9000	104	33%	4	4%	10	10%	21	20%	69	66%	4	1	1	1	1.51	0.82	0.17
Without ISO9000	128	41%	4	3%	4	3%	18	14%	102	80%	4	1	1	1	1.30	0.68	0.03
Grp A w ISO9000	3	1%	0	0%	0	0%	0	0%	3	100%	1	1	1	1	1.00	0.00	nil
Grp A w/o ISO9000	67	21%	3	4%	1	1%	7	10%	56	84%	4	1	1	1	1.27	0.71	-0
Grp B w ISO9000	15	5%	0	0%	1	7%	2	13%	12	80%	3	1	1	1	1.27	0.59	0.59
Grp B w/o ISO9000	53	17%	1	2%	1	2%	7	13%	44	83%	4	1	1	1	1.23	0.58	-0.1
Grp C w ISO9000	86	27%	4	5%	9	10%	19	22%	54	63%	4	1	1	1	1.57	0.86	0.15
Grp C w/o ISO9000	11	3%	0	0%	2	18%	4	36%	5	45%	3	1	2	1	1.73	0.79	0.08

Results of the 1998 postal survey of Hong Kong Public Works Contractors.

Part	Part 1 Use of IT to assist project communication																
Topic	Images used for communication																
Subject	Distribution of construction drawings as electronic files via the Internet																
Q.1.5.2.e	Response										Distribution Statistics						
Sample Sector	Nos	% o/a	No '4'	% '4'	No '3'	% '3'	No '2'	% '2'	No '1'	% '1'	H	L	Median	Mode	Mean	SD	Corr
All	230	73%	5	2%	18	8%	29	13%	178	77%	4	1	1	1	1.35	0.72	0.15
Group A	66	21%	0	0%	0	0%	7	11%	59	89%	2	1	1	1	1.11	0.31	-0
Group B	68	22%	0	0%	4	6%	7	10%	57	84%	3	1	1	1	1.22	0.54	0.05
Group C	97	31%	5	5%	14	14%	15	15%	63	65%	4	1	1	1	1.60	0.92	0.1
With ISO9000	104	33%	5	5%	12	12%	16	15%	71	68%	4	1	1	1	1.53	0.88	0.13
Without ISO9000	127	40%	0	0%	6	5%	13	10%	108	85%	3	1	1	1	1.20	0.50	-0.1
Grp A w ISO9000	3	1%	0	0%	0	0%	0	0%	3	100%	1	1	1	1	1.00	0.00	nil
Grp A w/o ISO9000	66	21%	0	0%	0	0%	7	11%	59	89%	2	1	1	1	1.11	0.31	-0
Grp B w ISO9000	15	5%	0	0%	1	7%	3	20%	11	73%	3	1	1	1	1.33	0.62	0.49
Grp B w/o ISO9000	53	17%	0	0%	3	6%	4	8%	46	87%	3	1	1	1	1.19	0.52	-0.1
Grp C w ISO9000	86	27%	5	6%	11	13%	13	15%	57	66%	4	1	1	1	1.58	0.93	0.12
Grp C w/o ISO9000	11	3%	0	0%	3	27%	2	18%	6	55%	3	1	1	1	1.73	0.90	-0.3

Part	Part 1 Use of IT to assist project communication																
Topic	Images used for communication																
Subject	Record of drawing transmittal by hardcopy																
Q.1.5.3.a	Response										Distribution Statistics						
Sample Sector	Nos	% o/a	No '4'	% '4'	No '3'	% '3'	No '2'	% '2'	No '1'	% '1'	H	L	Median	Mode	Mean	SD	Corr
All	234	74%	170	73%	47	20%	6	3%	11	5%	4	1	4	4	3.61	0.76	0.03
Group A	66	21%	48	73%	12	18%	2	3%	4	6%	4	1	4	4	3.58	0.82	0.13
Group B	71	22%	52	73%	12	17%	2	3%	5	7%	4	1	4	4	3.56	0.86	0.1
Group C	98	31%	71	72%	23	23%	2	2%	2	2%	4	1	4	4	3.66	0.62	0.02
With ISO9000	105	33%	80	76%	22	21%	1	1%	2	2%	4	1	4	4	3.71	0.58	-0
Without ISO9000	130	41%	91	70%	25	19%	5	4%	9	7%	4	1	4	4	3.52	0.86	0.12
Grp A w ISO9000	3	1%	3	100%	0	0%	0	0%	0	0%	4	4	4	4	4.00	0.00	nil
Grp A w/o ISO9000	66	21%	48	73%	12	18%	2	3%	4	6%	4	1	4	4	3.58	0.82	0.13
Grp B w ISO9000	15	5%	12	80%	2	13%	0	0%	1	7%	4	1	4	4	3.67	0.82	-0.2
Grp B w/o ISO9000	56	18%	40	71%	10	18%	2	4%	4	7%	4	1	4	4	3.54	0.87	0.16
Grp C w ISO9000	87	28%	65	75%	20	23%	1	1%	1	1%	4	1	4	4	3.71	0.55	-0
Grp C w/o ISO9000	11	3%	6	55%	3	27%	1	9%	1	9%	4	1	4	4	3.27	1.01	0.28

Results of the 1998 postal survey of Hong Kong Public Works Contractors.

Part	Part 1 Use of IT to assist project communication																
Topic	Images used for communication																
Subject	Record of drawing transmittal by electronic database register																
Q.1.5.3.b	Response										Distribution Statistics						
Sample Sector	Nos	% o/a	No '4'	% '4'	No '3'	% '3'	No '2'	% '2'	No '1'	% '1'	H	L	Median	Mode	Mean	SD	Corr
All	227	72%	19	8%	26	11%	39	17%	143	63%	4	1	1	1	1.65	0.98	0.11
Group A	66	21%	5	8%	6	9%	7	11%	48	73%	4	1	1	1	1.52	0.95	0.15
Group B	65	21%	5	8%	5	8%	10	15%	45	69%	4	1	1	1	1.54	0.94	0.19
Group C	97	31%	9	9%	15	15%	22	23%	51	53%	4	1	1	1	1.81	1.01	0.11
With ISO9000	103	33%	7	7%	16	16%	21	20%	59	57%	4	1	1	1	1.72	0.96	0.14
Without ISO9000	125	40%	12	10%	10	8%	18	14%	85	68%	4	1	1	1	1.59	0.99	0.16
Grp A w ISO9000	3	1%	1	33%	0	0%	0	0%	2	67%	4	1	1	1	2.00	1.73	0.21
Grp A w/o ISO9000	66	21%	5	8%	6	9%	7	11%	48	73%	4	1	1	1	1.52	0.95	0.15
Grp B w ISO9000	15	5%	0	0%	1	7%	2	13%	12	80%	3	1	1	1	1.27	0.59	-0
Grp B w/o ISO9000	50	16%	5	10%	4	8%	8	16%	33	66%	4	1	1	1	1.62	1.01	0.29
Grp C w ISO9000	85	27%	6	7%	15	18%	19	22%	45	53%	4	1	1	1	1.79	0.98	0.13
Grp C w/o ISO9000	12	4%	3	25%	0	0%	3	25%	6	50%	4	1	1.5	1	2.00	1.28	0.02

Part	Part 1 Use of IT to assist project communication																
Topic	Images used for communication																
Subject	Drawings are revised /checked in hardcopy form																
Q.1.5.4.a	Response										Distribution Statistics						
Sample Sector	Nos	% o/a	No '4'	% '4'	No '3'	% '3'	No '2'	% '2'	No '1'	% '1'	H	L	Median	Mode	Mean	SD	Corr
All	235	74%	155	66%	58	25%	9	4%	13	6%	4	1	4	4	3.51	0.81	0.03
Group A	67	21%	49	73%	10	15%	3	4%	5	7%	4	1	4	4	3.54	0.89	0.15
Group B	71	22%	42	59%	22	31%	2	3%	5	7%	4	1	4	4	3.42	0.86	0.03
Group C	98	31%	65	66%	26	27%	4	4%	3	3%	4	1	4	4	3.56	0.72	0.03
With ISO9000	105	33%	75	71%	24	23%	3	3%	3	3%	4	1	4	4	3.63	0.68	-0
Without ISO9000	131	41%	81	62%	34	26%	6	5%	10	8%	4	1	4	4	3.42	0.89	0.06
Grp A w ISO9000	3	1%	3	100%	0	0%	0	0%	0	0%	4	4	4	4	4.00	0.00	nil
Grp A w/o ISO9000	67	21%	49	73%	10	15%	3	4%	5	7%	4	1	4	4	3.54	0.89	0.15
Grp B w ISO9000	15	5%	12	80%	2	13%	0	0%	1	7%	4	1	4	4	3.67	0.82	-0.2
Grp B w/o ISO9000	56	18%	30	54%	20	36%	2	4%	4	7%	4	1	4	4	3.36	0.86	0.04
Grp C w ISO9000	87	28%	60	69%	22	25%	3	3%	2	2%	4	1	4	4	3.61	0.67	-0
Grp C w/o ISO9000	11	3%	5	45%	4	36%	1	9%	1	9%	4	1	3	4	3.18	0.98	0.3

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Part	Part 1 Use of IT to assist project communication																
Topic	Images used for communication																
Subject	Drawings are revised /checked in electronic form																
Q.1.5.4.b	Response										Distribution Statistics						
Sample Sector	Nos	% o/a	No '4'	% '4'	No '3'	% '3'	No '2'	% '2'	No '1'	% '1'	H	L	Median	Mode	Mean	SD	Corr
All	226	72%	14	6%	38	17%	42	19%	132	58%	4	1	1	1	1.71	0.96	0.06
Group A	65	21%	3	5%	9	14%	6	9%	47	72%	4	1	1	1	1.51	0.90	0.11
Group B	67	21%	3	4%	10	15%	11	16%	43	64%	4	1	1	1	1.60	0.91	0.17
Group C	95	30%	8	8%	19	20%	25	26%	43	45%	4	1	2	1	1.92	1.00	0.01
With ISO9000	101	32%	6	6%	18	18%	23	23%	54	53%	4	1	1	1	1.76	0.95	0.05
Without ISO9000	126	40%	8	6%	20	16%	19	15%	79	63%	4	1	1	1	1.66	0.96	0.15
Grp A w ISO9000	3	1%	0	0%	0	0%	0	0%	3	100%	1	1	1	1	1.00	0.00	nil
Grp A w/o ISO9000	65	21%	3	5%	9	14%	6	9%	47	72%	4	1	1	1	1.51	0.90	0.11
Grp B w ISO9000	15	5%	0	0%	1	7%	2	13%	12	80%	3	1	1	1	1.27	0.59	0.14
Grp B w/o ISO9000	52	16%	3	6%	9	17%	9	17%	31	60%	4	1	1	1	1.69	0.96	0.25
Grp C w ISO9000	83	26%	6	7%	17	20%	21	25%	39	47%	4	1	2	1	1.88	0.98	0.02
Grp C w/o ISO9000	12	4%	2	17%	2	17%	4	33%	4	33%	4	1	2	1	2.17	1.11	-0

Part	Part 1 Use of IT to assist project communication																
Topic	Images used for communication																
Subject	Use of photograph images for communication																
Q.1.5.5.a	Response										Distribution Statistics						
Sample Sector	Nos	% o/a	No '4'	% '4'	No '3'	% '3'	No '2'	% '2'	No '1'	% '1'	H	L	Median	Mode	Mean	SD	Corr
All	236	75%	136	58%	56	24%	14	6%	30	13%	4	1	4	4	3.26	1.04	0.01
Group A	67	21%	47	70%	12	18%	1	1%	7	10%	4	1	4	4	3.48	0.96	-0.2
Group B	71	22%	38	54%	17	24%	3	4%	13	18%	4	1	4	4	3.13	1.15	-0.1
Group C	99	31%	52	53%	27	27%	10	10%	10	10%	4	1	4	4	3.22	1.00	0.05
With ISO9000	105	33%	57	54%	26	25%	8	8%	14	13%	4	1	4	4	3.20	1.06	0.05
Without ISO9000	132	42%	80	61%	30	23%	6	5%	16	12%	4	1	4	4	3.32	1.02	-0.1
Grp A w ISO9000	3	1%	2	67%	0	0%	0	0%	1	33%	4	1	4	4	3.00	1.73	-0.7
Grp A w/o ISO9000	67	21%	47	70%	12	18%	1	1%	7	10%	4	1	4	4	3.48	0.96	-0.2
Grp B w ISO9000	15	5%	9	60%	3	20%	0	0%	3	20%	4	1	4	4	3.20	1.21	-0.1
Grp B w/o ISO9000	56	18%	29	52%	14	25%	3	5%	10	18%	4	1	4	4	3.11	1.14	-0.2
Grp C w ISO9000	87	28%	46	53%	23	26%	8	9%	10	11%	4	1	4	4	3.21	1.02	0.06
Grp C w/o ISO9000	12	4%	6	50%	4	33%	2	17%	0	0%	4	2	3.5	4	3.33	0.78	-0.1

Results of the 1998 postal survey of Hong Kong Public Works Contractors.

Part	Part 1 Use of IT to assist project communication																
Topic	Images used for communication																
Subject	Use of digital photograph images for communication																
Q.1.5.5.b	Response										Distribution Statistics						
Sample Sector	Nos	% o/a	No '4'	% '4'	No '3'	% '3'	No '2'	% '2'	No '1'	% '1'	H	L	Median	Mode	Mean	SD	Corr
All	232	73%	15	6%	30	13%	40	17%	147	63%	4	1	1	1	1.63	0.94	0.12
Group A	67	21%	3	4%	9	13%	10	15%	45	67%	4	1	1	1	1.55	0.89	0.05
Group B	68	22%	3	4%	8	12%	6	9%	51	75%	4	1	1	1	1.46	0.87	0.11
Group C	98	31%	9	9%	13	13%	24	24%	52	53%	4	1	1	1	1.79	1.00	0.13
With ISO9000	105	33%	10	10%	15	14%	21	20%	59	56%	4	1	1	1	1.77	1.02	0.12
Without ISO9000	128	41%	5	4%	15	12%	19	15%	89	70%	4	1	1	1	1.50	0.85	0.07
Grp A w ISO9000	3	1%	0	0%	0	0%	1	33%	2	67%	2	1	1	1	1.33	0.58	0.21
Grp A w/o ISO9000	67	21%	3	4%	9	13%	10	15%	45	67%	4	1	1	1	1.55	0.89	0.05
Grp B w ISO9000	15	5%	2	13%	2	13%	1	7%	10	67%	4	1	1	1	1.73	1.16	-0.1
Grp B w/o ISO9000	53	17%	1	2%	6	11%	5	9%	41	77%	4	1	1	1	1.38	0.77	0.14
Grp C w ISO9000	87	28%	8	9%	13	15%	19	22%	47	54%	4	1	1	1	1.79	1.01	0.13
Grp C w/o ISO9000	11	3%	1	9%	0	0%	5	45%	5	45%	4	1	2	1	1.73	0.90	0.08

Part	Part 1 Use of IT to assist project communication																
Topic	Images used for communication																
Subject	Use of video images for communication																
Q.1.5.5.c	Response										Distribution Statistics						
Sample Sector	Nos	% o/a	No '4'	% '4'	No '3'	% '3'	No '2'	% '2'	No '1'	% '1'	H	L	Median	Mode	Mean	SD	Corr
All	232	73%	16	7%	27	12%	50	22%	139	60%	4	1	1	1	1.66	0.94	0.13
Group A	67	21%	7	10%	6	9%	7	10%	47	70%	4	1	1	1	1.60	1.03	0.11
Group B	68	22%	1	1%	7	10%	18	26%	42	62%	4	1	1	1	1.51	0.74	0.12
Group C	98	31%	8	8%	14	14%	25	26%	51	52%	4	1	1	1	1.79	0.98	0.14
With ISO9000	105	33%	8	8%	13	12%	25	24%	59	56%	4	1	1	1	1.71	0.96	0.16
Without ISO9000	128	41%	8	6%	14	11%	25	20%	81	63%	4	1	1	1	1.60	0.92	0.09
Grp A w ISO9000	128	41%	8	6%	14	11%	25	20%	81	63%	4	1	1	1	1.60	0.92	0.09
Grp A w/o ISO9000	67	21%	7	10%	6	9%	7	10%	47	70%	4	1	1	1	1.60	1.03	0.11
Grp B w ISO9000	15	5%	1	7%	1	7%	3	20%	10	67%	4	1	1	1	1.53	0.92	-0.1
Grp B w/o ISO9000	53	17%	0	0%	6	11%	15	28%	32	60%	3	1	1	1	1.51	0.70	0.19
Grp C w ISO9000	87	28%	7	8%	12	14%	22	25%	46	53%	4	1	1	1	1.77	0.97	0.16
Grp C w/o ISO9000	11	3%	1	9%	2	18%	3	27%	5	45%	4	1	2	1	1.91	1.04	0.03

Results of the 1998 postal survey of Hong Kong Public Works Contractors.

Part	Part 1 Use of IT to assist project communication																
Topic	Images used for communication																
Subject	Distribution of picture images in original physical form																
Q.1.5.6.a	Response										Distribution Statistics						
Sample Sector	Nos	% o/a	No '4'	% '4'	No '3'	% '3'	No '2'	% '2'	No '1'	% '1'	H	L	Median	Mode	Mean	SD	Corr
All	232	73%	149	64%	51	22%	5	2%	27	12%	4	1	4	4	3.39	0.99	0.05
Group A	67	21%	45	67%	13	19%	1	1%	8	12%	4	1	4	4	3.42	1.00	0.12
Group B	70	22%	46	66%	14	20%	0	0%	10	14%	4	1	4	4	3.37	1.05	0.15
Group C	96	30%	59	61%	24	25%	4	4%	9	9%	4	1	4	4	3.39	0.94	0.07
With ISO9000	103	33%	67	65%	21	20%	3	3%	12	12%	4	1	4	4	3.39	1.00	0.07
Without ISO9000	130	41%	83	64%	30	23%	2	2%	15	12%	4	1	4	4	3.39	0.98	0.05
Grp A w ISO9000	3	1%	2	67%	0	0%	0	0%	1	33%	4	1	4	4	3.00	1.73	0.95
Grp A w/o ISO9000	67	21%	45	67%	13	19%	1	1%	8	12%	4	1	4	4	3.42	1.00	0.12
Grp B w ISO9000	15	5%	10	67%	2	13%	0	0%	3	20%	4	1	4	4	3.27	1.22	0.21
Grp B w/o ISO9000	55	17%	36	65%	12	22%	0	0%	7	13%	4	1	4	4	3.40	1.01	0.15
Grp C w ISO9000	85	27%	55	65%	19	22%	3	4%	8	9%	4	1	4	4	3.42	0.94	0.07
Grp C w/o ISO9000	11	3%	4	36%	5	45%	1	9%	1	9%	4	1	3	3	3.09	0.94	-0

Part	Part 1 Use of IT to assist project communication																
Topic	Images used for communication																
Subject	Distribution of picture images in electronic digital form																
Q.1.5.6.b	Response										Distribution Statistics						
Sample Sector	Nos	% o/a	No '4'	% '4'	No '3'	% '3'	No '2'	% '2'	No '1'	% '1'	H	L	Median	Mode	Mean	SD	Corr
All	229	72%	8	3%	23	10%	41	18%	156	68%	4	0	1	1	1.48	0.82	0.09
Group A	67	0.212	1	0.015	4	0.06	9	0.134	52	0.776	4	0	1	1	1.2836	0.67	0.02
Group B	66	21%	0	0%	6	9%	12	18%	48	73%	3	1	1	1	1.36	0.65	0.15
Group C	97	31%	7	7%	13	13%	20	21%	57	59%	4	1	1	1	1.69	0.96	0.04
With ISO9000	103	33%	6	6%	15	15%	20	19%	62	60%	4	1	1	1	1.66	0.93	0.05
Without ISO9000	127	40%	2	2%	8	6%	21	17%	95	75%	4	0	1	1	1.33	0.68	0.14
Grp A w ISO9000	3	1%	0	0%	0	0%	0	0%	3	100%	1	1	1	1	1.00	0.00	nil
Grp A w/o ISO9000	67	21%	1	1%	4	6%	9	13%	52	78%	4	0	1	1	1.28	0.67	0.02
Grp B w ISO9000	15	5%	0	0%	3	20%	2	13%	10	67%	3	1	1	1	1.53	0.83	0.07
Grp B w/o ISO9000	51	16%	0	0%	3	6%	10	20%	38	75%	3	1	1	1	1.31	0.58	0.14
Grp C w ISO9000	85	27%	6	7%	12	14%	18	21%	49	58%	4	1	1	1	1.71	0.96	0.04
Grp C w/o ISO9000	12	4%	1	8%	1	8%	2	17%	8	67%	4	1	1	1	1.58	1.00	0.2

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Part	Part 1 Use of IT to assist project communication																
Topic	Written communication																
Subject	Company standards/formats for written documents in company offices																
Q.1.6.1.a	Response										Distribution Statistics						
Sample Sector	Nos	% o/a	No '4'	% '4'	No '3'	% '3'	No '2'	% '2'	No '1'	% '1'	H	L	Median	Mode	Mean	SD	Corr
All	238	75%	167	70%	58	24%	6	3%	7	3%	4	1	4	4	3.62	0.68	0.07
Group A	68	22%	43	63%	17	25%	2	3%	6	9%	4	1	4	4	3.43	0.92	-0.2
Group B	72	23%	56	78%	14	19%	2	3%	0	0%	4	2	4	4	3.75	0.50	0
Group C	99	31%	69	70%	27	27%	2	2%	1	1%	4	1	4	4	3.66	0.57	0.1
With ISO9000	105	33%	78	74%	24	23%	2	2%	1	1%	4	1	4	4	3.70	0.55	0.07
Without ISO9000	134	42%	90	67%	34	25%	4	3%	6	4%	4	1	4	4	3.55	0.76	0.04
Grp A w ISO9000	3	1%	2	67%	0	0%	1	33%	0	0%	4	2	4	4	3.33	1.15	-0.7
Grp A w/o ISO9000	68	22%	43	63%	17	25%	2	3%	6	9%	4	1	4	4	3.43	0.92	-0.2
Grp B w ISO9000	15	5%	14	93%	1	7%	0	0%	0	0%	4	3	4	4	3.93	0.26	0.25
Grp B w/o ISO9000	57	18%	42	74%	13	23%	2	4%	0	0%	4	2	4	4	3.70	0.53	-0.1
Grp C w ISO9000	87	28%	62	71%	23	26%	1	1%	1	1%	4	1	4	4	3.68	0.56	0.09
Grp C w/o ISO9000	12	4%	7	58%	4	33%	1	8%	0	0%	4	2	4	4	3.50	0.67	0.28

Part	Part 1 Use of IT to assist project communication																
Topic	Written communication																
Subject	Company standards/formats for written documents in site offices																
Q.1.6.1.b	Response										Distribution Statistics						
Sample Sector	Nos	% o/a	No '4'	% '4'	No '3'	% '3'	No '2'	% '2'	No '1'	% '1'	H	L	Median	Mode	Mean	SD	Corr
All	234	74%	136	58%	76	32%	9	4%	13	6%	4	1	4	4	3.43	0.81	0.03
Group A	68	22%	32	47%	22	32%	4	6%	10	15%	4	1	3	4	3.12	1.06	-0.1
Group B	70	22%	45	64%	19	27%	3	4%	3	4%	4	1	4	4	3.51	0.78	0.04
Group C	97	31%	59	61%	35	36%	2	2%	1	1%	4	1	4	4	3.57	0.59	-0
With ISO9000	103	33%	65	63%	34	33%	3	3%	1	1%	4	1	4	4	3.58	0.60	-0
Without ISO9000	132	42%	71	54%	42	32%	6	5%	13	10%	4	1	4	4	3.30	0.95	0.08
Grp A w ISO9000	3	1%	0	0%	2	67%	1	33%	0	0%	3	2	3	3	2.67	0.58	-0.7
Grp A w/o ISO9000	68	22%	32	47%	22	32%	4	6%	10	15%	4	1	3	4	3.12	1.06	-0.1
Grp B w ISO9000	15	5%	12	80%	3	20%	0	0%	0	0%	4	3	4	4	3.80	0.41	-0
Grp B w/o ISO9000	55	17%	33	60%	16	29%	3	5%	3	5%	4	1	4	4	3.44	0.83	-0
Grp C w ISO9000	85	27%	53	62%	29	34%	2	2%	1	1%	4	1	4	4	3.58	0.61	-0
Grp C w/o ISO9000	12	4%	6	50%	6	50%	0	0%	0	0%	4	3	3.5	3	3.50	0.52	0.36

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Part	Part 1 Use of IT to assist project communication																
Topic	Written communication																
Subject	Use of printed proforma for routine documents in company offices																
Q.1.6.2.a	Response										Distribution Statistics						
Sample Sector	Nos	% o/a	No '4'	% '4'	No '3'	% '3'	No '2'	% '2'	No '1'	% '1'	H	L	Median	Mode	Mean	SD	Corr
All	237	75%	155	65%	63	27%	11	5%	8	3%	4	1	4	4	3.54	0.74	0.08
Group A	67	21%	41	61%	21	31%	1	1%	4	6%	4	1	4	4	3.48	0.80	0.1
Group B	72	23%	47	65%	22	31%	3	4%	0	0%	4	2	4	4	3.61	0.57	-0
Group C	99	31%	68	69%	20	20%	7	7%	4	4%	4	1	4	4	3.54	0.80	0.11
With ISO9000	105	33%	74	70%	21	20%	6	6%	4	4%	4	1	4	4	3.57	0.77	0.1
Without ISO9000	133	42%	82	62%	42	32%	5	4%	4	3%	4	1	4	4	3.52	0.71	0.04
Grp A w ISO9000	3	1%	1	33%	2	67%	0	0%	0	0%	4	3	3	3	3.33	0.58	0.21
Grp A w/o ISO9000	67	21%	41	61%	21	31%	1	1%	4	6%	4	1	4	4	3.48	0.80	0.1
Grp B w ISO9000	15	5%	11	73%	4	27%	0	0%	0	0%	4	3	4	4	3.73	0.46	0.06
Grp B w/o ISO9000	57	18%	36	63%	18	32%	3	5%	0	0%	4	2	4	4	3.58	0.60	-0.1
Grp C w ISO9000	87	28%	62	71%	15	17%	6	7%	4	5%	4	1	4	4	3.55	0.82	0.11
Grp C w/o ISO9000	12	4%	6	50%	5	42%	1	8%	0	0%	4	2	3.5	4	3.42	0.67	0.27

Part	Part 1 Use of IT to assist project communication																
Topic	Written communication																
Subject	Use of printed proforma for routine documents in site offices																
Q.1.6.2.b	Response										Distribution Statistics						
Sample Sector	Nos	% o/a	No '4'	% '4'	No '3'	% '3'	No '2'	% '2'	No '1'	% '1'	H	L	Median	Mode	Mean	SD	Corr
All	234	74%	136	58%	72	31%	13	6%	13	6%	4	1	4	4	3.41	0.83	0.09
Group A	67	21%	33	49%	24	36%	2	3%	8	12%	4	1	3	4	3.22	0.98	-0
Group B	72	23%	43	60%	20	28%	7	10%	2	3%	4	1	4	4	3.44	0.79	0.05
Group C	96	30%	60	63%	28	29%	4	4%	4	4%	4	1	4	4	3.50	0.77	0.12
With ISO9000	103	33%	66	64%	29	28%	4	4%	4	4%	4	1	4	4	3.52	0.75	0.1
Without ISO9000	132	42%	70	53%	43	33%	9	7%	10	8%	4	1	4	4	3.31	0.90	0.06
Grp A w ISO9000	3	1%	0	0%	3	100%	0	0%	0	0%	3	3	3	3	3.00	0.00	nil
Grp A w/o ISO9000	67	21%	33	49%	24	36%	2	3%	8	12%	4	1	3	4	3.22	0.98	-0
Grp B w ISO9000	15	5%	10	67%	4	27%	1	7%	0	0%	4	2	4	4	3.60	0.63	0.23
Grp B w/o ISO9000	57	18%	33	58%	16	28%	6	11%	2	4%	4	1	4	4	3.40	0.82	-0
Grp C w ISO9000	85	27%	56	66%	22	26%	3	4%	4	5%	4	1	4	4	3.53	0.78	0.11
Grp C w/o ISO9000	11	3%	4	36%	6	55%	1	9%	0	0%	4	2	3	3	3.27	0.65	0.35

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Part	Part 1 Use of IT to assist project communication																
Topic	Written communication																
Subject	Use of procedure/instruction for filing of written documents in company offices																
Q.1.6.3.a	Response										Distribution Statistics						
Sample Sector	Nos	% o/a	No '4'	% '4'	No '3'	% '3'	No '2'	% '2'	No '1'	% '1'	H	L	Median	Mode	Mean	SD	Corr
All	238	75%	193	81%	40	17%	4	2%	1	0%	4	1	4	4	3.79	0.48	0.06
Group A	68	22%	51	75%	14	21%	2	3%	1	1%	4	1	4	4	3.69	0.60	0.1
Group B	72	23%	61	85%	10	14%	1	1%	0	0%	4	2	4	4	3.83	0.41	0.13
Group C	99	31%	82	83%	16	16%	1	1%	0	0%	4	2	4	4	3.82	0.41	0.07
With ISO9000	105	33%	91	87%	14	13%	0	0%	0	0%	4	3	4	4	3.87	0.34	0.03
Without ISO9000	134	42%	103	77%	26	19%	4	3%	1	1%	4	1	4	4	3.72	0.55	0.09
Grp A w ISO9000	3	1%	3	100%	0	0%	0	0%	0	0%	4	4	4	4	4.00	0.00	nil
Grp A w/o ISO9000	68	22%	51	75%	14	21%	2	3%	1	1%	4	1	4	4	3.69	0.60	0.1
Grp B w ISO9000	15	5%	14	93%	1	7%	0	0%	0	0%	4	3	4	4	3.93	0.26	0.19
Grp B w/o ISO9000	57	18%	47	82%	9	16%	1	2%	0	0%	4	2	4	4	3.81	0.44	0.09
Grp C w ISO9000	87	28%	74	85%	13	15%	0	0%	0	0%	4	3	4	4	3.85	0.36	0.05
Grp C w/o ISO9000	12	4%	8	67%	3	25%	1	8%	0	0%	4	2	4	4	3.58	0.67	0.22

Part	Part 1 Use of IT to assist project communication																
Topic	Written communication																
Subject	Use of procedure/instruction for filing of written documents in site offices																
Q.1.6.3.b	Response										Distribution Statistics						
Sample Sector	Nos	% o/a	No '4'	% '4'	No '3'	% '3'	No '2'	% '2'	No '1'	% '1'	H	L	Median	Mode	Mean	SD	Corr
All	236	75%	166	70%	52	22%	11	5%	7	3%	4	1	4	4	3.60	0.72	0.1
Group A	68	22%	41	60%	17	25%	5	7%	5	7%	4	1	4	4	3.38	0.91	0.14
Group B	72	23%	47	65%	18	25%	4	6%	3	4%	4	1	4	4	3.51	0.79	0.24
Group C	97	31%	78	80%	17	18%	2	2%	0	0%	4	2	4	4	3.78	0.46	0.09
With ISO9000	103	33%	87	84%	15	15%	1	1%	0	0%	4	2	4	4	3.83	0.40	0.05
Without ISO9000	134	42%	79	59%	37	28%	10	7%	8	6%	4	1	4	4	3.40	0.87	0.14
Grp A w ISO9000	3	1%	3	100%	0	0%	0	0%	0	0%	4	4	4	4	4.00	0.00	nil
Grp A w/o ISO9000	68	22%	41	60%	17	25%	5	7%	5	7%	4	1	4	4	3.38	0.91	0.14
Grp B w ISO9000	15	5%	13	87%	2	13%	0	0%	0	0%	4	3	4	4	3.87	0.35	0.13
Grp B w/o ISO9000	57	18%	34	60%	16	28%	4	7%	3	5%	4	1	4	4	3.42	0.84	0.21
Grp C w ISO9000	85	27%	71	84%	13	15%	1	1%	0	0%	4	2	4	4	3.82	0.41	0.06
Grp C w/o ISO9000	12	4%	7	58%	4	33%	1	8%	0	0%	4	2	4	4	3.50	0.67	0.27

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Part	Part 1 Use of IT to assist project communication																
Topic	Written communication																
Subject	Use of the same procedure/instruction for filing of written documents on all sites																
Q.1.6.4	Response										Distribution Statistics						
Sample Sector	Nos	% o/a	No '4'	% '4'	No '3'	% '3'	No '2'	% '2'	No '1'	% '1'	H	L	Median	Mode	Mean	SD	Corr
All	232	73%	111	48%	92	40%	23	10%	6	3%	4	1	3	4	3.33	0.76	-0
Group A	66	21%	29	44%	24	36%	9	14%	4	6%	4	1	3	4	3.18	0.89	-0.1
Group B	71	22%	37	52%	26	37%	7	10%	1	1%	4	1	4	4	3.39	0.73	0.07
Group C	96	30%	46	48%	42	44%	7	7%	1	1%	4	1	3	4	3.39	0.67	-0.1
With ISO9000	102	32%	50	49%	46	45%	5	5%	1	1%	4	1	3	4	3.42	0.64	-0.1
Without ISO9000	131	41%	62	47%	46	35%	18	14%	5	4%	4	1	3	4	3.26	0.84	0.1
Grp A w ISO9000	3	1%	0	0%	3	100%	0	0%	0	0%	3	3	3	3	3.00	0.00	nil
Grp A w/o ISO9000	66	21%	29	44%	24	36%	9	14%	4	6%	4	1	3	4	3.18	0.89	-0.1
Grp B w ISO9000	15	5%	9	60%	6	40%	0	0%	0	0%	4	3	4	4	3.60	0.51	0.05
Grp B w/o ISO9000	56	18%	28	50%	20	36%	7	13%	1	2%	4	1	3.5	4	3.34	0.77	0.04
Grp C w ISO9000	84	27%	41	49%	37	44%	5	6%	1	1%	4	1	3	4	3.40	0.66	-0.1
Grp C w/o ISO9000	12	4%	5	42%	5	42%	2	17%	0	0%	4	2	3	4	3.25	0.75	0.37

Part	Part 1 Use of IT to assist project communication																
Topic	Written communication																
Subject	Use of a computer-based document management system in the company offices																
Q.1.6.5.a	Response										Distribution Statistics						
Sample Sector	Nos	% o/a	No '4'	% '4'	No '3'	% '3'	No '2'	% '2'	No '1'	% '1'	H	L	Median	Mode	Mean	SD	Corr
All	237	75%	59	25%	45	19%	55	23%	78	33%	4	1	2	1	2.36	1.18	0.05
Group A	68	22%	23	34%	14	21%	10	15%	21	31%	4	1	3	4	2.57	1.25	-0
Group B	71	22%	12	17%	10	14%	16	23%	33	46%	4	1	2	1	2.01	1.14	0.07
Group C	99	31%	25	25%	21	21%	29	29%	24	24%	4	1	2	2	2.47	1.12	0.06
With ISO9000	105	33%	24	23%	21	20%	32	30%	28	27%	4	1	2	2	2.39	1.11	0.09
Without ISO9000	133	42%	36	27%	24	18%	23	17%	50	38%	4	1	2	1	2.35	1.24	-0
Grp A w ISO9000	3	1%	1	33%	0	0%	1	33%	1	33%	4	1	2	nil	2.33	1.53	-0.1
Grp A w/o ISO9000	68	22%	23	34%	14	21%	10	15%	21	31%	4	1	3	4	2.57	1.25	-0
Grp B w ISO9000	15	5%	2	13%	2	13%	5	33%	6	40%	4	1	2	1	2.00	1.07	0.1
Grp B w/o ISO9000	56	18%	10	18%	8	14%	11	20%	27	48%	4	1	2	1	2.02	1.17	0.07
Grp C w ISO9000	87	28%	21	24%	19	22%	26	30%	21	24%	4	1	2	2	2.46	1.11	0.08
Grp C w/o ISO9000	12	4%	4	33%	2	17%	3	25%	3	25%	4	1	2.5	4	2.58	1.24	-0.2

Results of the 1998 postal survey of Hong Kong Public Works Contractors.

Part	Part 1 Use of IT to assist project communication																
Topic	Written communication																
Subject	Use of a computer-based document management system in the site offices																
Q.1.6.5.b	Response										Distribution Statistics						
Sample Sector	Nos	% o/a	No '4'	% '4'	No '3'	% '3'	No '2'	% '2'	No '1'	% '1'	H	L	Median	Mode	Mean	SD	Corr
All	234	74%	24	10%	49	21%	61	26%	100	43%	4	1	2	1	1.99	1.03	0.08
Group A	67	21%	4	6%	12	18%	17	25%	34	51%	4	1	1	1	1.79	0.95	0.12
Group B	71	22%	6	8%	10	14%	17	24%	38	54%	4	1	1	1	1.77	0.99	0.22
Group C	97	31%	14	14%	27	28%	27	28%	29	30%	4	1	2	1	2.27	1.05	0.03
With ISO9000	103	33%	11	11%	26	25%	32	31%	34	33%	4	1	2	1	2.14	1.00	0.06
Without ISO9000	132	42%	13	10%	23	17%	29	22%	67	51%	4	1	1	1	1.86	1.03	0.18
Grp A w ISO9000	3	1%	0	0%	0	0%	2	67%	1	33%	2	1	2	2	1.67	0.58	-0.7
Grp A w/o ISO9000	67	21%	4	6%	12	18%	17	25%	34	51%	4	1	1	1	1.79	0.95	0.12
Grp B w ISO9000	15	5%	0	0%	2	13%	6	40%	7	47%	3	1	2	1	1.67	0.72	0.31
Grp B w/o ISO9000	56	18%	6	11%	8	14%	11	20%	31	55%	4	1	1	1	1.80	1.05	0.24
Grp C w ISO9000	85	27%	11	13%	24	28%	24	28%	26	31%	4	1	2	1	2.24	1.03	0.03
Grp C w/o ISO9000	12	4%	3	25%	3	25%	3	25%	3	25%	4	1	2.5	4	2.50	1.17	0.15

Part	Part 1 Use of IT to assist project communication																
Topic	Written communication																
Subject	Use of a system of keywords to record contents of filed documents in the company offices																
Q.1.6.6.a	Response										Distribution Statistics						
Sample Sector	Nos	% o/a	No '4'	% '4'	No '3'	% '3'	No '2'	% '2'	No '1'	% '1'	H	L	Median	Mode	Mean	SD	Corr
All	237	75%	85	36%	62	26%	34	14%	56	24%	4	1	3	4	2.74	1.18	-0.1
Group A	68	22%	27	40%	17	25%	8	12%	16	24%	4	1	3	4	2.81	1.20	-0.4
Group B	71	22%	29	41%	16	23%	9	13%	17	24%	4	1	3	4	2.80	1.21	0.02
Group C	99	31%	30	30%	29	29%	17	17%	23	23%	4	1	3	4	2.67	1.14	-0.1
With ISO9000	105	33%	33	31%	32	30%	14	13%	26	25%	4	1	3	4	2.69	1.16	-0.1
Without ISO9000	133	42%	53	40%	30	23%	20	15%	30	23%	4	1	3	4	2.80	1.19	-0.1
Grp A w ISO9000	3	1%	0	0%	0	0%	0	0%	3	100%	1	1	1	1	1.00	0.00	nil
Grp A w/o ISO9000	68	22%	27	40%	17	25%	8	12%	16	24%	4	1	3	4	2.81	1.20	-0.4
Grp B w ISO9000	15	5%	7	47%	4	27%	1	7%	3	20%	4	1	3	4	3.00	1.20	0.46
Grp B w/o ISO9000	56	18%	22	39%	12	21%	8	14%	14	25%	4	1	3	4	2.75	1.22	-0.1
Grp C w ISO9000	87	28%	26	30%	28	32%	13	15%	20	23%	4	1	3	3	2.69	1.13	-0.1
Grp C w/o ISO9000	12	4%	4	33%	1	8%	4	33%	3	25%	4	1	2	4	2.50	1.24	-0.1

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Part	Part 1 Use of IT to assist project communication																
Topic	Written communication																
Subject	Use of a system of keywords to record contents of filed documents in the site offices																
Q.1.6.6.b	Response										Distribution Statistics						
Sample Sector	Nos	% o/a	No '4'	% '4'	No '3'	% '3'	No '2'	% '2'	No '1'	% '1'	H	L	Median	Mode	Mean	SD	Corr
All	234	74%	56	24%	55	24%	47	20%	76	32%	4	1	2	1	2.39	1.17	-0
Group A	67	21%	14	21%	16	24%	11	16%	26	39%	4	1	2	1	2.27	1.19	-0.3
Group B	71	22%	17	24%	18	25%	13	18%	23	32%	4	1	2	1	2.41	1.18	0.17
Group C	97	31%	25	26%	21	22%	23	24%	28	29%	4	1	2	1	2.44	1.16	-0.1
With ISO9000	103	33%	28	27%	23	22%	20	19%	32	31%	4	1	2	1	2.46	1.19	-0.1
Without ISO9000	132	42%	28	21%	32	24%	27	20%	45	34%	4	1	2	1	2.33	1.16	-0
Grp A w ISO9000	3	1%	0	0%	0	0%	0	0%	3	100%	1	1	1	1	1.00	0.00	nil
Grp A w/o ISO9000	67	21%	14	21%	16	24%	11	16%	26	39%	4	1	2	1	2.27	1.19	-0.3
Grp B w ISO9000	15	5%	6	40%	3	20%	2	13%	4	27%	4	1	3	4	2.73	1.28	0.63
Grp B w/o ISO9000	56	18%	11	20%	15	27%	11	20%	19	34%	4	1	2	1	2.32	1.15	-0
Grp C w ISO9000	85	27%	22	26%	20	24%	18	21%	25	29%	4	1	2	1	2.46	1.17	-0.1
Grp C w/o ISO9000	12	4%	3	25%	1	8%	5	42%	3	25%	4	1	2	2	2.33	1.15	-0.1

Part	Part 1 Use of IT to assist project communication																
Topic	Written communication																
Subject	Use of employed staff to maintain a filing system in the company offices																
Q.1.6.7.a	Response										Distribution Statistics						
Sample Sector	Nos	% o/a	No '4'	% '4'	No '3'	% '3'	No '2'	% '2'	No '1'	% '1'	H	L	Median	Mode	Mean	SD	Corr
All	238	75%	150	63%	48	20%	15	6%	25	11%	4	1	4	4	3.36	1.00	0.08
Group A	68	22%	44	65%	15	22%	2	3%	7	10%	4	1	4	4	3.41	0.97	0.08
Group B	72	23%	45	63%	16	22%	5	7%	6	8%	4	1	4	4	3.39	0.94	0.21
Group C	99	31%	62	63%	17	17%	8	8%	12	12%	4	1	4	4	3.30	1.05	0.12
With ISO9000	105	33%	69	66%	17	16%	7	7%	12	11%	4	1	4	4	3.36	1.03	0.12
Without ISO9000	134	42%	82	61%	31	23%	8	6%	13	10%	4	1	4	4	3.36	0.97	-0
Grp A w ISO9000	3	1%	3	100%	0	0%	0	0%	0	0%	4	4	4	4	4.00	0.00	nil
Grp A w/o ISO9000	68	22%	44	65%	15	22%	2	3%	7	10%	4	1	4	4	3.41	0.97	0.08
Grp B w ISO9000	15	5%	9	60%	3	20%	1	7%	2	13%	4	1	4	4	3.27	1.10	0.43
Grp B w/o ISO9000	57	18%	36	63%	13	23%	4	7%	4	7%	4	1	4	4	3.42	0.91	0.17
Grp C w ISO9000	87	28%	57	66%	14	16%	6	7%	10	11%	4	1	4	4	3.36	1.03	0.12
Grp C w/o ISO9000	12	4%	5	42%	3	25%	2	17%	2	17%	4	1	3	4	2.92	1.16	-0.2

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Part	Part 1 Use of IT to assist project communication																
Topic	Written communication																
Subject	Use of employed staff to maintain a filing system in the site offices																
Q.1.6.7.b	Response									Distribution Statistics							
Sample Sector	Nos	% o/a	No '4'	% '4'	No '3'	% '3'	No '2'	% '2'	No '1'	% '1'	H	L	Median	Mode	Mean	SD	Corr
All	235	74%	97	41%	57	24%	38	16%	43	18%	4	1	3	4	2.89	1.14	0.17
Group A	67	21%	22	33%	16	24%	12	18%	17	25%	4	1	3	4	2.64	1.19	0.18
Group B	72	23%	24	33%	19	26%	16	22%	13	18%	4	1	3	4	2.75	1.11	0.37
Group C	97	31%	51	53%	22	23%	10	10%	14	14%	4	1	4	4	3.13	1.10	0.18
With ISO9000	103	33%	56	54%	25	24%	9	9%	13	13%	4	1	4	4	3.20	1.05	0.17
Without ISO9000	133	42%	41	31%	32	24%	29	22%	31	23%	4	1	3	4	2.62	1.15	0.12
Grp A w ISO9000	3	1%	2	67%	0	0%	1	33%	0	0%	4	2	4	4	3.33	1.15	-0.2
Grp A w/o ISO9000	67	21%	22	33%	16	24%	12	18%	17	25%	4	1	3	4	2.64	1.19	0.18
Grp B w ISO9000	15	5%	6	40%	6	40%	2	13%	1	7%	4	1	3	4	3.13	0.92	0.39
Grp B w/o ISO9000	57	18%	18	32%	13	23%	14	25%	12	21%	4	1	3	4	2.65	1.14	0.34
Grp C w ISO9000	85	27%	48	56%	19	22%	6	7%	12	14%	4	1	4	4	3.21	1.08	0.18
Grp C w/o ISO9000	12	4%	3	25%	3	25%	4	33%	2	17%	4	1	2.5	2	2.58	1.08	-0.1

Part	Part 1 Use of IT to assist project communication																
Topic	Written communication																
Subject	Use of employed staff as Information Manager in the company offices																
Q.1.6.8.a	Response									Distribution Statistics							
Sample Sector	Nos	% o/a	No '4'	% '4'	No '3'	% '3'	No '2'	% '2'	No '1'	% '1'	H	L	Median	Mode	Mean	SD	Corr
All	237	75%	32	14%	27	11%	37	16%	141	59%	4	1	1	1	1.79	1.10	0.15
Group A	68	22%	9	13%	8	12%	10	15%	41	60%	4	1	1	1	1.78	1.10	-0.1
Group B	72	23%	8	11%	8	11%	11	15%	45	63%	4	1	1	1	1.71	1.05	-0
Group C	98	31%	15	15%	11	11%	16	16%	56	57%	4	1	1	1	1.85	1.13	0.23
With ISO9000	105	33%	17	16%	13	12%	19	18%	56	53%	4	1	1	1	1.91	1.14	0.2
Without ISO9000	133	42%	15	11%	14	11%	18	14%	86	65%	4	1	1	1	1.68	1.05	-0.1
Grp A w ISO9000	3	1%	1	33%	0	0%	0	0%	2	67%	4	1	1	1	2.00	1.73	0.21
Grp A w/o ISO9000	3	1%	1	33%	0	0%	0	0%	2	67%	4	1	1	1	2.00	1.73	0.21
Grp B w ISO9000	15	5%	2	13%	2	13%	4	27%	7	47%	4	1	2	1	1.93	1.10	-0.3
Grp B w/o ISO9000	57	18%	6	11%	6	11%	7	12%	38	67%	4	1	1	1	1.65	1.04	-0
Grp C w ISO9000	87	28%	14	16%	11	13%	15	17%	47	54%	4	1	1	1	1.91	1.15	0.23
Grp C w/o ISO9000	11	3%	1	9%	0	0%	1	9%	9	82%	4	1	1	1	1.36	0.92	-0

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Part	Part 1 Use of IT to assist project communication																
Topic	Written communication																
Subject	Use of employed staff as Information Manager in the site offices																
Q.1.6.8.b	Response										Distribution Statistics						
Sample Sector	Nos	% o/a	No '4'	% '4'	No '3'	% '3'	No '2'	% '2'	No '1'	% '1'	H	L	Median	Mode	Mean	SD	Corr
All	235	74%	15	6%	22	9%	46	20%	152	65%	4	1	1	1	1.57	0.90	0.25
Group A	68	22%	3	4%	2	3%	16	24%	47	69%	4	1	1	1	1.43	0.76	-0.2
Group B	72	23%	4	6%	6	8%	14	19%	48	67%	4	1	1	1	1.53	0.87	-0.1
Group C	96	30%	8	8%	14	15%	16	17%	58	60%	4	1	1	1	1.71	1.00	0.33
With ISO9000	103	33%	7	7%	16	16%	20	19%	60	58%	4	1	1	1	1.71	0.97	0.33
Without ISO9000	133	42%	8	6%	6	5%	26	20%	93	70%	4	1	1	1	1.47	0.84	-0
Grp A w ISO9000	3	1%	0	0%	0	0%	0	0%	3	100%	1	1	1	1	1.00	0.00	nil
Grp A w/o ISO9000	68	22%	3	4%	2	3%	16	24%	47	69%	4	1	1	1	1.43	0.76	-0.2
Grp B w ISO9000	15	5%	0	0%	2	13%	5	33%	8	53%	3	1	1	1	1.60	0.74	-0.4
Grp B w/o ISO9000	57	18%	4	7%	4	7%	9	16%	40	70%	4	1	1	1	1.51	0.91	-0
Grp C w ISO9000	85	27%	7	8%	14	16%	15	18%	49	58%	4	1	1	1	1.75	1.01	0.34
Grp C w/o ISO9000	11	3%	1	9%	0	0%	1	9%	9	82%	4	1	1	1	1.36	0.92	-0

Part	Part 1 Use of IT to assist project communication																
Topic	Electronic communication																
Subject	Use of e-mail in the company offices																
Q.1.7.1.a	Response										Distribution Statistics						
Sample Sector	Nos	% o/a	No '4'	% '4'	No '3'	% '3'	No '2'	% '2'	No '1'	% '1'	H	L	Median	Mode	Mean	SD	Corr
All	237	75%	33	14%	24	10%	21	9%	159	67%	4	1	1	1	1.71	1.12	0.32
Group A	68	22%	5	7%	4	6%	4	6%	55	81%	4	1	1	1	1.40	0.90	0.07
Group B	71	22%	4	6%	8	11%	9	13%	50	70%	4	1	1	1	1.52	0.91	-0
Group C	99	31%	25	25%	12	12%	8	8%	54	55%	4	1	1	1	2.08	1.30	0.35
With ISO9000	105	33%	23	22%	11	10%	10	10%	61	58%	4	1	1	1	1.96	1.26	0.36
Without ISO9000	133	42%	11	8%	13	10%	11	8%	98	74%	4	1	1	1	1.53	0.97	0.22
Grp A w ISO9000	3	1%	0	0%	0	0%	0	0%	3	100%	1	1	1	1	1.00	0.00	nil
Grp A w/o ISO9000	68	22%	5	7%	4	6%	4	6%	55	81%	4	1	1	1	1.40	0.90	0.07
Grp B w ISO9000	15	5%	0	0%	1	7%	2	13%	12	80%	3	1	1	1	1.27	0.59	-0.1
Grp B w/o ISO9000	56	18%	4	7%	7	13%	7	13%	38	68%	4	1	1	1	1.59	0.97	0.05
Grp C w ISO9000	87	28%	23	26%	10	11%	8	9%	46	53%	4	1	1	1	2.11	1.31	0.35
Grp C w/o ISO9000	12	4%	2	17%	2	17%	0	0%	8	67%	4	1	1	1	1.83	1.27	0.48

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Part	Part 1 Use of IT to assist project communication																
Topic	Electronic communication																
Subject	Use of e-mail in the site offices																
Q.1.7.1.b	Response										Distribution Statistics						
Sample Sector	Nos	% o/a	No '4'	% '4'	No '3'	% '3'	No '2'	% '2'	No '1'	% '1'	H	L	Median	Mode	Mean	SD	Corr
All	234	74%	11	5%	12	5%	24	10%	187	80%	4	1	1	1	1.35	0.78	0.08
Group A	67	21%	3	4%	1	1%	5	7%	58	87%	4	1	1	1	1.24	0.70	-0
Group B	71	22%	0	0%	1	1%	6	8%	64	90%	3	1	1	1	1.11	0.36	0.3
Group C	97	31%	9	9%	10	10%	13	13%	65	67%	4	1	1	1	1.62	1.00	0.01
With ISO9000	103	33%	7	7%	11	11%	12	12%	73	71%	4	1	1	1	1.53	0.94	0.04
Without ISO9000	132	42%	5	4%	1	1%	12	9%	114	86%	4	1	1	1	1.22	0.65	0.11
Grp A w ISO9000	3	1%	0	0%	0	0%	0	0%	3	100%	1	1	1	1	1.00	0.00	nil
Grp A w/o ISO9000	67	21%	3	4%	1	1%	5	7%	58	87%	4	1	1	1	1.24	0.70	-0
Grp B w ISO9000	15	5%	0	0%	1	7%	1	7%	13	87%	3	1	1	1	1.20	0.56	0
Grp B w/o ISO9000	56	18%	0	0%	0	0%	5	9%	51	91%	2	1	1	1	1.09	0.29	0.45
Grp C w ISO9000	85	27%	7	8%	10	12%	11	13%	57	67%	4	1	1	1	1.61	0.99	0.02
Grp C w/o ISO9000	12	4%	2	17%	0	0%	2	17%	8	67%	4	1	1	1	1.67	1.15	0.03

Part	Part 1 Use of IT to assist project communication																
Topic	Electronic communication																
Subject	Use of dial-up e-mail from company/site offices to others via modems																
Q.1.7.1.c	Response										Distribution Statistics						
Sample Sector	Nos	% o/a	No '4'	% '4'	No '3'	% '3'	No '2'	% '2'	No '1'	% '1'	H	L	Median	Mode	Mean	SD	Corr
All	236	75%	34	14%	31	13%	34	14%	137	58%	4	1	1	1	1.84	1.13	0.27
Group A	67	21%	5	7%	6	9%	5	7%	51	76%	4	1	1	1	1.48	0.94	0.14
Group B	72	23%	4	6%	7	10%	14	19%	47	65%	4	1	1	1	1.56	0.89	0.22
Group C	98	31%	25	26%	18	18%	15	15%	40	41%	4	1	2	1	2.29	1.24	0.27
With ISO9000	104	33%	23	22%	22	21%	17	16%	42	40%	4	1	2	1	2.25	1.20	0.28
Without ISO9000	133	42%	11	8%	9	7%	17	13%	96	72%	4	1	1	1	1.51	0.94	0.08
Grp A w ISO9000	3	1%	0	0%	1	33%	0	0%	2	67%	3	1	1	1	1.67	1.15	0.21
Grp A w/o ISO9000	67	21%	5	7%	6	9%	5	7%	51	76%	4	1	1	1	1.48	0.94	0.14
Grp B w ISO9000	15	5%	1	7%	4	27%	3	20%	7	47%	4	1	2	1	1.93	1.03	0.17
Grp B w/o ISO9000	57	18%	3	5%	3	5%	11	19%	40	70%	4	1	1	1	1.46	0.83	0.18
Grp C w ISO9000	86	27%	22	26%	17	20%	14	16%	33	38%	4	1	2	1	2.33	1.23	0.29
Grp C w/o ISO9000	12	4%	3	25%	1	8%	1	8%	7	58%	4	1	1	1	2.00	1.35	-0.1

Results of the 1998 postal survey of Hong Kong Public Works Contractors.

Part	Part 1 Use of IT to assist project communication																
Topic	Electronic communication																
Subject	Use of Internet e-mail																
Q.1.7.1.d	Response										Distribution Statistics						
Sample Sector	Nos	% o/a	No '4'	% '4'	No '3'	% '3'	No '2'	% '2'	No '1'	% '1'	H	L	Median	Mode	Mean	SD	Corr
All	235	74%	31	13%	26	11%	36	15%	142	60%	4	1	1	1	1.77	1.09	0.29
Group A	67	21%	4	6%	5	7%	6	9%	52	78%	4	1	1	1	1.42	0.87	0.13
Group B	71	22%	3	4%	9	13%	10	14%	49	69%	4	1	1	1	1.52	0.88	0.24
Group C	98	31%	24	24%	12	12%	20	20%	42	43%	4	1	2	1	2.18	1.23	0.29
With ISO9000	104	33%	22	21%	15	14%	21	20%	46	44%	4	1	2	1	2.13	1.20	0.31
Without ISO9000	132	42%	9	7%	11	8%	15	11%	97	73%	4	1	1	1	1.48	0.91	0.09
Grp A w ISO9000	3	1%	0	0%	1	33%	0	0%	2	67%	3	1	1	1	1.67	1.15	0.21
Grp A w/o ISO9000	67	21%	4	6%	5	7%	6	9%	52	78%	4	1	1	1	1.42	0.87	0.13
Grp B w ISO9000	15	5%	1	7%	3	20%	3	20%	8	53%	4	1	1	1	1.80	1.01	0.26
Grp B w/o ISO9000	56	18%	2	4%	6	11%	7	13%	41	73%	4	1	1	1	1.45	0.83	0.19
Grp C w ISO9000	86	27%	21	24%	11	13%	18	21%	36	42%	4	1	2	1	2.20	1.23	0.31
Grp C w/o ISO9000	12	4%	3	25%	1	8%	2	17%	6	50%	4	1	1.5	1	2.08	1.31	-0.1

Part	Part 1 Use of IT to assist project communication																
Topic	Electronic communication																
Subject	Provision of e-mail to office-based managerial staff																
Q.1.7.2.a	Response										Distribution Statistics						
Sample Sector	Nos	% o/a	No '4'	% '4'	No '3'	% '3'	No '2'	% '2'	No '1'	% '1'	H	L	Median	Mode	Mean	SD	Corr
All	238	75%	58	24%	27	11%	22	9%	131	55%	4	1	1	1	2.05	1.28	0.22
Group A	68	22%	6	9%	3	4%	6	9%	53	78%	4	1	1	1	1.44	0.94	0.2
Group B	72	23%	15	21%	8	11%	8	11%	41	57%	4	1	1	1	1.96	1.24	0.27
Group C	99	31%	37	37%	16	16%	8	8%	38	38%	4	1	3	1	2.53	1.34	0.21
With ISO9000	105	33%	39	37%	18	17%	10	10%	38	36%	4	1	3	4	2.55	1.32	0.19
Without ISO9000	134	42%	19	14%	9	7%	12	9%	94	70%	4	1	1	1	1.65	1.11	0.27
Grp A w ISO9000	3	1%	2	67%	0	0%	0	0%	1	33%	4	1	4	4	3.00	1.73	-0.7
Grp A w/o ISO9000	68	22%	6	9%	3	4%	6	9%	53	78%	4	1	1	1	1.44	0.94	0.2
Grp B w ISO9000	15	5%	4	27%	3	20%	3	20%	5	33%	4	1	2	1	2.40	1.24	0.19
Grp B w/o ISO9000	57	18%	11	19%	5	9%	5	9%	36	63%	4	1	1	1	1.84	1.22	0.25
Grp C w ISO9000	87	28%	33	38%	15	17%	7	8%	32	37%	4	1	3	4	2.56	1.33	0.21
Grp C w/o ISO9000	12	4%	4	33%	1	8%	1	8%	6	50%	4	1	1.5	1	2.25	1.42	0.32

Results of the 1998 postal survey of Hong Kong Public Works Contractors.

Part	Part 1 Use of IT to assist project communication																
Topic	Electronic communication																
Subject	Provision of e-mail to office-based professional staff																
Q.1.7.2.b	Response										Distribution Statistics						
Sample Sector	Nos	% o/a	No '4'	% '4'	No '3'	% '3'	No '2'	% '2'	No '1'	% '1'	H	L	Median	Mode	Mean	SD	Corr
All	237	75%	48	20%	25	11%	21	9%	143	60%	4	1	1	1	1.91	1.23	0.23
Group A	67	21%	7	10%	2	3%	7	10%	51	76%	4	1	1	1	1.48	0.97	0.21
Group B	72	23%	13	18%	6	8%	6	8%	47	65%	4	1	1	1	1.79	1.20	0.22
Group C	99	31%	28	28%	17	17%	8	8%	46	46%	4	1	2	1	2.27	1.31	0.24
With ISO9000	105	33%	30	29%	19	18%	9	9%	47	45%	4	1	2	1	2.30	1.30	0.22
Without ISO9000	133	42%	18	14%	6	5%	12	9%	97	73%	4	1	1	1	1.59	1.07	0.22
Grp A w ISO9000	3	1%	2	67%	0	0%	0	0%	1	33%	4	1	4	4	3.00	1.73	-0.7
Grp A w/o ISO9000	67	21%	7	10%	2	3%	7	10%	51	76%	4	1	1	1	1.48	0.97	0.21
Grp B w ISO9000	15	5%	4	27%	2	13%	2	13%	7	47%	4	1	2	1	2.20	1.32	0.29
Grp B w/o ISO9000	57	18%	9	16%	4	7%	4	7%	40	70%	4	1	1	1	1.68	1.15	0.15
Grp C w ISO9000	87	28%	24	28%	17	20%	7	8%	39	45%	4	1	2	1	2.30	1.30	0.24
Grp C w/o ISO9000	12	4%	4	33%	0	0%	1	8%	7	58%	4	1	1	1	2.08	1.44	0.36

Part	Part 1 Use of IT to assist project communication																
Topic	Electronic communication																
Subject	Provision of e-mail to office-based supervisory staff																
Q.1.7.2.c	Response										Distribution Statistics						
Sample Sector	Nos	% o/a	No '4'	% '4'	No '3'	% '3'	No '2'	% '2'	No '1'	% '1'	H	L	Median	Mode	Mean	SD	Corr
All	237	75%	29	12%	20	8%	30	13%	158	67%	4	1	1	1	1.66	1.06	0.23
Group A	67	21%	3	4%	0	0%	9	13%	55	82%	4	1	1	1	1.27	0.69	0.1
Group B	72	23%	8	11%	6	8%	8	11%	50	69%	4	1	1	1	1.61	1.04	0.15
Group C	99	31%	18	18%	14	14%	13	13%	54	55%	4	1	1	1	1.96	1.19	0.24
With ISO9000	105	33%	17	16%	16	15%	16	15%	56	53%	4	1	1	1	1.94	1.16	0.23
Without ISO9000	133	42%	12	9%	4	3%	14	11%	103	77%	4	1	1	1	1.44	0.92	0.27
Grp A w ISO9000	3	1%	0	0%	0	0%	1	33%	2	67%	2	1	1	1	1.33	0.58	0.21
Grp A w/o ISO9000	67	21%	3	4%	0	0%	9	13%	55	82%	4	1	1	1	1.27	0.69	0.1
Grp B w ISO9000	15	5%	1	7%	2	13%	3	20%	9	60%	4	1	1	1	1.67	0.98	0.27
Grp B w/o ISO9000	57	18%	7	12%	4	7%	5	9%	41	72%	4	1	1	1	1.60	1.07	0.11
Grp C w ISO9000	87	28%	16	18%	14	16%	12	14%	45	52%	4	1	1	1	2.01	1.20	0.23
Grp C w/o ISO9000	12	4%	2	17%	0	0%	1	8%	9	75%	4	1	1	1	1.58	1.16	0.62

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Part	Part 1 Use of IT to assist project communication																
Topic	Electronic communication																
Subject	Provision of e-mail to office-based clerical staff																
Q.1.7.2.d	Response										Distribution Statistics						
Sample Sector	Nos	% o/a	No '4'	% '4'	No '3'	% '3'	No '2'	% '2'	No '1'	% '1'	H	L	Median	Mode	Mean	SD	Corr
All	237	75%	23	10%	11	5%	28	12%	175	74%	4	1	1	1	1.50	0.96	0.11
Group A	67	21%	3	4%	1	1%	5	7%	58	87%	4	1	1	1	1.24	0.70	0
Group B	72	23%	5	7%	5	7%	7	10%	55	76%	4	1	1	1	1.44	0.90	-0
Group C	99	31%	15	15%	5	5%	16	16%	63	64%	4	1	1	1	1.72	1.11	0.1
With ISO9000	105	33%	14	13%	4	4%	18	17%	69	66%	4	1	1	1	1.65	1.06	0.1
Without ISO9000	133	42%	9	7%	7	5%	10	8%	107	80%	4	1	1	1	1.38	0.87	0.15
Grp A w ISO9000	3	1%	0	0%	0	0%	0	0%	3	100%	1	1	1	1	1.00	0.00	nil
Grp A w/o ISO9000	67	21%	3	4%	1	1%	5	7%	58	87%	4	1	1	1	1.24	0.70	0
Grp B w ISO9000	15	5%	0	0%	0	0%	3	20%	12	80%	2	1	1	1	1.20	0.41	0.04
Grp B w/o ISO9000	57	18%	5	9%	5	9%	4	7%	43	75%	4	1	1	1	1.51	0.98	0.01
Grp C w ISO9000	87	28%	14	16%	4	5%	15	17%	54	62%	4	1	1	1	1.75	1.12	0.08
Grp C w/o ISO9000	12	4%	1	8%	1	8%	1	8%	9	75%	4	1	1	1	1.50	1.00	0.43

Part	Part 1 Use of IT to assist project communication																
Topic	Electronic communication																
Subject	Provision of e-mail to site-based managerial staff																
Q.1.7.2.e	Response										Distribution Statistics						
Sample Sector	Nos	% o/a	No '4'	% '4'	No '3'	% '3'	No '2'	% '2'	No '1'	% '1'	H	L	Median	Mode	Mean	SD	Corr
All	235	74%	14	6%	23	10%	22	9%	176	75%	4	1	1	1	1.47	0.90	0.3
Group A	67	21%	1	1%	2	3%	4	6%	60	90%	4	1	1	1	1.16	0.54	-0.1
Group B	72	23%	1	1%	3	4%	7	10%	61	85%	4	1	1	1	1.22	0.59	0.3
Group C	97	31%	12	12%	18	19%	11	11%	56	58%	4	1	1	1	1.86	1.12	0.26
With ISO9000	103	33%	10	10%	20	19%	11	11%	62	60%	4	1	1	1	1.79	1.07	0.27
Without ISO9000	133	42%	4	3%	3	2%	11	8%	115	86%	4	1	1	1	1.22	0.63	0.31
Grp A w ISO9000	3	1%	0	0%	0	0%	0	0%	3	100%	1	1	1	1	1.00	0.00	nil
Grp A w/o ISO9000	67	21%	1	1%	2	3%	4	6%	60	90%	4	1	1	1	1.16	0.54	-0.1
Grp B w ISO9000	15	5%	1	7%	3	20%	1	7%	10	67%	4	1	1	1	1.67	1.05	0.16
Grp B w/o ISO9000	57	18%	0	0%	0	0%	6	11%	51	89%	2	1	1	1	1.11	0.31	0.37
Grp C w ISO9000	85	27%	9	11%	17	20%	10	12%	49	58%	4	1	1	1	1.84	1.09	0.28
Grp C w/o ISO9000	12	4%	3	25%	1	8%	1	8%	7	58%	4	1	1	1	2.00	1.35	0.4

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Part	Part 1 Use of IT to assist project communication																
Topic	Electronic communication																
Subject	Provision of e-mail to site-based professional staff																
Q.1.7.2.f	Response										Distribution Statistics						
Sample Sector	Nos	% o/a	No '4'	% '4'	No '3'	% '3'	No '2'	% '2'	No '1'	% '1'	H	L	Median	Mode	Mean	SD	Corr
All	235	74%	13	6%	21	9%	21	9%	180	77%	4	1	1	1	1.43	0.87	0.31
Group A	67	21%	1	1%	2	3%	4	6%	60	90%	4	1	1	1	1.16	0.54	-0.1
Group B	72	23%	1	1%	2	3%	7	10%	62	86%	4	1	1	1	1.19	0.55	0.35
Group C	97	31%	11	11%	17	18%	10	10%	59	61%	4	1	1	1	1.79	1.10	0.28
With ISO9000	103	33%	9	9%	19	18%	10	10%	65	63%	4	1	1	1	1.73	1.05	0.29
Without ISO9000	133	42%	4	3%	2	2%	11	8%	116	87%	4	1	1	1	1.20	0.61	0.33
Grp A w ISO9000	3	1%	0	0%	0	0%	0	0%	3	100%	1	1	1	1	1.00	0.00	nil
Grp A w/o ISO9000	67	21%	1	1%	2	3%	4	6%	60	90%	4	1	1	1	1.16	0.54	-0.1
Grp B w ISO9000	15	5%	1	7%	2	13%	1	7%	11	73%	4	1	1	1	1.53	0.99	0.29
Grp B w/o ISO9000	57	18%	0	0%	0	0%	6	11%	51	89%	2	1	1	1	1.11	0.31	0.37
Grp C w ISO9000	85	27%	8	9%	17	20%	9	11%	51	60%	4	1	1	1	1.79	1.07	0.3
Grp C w/o ISO9000	12	4%	3	25%	0	0%	1	8%	8	67%	4	1	1	1	1.83	1.34	0.46

Part	Part 1 Use of IT to assist project communication																
Topic	Electronic communication																
Subject	Provision of e-mail to site-based supervisory staff																
Q.1.7.2.g	Response										Distribution Statistics						
Sample Sector	Nos	% o/a	No '4'	% '4'	No '3'	% '3'	No '2'	% '2'	No '1'	% '1'	H	L	Median	Mode	Mean	SD	Corr
All	235	74%	5	2%	10	4%	28	12%	192	82%	4	1	1	1	1.27	0.64	0.25
Group A	67	21%	1	1%	1	1%	5	7%	60	90%	4	1	1	1	1.15	0.50	-0.1
Group B	72	23%	0	0%	0	0%	6	8%	66	92%	2	1	1	1	1.08	0.28	0.26
Group C	97	31%	4	4%	9	9%	17	18%	67	69%	4	1	1	1	1.48	0.83	0.23
With ISO9000	103	33%	2	2%	9	9%	18	17%	74	72%	4	1	1	1	1.41	0.73	0.25
Without ISO9000	133	42%	3	2%	1	1%	10	8%	119	89%	4	1	1	1	1.16	0.53	0.41
Grp A w ISO9000	3	1%	0	0%	0	0%	0	0%	3	100%	1	1	1	1	1.00	0.00	nil
Grp A w/o ISO9000	67	21%	1	1%	1	1%	5	7%	60	90%	4	1	1	1	1.15	0.50	-0.1
Grp B w ISO9000	15	5%	0	0%	0	0%	2	13%	13	87%	2	1	1	1	1.13	0.35	-0.3
Grp B w/o ISO9000	57	18%	0	0%	0	0%	4	7%	53	93%	2	1	1	1	1.07	0.26	0.47
Grp C w ISO9000	85	27%	2	2%	9	11%	16	19%	58	68%	4	1	1	1	1.47	0.78	0.24
Grp C w/o ISO9000	12	4%	2	17%	0	0%	1	8%	9	75%	4	1	1	1	1.58	1.16	0.62

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Part	Part 1 Use of IT to assist project communication																
Topic	Electronic communication																
Subject	Provision of e-mail to site-based clerical staff																
Q.1.7.2.h	Response										Distribution Statistics						
Sample Sector	Nos	% o/a	No '4'	% '4'	No '3'	% '3'	No '2'	% '2'	No '1'	% '1'	H	L	Median	Mode	Mean	SD	Corr
All	234	74%	3	1%	8	3%	29	12%	194	83%	4	1	1	1	1.23	0.57	0.08
Group A	67	21%	1	1%	2	3%	4	6%	60	90%	4	1	1	1	1.16	0.54	-0.1
Group B	71	22%	0	0%	0	0%	5	7%	66	93%	2	1	1	1	1.07	0.26	-0
Group C	97	31%	2	2%	6	6%	20	21%	69	71%	4	1	1	1	1.39	0.70	0.04
With ISO9000	102	32%	1	1%	6	6%	21	21%	74	73%	4	1	1	1	1.35	0.64	0.06
Without ISO9000	133	42%	2	2%	2	2%	8	6%	121	91%	4	1	1	1	1.14	0.49	-0.1
Grp A w ISO9000	3	1%	0	0%	0	0%	0	0%	3	100%	1	1	1	1	1.00	0.00	nil
Grp A w/o ISO9000	67	21%	1	1%	2	3%	4	6%	60	90%	4	1	1	1	1.16	0.54	-0.1
Grp B w ISO9000	14	4%	0	0%	0	0%	2	14%	12	86%	2	1	1	1	1.14	0.36	-0.3
Grp B w/o ISO9000	57	18%	0	0%	0	0%	3	5%	54	95%	2	1	1	1	1.05	0.23	0.04
Grp C w ISO9000	85	27%	1	1%	6	7%	19	22%	59	69%	4	1	1	1	1.40	0.68	0.05
Grp C w/o ISO9000	12	4%	1	8%	0	0%	1	8%	10	83%	4	1	1	1	1.33	0.89	-0.2

Part	Part 1 Use of IT to assist project communication																
Topic	Electronic communication																
Subject	Employment of staff to administer IT in company offices																
Q.1.7.3.a	Response										Distribution Statistics						
Sample Sector	Nos	% o/a	No '4'	% '4'	No '3'	% '3'	No '2'	% '2'	No '1'	% '1'	H	L	Median	Mode	Mean	SD	Corr
All	237	75%	61	26%	31	13%	31	13%	114	48%	4	1	2	1	2.16	1.27	0.17
Group A	67	21%	11	16%	7	10%	9	13%	40	60%	4	1	1	1	1.84	1.16	0.05
Group B	72	23%	16	22%	13	18%	8	11%	35	49%	4	1	2	1	2.14	1.25	0.23
Group C	99	31%	35	35%	11	11%	14	14%	39	39%	4	1	2	1	2.42	1.33	0.18
With ISO9000	105	33%	38	36%	16	15%	14	13%	37	35%	4	1	3	4	2.52	1.30	0.14
Without ISO9000	133	42%	24	18%	15	11%	17	13%	77	58%	4	1	1	1	1.89	1.19	0.28
Grp A w ISO9000	3	1%	1	33%	0	0%	0	0%	2	67%	4	1	1	1	2.00	1.73	0.21
Grp A w/o ISO9000	67	21%	11	16%	7	10%	9	13%	40	60%	4	1	1	1	1.84	1.16	0.05
Grp B w ISO9000	15	5%	5	33%	5	33%	1	7%	4	27%	4	1	3	3	2.73	1.22	-0.4
Grp B w/o ISO9000	57	18%	11	19%	8	14%	7	12%	31	54%	4	1	1	1	1.98	1.22	0.34
Grp C w ISO9000	87	28%	32	37%	11	13%	13	15%	31	36%	4	1	2	4	2.51	1.31	0.16
Grp C w/o ISO9000	12	4%	3	25%	0	0%	1	8%	8	67%	4	1	1	1	1.83	1.34	0.55

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Part	Part 1 Use of IT to assist project communication																
Topic	Electronic communication																
Subject	Employment of staff to administer IT in site offices																
Q.1.7.3.b	Response										Distribution Statistics						
Sample Sector	Nos	% o/a	No '4'	% '4'	No '3'	% '3'	No '2'	% '2'	No '1'	% '1'	H	L	Median	Mode	Mean	SD	Corr
All	234	74%	29	12%	30	13%	37	16%	138	59%	4	1	1	1	1.79	1.08	0.28
Group A	67	21%	11	16%	7	10%	9	13%	40	60%	4	1	1	1	1.84	1.16	0.05
Group B	71	22%	5	7%	12	17%	11	15%	43	61%	4	1	1	1	1.70	0.99	0.19
Group C	97	31%	21	22%	14	14%	17	18%	45	46%	4	1	2	1	2.11	1.22	0.3
With ISO9000	97	31%	19	20%	17	18%	18	19%	43	44%	4	1	2	1	2.12	1.18	0.1
Without ISO9000	132	42%	9	7%	12	9%	18	14%	93	70%	4	1	1	1	1.52	0.92	0.34
Grp A w ISO9000	3	1%	0	0%	0	0%	0	0%	3	100%	1	1	1	1	1.00	0.00	nil
Grp A w/o ISO9000	67	21%	3	4%	4	6%	9	13%	51	76%	4	1	1	1	1.39	0.80	-0.1
Grp B w ISO9000	15	5%	2	13%	4	27%	3	20%	6	40%	4	1	2	1	2.13	1.13	-0.4
Grp B w/o ISO9000	56	18%	3	5%	8	14%	8	14%	37	66%	4	1	1	1	1.59	0.93	0.34
Grp C w ISO9000	85	27%	18	21%	14	16%	16	19%	37	44%	4	1	2	1	2.15	1.20	0.3
Grp C w/o ISO9000	12	4%	3	25%	0	0%	1	8%	8	67%	4	1	1	1	1.83	1.34	0.55

Part	Part 1 Use of IT to assist project communication																
Topic	Electronic communication																
Subject	Full time Director is the highest level of IT management in the company																
Q.1.7.4 a	Response										Distribution Statistics						
Sample Sector	Nos	% o/a	No	%	na	na	na	na	na	na	H	L	Median	Mode	Mean	SD	Corr
All	234	74%	41	18%	na	na	na	na	na	na	13	1	10	1	7.79	4.84	0.13
Group A	65	21%	14	22%	na	na	na	na	na	na	13	1	8	1	6.97	5.24	-0.1
Group B	71	22%	13	18%	na	na	na	na	na	na	13	1	10	12	8.48	4.58	0.06
Group C	99	31%	14	14%	na	na	na	na	na	na	13	1	10	1	7.83	4.70	0.2
With ISO9000	105	33%	12	11%	na	na	na	na	na	na	13	1	10	1	8.10	4.44	0.18
Without ISO9000	130	41%	29	22%	na	na	na	na	na	na	4	1	1	1	1.40	0.90	0.16
Grp A w ISO9000	3	1%	1	33%	na	na	na	na	na	na	13	1	10	nil	8.00	6.24	0.85
Grp A w/o ISO9000	65	21%	14	22%	na	na	na	na	na	na	13	1	8	1	6.97	5.24	-0.1
Grp B w ISO9000	15	5%	0	0%	na	na	na	na	na	na	12	1	9	12	7.87	4.05	0.37
Grp B w/o ISO9000	56	18%	13	23%	na	na	na	na	na	na	13	1	11	13	8.64	4.73	0.01
Grp C w ISO9000	87	28%	11	13%	na	na	na	na	na	na	13	1	10	1	8.15	4.50	0.18
Grp C w/o ISO9000	12	4%	3	25%	na	na	na	na	na	na	13	1	1.5	1	5.50	5.62	0.46

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Part	Part 1 Use of IT to assist project communication																
Topic	Electronic communication																
Subject	Part time Director is the highest level of IT management in the company																
Q.1.7.4 b	Response										Distribution Statistics						
Sample Sector	Nos	% o/a	No	%	na	na	na	na	na	na	H	L	Median	Mode	Mean	SD	Corr
All	234	74%	44	19%	na	na	na	na	na	na	13	1	10	1	7.79	4.84	0.13
Group A	65	21%	9	14%	na	na	na	na	na	na	13	1	8	1	6.97	5.24	-0.1
Group B	71	22%	17	24%	na	na	na	na	na	na	13	1	10	12	8.48	4.58	0.06
Group C	99	31%	18	18%	na	na	na	na	na	na	13	1	10	1	7.83	4.70	0.2
With ISO9000	105	33%	21	20%	na	na	na	na	na	na	13	1	10	1	8.10	4.44	0.18
Without ISO9000	130	41%	9	18%	na	na	na	na	na	na	4	1	1	1	1.40	0.90	0.16
Grp A w ISO9000	3	1%	0	0%	na	na	na	na	na	na	13	1	10	nil	8.00	6.24	0.85
Grp A w/o ISO9000	65	21%	9	14%	na	na	na	na	na	na	13	1	8	1	6.97	5.24	-0.1
Grp B w ISO9000	15	5%	4	57%	na	na	na	na	na	na	12	1	9	12	7.87	4.05	0.37
Grp B w/o ISO9000	56	18%	13	23%	na	na	na	na	na	na	13	1	11	13	8.64	4.73	0.01
Grp C w ISO9000	87	28%	17	20%	na	na	na	na	na	na	13	1	10	1	8.15	4.50	0.18
Grp C w/o ISO9000	12	4%	1	8%	na	na	na	na	na	na	13	1	1.5	1	5.50	5.62	0.46

Part	Part 1 Use of IT to assist project communication																
Topic	Electronic communication																
Subject	Full time Manager reporting to a Director is the highest level of IT management in the company																
Q.1.7.4 .c	Response										Distribution Statistics						
Sample Sector	Nos	% o/a	No	%	na	na	na	na	na	na	H	L	Median	Mode	Mean	SD	Corr
All	234	74%	17	7%	na	na	na	na	na	na	13	1	10	1	7.79	4.84	0.13
Group A	65	21%	4	6%	na	na	na	na	na	na	13	1	8	1	6.97	5.24	-0.1
Group B	71	22%	3	4%	na	na	na	na	na	na	13	1	10	12	8.48	4.58	0.06
Group C	99	31%	10	10%	na	na	na	na	na	na	13	1	10	1	7.83	4.70	0.2
With ISO9000	105	33%	10	10%	na	na	na	na	na	na	13	1	10	1	8.10	4.44	0.18
Without ISO9000	130	41%	7	5%	na	na	na	na	na	na	4	1	1	1	1.40	0.90	0.16
Grp A w ISO9000	3	1%	0	0%	na	na	na	na	na	na	13	1	10	nil	8.00	6.24	0.85
Grp A w/o ISO9000	65	21%	4	6%	na	na	na	na	na	na	13	1	8	1	6.97	5.24	-0.1
Grp B w ISO9000	15	5%	3	43%	na	na	na	na	na	na	12	1	9	12	7.87	4.05	0.37
Grp B w/o ISO9000	56	18%	3	5%	na	na	na	na	na	na	13	1	11	13	8.64	4.73	0.01
Grp C w ISO9000	87	28%	10	11%	na	na	na	na	na	na	13	1	10	1	8.15	4.50	0.18
Grp C w/o ISO9000	12	4%	0	0%	na	na	na	na	na	na	13	1	1.5	1	5.50	5.62	0.46

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Part	Part 1 Use of IT to assist project communication																
Topic	Electronic communication																
Subject	Part time Manager reporting to a Director is the highest level of IT management in the company																
Q.1.7.4 d	Response										Distribution Statistics						
Sample Sector	Nos	% o/a	No	%	na	na	na	na	na	na	H	L	Median	Mode	Mean	SD	Corr
All	234	74%	25	11%	na	na	na	na	na	na	13	1	10	1	7.79	4.84	0.13
Group A	65	21%	4	6%	na	na	na	na	na	na	13	1	8	1	6.97	5.24	-0.1
Group B	71	22%	9	13%	na	na	na	na	na	na	13	1	10	12	8.48	4.58	0.06
Group C	99	31%	12	12%	na	na	na	na	na	na	13	1	10	1	7.83	4.70	0.2
With ISO9000	105	33%	16	15%	na	na	na	na	na	na	13	1	10	1	8.10	4.44	0.18
Without ISO9000	130	41%	9	7%	na	na	na	na	na	na	4	1	1	1	1.40	0.90	0.16
Grp A w ISO9000	3	1%	1	33%	na	na	na	na	na	na	13	1	10	nil	8.00	6.24	0.85
Grp A w/o ISO9000	65	21%	4	6%	na	na	na	na	na	na	13	1	8	1	6.97	5.24	-0.1
Grp B w ISO9000	15	5%	2	29%	na	na	na	na	na	na	12	1	9	12	7.87	4.05	0.37
Grp B w/o ISO9000	56	18%	6	11%	na	na	na	na	na	na	13	1	11	13	8.64	4.73	0.01
Grp C w ISO9000	87	28%	12	14%	na	na	na	na	na	na	13	1	10	1	8.15	4.50	0.18
Grp C w/o ISO9000	12	4%	0	0%	na	na	na	na	na	na	13	1	1.5	1	5.50	5.62	0.46

Part	Part 1 Use of IT to assist project communication																
Topic	Electronic communication																
Subject	Full time Senior professional is the highest level of IT management in the company																
Q.1.7.4 e	Response										Distribution Statistics						
Sample Sector	Nos	% o/a	No	%	na	na	na	na	na	na	H	L	Median	Mode	Mean	SD	Corr
All	234	74%	6	3%	na	na	na	na	na	na	13	1	10	1	7.79	4.84	0.13
Group A	65	21%	1	2%	na	na	na	na	na	na	13	1	8	1	6.97	5.24	-0.1
Group B	71	22%	4	6%	na	na	na	na	na	na	13	1	10	12	8.48	4.58	0.06
Group C	99	31%	1	1%	na	na	na	na	na	na	13	1	10	1	7.83	4.70	0.2
With ISO9000	105	33%	3	3%	na	na	na	na	na	na	13	1	10	1	8.10	4.44	0.18
Without ISO9000	130	41%	3	2%	na	na	na	na	na	na	4	1	1	1	1.40	0.90	0.16
Grp A w ISO9000	3	1%	0	0%	na	na	na	na	na	na	13	1	10	nil	8.00	6.24	0.85
Grp A w/o ISO9000	65	21%	1	2%	na	na	na	na	na	na	13	1	8	1	6.97	5.24	-0.1
Grp B w ISO9000	15	5%	2	29%	na	na	na	na	na	na	12	1	9	12	7.87	4.05	0.37
Grp B w/o ISO9000	56	18%	2	4%	na	na	na	na	na	na	13	1	11	13	8.64	4.73	0.01
Grp C w ISO9000	87	28%	1	1%	na	na	na	na	na	na	13	1	10	1	8.15	4.50	0.18
Grp C w/o ISO9000	12	4%	0	0%	na	na	na	na	na	na	13	1	1.5	1	5.50	5.62	0.46

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Part	Part 1 Use of IT to assist project communication																	
Topic	Electronic communication																	
Subject	Part time Senior professional is the highest level of IT management in the company																	
Q.1.7.4 f	Response											Distribution Statistics						
Sample Sector	Nos	% o/a	No	%	na	na	na	na	na	na	H	L	Median	Mode	Mean	SD	Corr	
All	234	74%	7	3%	na	na	na	na	na	na	13	1	10	1	7.79	4.84	0.13	
Group A	65	21%	1	2%	na	na	na	na	na	na	13	1	8	1	6.97	5.24	-0.1	
Group B	71	22%	1	1%	na	na	na	na	na	na	13	1	10	12	8.48	4.58	0.06	
Group C	99	31%	5	5%	na	na	na	na	na	na	13	1	10	1	7.83	4.70	0.2	
With ISO9000	105	33%	5	5%	na	na	na	na	na	na	13	1	10	1	8.10	4.44	0.18	
Without ISO9000	130	41%	2	2%	na	na	na	na	na	na	4	1	1	1	1.40	0.90	0.16	
Grp A w ISO9000	3	1%	0	0%	na	na	na	na	na	na	13	1	10	nil	8.00	6.24	0.85	
Grp A w/o ISO9000	65	21%	1	2%	na	na	na	na	na	na	13	1	8	1	6.97	5.24	-0.1	
Grp B w ISO9000	15	5%	0	0%	na	na	na	na	na	na	12	1	9	12	7.87	4.05	0.37	
Grp B w/o ISO9000	56	18%	1	2%	na	na	na	na	na	na	13	1	11	13	8.64	4.73	0.01	
Grp C w ISO9000	87	28%	5	6%	na	na	na	na	na	na	13	1	10	1	8.15	4.50	0.18	
Grp C w/o ISO9000	12	4%	0	0%	na	na	na	na	na	na	13	1	1.5	1	5.50	5.62	0.46	

Part	Part 1 Use of IT to assist project communication																	
Topic	Electronic communication																	
Subject	Full time IT professional is the highest level of IT management in the company																	
Q.1.7.4 g	Response											Distribution Statistics						
Sample Sector	Nos	% o/a	No	%	na	na	na	na	na	na	H	L	Median	Mode	Mean	SD	Corr	
All	234	74%	11	5%	na	na	na	na	na	na	13	1	10	1	7.79	4.84	0.13	
Group A	65	21%	2	3%	na	na	na	na	na	na	13	1	8	1	6.97	5.24	-0.1	
Group B	71	22%	3	4%	na	na	na	na	na	na	13	1	10	12	8.48	4.58	0.06	
Group C	99	31%	7	7%	na	na	na	na	na	na	13	1	10	1	7.83	4.70	0.2	
With ISO9000	105	33%	8	8%	na	na	na	na	na	na	13	1	10	1	8.10	4.44	0.18	
Without ISO9000	130	41%	4	3%	na	na	na	na	na	na	4	1	1	1	1.40	0.90	0.16	
Grp A w ISO9000	3	1%	0	0%	na	na	na	na	na	na	13	1	10	nil	8.00	6.24	0.85	
Grp A w/o ISO9000	65	21%	2	3%	na	na	na	na	na	na	13	1	8	1	6.97	5.24	-0.1	
Grp B w ISO9000	15	5%	2	29%	na	na	na	na	na	na	12	1	9	12	7.87	4.05	0.37	
Grp B w/o ISO9000	56	18%	1	2%	na	na	na	na	na	na	13	1	11	13	8.64	4.73	0.01	
Grp C w ISO9000	87	28%	6	7%	na	na	na	na	na	na	13	1	10	1	8.15	4.50	0.18	
Grp C w/o ISO9000	12	4%	1	8%	na	na	na	na	na	na	13	1	1.5	1	5.50	5.62	0.46	

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Part	Part 1 Use of IT to assist project communication																	
Topic	Electronic communication																	
Subject	Part time IT professional is the highest level of IT management in the company																	
Q.1.7.4 h	Response										Distribution Statistics							
Sample Sector	Nos	% o/a	No	%	na	na	na	na	na	na	H	L	Median	Mode	Mean	SD	Corr	
All	234	74%	1	0%	na	na	na	na	na	na	13	1	10	1	7.79	4.84	0.13	
Group A	65	21%	0	0%	na	na	na	na	na	na	13	1	8	1	6.97	5.24	-0.1	
Group B	71	22%	1	1%	na	na	na	na	na	na	13	1	10	12	8.48	4.58	0.06	
Group C	99	31%	0	0%	na	na	na	na	na	na	13	1	10	1	7.83	4.70	0.2	
With ISO9000	105	33%	0	0%	na	na	na	na	na	na	13	1	10	1	8.10	4.44	0.18	
Without ISO9000	130	41%	1	1%	na	na	na	na	na	na	4	1	1	1	1.40	0.90	0.16	
Grp A w ISO9000	3	1%	0	0%	na	na	na	na	na	na	13	1	10	nil	8.00	6.24	0.85	
Grp A w/o ISO9000	65	21%	0	0%	na	na	na	na	na	na	13	1	8	1	6.97	5.24	-0.1	
Grp B w ISO9000	15	5%	0	0%	na	na	na	na	na	na	12	1	9	12	7.87	4.05	0.37	
Grp B w/o ISO9000	56	18%	1	2%	na	na	na	na	na	na	13	1	11	13	8.64	4.73	0.01	
Grp C w ISO9000	87	28%	0	0%	na	na	na	na	na	na	13	1	10	1	8.15	4.50	0.18	
Grp C w/o ISO9000	12	4%	0	0%	na	na	na	na	na	na	13	1	1.5	1	5.50	5.62	0.46	

Part	Part 1 Use of IT to assist project communication																	
Topic	Electronic communication																	
Subject	Full time Operative is the highest level of management in the company																	
Q.1.7.4 I	Response										Distribution Statistics							
Sample Sector	Nos	% o/a	No	%	na	na	na	na	na	na	H	L	Median	Mode	Mean	SD	Corr	
All	234	74%	3	1%	na	na	na	na	na	na	13	1	10	1	7.79	4.84	0.13	
Group A	65	21%	1	2%	na	na	na	na	na	na	13	1	8	1	6.97	5.24	-0.1	
Group B	71	22%	1	1%	na	na	na	na	na	na	13	1	10	12	8.48	4.58	0.06	
Group C	99	31%	1	1%	na	na	na	na	na	na	13	1	10	1	7.83	4.70	0.2	
With ISO9000	105	33%	1	1%	na	na	na	na	na	na	13	1	10	1	8.10	4.44	0.18	
Without ISO9000	130	41%	2	2%	na	na	na	na	na	na	4	1	1	1	1.40	0.90	0.16	
Grp A w ISO9000	3	1%	0	0%	na	na	na	na	na	na	13	1	10	nil	8.00	6.24	0.85	
Grp A w/o ISO9000	65	21%	1	2%	na	na	na	na	na	na	13	1	8	1	6.97	5.24	-0.1	
Grp B w ISO9000	15	5%	0	0%	na	na	na	na	na	na	12	1	9	12	7.87	4.05	0.37	
Grp B w/o ISO9000	56	18%	1	2%	na	na	na	na	na	na	13	1	11	13	8.64	4.73	0.01	
Grp C w ISO9000	87	28%	1	1%	na	na	na	na	na	na	13	1	10	1	8.15	4.50	0.18	
Grp C w/o ISO9000	12	4%	0	0%	na	na	na	na	na	na	13	1	1.5	1	5.50	5.62	0.46	

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Part	Part 1 Use of IT to assist project communication																	
Topic	Electronic communication																	
Subject	Part time Operative is the highest level of IT management in the company																	
Q.1.7.4 j	Response											Distribution Statistics						
Sample Sector	Nos	% o/a	No	%	na	na	na	na	na	na	H	L	Median	Mode	Mean	SD	Corr	
All	234	74%	11	5%	na	na	na	na	na	na	13	1	10	1	7.79	4.84	0.13	
Group A	65	21%	4	6%	na	na	na	na	na	na	13	1	8	1	6.97	5.24	-0.1	
Group B	71	22%	3	4%	na	na	na	na	na	na	13	1	10	12	8.48	4.58	0.06	
Group C	99	31%	4	4%	na	na	na	na	na	na	13	1	10	1	7.83	4.70	0.2	
With ISO9000	105	33%	5	5%	na	na	na	na	na	na	13	1	10	1	8.10	4.44	0.18	
Without ISO9000	130	41%	6	5%	na	na	na	na	na	na	4	1	1	1	1.40	0.90	0.16	
Grp A w ISO9000	3	1%	0	0%	na	na	na	na	na	na	13	1	10	nil	8.00	6.24	0.85	
Grp A w/o ISO9000	65	21%	4	6%	na	na	na	na	na	na	13	1	8	1	6.97	5.24	-0.1	
Grp B w ISO9000	15	5%	1	14%	na	na	na	na	na	na	12	1	9	12	7.87	4.05	0.37	
Grp B w/o ISO9000	56	18%	2	4%	na	na	na	na	na	na	13	1	11	13	8.64	4.73	0.01	
Grp C w ISO9000	87	28%	4	5%	na	na	na	na	na	na	13	1	10	1	8.15	4.50	0.18	
Grp C w/o ISO9000	12	4%	0	0%	na	na	na	na	na	na	13	1	1.5	1	5.50	5.62	0.46	

Part	Part 1 Use of IT to assist project communication																	
Topic	Electronic communication																	
Subject	Full time sub-contractor is the highest level of IT management in the company																	
Q.1.7.4 k	Response										Distribution Statistics							
Sample Sector	Nos	% o/a	No	%	na	na	na	na	na	na	H	L	Median	Mode	Mean	SD	Corr	
All	234	74%	1	0%	na	na	na	na	na	na	13	1	10	1	7.79	4.84	0.13	
Group A	65	21%	1	2%	na	na	na	na	na	na	13	1	8	1	6.97	5.24	-0.1	
Group B	71	22%	0	0%	na	na	na	na	na	na	13	1	10	12	8.48	4.58	0.06	
Group C	99	31%	0	0%	na	na	na	na	na	na	13	1	10	1	7.83	4.70	0.2	
With ISO9000	105	33%	0	0%	na	na	na	na	na	na	13	1	10	1	8.10	4.44	0.18	
Without ISO9000	130	41%	1	1%	na	na	na	na	na	na	4	1	1	1	1.40	0.90	0.16	
Grp A w ISO9000	3	1%	0	0%	na	na	na	na	na	na	13	1	10	nil	8.00	6.24	0.85	
Grp A w/o ISO9000	65	21%	1	2%	na	na	na	na	na	na	13	1	8	1	6.97	5.24	-0.1	
Grp B w ISO9000	15	5%	0	0%	na	na	na	na	na	na	12	1	9	12	7.87	4.05	0.37	
Grp B w/o ISO9000	56	18%	0	0%	na	na	na	na	na	na	13	1	11	13	8.64	4.73	0.01	
Grp C w ISO9000	87	28%	0	0%	na	na	na	na	na	na	13	1	10	1	8.15	4.50	0.18	
Grp C w/o ISO9000	12	4%	0	0%	na	na	na	na	na	na	13	1	1.5	1	5.50	5.62	0.46	

Results of the 1998 postal survey of Hong Kong Public Works Contractors.

Part	Part 1 Use of IT to assist project communication																
Topic	Electronic communication																
Subject	Part time sub-contractor is the highest level of IT management in the company																
Q.1.7.4 l	Response										Distribution Statistics						
Sample Sector	Nos	% o/a	No	%	na	na	na	na	na	na	H	L	Median	Mode	Mean	SD	Corr
All	234	74%	3	1%	na	na	na	na	na	na	13	1	10	1	7.79	4.84	0.13
Group A	65	21%	0	0%	na	na	na	na	na	na	13	1	8	1	6.97	5.24	-0.1
Group B	71	22%	2	3%	na	na	na	na	na	na	13	1	10	12	8.48	4.58	0.06
Group C	99	31%	1	1%	na	na	na	na	na	na	13	1	10	1	7.83	4.70	0.2
With ISO9000	105	33%	1	1%	na	na	na	na	na	na	13	1	10	1	8.10	4.44	0.18
Without ISO9000	130	41%	2	2%	na	na	na	na	na	na	4	1	1	1	1.40	0.90	0.16
Grp A w ISO9000	3	1%	0	0%	na	na	na	na	na	na	13	1	10	nil	8.00	6.24	0.85
Grp A w/o ISO9000	65	21%	0	0%	na	na	na	na	na	na	13	1	8	1	6.97	5.24	-0.1
Grp B w ISO9000	15	5%	1	14%	na	na	na	na	na	na	12	1	9	12	7.87	4.05	0.37
Grp B w/o ISO9000	56	18%	1	2%	na	na	na	na	na	na	13	1	11	13	8.64	4.73	0.01
Grp C w ISO9000	87	28%	0	0%	na	na	na	na	na	na	13	1	10	1	8.15	4.50	0.18
Grp C w/o ISO9000	12	4%	1	8%	na	na	na	na	na	na	13	1	1.5	1	5.50	5.62	0.46

Part	Part 1 Use of IT to assist project communication																
Topic	Electronic communication																
Subject	No IT management in the company																
Q.1.7.4 m	Response										Distribution Statistics						
Sample Sector	Nos	% o/a	No	%	na	na	na	na	na	na	H	L	Median	Mode	Mean	SD	Corr
All	234	74%	64	27%	na	na	na	na	na	na	13	1	10	1	7.79	4.84	0.13
Group A	65	21%	24	37%	na	na	na	na	na	na	13	1	8	1	6.97	5.24	-0.1
Group B	71	22%	14	20%	na	na	na	na	na	na	13	1	10	12	8.48	4.58	0.06
Group C	99	31%	26	26%	na	na	na	na	na	na	13	1	10	1	7.83	4.70	0.2
With ISO9000	105	33%	23	22%	na	na	na	na	na	na	13	1	10	1	8.10	4.44	0.18
Without ISO9000	130	41%	41	32%	na	na	na	na	na	na	4	1	1	1	1.40	0.90	0.16
Grp A w ISO9000	3	1%	1	33%	na	na	na	na	na	na	13	1	10	nil	8.00	6.24	0.85
Grp A w/o ISO9000	65	21%	24	37%	na	na	na	na	na	na	13	1	8	1	6.97	5.24	-0.1
Grp B w ISO9000	15	5%	2	29%	na	na	na	na	na	na	12	1	9	12	7.87	4.05	0.37
Grp B w/o ISO9000	56	18%	12	21%	na	na	na	na	na	na	13	1	11	13	8.64	4.73	0.01
Grp C w ISO9000	87	28%	20	23%	na	na	na	na	na	na	13	1	10	1	8.15	4.50	0.18
Grp C w/o ISO9000	12	4%	6	50%	na	na	na	na	na	na	13	1	1.5	1	5.50	5.62	0.46

Results of the 1998 postal survey of Hong Kong Public Works Contractors.

Part	Part 1 Use of IT to assist project communication																
Topic	Electronic communication																
Subject	Use of e-mail in company offices for sending written messages																
Q.1.7.5.a	Response										Distribution Statistics						
Sample Sector	Nos	% o/a	No '4'	% '4'	No '3'	% '3'	No '2'	% '2'	No '1'	% '1'	H	L	Median	Mode	Mean	SD	Corr
All	237	75%	35	15%	32	14%	21	9%	149	63%	4	1	1	1	1.80	1.15	0.28
Group A	67	21%	6	9%	5	7%	2	3%	54	81%	4	1	1	1	1.45	0.97	-0
Group B	72	23%	7	10%	9	13%	7	10%	49	68%	4	1	1	1	1.64	1.04	0.31
Group C	99	31%	23	23%	18	18%	12	12%	46	46%	4	1	2	1	2.18	1.25	0.3
With ISO9000	105	33%	23	22%	17	16%	14	13%	51	49%	4	1	2	1	2.11	1.24	0.3
Without ISO9000	133	42%	13	10%	15	11%	7	5%	98	74%	4	1	1	1	1.57	1.03	0.26
Grp A w ISO9000	3	1%	0	0%	0	0%	1	33%	2	67%	2	1	1	1	1.33	0.58	0.21
Grp A w/o ISO9000	67	21%	6	9%	5	7%	2	3%	54	81%	4	1	1	1	1.45	0.97	-0
Grp B w ISO9000	15	5%	2	13%	1	7%	3	20%	9	60%	4	1	1	1	1.73	1.10	0.47
Grp B w/o ISO9000	57	18%	5	9%	8	14%	4	7%	40	70%	4	1	1	1	1.61	1.03	0.26
Grp C w ISO9000	87	28%	21	24%	16	18%	10	11%	40	46%	4	1	2	1	2.21	1.26	0.3
Grp C w/o ISO9000	12	4%	2	17%	2	17%	2	17%	6	50%	4	1	1.5	1	2.00	1.21	0.46

Part	Part 1 Use of IT to assist project communication																
Topic	Electronic communication																
Subject	Use of e-mail in company offices for agreeing drafting text of written messages																
Q.1.7.5.b	Response										Distribution Statistics						
Sample Sector	Nos	% o/a	No '4'	% '4'	No '3'	% '3'	No '2'	% '2'	No '1'	% '1'	H	L	Median	Mode	Mean	SD	Corr
All	237	75%	21	9%	27	11%	20	8%	169	71%	4	1	1	1	1.58	1.00	0.2
Group A	67	21%	5	7%	3	4%	1	1%	58	87%	4	1	1	1	1.33	0.88	-0
Group B	72	23%	2	3%	7	10%	7	10%	56	78%	4	1	1	1	1.38	0.78	-0.1
Group C	99	31%	14	14%	17	17%	12	12%	56	57%	4	1	1	1	1.89	1.14	0.2
With ISO9000	105	33%	12	11%	17	16%	14	13%	62	59%	4	1	1	1	1.80	1.09	0.21
Without ISO9000	133	42%	9	7%	10	8%	6	5%	108	81%	4	1	1	1	1.40	0.90	0.16
Grp A w ISO9000	3	1%	0	0%	0	0%	0	0%	3	100%	1	1	1	1	1.00	0.00	nil
Grp A w/o ISO9000	67	21%	5	7%	3	4%	1	1%	58	87%	4	1	1	1	1.33	0.88	-0
Grp B w ISO9000	15	5%	0	0%	1	7%	3	20%	11	73%	3	1	1	1	1.33	0.62	-0.2
Grp B w/o ISO9000	57	18%	2	4%	6	11%	4	7%	45	79%	4	1	1	1	1.39	0.82	-0.1
Grp C w ISO9000	87	28%	12	14%	16	18%	11	13%	48	55%	4	1	1	1	1.91	1.14	0.2
Grp C w/o ISO9000	12	4%	2	17%	1	8%	1	8%	8	67%	4	1	1	1	1.75	1.22	0.53

Results of the 1998 postal survey of Hong Kong Public Works Contractors.

Part	Part 1 Use of IT to assist project communication																
Topic	Electronic communication																
Subject	Use of e-mail in company offices for marking up amending written messages of others																
Q.1.7.5.c	Response										Distribution Statistics						
Sample Sector	Nos	% o/a	No '4'	% '4'	No '3'	% '3'	No '2'	% '2'	No '1'	% '1'	H	L	Median	Mode	Mean	SD	Corr
All	235	74%	21	9%	21	9%	27	11%	166	71%	4	1	1	1	1.56	0.98	0.24
Group A	66	21%	5	8%	2	3%	2	3%	57	86%	4	1	1	1	1.32	0.86	-0.1
Group B	72	23%	3	4%	5	7%	8	11%	56	78%	4	1	1	1	1.38	0.80	-0.1
Group C	98	31%	13	13%	14	14%	17	17%	54	55%	4	1	1	1	1.86	1.10	0.26
With ISO9000	104	33%	11	11%	15	14%	17	16%	61	59%	4	1	1	1	1.77	1.05	0.26
Without ISO9000	132	42%	10	8%	6	5%	10	8%	106	80%	4	1	1	1	1.39	0.89	0.18
Grp A w ISO9000	3	1%	0	0%	0	0%	0	0%	3	100%	1	1	1	1	1.00	0.00	nil
Grp A w/o ISO9000	66	21%	5	8%	2	3%	2	3%	57	86%	4	1	1	1	1.32	0.86	-0.1
Grp B w ISO9000	15	5%	0	0%	1	7%	2	13%	12	80%	3	1	1	1	1.27	0.59	-0.4
Grp B w/o ISO9000	57	18%	3	5%	4	7%	6	11%	44	77%	4	1	1	1	1.40	0.84	-0
Grp C w ISO9000	86	27%	11	13%	14	16%	15	17%	46	53%	4	1	1	1	1.88	1.10	0.26
Grp C w/o ISO9000	12	4%	2	17%	0	0%	2	17%	8	67%	4	1	1	1	1.67	1.15	0.59

Part	Part 1 Use of IT to assist project communication																
Topic	Electronic communication																
Subject	Use of e-mail in company offices for attaching other written messages to written messages																
Q.1.7.5.d	Response										Distribution Statistics						
Sample Sector	Nos	% o/a	No '4'	% '4'	No '3'	% '3'	No '2'	% '2'	No '1'	% '1'	H	L	Median	Mode	Mean	SD	Corr
All	235	74%	27	11%	28	12%	20	9%	160	68%	4	1	1	1	1.67	1.07	0.3
Group A	66	21%	6	9%	3	5%	0	0%	57	86%	4	1	1	1	1.36	0.94	-0.1
Group B	72	23%	3	4%	9	13%	5	7%	55	76%	4	1	1	1	1.44	0.87	0.12
Group C	98	31%	18	18%	16	16%	15	15%	49	50%	4	1	1.5	1	2.03	1.19	0.33
With ISO9000	104	33%	18	17%	17	16%	15	14%	54	52%	4	1	1	1	1.99	1.18	0.33
Without ISO9000	132	42%	9	7%	11	8%	5	4%	107	81%	4	1	1	1	1.41	0.91	0.16
Grp A w ISO9000	3	1%	0	0%	0	0%	0	0%	3	100%	1	1	1	1	1.00	0.00	nil
Grp A w/o ISO9000	66	21%	6	9%	3	5%	0	0%	57	86%	4	1	1	1	1.36	0.94	-0.1
Grp B w ISO9000	15	5%	2	13%	1	7%	2	13%	10	67%	4	1	1	1	1.67	1.11	0.52
Grp B w/o ISO9000	57	18%	1	2%	8	14%	3	5%	45	79%	4	1	1	1	1.39	0.80	-0.1
Grp C w ISO9000	86	27%	16	19%	16	19%	13	15%	41	48%	4	1	2	1	2.08	1.19	0.33
Grp C w/o ISO9000	12	4%	2	17%	0	0%	2	17%	8	67%	4	1	1	1	1.67	1.15	0.6

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Part	Part 1 Use of IT to assist project communication																
Topic	Electronic communication																
Subject	Use of e-mail in company offices for attaching drawing files to written messages																
Q.1.7.5.e	Response										Distribution Statistics						
Sample Sector	Nos	% o/a	No '4'	% '4'	No '3'	% '3'	No '2'	% '2'	No '1'	% '1'	H	L	Median	Mode	Mean	SD	Corr
All	235	74%	12	5%	20	9%	32	14%	171	73%	4	1	1	1	1.46	0.85	0.23
Group A	66	21%	3	5%	3	5%	1	2%	59	89%	4	1	1	1	1.24	0.75	-0.1
Group B	72	23%	1	1%	3	4%	11	15%	57	79%	4	1	1	1	1.28	0.61	0.15
Group C	98	31%	8	8%	14	14%	20	20%	56	57%	4	1	1	1	1.73	0.99	0.22
With ISO9000	104	33%	7	7%	14	13%	21	20%	62	60%	4	1	1	1	1.67	0.95	0.23
Without ISO9000	132	42%	5	4%	6	5%	11	8%	110	83%	4	1	1	1	1.29	0.73	0.18
Grp A w ISO9000	3	1%	0	0%	0	0%	0	0%	3	100%	1	1	1	1	1.00	0.00	nil
Grp A w/o ISO9000	66	21%	3	5%	3	5%	1	2%	59	89%	4	1	1	1	1.24	0.75	-0.1
Grp B w ISO9000	15	5%	0	0%	1	7%	3	20%	11	73%	3	1	1	1	1.33	0.62	0.18
Grp B w/o ISO9000	57	18%	1	2%	2	4%	8	14%	46	81%	4	1	1	1	1.26	0.61	0.13
Grp C w ISO9000	86	27%	7	8%	13	15%	18	21%	48	56%	4	1	1	1	1.76	0.99	0.22
Grp C w/o ISO9000	12	4%	1	8%	1	8%	2	17%	8	67%	4	1	1	1	1.58	1.00	0.41

Part	Part 1 Use of IT to assist project communication																
Topic	Electronic communication																
Subject	Use of e-mail in company offices for attaching digital photographs to written messages																
Q.1.7.5.f	Response										Distribution Statistics						
Sample Sector	Nos	% o/a	No '4'	% '4'	No '3'	% '3'	No '2'	% '2'	No '1'	% '1'	H	L	Median	Mode	Mean	SD	Corr
All	236	75%	5	2%	12	5%	37	16%	182	77%	4	1	1	1	1.32	0.67	0.22
Group A	66	21%	2	3%	0	0%	4	6%	60	91%	4	1	1	1	1.15	0.56	-0.1
Group B	72	23%	0	0%	3	4%	9	13%	60	83%	3	1	1	1	1.21	0.50	0.31
Group C	99	31%	4	4%	9	9%	24	24%	62	63%	4	1	1	1	1.55	0.82	0.19
With ISO9000	105	33%	3	3%	9	9%	25	24%	68	65%	4	1	1	1	1.50	0.77	0.21
Without ISO9000	132	42%	3	2%	3	2%	12	9%	114	86%	4	1	1	1	1.20	0.59	0.21
Grp A w ISO9000	3	1%	0	0%	0	0%	0	0%	3	100%	1	1	1	1	1.00	0.00	nil
Grp A w/o ISO9000	66	21%	2	3%	0	0%	4	6%	60	91%	4	1	1	1	1.15	0.56	-0.1
Grp B w ISO9000	15	5%	0	0%	0	0%	3	20%	12	80%	2	1	1	1	1.20	0.41	0.04
Grp B w/o ISO9000	57	18%	0	0%	3	5%	6	11%	48	84%	3	1	1	1	1.21	0.53	0.39
Grp C w ISO9000	87	28%	3	3%	9	10%	22	25%	53	61%	4	1	1	1	1.56	0.82	0.2
Grp C w/o ISO9000	12	4%	1	8%	0	0%	2	17%	9	75%	4	1	1	1	1.42	0.90	0.16

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Part	Part 1 Use of IT to assist project communication																
Topic	Electronic communication																
Subject	Use of e-mail in company offices for attaching digital video images to written messages																
Q.1.7.5.g	Response										Distribution Statistics						
Sample Sector	Nos	% o/a	No '4'	% '4'	No '3'	% '3'	No '2'	% '2'	No '1'	% '1'	H	L	Median	Mode	Mean	SD	Corr
All	237	75%	1	0%	3	1%	33	14%	200	84%	4	1	1	1	1.18	0.44	0.12
Group A	67	21%	1	1%	0	0%	3	4%	63	94%	4	1	1	1	1.09	0.42	-0.1
Group B	72	23%	0	0%	1	1%	9	13%	62	86%	3	1	1	1	1.15	0.40	0.35
Group C	99	31%	0	0%	2	2%	21	21%	76	77%	3	1	1	1	1.25	0.48	0.11
With ISO9000	105	33%	0	0%	1	1%	20	19%	84	80%	3	1	1	1	1.21	0.43	0.13
Without ISO9000	133	42%	1	1%	2	2%	13	10%	117	88%	4	1	1	1	1.15	0.45	0.31
Grp A w ISO9000	3	1%	0	0%	0	0%	0	0%	3	100%	1	1	1	1	1.00	0.00	nil
Grp A w/o ISO9000	67	21%	1	1%	0	0%	3	4%	63	94%	4	1	1	1	1.09	0.42	-0.1
Grp B w ISO9000	15	5%	0	0%	0	0%	1	7%	14	93%	2	1	1	1	1.07	0.26	-0.2
Grp B w/o ISO9000	57	18%	0	0%	1	2%	8	14%	48	84%	3	1	1	1	1.18	0.43	0.5
Grp C w ISO9000	87	28%	0	0%	1	1%	19	22%	67	77%	3	1	1	1	1.24	0.46	0.11
Grp C w/o ISO9000	12	4%	0	0%	1	8%	2	17%	9	75%	3	1	1	1	1.33	0.65	0.28

Part	Part 1 Use of IT to assist project communication																
Topic	Electronic communication																
Subject	Use of e-mail in company offices for attaching digital sound files to written messages																
Q.1.7.5.h	Response										Distribution Statistics						
Sample Sector	Nos	% o/a	No '4'	% '4'	No '3'	% '3'	No '2'	% '2'	No '1'	% '1'	H	L	Median	Mode	Mean	SD	Corr
All	237	75%	1	0%	2	1%	28	12%	206	87%	4	1	1	1	1.15	0.41	0.01
Group A	67	21%	1	1%	0	0%	3	4%	63	94%	4	1	1	1	1.09	0.42	-0.1
Group B	72	23%	0	0%	1	1%	8	11%	63	88%	3	1	1	1	1.14	0.39	0.37
Group C	99	31%	0	0%	1	1%	17	17%	81	82%	3	1	1	1	1.19	0.42	-0
With ISO9000	105	33%	0	0%	0	0%	16	15%	89	85%	2	1	1	1	1.15	0.36	-0
Without ISO9000	133	42%	1	1%	2	2%	12	9%	118	89%	4	1	1	1	1.14	0.45	0.31
Grp A w ISO9000	3	1%	0	0%	0	0%	0	0%	3	100%	1	1	1	1	1.00	0.00	nil
Grp A w/o ISO9000	67	21%	1	1%	0	0%	3	4%	63	94%	4	1	1	1	1.09	0.42	-0.1
Grp B w ISO9000	15	5%	0	0%	0	0%	1	7%	14	93%	2	1	1	1	1.07	0.26	-0.2
Grp B w/o ISO9000	57	18%	0	0%	1	2%	7	12%	49	86%	3	1	1	1	1.16	0.41	0.53
Grp C w ISO9000	87	28%	0	0%	0	0%	15	17%	72	83%	2	1	1	1	1.17	0.38	-0
Grp C w/o ISO9000	12	4%	0	0%	1	8%	2	17%	9	75%	3	1	1	1	1.33	0.65	0.28

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Part	Part 1 Use of IT to assist project communication																
Topic	Electronic communication																
Subject	Use of e-mail in company offices for assigning/delegating an action																
Q.1.7.5.I	Response										Distribution Statistics						
Sample Sector	Nos	% o/a	No '4'	% '4'	No '3'	% '3'	No '2'	% '2'	No '1'	% '1'	H	L	Median	Mode	Mean	SD	Corr
All	237	75%	10	4%	13	5%	27	11%	187	79%	4	1	1	1	1.35	0.77	0.16
Group A	67	21%	2	3%	2	3%	1	1%	62	93%	4	1	1	1	1.16	0.62	0.02
Group B	72	23%	0	0%	2	3%	8	11%	62	86%	3	1	1	1	1.17	0.44	0.08
Group C	99	31%	8	8%	9	9%	18	18%	64	65%	4	1	1	1	1.61	0.96	0.13
With ISO9000	105	33%	7	7%	9	9%	18	17%	71	68%	4	1	1	1	1.54	0.91	0.14
Without ISO9000	133	42%	3	2%	4	3%	9	7%	117	88%	4	1	1	1	1.20	0.60	0.17
Grp A w ISO9000	3	1%	0	0%	0	0%	0	0%	3	100%	1	1	1	1	1.00	0.00	nil
Grp A w/o ISO9000	67	21%	2	3%	2	3%	1	1%	62	93%	4	1	1	1	1.16	0.62	0.02
Grp B w ISO9000	15	5%	0	0%	2	13%	1	7%	12	80%	3	1	1	1	1.33	0.72	0.13
Grp B w/o ISO9000	57	18%	0	0%	0	0%	7	12%	50	88%	2	1	1	1	1.12	0.33	-0
Grp C w ISO9000	87	28%	7	8%	7	8%	17	20%	56	64%	4	1	1	1	1.60	0.95	0.13
Grp C w/o ISO9000	12	4%	1	8%	2	17%	1	8%	8	67%	4	1	1	1	1.67	1.07	0.33

Part	Part 1 Use of IT to assist project communication																
Topic	Electronic communication																
Subject	Use of e-mail in site offices for sending written messages																
Q.1.7.6.a	Response										Distribution Statistics						
Sample Sector	Nos	% o/a	No '4'	% '4'	No '3'	% '3'	No '2'	% '2'	No '1'	% '1'	H	L	Median	Mode	Mean	SD	Corr
All	236	75%	15	6%	17	7%	21	9%	182	77%	11	1	1	1	1.47	1.08	0.29
Group A	67	21%	2	3%	2	3%	1	1%	62	93%	4	1	1	1	1.16	0.62	-0.1
Group B	72	23%	2	3%	1	1%	7	10%	62	86%	4	1	1	1	1.21	0.60	0.44
Group C	98	31%	11	11%	14	14%	13	13%	59	60%	11	1	1	1	1.86	1.42	0.26
With ISO9000	104	33%	12	12%	13	13%	13	13%	66	63%	4	1	1	1	1.72	1.07	0.37
Without ISO9000	133	42%	3	2%	4	3%	8	6%	117	88%	11	1	1	1	1.26	1.04	0.12
Grp A w ISO9000	3	1%	0	0%	0	0%	0	0%	3	100%	1	1	1	1	1.00	0.00	nil
Grp A w/o ISO9000	67	21%	2	3%	2	3%	1	1%	62	93%	4	1	1	1	1.16	0.62	-0.1
Grp B w ISO9000	15	5%	2	13%	1	7%	1	7%	11	73%	4	1	1	1	1.60	1.12	0.55
Grp B w/o ISO9000	57	18%	0	0%	0	0%	6	11%	51	89%	2	1	1	1	1.11	0.31	0.37
Grp C w ISO9000	86	27%	10	12%	12	14%	12	14%	52	60%	4	1	1	1	1.77	1.08	0.39
Grp C w/o ISO9000	12	4%	1	8%	2	17%	1	8%	8	67%	4	1	1	1	1.67	1.07	0.33

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Part	Part 1 Use of IT to assist project communication																
Topic	Electronic communication																
Subject	Use of e-mail in site offices for agreeing drafting text of written messages																
Q.1.7.6.b	Response										Distribution Statistics						
Sample Sector	Nos	% o/a	No '4'	% '4'	No '3'	% '3'	No '2'	% '2'	No '1'	% '1'	H	L	Median	Mode	Mean	SD	Corr
All	235	74%	10	4%	15	6%	20	9%	190	81%	4	1	1	1	1.34	0.78	0.34
Group A	67	21%	2	3%	2	3%	1	1%	62	93%	4	1	1	1	1.16	0.62	-0.1
Group B	72	23%	0	0%	1	1%	6	8%	65	90%	3	1	1	1	1.11	0.36	0.17
Group C	97	31%	8	8%	12	12%	13	13%	64	66%	4	1	1	1	1.63	0.99	0.34
With ISO9000	103	33%	7	7%	12	12%	11	11%	73	71%	4	1	1	1	1.54	0.95	0.36
Without ISO9000	133	42%	3	2%	3	2%	9	7%	118	89%	4	1	1	1	1.18	0.58	0.13
Grp A w ISO9000	3	1%	0	0%	0	0%	0	0%	3	100%	1	1	1	1	1.00	0.00	nil
Grp A w/o ISO9000	67	21%	2	3%	2	3%	1	1%	62	93%	4	1	1	1	1.16	0.62	-0.1
Grp B w ISO9000	15	5%	0	0%	1	7%	0	0%	14	93%	3	1	1	1	1.13	0.52	-0.3
Grp B w/o ISO9000	57	18%	0	0%	0	0%	6	11%	51	89%	2	1	1	1	1.11	0.31	0.37
Grp C w ISO9000	85	27%	7	8%	11	13%	11	13%	56	66%	4	1	1	1	1.64	1.00	0.36
Grp C w/o ISO9000	12	4%	1	8%	1	8%	2	17%	8	67%	4	1	1	1	1.58	1.00	0.07

Part	Part 1 Use of IT to assist project communication																
Topic	Electronic communication																
Subject	Use of e-mail in site offices for marking up amending written messages of others																
Q.1.7.6.c	Response										Distribution Statistics						
Sample Sector	Nos	% o/a	No '4'	% '4'	No '3'	% '3'	No '2'	% '2'	No '1'	% '1'	H	L	Median	Mode	Mean	SD	Corr
All	234	74%	10	4%	9	4%	24	10%	191	82%	4	1	1	1	1.31	0.74	0.32
Group A	67	21%	2	3%	2	3%	1	1%	62	93%	4	1	1	1	1.16	0.62	-0.1
Group B	72	23%	0	0%	1	1%	5	7%	66	92%	3	1	1	1	1.10	0.34	0.19
Group C	96	30%	8	8%	6	6%	18	19%	64	67%	4	1	1	1	1.56	0.94	0.32
With ISO9000	102	32%	7	7%	7	7%	16	16%	72	71%	4	1	1	1	1.50	0.90	0.33
Without ISO9000	133	42%	3	2%	2	2%	8	6%	120	90%	4	1	1	1	1.16	0.55	0.14
Grp A w ISO9000	3	1%	0	0%	0	0%	0	0%	3	100%	1	1	1	1	1.00	0.00	nil
Grp A w/o ISO9000	67	21%	2	3%	2	3%	1	1%	62	93%	4	1	1	1	1.16	0.62	-0.1
Grp B w ISO9000	15	5%	0	0%	1	7%	0	0%	14	93%	3	1	1	1	1.13	0.52	-0.3
Grp B w/o ISO9000	57	18%	0	0%	0	0%	5	9%	52	91%	2	1	1	1	1.09	0.29	0.41
Grp C w ISO9000	84	27%	7	8%	6	7%	16	19%	55	65%	4	1	1	1	1.58	0.95	0.33
Grp C w/o ISO9000	12	4%	1	8%	0	0%	2	17%	9	75%	4	1	1	1	1.42	0.90	0.16

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Part	Part 1 Use of IT to assist project communication																
Topic	Electronic communication																
Subject	Use of e-mail in site offices for attaching other written messages to written messages																
Q.1.7.6.d	Response										Distribution Statistics						
Sample Sector	Nos	% o/a	No '4'	% '4'	No '3'	% '3'	No '2'	% '2'	No '1'	% '1'	H	L	Median	Mode	Mean	SD	Corr
All	234	74%	14	6%	16	7%	17	7%	187	80%	4	1	1	1	1.39	0.86	0.37
Group A	66	21%	2	3%	2	3%	1	2%	61	92%	4	1	1	1	1.17	0.62	-0.1
Group B	72	23%	2	3%	2	3%	5	7%	63	88%	4	1	1	1	1.21	0.63	0.43
Group C	97	31%	10	10%	12	12%	11	11%	64	66%	4	1	1	1	1.67	1.05	0.39
With ISO9000	103	33%	11	11%	13	13%	9	9%	70	68%	4	1	1	1	1.66	1.06	0.38
Without ISO9000	132	42%	3	2%	3	2%	8	6%	118	89%	4	1	1	1	1.17	0.57	0.14
Grp A w ISO9000	3	1%	0	0%	0	0%	0	0%	3	100%	1	1	1	1	1.00	0.00	nil
Grp A w/o ISO9000	66	21%	2	3%	2	3%	1	2%	61	92%	4	1	1	1	1.17	0.62	-0.1
Grp B w ISO9000	15	5%	2	13%	1	7%	0	0%	12	80%	4	1	1	1	1.53	1.13	0.61
Grp B w/o ISO9000	57	18%	0	0%	1	2%	5	9%	51	89%	3	1	1	1	1.12	0.38	0.29
Grp C w ISO9000	85	27%	9	11%	12	14%	9	11%	55	65%	4	1	1	1	1.71	1.07	0.4
Grp C w/o ISO9000	12	4%	1	8%	0	0%	2	17%	9	75%	4	1	1	1	1.42	0.90	0.16

Part	Part 1 Use of IT to assist project communication																
Topic	Electronic communication																
Subject	Use of e-mail in site offices for attaching drawing files to written messages																
Q.1.7.6.e	Response										Distribution Statistics						
Sample Sector	Nos	% o/a	No '4'	% '4'	No '3'	% '3'	No '2'	% '2'	No '1'	% '1'	H	L	Median	Mode	Mean	SD	Corr
All	235	74%	7	3%	15	6%	22	9%	191	81%	4	1	1	1	1.31	0.72	0.27
Group A	67	21%	1	1%	3	4%	1	1%	62	93%	4	1	1	1	1.15	0.56	-0.1
Group B	72	23%	0	0%	2	3%	7	10%	63	88%	3	1	1	1	1.15	0.43	0.5
Group C	97	31%	6	6%	10	10%	14	14%	67	69%	4	1	1	1	1.54	0.91	0.25
With ISO9000	103	33%	4	4%	11	11%	14	14%	74	72%	4	1	1	1	1.47	0.84	0.26
Without ISO9000	133	42%	3	2%	4	3%	8	6%	118	89%	4	1	1	1	1.19	0.59	0.44
Grp A w ISO9000	3	1%	0	0%	0	0%	0	0%	3	100%	1	1	1	1	1.00	0.00	nil
Grp A w/o ISO9000	67	21%	1	1%	3	4%	1	1%	62	93%	4	1	1	1	1.15	0.56	-0.1
Grp B w ISO9000	15	5%	0	0%	1	7%	1	7%	13	87%	3	1	1	1	1.20	0.56	0.38
Grp B w/o ISO9000	57	18%	0	0%	1	2%	6	11%	50	88%	3	1	1	1	1.14	0.40	0.56
Grp C w ISO9000	85	27%	4	5%	10	12%	13	15%	58	68%	4	1	1	1	1.53	0.88	0.26
Grp C w/o ISO9000	12	4%	2	17%	0	0%	1	8%	9	75%	4	1	1	1	1.58	1.16	0.62

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Part	Part 1 Use of IT to assist project communication																
Topic	Electronic communication																
Subject	Use of e-mail in site offices for attaching digital photographs to written messages																
Q.1.7.6.f	Response										Distribution Statistics						
Sample Sector	Nos	% o/a	No '4'	% '4'	No '3'	% '3'	No '2'	% '2'	No '1'	% '1'	H	L	Median	Mode	Mean	SD	Corr
All	233	74%	6	3%	6	3%	28	12%	193	83%	4	1	1	1	1.25	0.63	0.15
Group A	66	21%	2	3%	0	0%	2	3%	62	94%	4	1	1	1	1.12	0.54	-0.1
Group B	71	22%	0	0%	1	1%	8	11%	62	87%	3	1	1	1	1.14	0.39	0.54
Group C	97	31%	4	4%	5	5%	18	19%	70	72%	4	1	1	1	1.41	0.77	0.11
With ISO9000	103	33%	3	3%	4	4%	19	18%	77	75%	4	1	1	1	1.35	0.70	0.11
Without ISO9000	131	41%	3	2%	2	2%	9	7%	117	89%	4	1	1	1	1.17	0.56	0.51
Grp A w ISO9000	3	1%	0	0%	0	0%	0	0%	3	100%	1	1	1	1	1.00	0.00	nil
Grp A w/o ISO9000	66	21%	2	3%	0	0%	2	3%	62	94%	4	1	1	1	1.12	0.54	-0.1
Grp B w ISO9000	15	5%	0	0%	0	0%	2	13%	13	87%	2	1	1	1	1.13	0.35	0.21
Grp B w/o ISO9000	56	18%	0	0%	1	2%	6	11%	49	88%	3	1	1	1	1.14	0.40	0.65
Grp C w ISO9000	85	27%	3	4%	4	5%	17	20%	61	72%	4	1	1	1	1.40	0.74	0.09
Grp C w/o ISO9000	12	4%	1	8%	1	8%	1	8%	9	75%	4	1	1	1	1.50	1.00	0.75

Part	Part 1 Use of IT to assist project communication																
Topic	Electronic communication																
Subject	Use of e-mail in site offices for attaching digital video images to written messages																
Q.1.7.6.g	Response										Distribution Statistics						
Sample Sector	Nos	% o/a	No '4'	% '4'	No '3'	% '3'	No '2'	% '2'	No '1'	% '1'	H	L	Median	Mode	Mean	SD	Corr
All	235	74%	3	1%	3	1%	21	9%	208	89%	4	1	1	1	1.15	0.48	0.03
Group A	67	21%	2	3%	0	0%	2	3%	63	94%	4	1	1	1	1.12	0.54	-0.1
Group B	72	23%	0	0%	1	1%	4	6%	67	93%	3	1	1	1	1.08	0.33	0.5
Group C	97	31%	1	1%	2	2%	15	15%	79	81%	4	1	1	1	1.23	0.53	-0
With ISO9000	103	33%	0	0%	1	1%	14	14%	88	85%	3	1	1	1	1.16	0.39	-0
Without ISO9000	133	42%	3	2%	2	2%	7	5%	121	91%	4	1	1	1	1.15	0.54	0.49
Grp A w ISO9000	3	1%	0	0%	0	0%	0	0%	3	100%	1	1	1	1	1.00	0.00	nil
Grp A w/o ISO9000	67	21%	2	3%	0	0%	2	3%	63	94%	4	1	1	1	1.12	0.54	-0.1
Grp B w ISO9000	15	5%	0	0%	0	0%	0	0%	15	100%	1	1	1	1	1.00	0.00	nil
Grp B w/o ISO9000	57	18%	0	0%	1	2%	4	7%	52	91%	3	1	1	1	1.11	0.36	0.63
Grp C w ISO9000	85	27%	0	0%	1	1%	14	16%	70	82%	3	1	1	1	1.19	0.42	-0
Grp C w/o ISO9000	12	4%	1	8%	1	8%	1	8%	9	75%	4	1	1	1	1.50	1.00	0.75

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Part	Part 1 Use of IT to assist project communication																
Topic	Electronic communication																
Subject	Use of e-mail in site offices for attaching digital sound files to written messages																
Q.1.7.6.h	Response										Distribution Statistics						
Sample Sector	Nos	% o/a	No '4'	% '4'	No '3'	% '3'	No '2'	% '2'	No '1'	% '1'	H	L	Median	Mode	Mean	SD	Corr
All	235	74%	3	1%	2	1%	20	9%	210	89%	4	1	1	1	1.14	0.46	0.03
Group A	67	21%	2	3%	0	0%	2	3%	63	94%	4	1	1	1	1.12	0.54	-0.1
Group B	72	23%	0	0%	1	1%	4	6%	67	93%	3	1	1	1	1.08	0.33	0.5
Group C	97	31%	1	1%	1	1%	14	14%	81	84%	4	1	1	1	1.20	0.49	-0
With ISO9000	103	33%	0	0%	0	0%	13	13%	90	87%	2	1	1	1	1.13	0.33	-0
Without ISO9000	133	42%	3	2%	2	2%	7	5%	121	91%	4	1	1	1	1.15	0.54	0.49
Grp A w ISO9000	3	1%	0	0%	0	0%	0	0%	3	100%	1	1	1	1	1.00	0.00	nil
Grp A w/o ISO9000	67	21%	2	3%	0	0%	2	3%	63	94%	4	1	1	1	1.12	0.54	-0.1
Grp B w ISO9000	15	5%	0	0%	0	0%	0	0%	15	100%	1	1	1	1	1.00	0.00	nil
Grp B w/o ISO9000	57	18%	0	0%	1	2%	4	7%	52	91%	3	1	1	1	1.11	0.36	0.63
Grp C w ISO9000	85	27%	0	0%	0	0%	13	15%	72	85%	2	1	1	1	1.15	0.36	-0
Grp C w/o ISO9000	12	4%	1	8%	1	8%	1	8%	9	75%	4	1	1	1	1.50	1.00	0.75

Part	Part 1 Use of IT to assist project communication																
Topic	Electronic communication																
Subject	Use of e-mail in site offices for assigning/delegating an action																
Q.1.7.6.I	Response										Distribution Statistics						
Sample Sector	Nos	% o/a	No '4'	% '4'	No '3'	% '3'	No '2'	% '2'	No '1'	% '1'	H	L	Median	Mode	Mean	SD	Corr
All	235	74%	5	2%	8	3%	19	8%	203	86%	4	1	1	1	1.21	0.60	0.07
Group A	67	21%	1	1%	2	3%	1	1%	63	94%	4	1	1	1	1.12	0.51	-0.1
Group B	72	23%	0	0%	1	1%	5	7%	66	92%	3	1	1	1	1.10	0.34	0.05
Group C	97	31%	4	4%	5	5%	13	13%	75	77%	4	1	1	1	1.36	0.77	0.03
With ISO9000	103	33%	3	3%	5	5%	13	13%	82	80%	4	1	1	1	1.31	0.70	0.03
Without ISO9000	133	42%	2	2%	3	2%	6	5%	122	92%	4	1	1	1	1.14	0.50	0.21
Grp A w ISO9000	3	1%	0	0%	0	0%	0	0%	3	100%	1	1	1	1	1.00	0.00	nil
Grp A w/o ISO9000	67	21%	1	1%	2	3%	1	1%	63	94%	4	1	1	1	1.12	0.51	-0.1
Grp B w ISO9000	15	5%	0	0%	1	7%	1	7%	13	87%	3	1	1	1	1.20	0.56	0.01
Grp B w/o ISO9000	57	18%	0	0%	0	0%	4	7%	53	93%	2	1	1	1	1.07	0.26	0.02
Grp C w ISO9000	85	27%	3	4%	4	5%	12	14%	66	78%	4	1	1	1	1.34	0.73	0.02
Grp C w/o ISO9000	12	4%	1	8%	1	8%	1	8%	9	75%	4	1	1	1	1.50	1.00	0.43

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Part	Part 1 Use of IT to assist project communication																
Topic	Electronic communication																
Subject	Company home page on the Internet																
Q.1.7.7	Response										Distribution Statistics						
Sample Sector	Nos	% o/a	No '4'	% '4'	No '3'	% '3'	No '2'	% '2'	No '1'	% '1'	H	L	Median	Mode	Mean	SD	Corr
All	236	75%	37	16%	0	0%	1	0%	198	84%	4	1	1	1	1.47	1.09	0.26
Group A	68	22%	3	4%	0	0%	0	0%	65	96%	4	1	1	1	1.13	0.62	-0
Group B	71	22%	13	18%	0	0%	0	0%	58	82%	4	1	1	1	1.55	1.17	0.05
Group C	98	31%	21	21%	0	0%	1	1%	76	78%	4	1	1	1	1.65	1.24	0.31
With ISO9000	103	33%	22	21%	0	0%	1	1%	80	78%	4	1	1	1	1.65	1.23	0.29
Without ISO9000	134	42%	15	11%	0	0%	0	0%	119	89%	4	1	1	1	1.34	0.95	0.18
Grp A w ISO9000	3	1%	0	0%	0	0%	0	0%	3	100%	1	1	1	1	1.00	0.00	nil
Grp A w/o ISO9000	68	22%	3	4%	0	0%	0	0%	65	96%	4	1	1	1	1.13	0.62	-0
Grp B w ISO9000	14	4%	3	21%	0	0%	0	0%	11	79%	4	1	1	1	1.64	1.28	0.42
Grp B w/o ISO9000	57	18%	10	18%	0	0%	0	0%	47	82%	4	1	1	1	1.53	1.15	-0.1
Grp C w ISO9000	86	27%	19	22%	0	0%	1	1%	66	77%	4	1	1	1	1.67	1.25	0.31
Grp C w/o ISO9000	12	4%	2	17%	0	0%	0	0%	10	83%	4	1	1	1	1.50	1.17	0.64

Part	Part 1 Use of IT to assist project communication																
Topic	Electronic communication																
Subject	Company Internet server																
Q.1.7.8	Response										Distribution Statistics						
Sample Sector	Nos	% o/a	No '4'	% '4'	No '3'	% '3'	No '2'	% '2'	No '1'	% '1'	H	L	Median	Mode	Mean	SD	Corr
All	237	75%	41	17%	0	0%	0	0%	196	83%	4	1	1	1	1.52	1.14	0.06
Group A	68	22%	8	12%	0	0%	0	0%	60	88%	4	1	1	1	1.35	0.97	0.15
Group B	71	22%	13	18%	0	0%	0	0%	58	82%	4	1	1	1	1.55	1.17	0.05
Group C	99	31%	20	20%	0	0%	0	0%	79	80%	4	1	1	1	1.61	1.21	0.06
With ISO9000	104	33%	24	23%	0	0%	0	0%	80	77%	4	1	1	1	1.69	1.27	0.04
Without ISO9000	134	42%	17	13%	0	0%	0	0%	117	87%	4	1	1	1	1.38	1.00	-0
Grp A w ISO9000	3	1%	1	33%	0	0%	0	0%	2	67%	4	1	1	1	2.00	1.73	0.21
Grp A w/o ISO9000	68	22%	8	12%	0	0%	0	0%	60	88%	4	1	1	1	1.35	0.97	0.15
Grp B w ISO9000	14	4%	4	29%	0	0%	0	0%	10	71%	4	1	1	1	1.86	1.41	0.26
Grp B w/o ISO9000	57	18%	9	16%	0	0%	0	0%	48	84%	4	1	1	1	1.47	1.10	-0.1
Grp C w ISO9000	87	28%	19	22%	0	0%	0	0%	68	78%	4	1	1	1	1.66	1.25	0.05
Grp C w/o ISO9000	12	4%	1	8%	0	0%	0	0%	11	92%	4	1	1	1	1.25	0.87	-0.1

Results of the 1998 postal survey of Hong Kong Public Works Contractors.

Part	Part 1 Use of IT to assist project communication																
Topic	Electronic communication																
Subject	Provision of an Internet service to managerial staff																
Q.1.7.9.a	Response										Distribution Statistics						
Sample Sector	Nos	% o/a	No '4'	% '4'	No '3'	% '3'	No '2'	% '2'	No '1'	% '1'	H	L	Median	Mode	Mean	SD	Corr
All	237	75%	54	23%	33	14%	23	10%	127	54%	4	1	1	1	2.06	1.26	0.23
Group A	67	21%	9	13%	4	6%	2	3%	52	78%	4	1	1	1	1.55	1.09	0.12
Group B	72	23%	12	17%	10	14%	7	10%	43	60%	4	1	1	1	1.88	1.19	0.2
Group C	99	31%	34	34%	19	19%	14	14%	32	32%	4	1	3	4	2.56	1.26	0.23
With ISO9000	105	33%	34	32%	21	20%	17	16%	33	31%	4	1	3	4	2.53	1.24	0.23
Without ISO9000	133	42%	21	16%	12	9%	6	5%	94	71%	4	1	1	1	1.70	1.16	0.18
Grp A w ISO9000	3	1%	0	0%	1	33%	0	0%	2	67%	3	1	1	1	1.67	1.15	0.21
Grp A w/o ISO9000	67	21%	9	13%	4	6%	2	3%	52	78%	4	1	1	1	1.55	1.09	0.12
Grp B w ISO9000	15	5%	4	27%	3	20%	3	20%	5	33%	4	1	2	1	2.40	1.24	0.27
Grp B w/o ISO9000	57	18%	8	14%	7	12%	4	7%	38	67%	4	1	1	1	1.74	1.14	0.12
Grp C w ISO9000	87	28%	30	34%	17	20%	14	16%	26	30%	4	1	3	4	2.59	1.24	0.24
Grp C w/o ISO9000	12	4%	4	33%	2	17%	0	0%	6	50%	4	1	2	1	2.33	1.44	0.31

Part	Part 1 Use of IT to assist project communication																
Topic	Electronic communication																
Subject	Provision of an Internet service to professional staff																
Q.1.7.9.b	Response										Distribution Statistics						
Sample Sector	Nos	% o/a	No '4'	% '4'	No '3'	% '3'	No '2'	% '2'	No '1'	% '1'	H	L	Median	Mode	Mean	SD	Corr
All	236	75%	37	16%	35	15%	21	9%	143	61%	4	1	1	1	1.86	1.17	0.24
Group A	66	21%	7	11%	5	8%	1	2%	53	80%	4	1	1	1	1.48	1.03	0.15
Group B	72	23%	10	14%	9	13%	8	11%	45	63%	4	1	1	1	1.78	1.13	0.26
Group C	99	31%	20	20%	21	21%	12	12%	46	46%	4	1	2	1	2.15	1.22	0.27
With ISO9000	105	33%	19	18%	23	22%	15	14%	48	46%	4	1	2	1	2.12	1.18	0.28
Without ISO9000	132	42%	18	14%	12	9%	6	5%	96	73%	4	1	1	1	1.64	1.11	0.15
Grp A w ISO9000	3	1%	0	0%	1	33%	0	0%	2	67%	3	1	1	1	1.67	1.15	0.21
Grp A w/o ISO9000	66	21%	7	11%	5	8%	1	2%	53	80%	4	1	1	1	1.48	1.03	0.15
Grp B w ISO9000	15	5%	2	13%	4	27%	3	20%	6	40%	4	1	2	1	2.13	1.13	0.5
Grp B w/o ISO9000	57	18%	8	14%	5	9%	5	9%	39	68%	4	1	1	1	1.68	1.12	0.15
Grp C w ISO9000	87	28%	17	20%	18	21%	12	14%	40	46%	4	1	2	1	2.14	1.20	0.3
Grp C w/o ISO9000	12	4%	3	25%	3	25%	0	0%	6	50%	4	1	2	1	2.25	1.36	0.11

Results of the 1998 postal survey of Hong Kong Public Works Contractors.

Part	Part 1 Use of IT to assist project communication																
Topic	Electronic communication																
Subject	Provision of an Internet service to supervisory staff																
Q.1.7.9.c	Response										Distribution Statistics						
Sample Sector	Nos	% o/a	No '4'	% '4'	No '3'	% '3'	No '2'	% '2'	No '1'	% '1'	H	L	Median	Mode	Mean	SD	Corr
All	237	75%	19	8%	14	6%	29	12%	175	74%	4	1	1	1	1.48	0.92	0.21
Group A	67	21%	4	6%	2	3%	2	3%	59	88%	4	1	1	1	1.27	0.79	0.06
Group B	72	23%	4	6%	3	4%	9	13%	56	78%	4	1	1	1	1.38	0.81	0.17
Group C	99	31%	11	11%	9	9%	18	18%	61	62%	4	1	1	1	1.70	1.03	0.23
With ISO9000	105	33%	10	10%	9	9%	22	21%	64	61%	4	1	1	1	1.67	0.99	0.24
Without ISO9000	133	42%	9	7%	5	4%	7	5%	112	84%	4	1	1	1	1.33	0.84	0.09
Grp A w ISO9000	3	1%	0	0%	0	0%	1	33%	2	67%	2	1	1	1	1.33	0.58	0.21
Grp A w/o ISO9000	67	21%	4	6%	2	3%	2	3%	59	88%	4	1	1	1	1.27	0.79	0.06
Grp B w ISO9000	15	5%	1	7%	0	0%	4	27%	10	67%	4	1	1	1	1.47	0.83	0.36
Grp B w/o ISO9000	57	18%	3	5%	3	5%	5	9%	46	81%	4	1	1	1	1.35	0.81	0.11
Grp C w ISO9000	87	28%	9	10%	9	10%	17	20%	52	60%	4	1	1	1	1.71	1.02	0.24
Grp C w/o ISO9000	12	4%	2	17%	0	0%	1	8%	9	75%	4	1	1	1	1.58	1.16	0.06

Part	Part 1 Use of IT to assist project communication																
Topic	Electronic communication																
Subject	Provision of an Internet service to adminstrative , clerical and other staff																
Q.1.7.9.d	Response										Distribution Statistics						
Sample Sector	Nos	% o/a	No '4'	% '4'	No '3'	% '3'	No '2'	% '2'	No '1'	% '1'	H	L	Median	Mode	Mean	SD	Corr
All	238	75%	10	4%	18	8%	24	10%	186	78%	4	1	1	1	1.38	0.80	0.13
Group A	68	22%	3	4%	3	4%	1	1%	61	90%	4	1	1	1	1.24	0.74	0.02
Group B	72	23%	2	3%	6	8%	5	7%	59	82%	4	1	1	1	1.32	0.75	0.02
Group C	99	31%	5	5%	9	9%	18	18%	67	68%	4	1	1	1	1.52	0.86	0.14
With ISO9000	105	33%	4	4%	10	10%	19	18%	72	69%	4	1	1	1	1.49	0.82	0.15
Without ISO9000	134	42%	6	4%	8	6%	5	4%	115	86%	4	1	1	1	1.29	0.77	0.05
Grp A w ISO9000	3	1%	0	0%	0	0%	0	0%	3	100%	1	1	1	1	1.00	0.00	nil
Grp A w/o ISO9000	68	22%	3	4%	3	4%	1	1%	61	90%	4	1	1	1	1.24	0.74	0.02
Grp B w ISO9000	15	5%	0	0%	1	7%	2	13%	12	80%	3	1	1	1	1.27	0.59	0.35
Grp B w/o ISO9000	57	18%	2	4%	5	9%	3	5%	47	82%	4	1	1	1	1.33	0.79	-0
Grp C w ISO9000	87	28%	4	5%	9	10%	17	20%	57	66%	4	1	1	1	1.54	0.86	0.14
Grp C w/o ISO9000	12	4%	1	8%	0	0%	1	8%	10	83%	4	1	1	1	1.33	0.89	0.2

Results of the 1998 postal survey of Hong Kong Public Works Contractors.

Part	Part 2 Purpose of the IT																
Topic	.																
Subject	Use of the telephone to communicate transmit work-content related data/information																
Q.2.1.a	Response										Distribution Statistics						
Sample Sector	Nos	% o/a	No '4'	% '4'	No '3'	% '3'	No '2'	% '2'	No '1'	% '1'	H	L	Median	Mode	Mean	SD	Corr
All	237	75%	187	79%	41	17%	5	2%	4	2%	4	1	4	4	3.73	0.58	0.01
Group A	68	22%	61	90%	7	10%	0	0%	0	0%	4	3	4	4	3.90	0.31	-0.1
Group B	71	22%	57	80%	11	15%	1	1%	2	3%	4	1	4	4	3.73	0.63	0.12
Group C	99	31%	70	71%	23	23%	4	4%	2	2%	4	1	4	4	3.63	0.66	0.06
With ISO9000	105	33%	79	75%	20	19%	4	4%	2	2%	4	1	4	4	3.68	0.64	0.03
Without ISO9000	133	42%	109	82%	21	16%	1	1%	2	2%	4	1	4	4	3.78	0.53	0.05
Grp A w ISO9000	3	1%	2	67%	1	33%	0	0%	0	0%	4	3	4	4	3.67	0.58	-0.7
Grp A w/o ISO9000	68	22%	61	90%	7	10%	0	0%	0	0%	4	3	4	4	3.90	0.31	-0.1
Grp B w ISO9000	15	5%	12	80%	3	20%	0	0%	0	0%	4	3	4	4	3.80	0.41	0.36
Grp B w/o ISO9000	56	18%	45	80%	8	14%	1	2%	2	4%	4	1	4	4	3.71	0.68	0.07
Grp C w ISO9000	87	28%	65	75%	16	18%	4	5%	2	2%	4	1	4	4	3.66	0.68	0.04
Grp C w/o ISO9000	12	4%	5	42%	7	58%	0	0%	0	0%	4	3	3	3	3.42	0.51	0.41

Part	Part 2 Purpose of the IT																
Topic	.																
Subject	Use of the fax to communicate transmit work-content related data/information																
Q.2.1.b	Response										Distribution Statistics						
Sample Sector	Nos	% o/a	No '4'	% '4'	No '3'	% '3'	No '2'	% '2'	No '1'	% '1'	H	L	Median	Mode	Mean	SD	Corr
All	237	75%	189	80%	41	17%	3	1%	4	2%	4	1	4	4	3.75	0.56	-0
Group A	68	22%	57	84%	9	13%	2	3%	0	0%	4	2	4	4	3.81	0.47	-0.1
Group B	71	22%	58	82%	11	15%	1	1%	1	1%	4	1	4	4	3.77	0.54	0.09
Group C	99	31%	75	76%	21	21%	0	0%	3	3%	4	1	4	4	3.70	0.63	0.01
With ISO9000	105	33%	83	79%	20	19%	0	0%	2	2%	4	1	4	4	3.75	0.55	-0
Without ISO9000	133	42%	107	80%	21	16%	3	2%	2	2%	4	1	4	4	3.75	0.57	0.06
Grp A w ISO9000	3	1%	2	67%	1	33%	0	0%	0	0%	4	3	4	4	3.67	0.58	-0.2
Grp A w/o ISO9000	68	22%	57	84%	9	13%	2	3%	0	0%	4	2	4	4	3.81	0.47	-0.1
Grp B w ISO9000	15	5%	12	80%	3	20%	0	0%	0	0%	4	3	4	4	3.80	0.41	0.32
Grp B w/o ISO9000	56	18%	46	82%	8	14%	1	2%	1	2%	4	1	4	4	3.77	0.57	0.04
Grp C w ISO9000	87	28%	69	79%	16	18%	0	0%	2	2%	4	1	4	4	3.75	0.58	-0
Grp C w/o ISO9000	12	4%	6	50%	5	42%	0	0%	1	8%	4	1	3.5	4	3.33	0.89	0.28

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Part	Part 2 Purpose of the IT																
Topic	.																
Subject	Use of the e-mail to communicate transmit work-content related data/information																
Q.2.1.c	Response										Distribution Statistics						
Sample Sector	Nos	% o/a	No '4'	% '4'	No '3'	% '3'	No '2'	% '2'	No '1'	% '1'	H	L	Median	Mode	Mean	SD	Corr
All	233	74%	8	3%	25	11%	62	27%	138	59%	4	1	1	1	1.58	0.82	0.27
Group A	66	21%	2	3%	3	5%	11	17%	50	76%	4	1	1	1	1.35	0.71	-0
Group B	70	22%	2	3%	4	6%	18	26%	46	66%	4	1	1	1	1.46	0.74	0.16
Group C	98	31%	4	4%	18	18%	34	35%	42	43%	4	1	2	1	1.84	0.87	0.31
With ISO9000	105	33%	3	3%	17	16%	41	39%	44	42%	4	1	2	1	1.80	0.81	0.31
Without ISO9000	129	41%	5	4%	8	6%	22	17%	94	73%	4	1	1	1	1.41	0.78	0.25
Grp A w ISO9000	3	1%	0	0%	0	0%	1	33%	2	67%	2	1	1	1	1.33	0.58	0.21
Grp A w/o ISO9000	66	21%	2	3%	3	5%	11	17%	50	76%	4	1	1	1	1.35	0.71	-0
Grp B w ISO9000	15	5%	0	0%	1	7%	7	47%	7	47%	3	1	2	1	1.60	0.63	0.35
Grp B w/o ISO9000	55	17%	2	4%	3	5%	11	20%	39	71%	4	1	1	1	1.42	0.76	0.09
Grp C w ISO9000	87	28%	3	3%	16	18%	33	38%	35	40%	4	1	2	1	1.85	0.84	0.31
Grp C w/o ISO9000	11	3%	1	9%	2	18%	1	9%	7	64%	4	1	1	1	1.73	1.10	0.65

Part	Part 2 Purpose of the IT																
Topic	.																
Subject	Use of hardcopy/ letter/reportt/form to communicate transmit work-content related data/information																
Q.2.1.d	Response										Distribution Statistics						
Sample Sector	Nos	% o/a	No '4'	% '4'	No '3'	% '3'	No '2'	% '2'	No '1'	% '1'	H	L	Median	Mode	Mean	SD	Corr
All	236	75%	166	70%	53	22%	12	5%	5	2%	4	1	4	4	3.61	0.68	0.02
Group A	68	22%	43	63%	17	25%	5	7%	3	4%	4	1	4	4	3.47	0.82	0.09
Group B	71	22%	52	73%	16	23%	2	3%	1	1%	4	1	4	4	3.68	0.60	0.21
Group C	98	31%	71	72%	21	21%	5	5%	1	1%	4	1	4	4	3.65	0.63	-0
With ISO9000	105	33%	77	73%	25	24%	2	2%	1	1%	4	1	4	4	3.70	0.56	-0
Without ISO9000	132	42%	89	67%	29	22%	10	8%	4	3%	4	1	4	4	3.54	0.77	0.15
Grp A w ISO9000	3	1%	1	33%	2	67%	0	0%	0	0%	4	3	3	3	3.33	0.58	-1
Grp A w/o ISO9000	68	22%	43	63%	17	25%	5	7%	3	4%	4	1	4	4	3.47	0.82	0.09
Grp B w ISO9000	15	5%	10	67%	5	33%	0	0%	0	0%	4	3	4	4	3.67	0.49	0.43
Grp B w/o ISO9000	56	18%	42	75%	11	20%	2	4%	1	2%	4	1	4	4	3.68	0.64	0.18
Grp C w ISO9000	87	28%	66	76%	18	21%	2	2%	1	1%	4	1	4	4	3.71	0.57	-0
Grp C w/o ISO9000	11	3%	5	45%	3	27%	3	27%	0	0%	4	2	3	4	3.18	0.87	0.33

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Part	Part 2 Purpose of the IT																
Topic	.																
Subject	Transmission of lists of 'activities' ('work-content data) using IT																
Q.2.2.a	Response										Distribution Statistics						
Sample Sector	Nos	% o/a	No '4'	% '4'	No '3'	% '3'	No '2'	% '2'	No '1'	% '1'	H	L	Median	Mode	Mean	SD	Corr
All	234	74%	89	38%	76	32%	44	19%	25	11%	4	1	3	4	2.98	1.00	0.04
Group A	67	21%	28	42%	15	22%	12	18%	12	18%	4	1	3	4	2.88	1.15	-0.1
Group B	70	22%	26	37%	29	41%	10	14%	5	7%	4	1	3	3	3.09	0.90	0.24
Group C	98	31%	35	36%	32	33%	23	23%	8	8%	4	1	3	4	2.96	0.96	0.05
With ISO9000	105	33%	38	36%	35	33%	24	23%	8	8%	4	1	3	4	2.98	0.95	0.06
Without ISO9000	130	41%	51	39%	41	32%	21	16%	17	13%	4	1	3	4	2.97	1.04	0.02
Grp A w ISO9000	3	1%	0	0%	0	0%	2	67%	1	33%	2	1	2	2	1.67	0.58	-0.7
Grp A w/o ISO9000	67	21%	28	42%	15	22%	12	18%	12	18%	4	1	3	4	2.88	1.15	-0.1
Grp B w ISO9000	15	5%	6	40%	7	47%	2	13%	0	0%	4	2	3	3	3.27	0.70	0.22
Grp B w/o ISO9000	55	17%	20	36%	22	40%	8	15%	5	9%	4	1	3	3	3.04	0.94	0.22
Grp C w ISO9000	87	28%	32	37%	28	32%	20	23%	7	8%	4	1	3	4	2.98	0.96	0.06
Grp C w/o ISO9000	11	3%	3	27%	4	36%	3	27%	1	9%	4	1	3	3	2.82	0.98	-0.3

Part	Part 2 Purpose of the IT																
Topic	.																
Subject	Transmission of lists of 'items to be done' ('work-content data) using IT																
Q.2.2.b	Response										Distribution Statistics						
Sample Sector	Nos	% o/a	No '4'	% '4'	No '3'	% '3'	No '2'	% '2'	No '1'	% '1'	H	L	Median	Mode	Mean	SD	Corr
All	235	74%	84	36%	80	34%	40	17%	31	13%	4	1	3	4	2.92	1.03	0.05
Group A	67	21%	27	40%	17	25%	11	16%	12	18%	4	1	3	4	2.88	1.14	-0.1
Group B	70	22%	25	36%	30	43%	8	11%	7	10%	4	1	3	3	3.04	0.94	0.28
Group C	99	31%	32	32%	33	33%	22	22%	12	12%	4	1	3	3	2.86	1.01	0.08
With ISO9000	105	33%	35	33%	35	33%	23	22%	12	11%	4	1	3	4	2.89	1.00	0.08
Without ISO9000	131	41%	49	37%	45	34%	18	14%	19	15%	4	1	3	4	2.95	1.05	0.02
Grp A w ISO9000	3	1%	0	0%	0	0%	2	67%	1	33%	2	1	2	2	1.67	0.58	-0.7
Grp A w/o ISO9000	67	21%	27	40%	17	25%	11	16%	12	18%	4	1	3	4	2.88	1.14	-0.1
Grp B w ISO9000	15	5%	7	47%	6	40%	2	13%	0	0%	4	2	3	4	3.33	0.72	0.41
Grp B w/o ISO9000	55	17%	18	33%	24	44%	6	11%	7	13%	4	1	3	3	2.96	0.98	0.22
Grp C w ISO9000	87	28%	28	32%	29	33%	19	22%	11	13%	4	1	3	3	2.85	1.02	0.09
Grp C w/o ISO9000	12	4%	4	33%	4	33%	3	25%	1	8%	4	1	3	4	2.92	1.00	-0.3

Results of the 1998 postal survey of Hong Kong Public Works Contractors.

Part	Part 2 Purpose of the IT																
Topic	.																
Subject	Transmission of lists of 'variations and their status' ('work-content data) using IT																
Q.2.2.c	Response										Distribution Statistics						
Sample Sector	Nos	% o/a	No '4'	% '4'	No '3'	% '3'	No '2'	% '2'	No '1'	% '1'	H	L	Median	Mode	Mean	SD	Corr
All	234	74%	82	35%	75	32%	50	21%	27	12%	4	1	3	4	2.91	1.01	0.04
Group A	67	21%	26	39%	16	24%	13	19%	12	18%	4	1	3	4	2.84	1.14	-0.1
Group B	70	22%	23	33%	27	39%	14	20%	6	9%	4	1	3	3	2.96	0.94	0.19
Group C	98	31%	33	34%	32	33%	24	24%	9	9%	4	1	3	4	2.91	0.97	0.05
With ISO9000	105	33%	34	32%	36	34%	24	23%	11	10%	4	1	3	3	2.89	0.98	0.07
Without ISO9000	130	41%	48	37%	39	30%	27	21%	16	12%	4	1	3	4	2.92	1.03	0.01
Grp A w ISO9000	3	1%	0	0%	1	33%	0	0%	2	67%	3	1	1	1	1.67	1.15	0.21
Grp A w/o ISO9000	67	21%	26	39%	16	24%	13	19%	12	18%	4	1	3	4	2.84	1.14	-0.1
Grp B w ISO9000	15	5%	5	33%	5	33%	4	27%	1	7%	4	1	3	4	2.93	0.96	0.21
Grp B w/o ISO9000	55	17%	18	33%	22	40%	10	18%	5	9%	4	1	3	3	2.96	0.94	0.2
Grp C w ISO9000	87	28%	29	33%	30	34%	20	23%	8	9%	4	1	3	3	2.92	0.97	0.06
Grp C w/o ISO9000	11	3%	4	36%	2	18%	4	36%	1	9%	4	1	3	4	2.82	1.08	-0.3

Part	Part 2 Purpose of the IT																
Topic	.																
Subject	Transmission of lists of 'disputes and their status' ('work-content data) using IT																
Q.2.2.d	Response										Distribution Statistics						
Sample Sector	Nos	% o/a	No '4'	% '4'	No '3'	% '3'	No '2'	% '2'	No '1'	% '1'	H	L	Median	Mode	Mean	SD	Corr
All	235	74%	80	34%	63	27%	59	25%	33	14%	4	1	3	4	2.81	1.06	0.07
Group A	67	21%	25	37%	15	22%	14	21%	13	19%	4	1	3	4	2.78	1.15	-0.1
Group B	70	22%	19	27%	25	36%	18	26%	8	11%	4	1	3	3	2.79	0.98	0.16
Group C	99	31%	36	36%	23	23%	28	28%	12	12%	4	1	3	4	2.84	1.06	0.1
With ISO9000	105	33%	33	31%	30	29%	28	27%	14	13%	4	1	3	4	2.78	1.04	0.12
Without ISO9000	131	41%	47	36%	33	25%	32	24%	19	15%	4	1	3	4	2.82	1.08	0.03
Grp A w ISO9000	3	1%	0	0%	1	33%	0	0%	2	67%	3	1	1	1	1.67	1.15	0.21
Grp A w/o ISO9000	67	21%	25	37%	15	22%	14	21%	13	19%	4	1	3	4	2.78	1.15	-0.1
Grp B w ISO9000	15	5%	2	13%	7	47%	5	33%	1	7%	4	1	3	3	2.67	0.82	0
Grp B w/o ISO9000	55	17%	17	31%	18	33%	13	24%	7	13%	4	1	3	3	2.82	1.02	0.22
Grp C w ISO9000	87	28%	31	36%	22	25%	23	26%	11	13%	4	1	3	4	2.84	1.06	0.11
Grp C w/o ISO9000	12	4%	5	42%	1	8%	5	42%	1	8%	4	1	2.5	4	2.83	1.11	-0.2

Results of the 1998 postal survey of Hong Kong Public Works Contractors.

Part	Part 2 Purpose of the IT																
Topic	.																
Subject	Use of the telephone to communicate transmit time related data/information																
Q.2.3.a	Response										Distribution Statistics						
Sample Sector	Nos	% o/a	No '4'	% '4'	No '3'	% '3'	No '2'	% '2'	No '1'	% '1'	H	L	Median	Mode	Mean	SD	Corr
All	234	74%	169	72%	49	21%	12	5%	4	2%	4	1	4	4	3.64	0.66	0.02
Group A	67	21%	53	79%	10	15%	4	6%	0	0%	4	2	4	4	3.73	0.57	-0.1
Group B	70	22%	51	73%	13	19%	4	6%	2	3%	4	1	4	4	3.61	0.73	0.06
Group C	98	31%	66	67%	26	27%	4	4%	2	2%	4	1	4	4	3.59	0.67	0.06
With ISO9000	105	33%	73	70%	26	25%	4	4%	2	2%	4	1	4	4	3.62	0.66	0.04
Without ISO9000	130	41%	97	75%	23	18%	8	6%	2	2%	4	1	4	4	3.65	0.67	-0
Grp A w ISO9000	3	1%	2	67%	1	33%	0	0%	0	0%	4	3	4	4	3.67	0.58	-0.7
Grp A w/o ISO9000	67	21%	53	79%	10	15%	4	6%	0	0%	4	2	4	4	3.73	0.57	-0.1
Grp B w ISO9000	15	5%	11	73%	4	27%	0	0%	0	0%	4	3	4	4	3.73	0.46	0.44
Grp B w/o ISO9000	55	17%	40	73%	9	16%	4	7%	2	4%	4	1	4	4	3.58	0.79	-0
Grp C w ISO9000	87	28%	60	69%	21	24%	4	5%	2	2%	4	1	4	4	3.60	0.69	0.05
Grp C w/o ISO9000	11	3%	6	55%	5	45%	0	0%	0	0%	4	3	4	4	3.55	0.52	0.28

Part	Part 2 Purpose of the IT																
Topic	.																
Subject	Use of the fax to communicate transmit time related data/information																
Q.2.3.b	Response										Distribution Statistics						
Sample Sector	Nos	% o/a	No '4'	% '4'	No '3'	% '3'	No '2'	% '2'	No '1'	% '1'	H	L	Median	Mode	Mean	SD	Corr
All	235	74%	170	72%	52	22%	7	3%	6	3%	4	1	4	4	3.64	0.67	0.02
Group A	67	21%	51	76%	12	18%	4	6%	0	0%	4	2	4	4	3.70	0.58	-0
Group B	70	22%	53	76%	13	19%	2	3%	2	3%	4	1	4	4	3.67	0.68	0.21
Group C	99	31%	67	68%	27	27%	1	1%	4	4%	4	1	4	4	3.59	0.71	0.05
With ISO9000	105	33%	75	71%	26	25%	1	1%	3	3%	4	1	4	4	3.65	0.65	0.02
Without ISO9000	131	41%	96	73%	26	20%	6	5%	3	2%	4	1	4	4	3.64	0.68	0.12
Grp A w ISO9000	3	1%	2	67%	1	33%	0	0%	0	0%	4	3	4	4	3.67	0.58	-0.2
Grp A w/o ISO9000	67	21%	51	76%	12	18%	4	6%	0	0%	4	2	4	4	3.70	0.58	-0
Grp B w ISO9000	15	5%	11	73%	4	27%	0	0%	0	0%	4	3	4	4	3.73	0.46	0.41
Grp B w/o ISO9000	55	17%	42	76%	9	16%	2	4%	2	4%	4	1	4	4	3.65	0.73	0.18
Grp C w ISO9000	87	28%	62	71%	21	24%	1	1%	3	3%	4	1	4	4	3.63	0.68	0.02
Grp C w/o ISO9000	12	4%	5	42%	6	50%	0	0%	1	8%	4	1	3	3	3.25	0.87	0.32

Results of the 1998 postal survey of Hong Kong Public Works Contractors.

Part	Part 2 Purpose of the IT																
Topic	.																
Subject	Use of the e-mail to communicate transmit time related data/information																
Q.2.3.c	Response										Distribution Statistics						
Sample Sector	Nos	% o/a	No '4'	% '4'	No '3'	% '3'	No '2'	% '2'	No '1'	% '1'	H	L	Median	Mode	Mean	SD	Corr
All	234	74%	15	6%	23	10%	54	23%	142	61%	4	1	1	1	1.62	0.91	0.25
Group A	67	21%	1	1%	3	4%	10	15%	53	79%	4	1	1	1	1.28	0.62	-0.1
Group B	70	22%	2	3%	2	3%	19	27%	47	67%	4	1	1	1	1.41	0.69	0.11
Group C	98	31%	12	12%	18	18%	26	27%	42	43%	4	1	2	1	2.00	1.06	0.23
With ISO9000	104	33%	10	10%	17	16%	31	30%	46	44%	4	1	2	1	1.91	1.00	0.24
Without ISO9000	131	41%	5	4%	6	5%	24	18%	96	73%	4	1	1	1	1.39	0.75	0.27
Grp A w ISO9000	3	1%	0	0%	0	0%	0	0%	3	100%	1	1	1	1	1.00	0.00	nil
Grp A w/o ISO9000	67	21%	1	1%	3	4%	10	15%	53	79%	4	1	1	1	1.28	0.62	-0.1
Grp B w ISO9000	15	5%	0	0%	1	7%	7	47%	7	47%	3	1	2	1	1.60	0.63	0.1
Grp B w/o ISO9000	55	17%	2	4%	1	2%	12	22%	40	73%	4	1	1	1	1.36	0.70	0.07
Grp C w ISO9000	86	27%	10	12%	16	19%	24	28%	36	42%	4	1	2	1	2.00	1.04	0.23
Grp C w/o ISO9000	12	4%	2	17%	2	17%	2	17%	6	50%	4	1	1.5	1	2.00	1.21	0.55

Part	Part 2 Purpose of the IT																
Topic	.																
Subject	Use of hardcopy/ letter/reportt/form to communicate transmit time related data/information																
Q.2.3.d	Response										Distribution Statistics						
Sample Sector	Nos	% o/a	No '4'	% '4'	No '3'	% '3'	No '2'	% '2'	No '1'	% '1'	H	L	Median	Mode	Mean	SD	Corr
All	234	74%	139	59%	64	27%	19	8%	12	5%	4	1	4	4	3.41	0.85	0.05
Group A	67	21%	38	57%	16	24%	6	9%	7	10%	4	1	4	4	3.27	1.01	-0
Group B	70	22%	40	57%	23	33%	4	6%	3	4%	4	1	4	4	3.43	0.79	0.05
Group C	98	31%	61	62%	26	27%	9	9%	2	2%	4	1	4	4	3.49	0.75	0.05
With ISO9000	105	33%	65	62%	31	30%	6	6%	3	3%	4	1	4	4	3.50	0.74	0.04
Without ISO9000	130	41%	74	57%	34	26%	13	10%	9	7%	4	1	4	4	3.33	0.92	0.04
Grp A w ISO9000	3	1%	0	0%	3	100%	0	0%	0	0%	3	3	3	3	3.00	0.00	nil
Grp A w/o ISO9000	67	21%	38	57%	16	24%	6	9%	7	10%	4	1	4	4	3.27	1.01	-0
Grp B w ISO9000	15	5%	8	53%	6	40%	0	0%	1	7%	4	1	4	4	3.40	0.83	-0.2
Grp B w/o ISO9000	55	17%	32	58%	17	31%	4	7%	2	4%	4	1	4	4	3.44	0.79	0.13
Grp C w ISO9000	87	28%	57	66%	22	25%	6	7%	2	2%	4	1	4	4	3.54	0.73	0.03
Grp C w/o ISO9000	11	3%	4	36%	4	36%	3	27%	0	0%	4	2	3	3	3.09	0.83	-0

Results of the 1998 postal survey of Hong Kong Public Works Contractors.

Part	Part 2 Purpose of the IT																
Topic	.																
Subject	Transmission of 'work schedule of activities' ('time-content data) using IT																
Q.2.4.a	Response										Distribution Statistics						
Sample Sector	Nos	% o/a	No '4'	% '4'	No '3'	% '3'	No '2'	% '2'	No '1'	% '1'	H	L	Median	Mode	Mean	SD	Corr
All	231	73%	90	39%	89	39%	35	15%	17	7%	4	1	3	4	3.09	0.91	0.01
Group A	66	21%	26	39%	22	33%	11	17%	7	11%	4	1	3	4	3.02	1.00	-0.1
Group B	69	22%	26	38%	29	42%	11	16%	3	4%	4	1	3	3	3.13	0.84	0.2
Group C	97	31%	39	40%	38	39%	13	13%	7	7%	4	1	3	4	3.12	0.90	0
With ISO9000	104	33%	43	41%	41	39%	14	13%	6	6%	4	1	3	4	3.16	0.87	0
Without ISO9000	128	41%	48	38%	48	38%	21	16%	11	9%	4	1	3	4	3.04	0.94	-0
Grp A w ISO9000	3	1%	1	33%	1	33%	1	33%	0	0%	4	2	3	nil	3.00	1.00	-1
Grp A w/o ISO9000	66	21%	26	39%	22	33%	11	17%	7	11%	4	1	3	4	3.02	1.00	-0.1
Grp B w ISO9000	15	5%	7	47%	6	40%	2	13%	0	0%	4	2	3	4	3.33	0.72	0.18
Grp B w/o ISO9000	54	17%	19	35%	23	43%	9	17%	3	6%	4	1	3	3	3.07	0.87	0.17
Grp C w ISO9000	86	27%	35	41%	34	40%	11	13%	6	7%	4	1	3	4	3.14	0.90	0.01
Grp C w/o ISO9000	11	3%	4	36%	4	36%	2	18%	1	9%	4	1	3	4	3.00	1.00	-0.4

Part	Part 2 Purpose of the IT																
Topic	.																
Subject	Transmission of '% work done' ('time-content data) using IT																
Q.2.4.b	Response										Distribution Statistics						
Sample Sector	Nos	% o/a	No '4'	% '4'	No '3'	% '3'	No '2'	% '2'	No '1'	% '1'	H	L	Median	Mode	Mean	SD	Corr
All	233	74%	82	35%	91	39%	43	18%	17	7%	4	1	3	3	3.02	0.91	0.07
Group A	66	21%	25	38%	20	30%	14	21%	7	11%	4	1	3	4	2.95	1.01	-0.1
Group B	70	22%	23	33%	32	46%	12	17%	3	4%	4	1	3	3	3.07	0.82	0.15
Group C	98	31%	35	36%	39	40%	17	17%	7	7%	4	1	3	3	3.04	0.91	0.1
With ISO9000	104	33%	39	38%	42	40%	17	16%	6	6%	4	1	3	3	3.10	0.88	0.1
Without ISO9000	130	41%	44	34%	49	38%	26	20%	11	8%	4	1	3	3	2.97	0.94	-0
Grp A w ISO9000	3	1%	1	33%	1	33%	1	33%	0	0%	4	2	3	nil	3.00	1.00	-1
Grp A w/o ISO9000	66	21%	25	38%	20	30%	14	21%	7	11%	4	1	3	4	2.95	1.01	-0.1
Grp B w ISO9000	15	5%	6	40%	8	53%	1	7%	0	0%	4	2	3	3	3.33	0.62	0
Grp B w/o ISO9000	55	17%	17	31%	24	44%	11	20%	3	5%	4	1	3	3	3.00	0.86	0.15
Grp C w ISO9000	86	27%	32	37%	33	38%	15	17%	6	7%	4	1	3	3	3.06	0.91	0.11
Grp C w/o ISO9000	12	4%	3	25%	6	50%	2	17%	1	8%	4	1	3	3	2.92	0.90	-0.3

Results of the 1998 postal survey of Hong Kong Public Works Contractors.

Part	Part 2 Purpose of the IT																
Topic	.																
Subject	Transmission of '% work to be done' ('time-content data) using IT																
Q.2.4.c	Response										Distribution Statistics						
Sample Sector	Nos	% o/a	No '4'	% '4'	No '3'	% '3'	No '2'	% '2'	No '1'	% '1'	H	L	Median	Mode	Mean	SD	Corr
All	232	73%	79	34%	85	37%	50	22%	18	8%	4	1	3	3	2.97	0.93	0.08
Group A	66	21%	25	38%	17	26%	16	24%	8	12%	4	1	3	4	2.89	1.05	-0.2
Group B	70	22%	22	31%	31	44%	14	20%	3	4%	4	1	3	3	3.03	0.83	0.17
Group C	97	31%	33	34%	37	38%	20	21%	7	7%	4	1	3	3	2.99	0.92	0.11
With ISO9000	104	33%	38	37%	40	38%	20	19%	6	6%	4	1	3	3	3.06	0.89	0.1
Without ISO9000	129	41%	42	33%	45	35%	30	23%	12	9%	4	1	3	3	2.91	0.96	-0
Grp A w ISO9000	3	1%	1	33%	0	0%	2	67%	0	0%	4	2	2	2	2.67	1.15	-1
Grp A w/o ISO9000	66	21%	25	38%	17	26%	16	24%	8	12%	4	1	3	4	2.89	1.05	-0.2
Grp B w ISO9000	15	5%	6	40%	8	53%	1	7%	0	0%	4	2	3	3	3.33	0.62	0
Grp B w/o ISO9000	55	17%	16	29%	23	42%	13	24%	3	5%	4	1	3	3	2.95	0.87	0.16
Grp C w ISO9000	86	27%	31	36%	32	37%	17	20%	6	7%	4	1	3	3	3.02	0.92	0.11
Grp C w/o ISO9000	11	3%	2	18%	5	45%	3	27%	1	9%	4	1	3	3	2.73	0.90	-0.3

Part	Part 2 Purpose of the IT																
Topic	.																
Subject	Transmission of lists of 'replanned work ' ('time-content data) using IT																
Q.2.4.d	Response										Distribution Statistics						
Sample Sector	Nos	% o/a	No '4'	% '4'	No '3'	% '3'	No '2'	% '2'	No '1'	% '1'	H	L	Median	Mode	Mean	SD	Corr
All	232	73%	75	32%	88	38%	47	20%	22	9%	4	1	3	3	2.93	0.95	0.01
Group A	66	21%	25	38%	17	26%	14	21%	10	15%	4	1	3	4	2.86	1.09	-0.1
Group B	70	22%	19	27%	34	49%	13	19%	4	6%	4	1	3	3	2.97	0.83	0.12
Group C	97	31%	32	33%	37	38%	20	21%	8	8%	4	1	3	3	2.96	0.93	-0
With ISO9000	104	33%	36	35%	39	38%	22	21%	7	7%	4	1	3	3	3.00	0.91	-0
Without ISO9000	129	41%	40	31%	49	38%	25	19%	15	12%	4	1	3	3	2.88	0.98	-0
Grp A w ISO9000	3	1%	1	33%	0	0%	2	67%	0	0%	4	2	2	2	2.67	1.15	-1
Grp A w/o ISO9000	66	21%	25	38%	17	26%	14	21%	10	15%	4	1	3	4	2.86	1.09	-0.1
Grp B w ISO9000	15	5%	6	40%	7	47%	2	13%	0	0%	4	2	3	3	3.27	0.70	-0.2
Grp B w/o ISO9000	55	17%	13	24%	27	49%	11	20%	4	7%	4	1	3	3	2.89	0.85	0.15
Grp C w ISO9000	86	27%	29	34%	32	37%	18	21%	7	8%	4	1	3	3	2.97	0.94	0
Grp C w/o ISO9000	11	3%	3	27%	5	45%	2	18%	1	9%	4	1	3	3	2.91	0.94	-0.4

Results of the 1998 postal survey of Hong Kong Public Works Contractors.

Part	Part 2 Purpose of the IT																
Topic	.																
Subject	Use of the telephone to communicate transmit cost related data/information																
Q.2.5.a	Response										Distribution Statistics						
Sample Sector	Nos	% o/a	No '4'	% '4'	No '3'	% '3'	No '2'	% '2'	No '1'	% '1'	H	L	Median	Mode	Mean	SD	Corr
All	234	74%	141	60%	54	23%	31	13%	8	3%	4	1	4	4	3.40	0.84	-0
Group A	67	21%	43	64%	12	18%	10	15%	2	3%	4	1	4	4	3.43	0.86	-0.4
Group B	70	22%	42	60%	19	27%	6	9%	3	4%	4	1	4	4	3.43	0.83	0.22
Group C	98	31%	57	58%	23	23%	15	15%	3	3%	4	1	4	4	3.37	0.85	-0
With ISO9000	105	33%	66	63%	22	21%	14	13%	3	3%	4	1	4	4	3.44	0.83	-0
Without ISO9000	130	41%	76	58%	32	25%	17	13%	5	4%	4	1	4	4	3.38	0.86	-0.1
Grp A w ISO9000	3	1%	1	33%	1	33%	1	33%	0	0%	4	2	3	nil	3.00	1.00	-1
Grp A w/o ISO9000	67	21%	43	64%	12	18%	10	15%	2	3%	4	1	4	4	3.43	0.86	-0.4
Grp B w ISO9000	15	5%	11	73%	4	27%	0	0%	0	0%	4	3	4	4	3.73	0.46	0.3
Grp B w/o ISO9000	55	17%	31	56%	15	27%	6	11%	3	5%	4	1	4	4	3.35	0.89	0.18
Grp C w ISO9000	87	28%	54	62%	17	20%	13	15%	3	3%	4	1	4	4	3.40	0.87	-0
Grp C w/o ISO9000	11	3%	3	27%	6	55%	2	18%	0	0%	4	2	3	3	3.09	0.70	-0.4

Part	Part 2 Purpose of the IT																
Topic	.																
Subject	Use of the fax to communicate transmit cost related data/information																
Q.2.5.b	Response										Distribution Statistics						
Sample Sector	Nos	% o/a	No '4'	% '4'	No '3'	% '3'	No '2'	% '2'	No '1'	% '1'	H	L	Median	Mode	Mean	SD	Corr
All	234	74%	162	69%	54	23%	14	6%	4	2%	4	1	4	4	3.60	0.68	-0.1
Group A	67	21%	48	72%	13	19%	5	7%	1	1%	4	1	4	4	3.61	0.70	-0.1
Group B	70	22%	50	71%	16	23%	3	4%	1	1%	4	1	4	4	3.64	0.64	0.21
Group C	98	31%	65	66%	25	26%	6	6%	2	2%	4	1	4	4	3.56	0.70	-0.1
With ISO9000	105	33%	71	68%	27	26%	5	5%	2	2%	4	1	4	4	3.59	0.68	-0.1
Without ISO9000	130	41%	92	71%	27	21%	9	7%	2	2%	4	1	4	4	3.61	0.69	-0.1
Grp A w ISO9000	3	1%	2	67%	1	33%	0	0%	0	0%	4	3	4	4	3.67	0.58	-0.2
Grp A w/o ISO9000	67	21%	48	72%	13	19%	5	7%	1	1%	4	1	4	4	3.61	0.70	-0.1
Grp B w ISO9000	15	5%	9	60%	6	40%	0	0%	0	0%	4	3	4	4	3.60	0.51	0.52
Grp B w/o ISO9000	55	17%	41	75%	10	18%	3	5%	1	2%	4	1	4	4	3.65	0.67	0.16
Grp C w ISO9000	87	28%	60	69%	20	23%	5	6%	2	2%	4	1	4	4	3.59	0.71	-0.1
Grp C w/o ISO9000	11	3%	5	45%	5	45%	1	9%	0	0%	4	2	3	4	3.36	0.67	-0.6

Results of the 1998 postal survey of Hong Kong Public Works Contractors.

Part	Part 2 Purpose of the IT																
Topic	.																
Subject	Use of the e-mail to communicate transmit cost related data/information																
Q.2.5.c	Response										Distribution Statistics						
Sample Sector	Nos	% o/a	No '4'	% '4'	No '3'	% '3'	No '2'	% '2'	No '1'	% '1'	H	L	Median	Mode	Mean	SD	Corr
All	232	73%	13	6%	25	11%	46	20%	148	64%	4	1	1	1	1.58	0.89	0.29
Group A	67	21%	2	3%	5	7%	8	12%	52	78%	4	1	1	1	1.36	0.75	-0.1
Group B	69	22%	2	3%	2	3%	18	26%	47	68%	4	1	1	1	1.41	0.69	0.19
Group C	97	31%	9	9%	18	19%	21	22%	49	51%	4	1	1	1	1.87	1.03	0.31
With ISO9000	104	33%	10	10%	18	17%	25	24%	51	49%	4	1	2	1	1.88	1.02	0.29
Without ISO9000	129	41%	3	2%	7	5%	22	17%	97	75%	4	1	1	1	1.35	0.69	0.19
Grp A w ISO9000	3	1%	0	0%	0	0%	0	0%	3	100%	1	1	1	1	1.00	0.00	nil
Grp A w/o ISO9000	67	21%	2	3%	5	7%	8	12%	52	78%	4	1	1	1	1.36	0.75	-0.1
Grp B w ISO9000	15	5%	1	7%	1	7%	6	40%	7	47%	4	1	2	1	1.73	0.88	0.16
Grp B w/o ISO9000	54	17%	1	2%	1	2%	12	22%	40	74%	4	1	1	1	1.31	0.61	0.13
Grp C w ISO9000	86	27%	9	10%	17	20%	19	22%	41	48%	4	1	2	1	1.93	1.05	0.3
Grp C w/o ISO9000	11	3%	0	0%	1	9%	2	18%	8	73%	3	1	1	1	1.36	0.67	0.77

Part	Part 2 Purpose of the IT																
Topic	.																
Subject	Use of hardcopy/ letter/reportt/form to communicate transmit cost related data/information																
Q.2.5.d	Response										Distribution Statistics						
Sample Sector	Nos	% o/a	No '4'	% '4'	No '3'	% '3'	No '2'	% '2'	No '1'	% '1'	H	L	Median	Mode	Mean	SD	Corr
All	234	74%	142	61%	66	28%	17	7%	9	4%	4	1	4	4	3.46	0.79	-0
Group A	67	21%	39	58%	16	24%	6	9%	6	9%	4	1	4	4	3.31	0.97	-0.1
Group B	69	22%	40	58%	24	35%	4	6%	1	1%	4	1	4	4	3.49	0.68	0.21
Group C	99	31%	64	65%	26	26%	7	7%	2	2%	4	1	4	4	3.54	0.72	-0.1
With ISO9000	105	33%	69	66%	28	27%	6	6%	2	2%	4	1	4	4	3.56	0.69	-0.1
Without ISO9000	130	41%	74	57%	38	29%	11	8%	7	5%	4	1	4	4	3.38	0.86	0.11
Grp A w ISO9000	3	1%	2	67%	0	0%	0	0%	1	33%	4	1	4	4	3.00	1.73	-0.2
Grp A w/o ISO9000	67	21%	39	58%	16	24%	6	9%	6	9%	4	1	4	4	3.31	0.97	-0.1
Grp B w ISO9000	15	5%	8	53%	7	47%	0	0%	0	0%	4	3	4	4	3.53	0.52	0.25
Grp B w/o ISO9000	54	17%	32	59%	17	31%	4	7%	1	2%	4	1	4	4	3.48	0.72	0.2
Grp C w ISO9000	87	28%	59	68%	21	24%	6	7%	1	1%	4	1	4	4	3.59	0.67	-0.1
Grp C w/o ISO9000	12	4%	5	42%	5	42%	1	8%	1	8%	4	1	3	3	3.17	0.94	0.2

Results of the 1998 postal survey of Hong Kong Public Works Contractors.

Part	Part 2 Purpose of the IT																
Topic	.																
Subject	Transmission of 'value of work done' ('cost content data) using IT																
Q.2.6.a	Response										Distribution Statistics						
Sample Sector	Nos	% o/a	No '4'	% '4'	No '3'	% '3'	No '2'	% '2'	No '1'	% '1'	H	L	Median	Mode	Mean	SD	Corr
All	234	74%	112	48%	69	29%	39	17%	14	6%	4	1	3	4	3.19	0.92	0.05
Group A	67	21%	30	45%	18	27%	13	19%	6	9%	4	1	3	4	3.07	1.00	-0.2
Group B	69	22%	27	39%	25	36%	14	20%	3	4%	4	1	3	4	3.10	0.88	0.13
Group C	99	31%	56	57%	26	26%	12	12%	5	5%	4	1	4	4	3.34	0.88	0.02
With ISO9000	105	33%	56	53%	31	30%	15	14%	3	3%	4	1	4	4	3.33	0.83	0.03
Without ISO9000	130	41%	57	44%	38	29%	24	18%	11	8%	4	1	3	4	3.08	0.98	-0
Grp A w ISO9000	3	1%	0	0%	1	33%	2	67%	0	0%	3	2	2	2	2.33	0.58	-1
Grp A w/o ISO9000	67	21%	30	45%	18	27%	13	19%	6	9%	4	1	3	4	3.07	1.00	-0.2
Grp B w ISO9000	15	5%	5	33%	7	47%	3	20%	0	0%	4	2	3	3	3.13	0.74	0.12
Grp B w/o ISO9000	54	17%	22	41%	18	33%	11	20%	3	6%	4	1	3	4	3.09	0.92	0.14
Grp C w ISO9000	87	28%	51	59%	23	26%	10	11%	3	3%	4	1	4	4	3.40	0.83	0.01
Grp C w/o ISO9000	12	4%	5	42%	3	25%	2	17%	2	17%	4	1	3	4	2.92	1.16	-0.2

Part	Part 2 Purpose of the IT																
Topic	.																
Subject	Transmission of 'value of work to be done' ('cost content data) using IT																
Q.2.6.b	Response										Distribution Statistics						
Sample Sector	Nos	% o/a	No '4'	% '4'	No '3'	% '3'	No '2'	% '2'	No '1'	% '1'	H	L	Median	Mode	Mean	SD	Corr
All	234	74%	96	41%	68	29%	52	22%	18	8%	4	1	3	4	3.03	0.97	0.05
Group A	67	21%	29	43%	17	25%	13	19%	8	12%	4	1	3	4	3.00	1.06	-0.1
Group B	69	22%	23	33%	25	36%	17	25%	4	6%	4	1	3	3	2.97	0.91	0.17
Group C	99	31%	45	45%	26	26%	22	22%	6	6%	4	1	3	4	3.11	0.96	0.05
With ISO9000	105	33%	44	42%	34	32%	23	22%	4	4%	4	1	3	4	3.12	0.88	0.05
Without ISO9000	130	41%	53	41%	34	26%	29	22%	14	11%	4	1	3	4	2.97	1.03	-0
Grp A w ISO9000	3	1%	0	0%	2	67%	1	33%	0	0%	3	2	3	3	2.67	0.58	-0.7
Grp A w/o ISO9000	67	21%	29	43%	17	25%	13	19%	8	12%	4	1	3	4	3.00	1.06	-0.1
Grp B w ISO9000	15	5%	4	27%	7	47%	4	27%	0	0%	4	2	3	3	3.00	0.76	0.02
Grp B w/o ISO9000	54	17%	19	35%	18	33%	13	24%	4	7%	4	1	3	4	2.96	0.95	0.2
Grp C w ISO9000	87	28%	40	46%	25	29%	18	21%	4	5%	4	1	3	4	3.16	0.91	0.05
Grp C w/o ISO9000	12	4%	5	42%	1	8%	4	33%	2	17%	4	1	2.5	4	2.75	1.22	-0.2

Results of the 1998 postal survey of Hong Kong Public Works Contractors.

Part	Part 2 Purpose of the IT																
Topic	.																
Subject	Transmission of 'value of materials delivered' ('cost-content data) using IT																
Q.2.6.c	Response										Distribution Statistics						
Sample Sector	Nos	% o/a	No '4'	% '4'	No '3'	% '3'	No '2'	% '2'	No '1'	% '1'	H	L	Median	Mode	Mean	SD	Corr
All	233	74%	98	42%	72	31%	43	18%	20	9%	4	1	3	4	3.06	0.97	-0.1
Group A	66	21%	33	50%	18	27%	9	14%	6	9%	4	1	3.5	4	3.18	0.99	-0.2
Group B	69	22%	27	39%	23	33%	13	19%	6	9%	4	1	3	4	3.03	0.97	0.15
Group C	99	31%	39	39%	31	31%	21	21%	8	8%	4	1	3	4	3.02	0.97	-0.1
With ISO9000	105	33%	43	41%	33	31%	22	21%	7	7%	4	1	3	4	3.07	0.94	-0.1
Without ISO9000	129	41%	56	43%	39	30%	21	16%	13	10%	4	1	3	4	3.07	1.00	-0.1
Grp A w ISO9000	3	1%	1	33%	1	33%	1	33%	0	0%	4	2	3	nil	3.00	1.00	-1
Grp A w/o ISO9000	66	21%	33	50%	18	27%	9	14%	6	9%	4	1	3.5	4	3.18	0.99	-0.2
Grp B w ISO9000	15	5%	6	40%	5	33%	3	20%	1	7%	4	1	3	4	3.07	0.96	0.31
Grp B w/o ISO9000	54	17%	21	39%	18	33%	10	19%	5	9%	4	1	3	4	3.02	0.98	0.1
Grp C w ISO9000	87	28%	36	41%	27	31%	18	21%	6	7%	4	1	3	4	3.07	0.95	-0.1
Grp C w/o ISO9000	12	4%	3	25%	4	33%	3	25%	2	17%	4	1	3	3	2.67	1.07	-0.2

Part	Part 2 Purpose of the IT																
Topic	.																
Subject	Transmission of 'value of materials ordered ' ('cost-content data) using IT																
Q.2.6.d	Response										Distribution Statistics						
Sample Sector	Nos	% o/a	No '4'	% '4'	No '3'	% '3'	No '2'	% '2'	No '1'	% '1'	H	L	Median	Mode	Mean	SD	Corr
All	234	74%	92	39%	76	32%	44	19%	22	9%	4	1	3	4	3.02	0.98	-0.1
Group A	67	21%	32	48%	20	30%	8	12%	7	10%	4	1	3	4	3.15	1.00	-0.1
Group B	69	22%	25	36%	25	36%	12	17%	7	10%	4	1	3	4	2.99	0.98	0.17
Group C	99	31%	36	36%	31	31%	24	24%	8	8%	4	1	3	4	2.96	0.97	-0.1
With ISO9000	105	33%	41	39%	33	31%	24	23%	7	7%	4	1	3	4	3.03	0.95	-0.1
Without ISO9000	130	41%	52	40%	43	33%	20	15%	15	12%	4	1	3	4	3.02	1.01	0.03
Grp A w ISO9000	3	1%	2	67%	0	0%	1	33%	0	0%	4	2	4	4	3.33	1.15	-0.7
Grp A w/o ISO9000	67	21%	32	48%	20	30%	8	12%	7	10%	4	1	3	4	3.15	1.00	-0.1
Grp B w ISO9000	15	5%	6	40%	6	40%	2	13%	1	7%	4	1	3	4	3.13	0.92	0.26
Grp B w/o ISO9000	54	17%	19	35%	19	35%	10	19%	6	11%	4	1	3	4	2.94	1.00	0.13
Grp C w ISO9000	87	28%	33	38%	27	31%	21	24%	6	7%	4	1	3	4	3.00	0.95	-0.1
Grp C w/o ISO9000	12	4%	3	25%	4	33%	3	25%	2	17%	4	1	3	3	2.67	1.07	0.1

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Part	Part 2 Purpose of the IT																
Topic	.																
Subject	Transmission of 'value of variations' ('cost content data) using IT																
Q.2.6.e	Response										Distribution Statistics						
Sample Sector	Nos	% o/a	No '4'	% '4'	No '3'	% '3'	No '2'	% '2'	No '1'	% '1'	H	L	Median	Mode	Mean	SD	Corr
All	233	74%	94	40%	73	31%	43	18%	23	10%	4	1	3	4	3.02	0.99	-0.1
Group A	67	21%	31	46%	17	25%	13	19%	6	9%	4	1	3	4	3.09	1.01	-0.2
Group B	69	22%	20	29%	29	42%	12	17%	8	12%	4	1	3	3	2.88	0.96	0.12
Group C	98	31%	44	45%	27	28%	18	18%	9	9%	4	1	3	4	3.08	1.00	-0.1
With ISO9000	104	33%	44	42%	34	33%	18	17%	8	8%	4	1	3	4	3.10	0.95	-0.1
Without ISO9000	130	41%	51	39%	39	30%	25	19%	15	12%	4	1	3	4	2.97	1.03	-0
Grp A w ISO9000	3	1%	0	0%	2	67%	1	33%	0	0%	3	2	3	3	2.67	0.58	-0.7
Grp A w/o ISO9000	67	21%	31	46%	17	25%	13	19%	6	9%	4	1	3	4	3.09	1.01	-0.2
Grp B w ISO9000	15	5%	4	27%	8	53%	2	13%	1	7%	4	1	3	3	3.00	0.85	0.08
Grp B w/o ISO9000	54	17%	16	30%	21	39%	10	19%	7	13%	4	1	3	3	2.85	1.00	0.12
Grp C w ISO9000	86	27%	40	47%	24	28%	15	17%	7	8%	4	1	3	4	3.13	0.98	-0.1
Grp C w/o ISO9000	12	4%	4	33%	3	25%	3	25%	2	17%	4	1	3	4	2.75	1.14	-0.2

Part	Part 2 Purpose of the IT																
Topic	.																
Subject	Transmission of 'value of disputes' ('cost content data) using IT																
Q.2.6.f	Response										Distribution Statistics						
Sample Sector	Nos	% o/a	No '4'	% '4'	No '3'	% '3'	No '2'	% '2'	No '1'	% '1'	H	L	Median	Mode	Mean	SD	Corr
All	233	74%	76	33%	78	33%	52	22%	27	12%	4	1	3	3	2.87	1.00	-0
Group A	67	21%	25	37%	19	28%	15	22%	8	12%	4	1	3	4	2.91	1.04	-0.1
Group B	68	22%	15	22%	29	43%	14	21%	10	15%	4	1	3	3	2.72	0.97	0.09
Group C	99	31%	37	37%	30	30%	23	23%	9	9%	4	1	3	4	2.96	0.99	-0.1
With ISO9000	105	33%	36	34%	36	34%	23	22%	10	10%	4	1	3	4	2.93	0.97	-0.1
Without ISO9000	129	41%	41	32%	42	33%	29	22%	17	13%	4	1	3	3	2.83	1.02	-0
Grp A w ISO9000	3	1%	0	0%	2	67%	1	33%	0	0%	3	2	3	3	2.67	0.58	-0.7
Grp A w/o ISO9000	67	21%	25	37%	19	28%	15	22%	8	12%	4	1	3	4	2.91	1.04	-0.1
Grp B w ISO9000	15	5%	3	20%	7	47%	3	20%	2	13%	4	1	3	3	2.73	0.96	-0.2
Grp B w/o ISO9000	53	17%	12	23%	22	42%	11	21%	8	15%	4	1	3	3	2.72	0.99	0.18
Grp C w ISO9000	87	28%	33	38%	27	31%	19	22%	8	9%	4	1	3	4	2.98	0.99	-0.1
Grp C w/o ISO9000	12	4%	4	33%	3	25%	4	33%	1	8%	4	1	3	4	2.83	1.03	-0.3

Results of the 1998 postal survey of Hong Kong Public Works Contractors.

Part	Part 2 Purpose of the IT																
Topic	.																
Subject	Transmission of 'money received' ('cost-content data) using IT																
Q.2.6.g	Response										Distribution Statistics						
Sample Sector	Nos	% o/a	No '4'	% '4'	No '3'	% '3'	No '2'	% '2'	No '1'	% '1'	H	L	Median	Mode	Mean	SD	Corr
All	233	74%	102	44%	55	24%	44	19%	32	14%	4	1	3	4	2.97	1.09	-0
Group A	67	21%	35	52%	9	13%	14	21%	9	13%	4	1	4	4	3.04	1.13	-0.1
Group B	68	22%	19	28%	25	37%	12	18%	12	18%	4	1	3	3	2.75	1.06	0.01
Group C	99	31%	49	49%	21	21%	18	18%	11	11%	4	1	3	4	3.09	1.06	-0.1
With ISO9000	105	33%	50	48%	25	24%	18	17%	12	11%	4	1	3	4	3.08	1.05	-0.1
Without ISO9000	129	41%	53	41%	30	23%	26	20%	20	16%	4	1	3	4	2.90	1.11	-0
Grp A w ISO9000	3	1%	1	33%	1	33%	1	33%	0	0%	4	2	3	nil	3.00	1.00	-0.3
Grp A w/o ISO9000	67	21%	35	52%	9	13%	14	21%	9	13%	4	1	4	4	3.04	1.13	-0.1
Grp B w ISO9000	15	5%	3	20%	6	40%	4	27%	2	13%	4	1	3	3	2.67	0.98	-0.4
Grp B w/o ISO9000	53	17%	16	30%	19	36%	8	15%	10	19%	4	1	3	3	2.77	1.09	0.13
Grp C w ISO9000	87	28%	46	53%	18	21%	13	15%	10	11%	4	1	4	4	3.15	1.06	-0.1
Grp C w/o ISO9000	12	4%	3	25%	3	25%	5	42%	1	8%	4	1	2.5	2	2.67	0.98	-0.2

Part	Part 2 Purpose of the IT																
Topic	.																
Subject	Transmission of 'money owed' ('cost-content data) using IT																
Q.2.6.h	Response										Distribution Statistics						
Sample Sector	Nos	% o/a	No '4'	% '4'	No '3'	% '3'	No '2'	% '2'	No '1'	% '1'	H	L	Median	Mode	Mean	SD	Corr
All	234	74%	90	38%	58	25%	50	21%	36	15%	4	1	3	4	2.86	1.10	-0
Group A	67	21%	31	46%	11	16%	15	22%	10	15%	4	1	3	4	2.94	1.14	-0
Group B	69	22%	16	23%	26	38%	14	20%	13	19%	4	1	3	3	2.65	1.04	0.07
Group C	99	31%	44	44%	21	21%	21	21%	13	13%	4	1	3	4	2.97	1.09	-0.1
With ISO9000	105	33%	45	43%	25	24%	21	20%	14	13%	4	1	3	4	2.96	1.08	-0.1
Without ISO9000	130	41%	46	35%	33	25%	29	22%	22	17%	4	1	3	4	2.79	1.10	0
Grp A w ISO9000	3	1%	1	33%	1	33%	1	33%	0	0%	4	2	3	nil	3.00	1.00	-0.3
Grp A w/o ISO9000	67	21%	31	46%	11	16%	15	22%	10	15%	4	1	3	4	2.94	1.14	-0
Grp B w ISO9000	15	5%	3	20%	5	33%	4	27%	3	20%	4	1	3	3	2.53	1.06	-0.2
Grp B w/o ISO9000	54	17%	13	24%	21	39%	10	19%	10	19%	4	1	3	3	2.69	1.04	0.18
Grp C w ISO9000	87	28%	41	47%	19	22%	16	18%	11	13%	4	1	3	4	3.03	1.08	-0.1
Grp C w/o ISO9000	12	4%	3	25%	2	17%	5	42%	2	17%	4	1	2	2	2.50	1.09	-0.1

Results of the 1998 postal survey of Hong Kong Public Works Contractors.

Part	Part 2 Purpose of the IT																
Topic	.																
Subject	Use of the telephone to communicate transmit resource related data/information																
Q.2.7.a	Response										Distribution Statistics						
Sample Sector	Nos	% o/a	No '4'	% '4'	No '3'	% '3'	No '2'	% '2'	No '1'	% '1'	H	L	Median	Mode	Mean	SD	Corr
All	234	74%	164	70%	49	21%	15	6%	6	3%	4	1	4	4	3.59	0.73	0.03
Group A	67	21%	50	75%	9	13%	5	7%	3	4%	4	1	4	4	3.58	0.82	-0.3
Group B	69	22%	52	75%	15	22%	1	1%	1	1%	4	1	4	4	3.71	0.57	0.05
Group C	99	31%	63	64%	25	25%	9	9%	2	2%	4	1	4	4	3.51	0.75	0.07
With ISO9000	105	33%	71	68%	22	21%	10	10%	2	2%	4	1	4	4	3.54	0.75	0.05
Without ISO9000	130	41%	94	72%	27	21%	5	4%	4	3%	4	1	4	4	3.62	0.71	0.04
Grp A w ISO9000	3	1%	2	67%	0	0%	1	33%	0	0%	4	2	4	4	3.33	1.15	-0.7
Grp A w/o ISO9000	67	21%	50	75%	9	13%	5	7%	3	4%	4	1	4	4	3.58	0.82	-0.3
Grp B w ISO9000	15	5%	11	73%	4	27%	0	0%	0	0%	4	3	4	4	3.73	0.46	0.22
Grp B w/o ISO9000	54	17%	41	76%	11	20%	1	2%	1	2%	4	1	4	4	3.70	0.60	0
Grp C w ISO9000	87	28%	58	67%	18	21%	9	10%	2	2%	4	1	4	4	3.52	0.78	0.06
Grp C w/o ISO9000	12	4%	5	42%	7	58%	0	0%	0	0%	4	3	3	3	3.42	0.51	0.41

Part	Part 2 Purpose of the IT																
Topic	.																
Subject	Use of the fax to communicate transmit resource related data/information																
Q.2.7.b	Response										Distribution Statistics						
Sample Sector	Nos	% o/a	No '4'	% '4'	No '3'	% '3'	No '2'	% '2'	No '1'	% '1'	H	L	Median	Mode	Mean	SD	Corr
All	233	74%	154	66%	61	26%	13	6%	5	2%	4	1	4	4	3.56	0.70	0.04
Group A	67	21%	45	67%	11	16%	8	12%	3	4%	4	1	4	4	3.46	0.88	-0.2
Group B	69	22%	46	67%	22	32%	1	1%	0	0%	4	2	4	4	3.65	0.51	0.15
Group C	98	31%	64	65%	28	29%	4	4%	2	2%	4	1	4	4	3.57	0.67	0.04
With ISO9000	104	33%	71	68%	27	26%	4	4%	2	2%	4	1	4	4	3.61	0.66	0.04
Without ISO9000	130	41%	84	65%	34	26%	9	7%	3	2%	4	1	4	4	3.53	0.73	0.01
Grp A w ISO9000	3	1%	2	67%	1	33%	0	0%	0	0%	4	3	4	4	3.67	0.58	-0.2
Grp A w/o ISO9000	67	21%	45	67%	11	16%	8	12%	3	4%	4	1	4	4	3.46	0.88	-0.2
Grp B w ISO9000	15	5%	9	60%	5	33%	1	7%	0	0%	4	2	4	4	3.53	0.64	0.27
Grp B w/o ISO9000	54	17%	37	69%	17	31%	0	0%	0	0%	4	3	4	4	3.69	0.47	0.16
Grp C w ISO9000	86	27%	60	70%	21	24%	3	3%	2	2%	4	1	4	4	3.62	0.67	0.03
Grp C w/o ISO9000	12	4%	4	33%	7	58%	1	8%	0	0%	4	2	3	3	3.25	0.62	-0.1

Results of the 1998 postal survey of Hong Kong Public Works Contractors.

Part	Part 2 Purpose of the IT																
Topic	.																
Subject	Use of the e-mail to communicate transmit resource related data/information																
Q.2.7.c	Response										Distribution Statistics						
Sample Sector	Nos	% o/a	No '4'	% '4'	No '3'	% '3'	No '2'	% '2'	No '1'	% '1'	H	L	Median	Mode	Mean	SD	Corr
All	232	73%	10	4%	24	10%	47	20%	151	65%	4	1	1	1	1.54	0.85	0.31
Group A	67	21%	2	3%	3	4%	10	15%	52	78%	4	1	1	1	1.33	0.70	-0.1
Group B	69	22%	1	1%	4	6%	15	22%	49	71%	4	1	1	1	1.38	0.67	0.17
Group C	97	31%	7	7%	17	18%	23	24%	50	52%	4	1	1	1	1.80	0.98	0.34
With ISO9000	104	33%	7	7%	18	17%	27	26%	52	50%	4	1	1.5	1	1.81	0.96	0.32
Without ISO9000	129	41%	3	2%	6	5%	21	16%	99	77%	4	1	1	1	1.33	0.68	0.2
Grp A w ISO9000	3	1%	0	0%	0	0%	0	0%	3	100%	1	1	1	1	1.00	0.00	nil
Grp A w/o ISO9000	67	21%	2	3%	3	4%	10	15%	52	78%	4	1	1	1	1.33	0.70	-0.1
Grp B w ISO9000	15	5%	0	0%	2	13%	6	40%	7	47%	3	1	2	1	1.67	0.72	0.15
Grp B w/o ISO9000	54	17%	1	2%	2	4%	9	17%	42	78%	4	1	1	1	1.30	0.63	0.12
Grp C w ISO9000	86	27%	7	8%	16	19%	21	24%	42	49%	4	1	2	1	1.86	1.00	0.33
Grp C w/o ISO9000	11	3%	0	0%	1	9%	2	18%	8	73%	3	1	1	1	1.36	0.67	0.77

Part	Part 2 Purpose of the IT																
Topic	.																
Subject	Use of hardcopy/ letter/reportt/form to communicate transmit resource related data/information																
Q.2.7.d	Response										Distribution Statistics						
Sample Sector	Nos	% o/a	No '4'	% '4'	No '3'	% '3'	No '2'	% '2'	No '1'	% '1'	H	L	Median	Mode	Mean	SD	Corr
All	234	74%	132	56%	70	30%	16	7%	16	7%	4	1	4	4	3.36	0.88	0.13
Group A	67	21%	36	54%	16	24%	7	10%	8	12%	4	1	4	4	3.19	1.05	-0
Group B	69	22%	38	55%	24	35%	3	4%	4	6%	4	1	4	4	3.39	0.83	0.21
Group C	99	31%	59	60%	30	30%	6	6%	4	4%	4	1	4	4	3.45	0.79	0.18
With ISO9000	105	33%	65	62%	34	32%	3	3%	3	3%	4	1	4	4	3.53	0.69	0.16
Without ISO9000	130	41%	68	52%	36	28%	13	10%	13	10%	4	1	4	4	3.22	0.99	0.12
Grp A w ISO9000	3	1%	2	67%	0	0%	0	0%	1	33%	4	1	4	4	3.00	1.73	-0.2
Grp A w/o ISO9000	67	21%	36	54%	16	24%	7	10%	8	12%	4	1	4	4	3.19	1.05	-0
Grp B w ISO9000	15	5%	8	53%	7	47%	0	0%	0	0%	4	3	4	4	3.53	0.52	0.44
Grp B w/o ISO9000	54	17%	30	56%	17	31%	3	6%	4	7%	4	1	4	4	3.35	0.89	0.16
Grp C w ISO9000	87	28%	55	63%	27	31%	3	3%	2	2%	4	1	4	4	3.55	0.68	0.17
Grp C w/o ISO9000	12	4%	4	33%	3	25%	3	25%	2	17%	4	1	3	4	2.75	1.14	0.32

Results of the 1998 postal survey of Hong Kong Public Works Contractors.

Part	Part 2 Purpose of the IT																
Topic	.																
Subject	Transmission of 'labour deployed' ('resource-content data) using IT																
Q.2.8.a	Response										Distribution Statistics						
Sample Sector	Nos	% o/a	No '4'	% '4'	No '3'	% '3'	No '2'	% '2'	No '1'	% '1'	H	L	Median	Mode	Mean	SD	Corr
All	233	74%	76	33%	83	36%	49	21%	24	10%	23	1	3	3	3.00	1.64	-0
Group A	68	22%	24	35%	19	28%	14	21%	11	16%	4	1	3	4	2.82	1.09	-0.1
Group B	68	22%	20	29%	32	47%	12	18%	4	6%	4	1	3	3	3.00	0.85	0.21
Group C	98	31%	32	33%	32	33%	24	24%	9	9%	23	1	3	4	3.10	2.25	-0
With ISO9000	103	33%	36	35%	34	33%	25	24%	8	8%	4	1	3	4	2.95	0.95	-0
Without ISO9000	131	41%	40	31%	49	37%	25	19%	16	12%	23	1	3	3	3.02	2.02	0.03
Grp A w ISO9000	3	1%	0	0%	1	33%	2	67%	0	0%	3	2	2	2	2.33	0.58	-1
Grp A w/o ISO9000	68	22%	24	35%	19	28%	14	21%	11	16%	4	1	3	4	2.82	1.09	-0.1
Grp B w ISO9000	14	4%	6	43%	5	36%	2	14%	1	7%	4	1	3	4	3.14	0.95	-0.1
Grp B w/o ISO9000	54	17%	14	26%	27	50%	10	19%	3	6%	4	1	3	3	2.96	0.82	0.31
Grp C w ISO9000	86	27%	30	35%	28	33%	21	24%	7	8%	4	1	3	4	2.94	0.96	0
Grp C w/o ISO9000	12	4%	2	17%	4	33%	3	25%	2	17%	23	1	3	3	4.25	5.99	-0.1

Part	Part 2 Purpose of the IT																
Topic	.																
Subject	Transmission of 'labour required ' ('resource-content data) using IT																
Q.2.8.b	Response										Distribution Statistics						
Sample Sector	Nos	% o/a	No '4'	% '4'	No '3'	% '3'	No '2'	% '2'	No '1'	% '1'	H	L	Median	Mode	Mean	SD	Corr
All	234	74%	74	32%	86	37%	56	24%	18	8%	4	1	3	3	2.92	0.93	0.02
Group A	68	22%	24	35%	22	32%	15	22%	7	10%	4	1	3	4	2.93	1.00	-0.2
Group B	68	22%	20	29%	30	44%	14	21%	4	6%	4	1	3	3	2.97	0.86	0.26
Group C	99	31%	30	30%	35	35%	27	27%	7	7%	4	1	3	3	2.89	0.92	0.02
With ISO9000	104	33%	34	33%	35	34%	28	27%	7	7%	4	1	3	3	2.92	0.93	0.01
Without ISO9000	131	41%	40	31%	52	40%	28	21%	11	8%	4	1	3	3	2.92	0.93	0.11
Grp A w ISO9000	3	1%	0	0%	1	33%	2	67%	0	0%	3	2	2	2	2.33	0.58	-1
Grp A w/o ISO9000	68	22%	24	35%	22	32%	15	22%	7	10%	4	1	3	4	2.93	1.00	-0.2
Grp B w ISO9000	14	4%	6	43%	3	21%	4	29%	1	7%	4	1	3	4	3.00	1.04	0.1
Grp B w/o ISO9000	54	17%	14	26%	27	50%	10	19%	3	6%	4	1	3	3	2.96	0.82	0.32
Grp C w ISO9000	87	28%	28	32%	31	36%	22	25%	6	7%	4	1	3	3	2.93	0.93	0.01
Grp C w/o ISO9000	12	4%	2	17%	4	33%	5	42%	1	8%	4	1	2.5	2	2.58	0.90	0.16

Results of the 1998 postal survey of Hong Kong Public Works Contractors.

Part	Part 2 Purpose of the IT																
Topic	.																
Subject	Transmission of 'plant deployed' ('resource-content data) using IT																
Q.2.8.c	Response										Distribution Statistics						
Sample Sector	Nos	% o/a	No '4'	% '4'	No '3'	% '3'	No '2'	% '2'	No '1'	% '1'	H	L	Median	Mode	Mean	SD	Corr
All	232	73%	75	32%	76	33%	56	24%	25	11%	4	1	3	3	2.87	0.99	0.02
Group A	67	21%	21	31%	19	28%	17	25%	10	15%	4	1	3	4	2.76	1.06	-0.1
Group B	68	22%	21	31%	26	38%	13	19%	8	12%	4	1	3	3	2.88	0.99	0.23
Group C	98	31%	33	34%	31	32%	27	28%	7	7%	4	1	3	4	2.92	0.95	-0
With ISO9000	103	33%	36	35%	31	30%	28	27%	8	8%	4	1	3	4	2.92	0.97	-0
Without ISO9000	130	41%	39	30%	45	35%	29	22%	17	13%	4	1	3	3	2.82	1.01	0.12
Grp A w ISO9000	3	1%	0	0%	1	33%	2	67%	0	0%	3	2	2	2	2.33	0.58	-1
Grp A w/o ISO9000	67	21%	21	31%	19	28%	17	25%	10	15%	4	1	3	4	2.76	1.06	-0.1
Grp B w ISO9000	14	4%	6	43%	3	21%	3	21%	2	14%	4	1	3	4	2.93	1.14	0.06
Grp B w/o ISO9000	54	17%	15	28%	23	43%	10	19%	6	11%	4	1	3	3	2.87	0.95	0.28
Grp C w ISO9000	86	27%	30	35%	27	31%	23	27%	6	7%	4	1	3	4	2.94	0.95	-0
Grp C w/o ISO9000	12	4%	3	25%	4	33%	4	33%	1	8%	4	1	3	3	2.75	0.97	0.07

Part	Part 2 Purpose of the IT																
Topic	.																
Subject	Transmission of lists of 'plant required ' ('resource-content data) using IT																
Q.2.8.d	Response										Distribution Statistics						
Sample Sector	Nos	% o/a	No '4'	% '4'	No '3'	% '3'	No '2'	% '2'	No '1'	% '1'	H	L	Median	Mode	Mean	SD	Corr
All	234	74%	75	32%	88	38%	50	21%	21	9%	4	1	3	3	2.93	0.94	0.01
Group A	68	22%	22	32%	23	34%	15	22%	8	12%	4	1	3	4	2.87	1.01	-0.1
Group B	68	22%	21	31%	28	41%	13	19%	6	9%	4	1	3	3	2.94	0.93	0.24
Group C	99	31%	32	32%	38	38%	22	22%	7	7%	4	1	3	3	2.96	0.91	-0
With ISO9000	104	33%	35	34%	39	38%	22	21%	8	8%	4	1	3	3	2.97	0.93	-0
Without ISO9000	131	41%	40	31%	50	38%	28	21%	13	10%	4	1	3	3	2.89	0.95	0.11
Grp A w ISO9000	3	1%	0	0%	1	33%	2	67%	0	0%	3	2	2	2	2.33	0.58	-1
Grp A w/o ISO9000	68	22%	22	32%	23	34%	15	22%	8	12%	4	1	3	3	2.87	1.01	-0.1
Grp B w ISO9000	14	4%	6	43%	3	21%	3	21%	2	14%	4	1	3	4	2.93	1.14	0.2
Grp B w/o ISO9000	54	17%	15	28%	25	46%	10	19%	4	7%	4	1	3	3	2.94	0.88	0.27
Grp C w ISO9000	87	28%	29	33%	35	40%	17	20%	6	7%	4	1	3	3	3.00	0.90	-0
Grp C w/o ISO9000	12	4%	3	25%	3	25%	5	42%	1	8%	4	1	2.5	2	2.67	0.98	0.1

Results of the 1998 postal survey of Hong Kong Public Works Contractors.

Part	Part 2 Purpose of the IT																
Topic	.																
Subject	Transmission of lists of 'sub-contractors hired ' ('resource-content data) using IT																
Q.2.8.e	Response										Distribution Statistics						
Sample Sector	Nos	% o/a	No '4'	% '4'	No '3'	% '3'	No '2'	% '2'	No '1'	% '1'	H	L	Median	Mode	Mean	SD	Corr
All	234	74%	89	38%	78	33%	50	21%	17	7%	4	1	3	4	3.02	0.94	-0
Group A	68	22%	26	38%	23	34%	13	19%	6	9%	4	1	3	4	3.01	0.97	-0.2
Group B	68	22%	24	35%	27	40%	12	18%	5	7%	4	1	3	3	3.03	0.91	0.14
Group C	99	31%	39	39%	29	29%	25	25%	6	6%	4	1	3	4	3.02	0.95	-0
With ISO9000	104	33%	37	36%	36	35%	24	23%	7	7%	4	1	3	4	2.99	0.93	-0
Without ISO9000	131	41%	52	40%	43	33%	26	20%	10	8%	4	1	3	4	3.05	0.95	-0
Grp A w ISO9000	3	1%	0	0%	2	67%	1	33%	0	0%	3	2	3	3	2.67	0.58	-0.7
Grp A w/o ISO9000	68	22%	26	38%	23	34%	13	19%	6	9%	4	1	3	4	3.01	0.97	-0.2
Grp B w ISO9000	14	4%	3	21%	7	50%	2	14%	2	14%	4	1	3	3	2.79	0.97	0.1
Grp B w/o ISO9000	54	17%	21	39%	20	37%	10	19%	3	6%	4	1	3	4	3.09	0.90	0.2
Grp C w ISO9000	87	28%	34	39%	27	31%	21	24%	5	6%	4	1	3	4	3.03	0.93	-0
Grp C w/o ISO9000	12	4%	5	42%	2	17%	4	33%	1	8%	4	1	3	4	2.92	1.08	-0.3

Part	Part 2 Purpose of the IT																
Topic	.																
Subject	Transmission of lists of 'purchasing services required ' ('resource-content data) using IT																
Q.2.8.f	Response										Distribution Statistics						
Sample Sector	Nos	% o/a	No '4'	% '4'	No '3'	% '3'	No '2'	% '2'	No '1'	% '1'	H	L	Median	Mode	Mean	SD	Corr
All	234	74%	95	41%	75	32%	48	21%	16	7%	4	1	3	4	3.06	0.94	-0
Group A	68	22%	25	37%	24	35%	12	18%	7	10%	4	1	3	4	2.99	0.98	-0.1
Group B	68	22%	32	47%	22	32%	10	15%	4	6%	4	1	3	4	3.21	0.91	0.23
Group C	99	31%	38	38%	30	30%	26	26%	5	5%	4	1	3	4	3.02	0.93	-0
With ISO9000	104	33%	41	39%	34	33%	23	22%	6	6%	4	1	3	4	3.06	0.92	-0
Without ISO9000	131	41%	54	41%	42	32%	25	19%	10	8%	4	1	3	4	3.07	0.95	0.02
Grp A w ISO9000	3	1%	0	0%	2	67%	1	33%	0	0%	3	2	3	3	2.67	0.58	-0.7
Grp A w/o ISO9000	68	22%	25	37%	24	35%	12	18%	7	10%	4	1	3	4	2.99	0.98	-0.1
Grp B w ISO9000	14	4%	7	50%	5	36%	0	0%	2	14%	4	1	3.5	4	3.21	1.05	0.24
Grp B w/o ISO9000	54	17%	25	46%	17	31%	10	19%	2	4%	4	1	3	4	3.20	0.88	0.23
Grp C w ISO9000	87	28%	34	39%	27	31%	22	25%	4	5%	4	1	3	4	3.05	0.91	-0
Grp C w/o ISO9000	12	4%	4	33%	3	25%	4	33%	1	8%	4	1	3	4	2.83	1.03	-0.3

Results of the 1998 postal survey of Hong Kong Public Works Contractors.

Part	Part 2 Purpose of the IT																
Topic	.																
Subject	Transmission of lists of 'QS services required ' ('resource-content data) using IT																
Q.2.8.g	Response										Distribution Statistics						
Sample Sector	Nos	% o/a	No '4'	% '4'	No '3'	% '3'	No '2'	% '2'	No '1'	% '1'	H	L	Median	Mode	Mean	SD	Corr
All	233	74%	69	30%	90	39%	55	24%	19	8%	4	1	3	3	2.90	0.92	0.02
Group A	67	21%	20	30%	23	34%	15	22%	9	13%	4	1	3	3	2.81	1.02	-0.2
Group B	68	22%	18	26%	30	44%	15	22%	5	7%	4	1	3	3	2.90	0.88	0.17
Group C	99	31%	31	31%	37	37%	26	26%	5	5%	4	1	3	3	2.95	0.88	-0
With ISO9000	104	33%	31	30%	40	38%	27	26%	6	6%	4	1	3	3	2.92	0.89	0.01
Without ISO9000	130	41%	38	29%	50	38%	29	22%	13	10%	4	1	3	3	2.87	0.95	0.03
Grp A w ISO9000	3	1%	0	0%	1	33%	2	67%	0	0%	3	2	2	2	2.33	0.58	-1
Grp A w/o ISO9000	67	21%	20	30%	23	34%	15	22%	9	13%	4	1	3	3	2.81	1.02	-0.2
Grp B w ISO9000	14	4%	3	21%	6	43%	3	21%	2	14%	4	1	3	3	2.71	0.99	0.04
Grp B w/o ISO9000	54	17%	15	28%	24	44%	12	22%	3	6%	4	1	3	3	2.94	0.86	0.26
Grp C w ISO9000	87	28%	28	32%	33	38%	22	25%	4	5%	4	1	3	3	2.98	0.88	-0
Grp C w/o ISO9000	12	4%	3	25%	4	33%	4	33%	1	8%	4	1	3	3	2.75	0.97	-0.2

Part	Part 2 Purpose of the IT																
Topic	.																
Subject	Transmission of lists of 'legal services required ' ('resource-content data) using IT																
Q.2.8.h	Response										Distribution Statistics						
Sample Sector	Nos	% o/a	No '4'	% '4'	No '3'	% '3'	No '2'	% '2'	No '1'	% '1'	H	L	Median	Mode	Mean	SD	Corr
All	233	74%	64	27%	62	27%	81	35%	26	11%	4	1	3	2	2.70	0.99	0.01
Group A	67	21%	17	25%	14	21%	25	37%	11	16%	4	1	2	2	2.55	1.05	-0.1
Group B	68	22%	17	25%	22	32%	23	34%	6	9%	4	1	3	2	2.74	0.94	0.11
Group C	99	31%	30	30%	26	26%	34	34%	9	9%	4	1	3	2	2.78	0.99	-0
With ISO9000	104	33%	30	29%	27	26%	36	35%	11	11%	4	1	3	2	2.73	1.00	-0
Without ISO9000	130	41%	34	26%	35	27%	46	35%	15	12%	4	1	3	2	2.68	0.99	0.07
Grp A w ISO9000	3	1%	0	0%	0	0%	3	100%	0	0%	2	2	2	2	2.00	0.00	nil
Grp A w/o ISO9000	67	21%	17	25%	14	21%	25	37%	11	16%	4	1	2	2	2.55	1.05	-0.1
Grp B w ISO9000	14	4%	2	14%	4	29%	5	36%	3	21%	4	1	2	2	2.36	1.01	-0.1
Grp B w/o ISO9000	54	17%	15	28%	18	33%	18	33%	3	6%	4	1	3	3	2.83	0.91	0.24
Grp C w ISO9000	87	28%	28	32%	23	26%	28	32%	8	9%	4	1	3	4	2.82	0.99	-0
Grp C w/o ISO9000	12	4%	2	17%	3	25%	6	50%	1	8%	4	1	2	2	2.50	0.90	-0.2

Results of the 1998 postal survey of Hong Kong Public Works Contractors.

Part	Part 2 Purpose of the IT																
Topic	.																
Subject	Transmission of lists of 'management services required ' ('resource-content data) using IT																
Q.2.8.i	Response										Distribution Statistics						
Sample Sector	Nos	% o/a	No '4'	% '4'	No '3'	% '3'	No '2'	% '2'	No '1'	% '1'	H	L	Median	Mode	Mean	SD	Corr
All	233	74%	68	29%	73	31%	69	30%	23	10%	4	1	3	3	2.80	0.97	0.02
Group A	67	21%	18	27%	16	24%	23	34%	10	15%	4	1	3	2	2.63	1.04	-0.1
Group B	68	22%	17	25%	24	35%	21	31%	6	9%	4	1	3	3	2.76	0.93	0.15
Group C	99	31%	33	33%	33	33%	26	26%	7	7%	4	1	3	4	2.93	0.94	-0
With ISO9000	104	33%	33	32%	36	35%	26	25%	9	9%	4	1	3	3	2.89	0.95	-0
Without ISO9000	130	41%	35	27%	37	28%	44	34%	14	11%	4	1	3	2	2.72	0.98	0.06
Grp A w ISO9000	3	1%	0	0%	0	0%	3	100%	0	0%	2	2	2	2	2.00	0.00	nil
Grp A w/o ISO9000	67	21%	18	27%	16	24%	23	34%	10	15%	4	1	3	2	2.63	1.04	-0.1
Grp B w ISO9000	14	4%	2	14%	6	43%	3	21%	3	21%	4	1	3	3	2.50	1.02	0.01
Grp B w/o ISO9000	54	17%	15	28%	18	33%	18	33%	3	6%	4	1	3	3	2.83	0.91	0.26
Grp C w ISO9000	87	28%	31	36%	30	34%	20	23%	6	7%	4	1	3	4	2.99	0.93	-0
Grp C w/o ISO9000	12	4%	2	17%	3	25%	6	50%	1	8%	4	1	2	2	2.50	0.90	-0.2

Part	Part 2 Purpose of the IT																
Topic	.																
Subject	Transmission of lists of 'administrative services required ' ('resource-content data) using IT																
Q.2.8.j	Response										Distribution Statistics						
Sample Sector	Nos	% o/a	No '4'	% '4'	No '3'	% '3'	No '2'	% '2'	No '1'	% '1'	H	L	Median	Mode	Mean	SD	Corr
All	234	74%	68	29%	84	36%	59	25%	23	10%	4	1	3	3	2.84	0.96	0.02
Group A	68	22%	19	28%	17	25%	22	32%	10	15%	4	1	3	2	2.66	1.05	-0.2
Group B	68	22%	17	25%	27	40%	18	26%	6	9%	4	1	3	3	2.81	0.92	0.2
Group C	99	31%	32	32%	40	40%	20	20%	7	7%	4	1	3	3	2.98	0.90	-0
With ISO9000	104	33%	33	32%	41	39%	21	20%	9	9%	4	1	3	3	2.94	0.93	0
Without ISO9000	131	41%	35	27%	43	33%	39	30%	14	11%	4	1	3	3	2.76	0.97	0.05
Grp A w ISO9000	3	1%	0	0%	0	0%	3	100%	0	0%	2	2	2	2	2.00	0.00	nil
Grp A w/o ISO9000	68	22%	19	28%	17	25%	22	32%	10	15%	4	1	3	2	2.66	1.05	-0.2
Grp B w ISO9000	14	4%	3	21%	6	43%	2	14%	3	21%	4	1	3	3	2.64	1.08	0.13
Grp B w/o ISO9000	54	17%	14	26%	21	39%	16	30%	3	6%	4	1	3	3	2.85	0.88	0.27
Grp C w ISO9000	87	28%	30	34%	35	40%	16	18%	6	7%	4	1	3	3	3.02	0.90	-0
Grp C w/o ISO9000	12	4%	2	17%	5	42%	4	33%	1	8%	4	1	3	3	2.67	0.89	-0.2

Results of the 1998 postal survey of Hong Kong Public Works Contractors.

Part	Part 2 Purpose of the IT																
Topic	.																
Subject	Transmission of lists of 'professional services required ' ('resource-content data) using IT																
Q.2.8.k	Response										Distribution Statistics						
Sample Sector	Nos	% o/a	No '4'	% '4'	No '3'	% '3'	No '2'	% '2'	No '1'	% '1'	H	L	Median	Mode	Mean	SD	Corr
All	233	74%	66	28%	81	35%	62	27%	24	10%	4	1	3	3	2.81	0.96	0.01
Group A	67	21%	20	30%	19	28%	17	25%	11	16%	4	1	3	4	2.72	1.07	-0.1
Group B	68	22%	15	22%	31	46%	17	25%	5	7%	4	1	3	3	2.82	0.86	0.14
Group C	99	31%	31	31%	32	32%	28	28%	8	8%	4	1	3	3	2.87	0.95	-0
With ISO9000	104	33%	32	31%	37	36%	26	25%	9	9%	4	1	3	3	2.88	0.95	-0
Without ISO9000	130	41%	34	26%	45	35%	36	28%	15	12%	4	1	3	3	2.75	0.97	0.04
Grp A w ISO9000	3	1%	0	0%	1	33%	2	67%	0	0%	3	2	2	2	2.33	0.58	0.21
Grp A w/o ISO9000	67	21%	20	30%	19	28%	17	25%	11	16%	4	1	3	4	2.72	1.07	-0.1
Grp B w ISO9000	14	4%	3	21%	7	50%	1	7%	3	21%	4	1	3	3	2.71	1.07	-0.1
Grp B w/o ISO9000	54	17%	12	22%	24	44%	16	30%	2	4%	4	1	3	3	2.85	0.81	0.28
Grp C w ISO9000	87	28%	29	33%	29	33%	23	26%	6	7%	4	1	3	4	2.93	0.94	-0
Grp C w/o ISO9000	12	4%	2	17%	3	25%	5	42%	2	17%	4	1	2	2	2.42	1.00	-0.1

Q.2.9

open question

Part	Part 2 Purpose of the IT																
Topic	.																
Subject	e of the telephone to communicate transmit five most important items of data/information stated in Q.2.10																
Q.2.10.a	Response										Distribution Statistics						
Sample Sector	Nos	% o/a	No '4'	% '4'	No '3'	% '3'	No '2'	% '2'	No '1'	% '1'	H	L	Median	Mode	Mean	SD	Corr
All	228	72%	145	64%	52	23%	23	10%	8	4%	4	1	4	4	3.46	0.81	-0.1
Group A	65	21%	49	75%	12	18%	3	5%	1	2%	4	1	4	4	3.68	0.64	-0.3
Group B	67	21%	41	61%	20	30%	3	4%	3	4%	4	1	4	4	3.48	0.79	-0.2
Group C	97	31%	55	57%	21	22%	17	18%	4	4%	4	1	4	4	3.31	0.91	-0.1
With ISO9000	102	32%	60	59%	19	19%	18	18%	5	5%	4	1	4	4	3.31	0.93	-0.1
Without ISO9000	127	40%	85	67%	34	27%	5	4%	3	2%	4	1	4	4	3.58	0.68	-0.2
Grp A w ISO9000	3	1%	2	67%	0	0%	1	33%	0	0%	4	2	4	4	3.33	1.15	-0.7
Grp A w/o ISO9000	65	21%	49	75%	12	18%	3	5%	1	2%	4	1	4	4	3.68	0.64	-0.3
Grp B w ISO9000	14	4%	7	50%	3	21%	2	14%	2	14%	4	1	3.5	4	3.07	1.14	-0.2
Grp B w/o ISO9000	53	17%	34	64%	17	32%	1	2%	1	2%	4	1	4	4	3.58	0.63	-0.1
Grp C w ISO9000	85	27%	51	60%	16	19%	15	18%	3	4%	4	1	4	4	3.35	0.90	-0.1
Grp C w/o ISO9000	12	4%	4	33%	5	42%	2	17%	1	8%	4	1	3	3	3.00	0.95	-0.3

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Part	Part 2 Purpose of the IT																
Topic	.																
Subject	Use of the fax to communicate transmit five most important items of data/information stated in Q.2.10																
Q.2.10.b	Response										Distribution Statistics						
Sample Sector	Nos	% o/a	No '4'	% '4'	No '3'	% '3'	No '2'	% '2'	No '1'	% '1'	H	L	Median	Mode	Mean	SD	Corr
All	228	72%	144	63%	62	27%	16	7%	6	3%	4	1	4	4	3.51	0.74	-0.1
Group A	65	21%	40	62%	18	28%	5	8%	2	3%	4	1	4	4	3.48	0.77	-0.1
Group B	67	21%	44	66%	19	28%	3	4%	1	1%	4	1	4	4	3.58	0.65	-0
Group C	97	31%	60	62%	25	26%	9	9%	3	3%	4	1	4	4	3.46	0.79	-0.1
With ISO9000	102	32%	67	66%	25	25%	7	7%	3	3%	4	1	4	4	3.53	0.75	-0.1
Without ISO9000	127	40%	77	61%	37	29%	10	8%	3	2%	4	1	4	4	3.48	0.74	-0
Grp A w ISO9000	3	1%	2	67%	1	33%	0	0%	0	0%	4	3	4	4	3.67	0.58	-0.2
Grp A w/o ISO9000	65	21%	40	62%	18	28%	5	8%	2	3%	4	1	4	4	3.48	0.77	-0.1
Grp B w ISO9000	14	4%	9	64%	4	29%	0	0%	1	7%	4	1	4	4	3.50	0.85	-0.1
Grp B w/o ISO9000	53	17%	35	66%	15	28%	3	6%	0	0%	4	2	4	4	3.60	0.60	0
Grp C w ISO9000	85	27%	56	66%	20	24%	7	8%	2	2%	4	1	4	4	3.53	0.75	-0.1
Grp C w/o ISO9000	12	4%	4	33%	5	42%	2	17%	1	8%	4	1	3	3	3.00	0.95	-0

Part	Part 2 Purpose of the IT																
Topic	.																
Subject	Use of the e-mail to communicate transmit five most important items of data/information stated in Q.2.10																
Q.2.10.c	Response										Distribution Statistics						
Sample Sector	Nos	% o/a	No '4'	% '4'	No '3'	% '3'	No '2'	% '2'	No '1'	% '1'	H	L	Median	Mode	Mean	SD	Corr
All	222	70%	8	4%	21	9%	52	23%	141	64%	4	1	1	1	1.53	0.81	0.25
Group A	64	20%	1	2%	3	5%	10	16%	50	78%	4	1	1	1	1.30	0.63	0
Group B	66	21%	3	5%	2	3%	18	27%	43	65%	4	1	1	1	1.47	0.77	0.32
Group C	93	29%	4	4%	17	18%	24	26%	48	52%	4	1	1	1	1.75	0.90	0.25
With ISO9000	100	32%	6	6%	18	18%	29	29%	47	47%	4	1	2	1	1.83	0.93	0.22
Without ISO9000	123	39%	2	2%	4	3%	23	19%	94	76%	4	1	1	1	1.30	0.61	0.12
Grp A w ISO9000	3	1%	0	0%	0	0%	2	67%	1	33%	2	1	2	2	1.67	0.58	-0.7
Grp A w/o ISO9000	64	20%	1	2%	3	5%	10	16%	50	78%	4	1	1	1	1.30	0.63	0
Grp B w ISO9000	14	4%	2	14%	2	14%	6	43%	4	29%	4	1	2	2	2.14	1.03	0.44
Grp B w/o ISO9000	52	16%	1	2%	0	0%	12	23%	39	75%	4	1	1	1	1.29	0.57	0.15
Grp C w ISO9000	83	26%	4	5%	16	19%	21	25%	42	51%	4	1	1	1	1.78	0.92	0.25
Grp C w/o ISO9000	10	3%	0	0%	1	10%	3	30%	6	60%	3	1	1	1	1.50	0.71	0.21

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Part	Part 2 Purpose of the IT																
Topic	.																
Subject	Use of hardcopy to communicate transmit five most important items of data/information stated in Q.2.10																
Q.2.10.d	Response										Distribution Statistics						
Sample Sector	Nos	% o/a	No '4'	% '4'	No '3'	% '3'	No '2'	% '2'	No '1'	% '1'	H	L	Median	Mode	Mean	SD	Corr
All	226	72%	144	64%	55	24%	14	6%	13	6%	4	1	4	4	3.46	0.85	0.11
Group A	65	21%	38	58%	15	23%	7	11%	5	8%	4	1	4	4	3.32	0.95	-0.1
Group B	66	21%	39	59%	20	30%	2	3%	5	8%	4	1	4	4	3.41	0.88	0.1
Group C	96	30%	67	70%	21	22%	5	5%	3	3%	4	1	4	4	3.58	0.74	0.14
With ISO9000	101	32%	74	73%	23	23%	1	1%	3	3%	4	1	4	4	3.66	0.65	0.11
Without ISO9000	126	40%	70	56%	33	26%	13	10%	10	8%	4	1	4	4	3.29	0.95	0.12
Grp A w ISO9000	3	1%	2	67%	0	0%	0	0%	1	33%	4	1	4	4	3.00	1.73	-0.2
Grp A w/o ISO9000	65	21%	38	58%	15	23%	7	11%	5	8%	4	1	4	4	3.32	0.95	-0.1
Grp B w ISO9000	13	4%	7	54%	5	38%	0	0%	1	8%	4	1	4	4	3.38	0.87	-0.1
Grp B w/o ISO9000	53	17%	32	60%	15	28%	2	4%	4	8%	4	1	4	4	3.42	0.89	0.15
Grp C w ISO9000	85	27%	65	76%	18	21%	1	1%	1	1%	4	1	4	4	3.73	0.54	0.11
Grp C w/o ISO9000	11	3%	2	18%	3	27%	4	36%	2	18%	4	1	2	2	2.45	1.04	0.46

Part	Part 2 Purpose of the IT																
Topic	.																
Subject	Transmission of 'requests for information' ('issue-content data) using IT																
Q.2.11.a	Response										Distribution Statistics						
Sample Sector	Nos	% o/a	No '4'	% '4'	No '3'	% '3'	No '2'	% '2'	No '1'	% '1'	H	L	Median	Mode	Mean	SD	Corr
All	233	74%	121	52%	69	30%	31	13%	12	5%	4	1	4	4	3.28	0.88	-0
Group A	68	22%	39	57%	16	24%	10	15%	3	4%	4	1	4	4	3.34	0.89	-0.1
Group B	68	22%	34	50%	26	38%	6	9%	2	3%	4	1	3.5	4	3.35	0.77	0.01
Group C	98	31%	48	49%	28	29%	15	15%	7	7%	4	1	3	4	3.19	0.95	-0
With ISO9000	103	33%	53	51%	29	28%	14	14%	7	7%	4	1	4	4	3.24	0.93	-0
Without ISO9000	131	41%	68	52%	41	31%	17	13%	5	4%	4	1	4	4	3.31	0.84	-0
Grp A w ISO9000	3	1%	2	67%	0	0%	1	33%	0	0%	4	2	4	4	3.33	1.15	-0.7
Grp A w/o ISO9000	68	22%	39	57%	16	24%	10	15%	3	4%	4	1	4	4	3.34	0.89	-0.1
Grp B w ISO9000	14	4%	8	57%	5	36%	0	0%	1	7%	4	1	4	4	3.43	0.85	-0
Grp B w/o ISO9000	54	17%	26	48%	21	39%	6	11%	1	2%	4	1	3	4	3.33	0.75	-0
Grp C w ISO9000	86	27%	43	50%	24	28%	13	15%	6	7%	4	1	3.5	4	3.21	0.95	-0
Grp C w/o ISO9000	12	4%	5	42%	4	33%	2	17%	1	8%	4	1	3	4	3.08	1.00	-0

Results of the 1998 postal survey of Hong Kong Public Works Contractors.

Part	Part 2 Purpose of the IT																
Topic	.																
Subject	Transmission of 'variation quotations' ('issue-content data) using IT																
Q.2.11.b	Response										Distribution Statistics						
Sample Sector	Nos	% o/a	No '4'	% '4'	No '3'	% '3'	No '2'	% '2'	No '1'	% '1'	H	L	Median	Mode	Mean	SD	Corr
All	233	74%	106	45%	77	33%	37	16%	13	6%	4	1	3	4	3.18	0.90	-0
Group A	68	22%	39	57%	17	25%	8	12%	4	6%	4	1	4	4	3.34	0.91	-0.1
Group B	68	22%	28	41%	26	38%	10	15%	4	6%	4	1	3	4	3.15	0.89	0.07
Group C	98	31%	39	40%	35	36%	19	19%	5	5%	4	1	3	4	3.10	0.89	-0
With ISO9000	103	33%	43	42%	35	34%	20	19%	5	5%	4	1	3	4	3.13	0.89	0
Without ISO9000	131	41%	63	48%	43	33%	17	13%	8	6%	4	1	3	4	3.23	0.90	-0.1
Grp A w ISO9000	3	1%	1	33%	1	33%	1	33%	0	0%	4	2	3	nil	3.00	1.00	-0.3
Grp A w/o ISO9000	68	22%	39	57%	17	25%	8	12%	4	6%	4	1	4	4	3.34	0.91	-0.1
Grp B w ISO9000	14	4%	7	50%	5	36%	1	7%	1	7%	4	1	3.5	4	3.29	0.91	-0.1
Grp B w/o ISO9000	54	17%	21	39%	21	39%	9	17%	3	6%	4	1	3	4	3.11	0.88	0.1
Grp C w ISO9000	86	27%	35	41%	29	34%	18	21%	4	5%	4	1	3	4	3.10	0.89	0.01
Grp C w/o ISO9000	12	4%	4	33%	6	50%	1	8%	1	8%	4	1	3	3	3.08	0.90	-0.4

Part	Part 2 Purpose of the IT																
Topic	.																
Subject	Transmission of 'change order proposals' ('issue-content data) using IT																
Q.2.11.c	Response										Distribution Statistics						
Sample Sector	Nos	% o/a	No '4'	% '4'	No '3'	% '3'	No '2'	% '2'	No '1'	% '1'	H	L	Median	Mode	Mean	SD	Corr
All	232	73%	92	40%	85	37%	41	18%	14	6%	4	1	3	4	3.10	0.90	-0.1
Group A	68	22%	31	46%	22	32%	12	18%	3	4%	4	1	3	4	3.19	0.89	-0.1
Group B	68	22%	27	40%	28	41%	7	10%	6	9%	4	1	3	3	3.12	0.92	0.01
Group C	97	31%	34	35%	36	37%	22	23%	5	5%	4	1	3	3	3.02	0.89	-0.1
With ISO9000	102	32%	35	34%	41	40%	21	21%	5	5%	4	1	3	3	3.04	0.87	-0.1
Without ISO9000	131	41%	57	44%	45	34%	20	15%	9	7%	4	1	3	4	3.15	0.92	-0.1
Grp A w ISO9000	3	1%	0	0%	2	67%	1	33%	0	0%	3	2	3	3	2.67	0.58	-0.7
Grp A w/o ISO9000	68	22%	31	46%	22	32%	12	18%	3	4%	4	1	3	4	3.19	0.89	-0.1
Grp B w ISO9000	14	4%	5	36%	7	50%	1	7%	1	7%	4	1	3	3	3.14	0.86	-0.2
Grp B w/o ISO9000	54	17%	22	41%	21	39%	6	11%	5	9%	4	1	3	4	3.11	0.95	0.06
Grp C w ISO9000	85	27%	30	35%	32	38%	19	22%	4	5%	4	1	3	3	3.04	0.88	-0.1
Grp C w/o ISO9000	12	4%	4	33%	4	33%	3	25%	1	8%	4	1	3	4	2.92	1.00	-0.3

Results of the 1998 postal survey of Hong Kong Public Works Contractors.

Part	Part 2 Purpose of the IT																
Topic	.																
Subject	Transmission of lists of 'accident/safety reports' ('issue-content data) using IT																
Q.2.11.d	Response										Distribution Statistics						
Sample Sector	Nos	% o/a	No '4'	% '4'	No '3'	% '3'	No '2'	% '2'	No '1'	% '1'	H	L	Median	Mode	Mean	SD	Corr
All	231	73%	102	44%	67	29%	48	21%	14	6%	4	1	3	4	3.11	0.94	0.07
Group A	67	21%	32	48%	17	25%	13	19%	5	7%	4	1	3	4	3.13	0.98	-0
Group B	68	22%	28	41%	24	35%	12	18%	4	6%	4	1	3	4	3.12	0.91	0.15
Group C	97	31%	42	43%	27	28%	23	24%	5	5%	4	1	3	4	3.09	0.94	0.11
With ISO9000	102	32%	44	43%	31	30%	22	22%	5	5%	4	1	3	4	3.12	0.92	0.11
Without ISO9000	130	41%	58	45%	37	28%	26	20%	9	7%	4	1	3	4	3.11	0.96	-0
Grp A w ISO9000	3	1%	1	33%	1	33%	1	33%	0	0%	4	2	3	nil	3.00	1.00	-0.3
Grp A w/o ISO9000	67	21%	32	48%	17	25%	13	19%	5	7%	4	1	3	4	3.13	0.98	-0
Grp B w ISO9000	14	4%	6	43%	6	43%	1	7%	1	7%	4	1	3	4	3.21	0.89	0.02
Grp B w/o ISO9000	54	17%	22	41%	18	33%	11	20%	3	6%	4	1	3	4	3.09	0.92	0.18
Grp C w ISO9000	85	27%	37	44%	24	28%	20	24%	4	5%	4	1	3	4	3.11	0.93	0.13
Grp C w/o ISO9000	12	4%	5	42%	3	25%	3	25%	1	8%	4	1	3	4	3.00	1.04	-0.3

Part	Part 2 Purpose of the IT																
Topic	.																
Subject	Transmission of lists of 'quality conformance' ('issue-content data) using IT																
Q.2.11.e	Response										Distribution Statistics						
Sample Sector	Nos	% o/a	No '4'	% '4'	No '3'	% '3'	No '2'	% '2'	No '1'	% '1'	H	L	Median	Mode	Mean	SD	Corr
All	232	73%	76	33%	84	36%	57	25%	15	6%	4	1	3	3	2.95	0.91	-0.1
Group A	67	21%	22	33%	22	33%	18	27%	5	7%	4	1	3	4	2.91	0.95	-0.2
Group B	68	22%	19	28%	31	46%	13	19%	5	7%	4	1	3	3	2.94	0.88	0.06
Group C	98	31%	35	36%	32	33%	26	27%	5	5%	4	1	3	4	2.99	0.91	-0.1
With ISO9000	103	33%	36	35%	34	33%	28	27%	5	5%	4	1	3	4	2.98	0.91	-0.1
Without ISO9000	130	41%	40	31%	51	39%	29	22%	10	8%	4	1	3	3	2.93	0.92	0.01
Grp A w ISO9000	3	1%	0	0%	2	67%	1	33%	0	0%	3	2	3	3	2.67	0.58	-0.7
Grp A w/o ISO9000	67	21%	22	33%	22	33%	18	27%	5	7%	4	1	3	3	2.91	0.95	-0.2
Grp B w ISO9000	14	4%	4	29%	8	57%	1	7%	1	7%	4	1	3	3	3.07	0.83	-0
Grp B w/o ISO9000	54	17%	15	28%	23	43%	12	22%	4	7%	4	1	3	3	2.91	0.90	0.06
Grp C w ISO9000	86	27%	32	37%	24	28%	26	30%	4	5%	4	1	3	4	2.98	0.93	-0.1
Grp C w/o ISO9000	12	4%	3	25%	8	67%	0	0%	1	8%	4	1	3	3	3.08	0.79	-0.1

Results of the 1998 postal survey of Hong Kong Public Works Contractors.

Part	Part 2 Purpose of the IT																
Topic	.																
Subject	Transmission of lists of 'approvals' ('issue-content data) using IT																
Q.2.11.f	Response										Distribution Statistics						
Sample Sector	Nos	% o/a	No '4'	% '4'	No '3'	% '3'	No '2'	% '2'	No '1'	% '1'	H	L	Median	Mode	Mean	SD	Corr
All	230	73%	109	47%	66	29%	42	18%	13	6%	4	1	3	4	3.18	0.92	-0.1
Group A	67	21%	34	51%	20	30%	11	16%	2	3%	4	1	4	4	3.28	0.85	-0.2
Group B	68	22%	31	46%	22	32%	10	15%	5	7%	4	1	3	4	3.16	0.94	0.06
Group C	96	30%	44	46%	25	26%	21	22%	6	6%	4	1	3	4	3.11	0.96	-0.1
With ISO9000	102	32%	48	47%	26	25%	22	22%	6	6%	4	1	3	4	3.14	0.95	-0.1
Without ISO9000	129	41%	61	47%	41	32%	20	16%	7	5%	4	1	3	4	3.21	0.90	-0.1
Grp A w ISO9000	3	1%	2	67%	0	0%	1	33%	0	0%	4	2	4	4	3.33	1.15	-0.7
Grp A w/o ISO9000	67	21%	34	51%	20	30%	11	16%	2	3%	4	1	4	4	3.28	0.85	-0.2
Grp B w ISO9000	14	4%	7	50%	5	36%	1	7%	1	7%	4	1	3.5	4	3.29	0.91	0.03
Grp B w/o ISO9000	54	17%	24	44%	17	31%	9	17%	4	7%	4	1	3	4	3.13	0.95	0.04
Grp C w ISO9000	85	27%	39	46%	21	25%	20	24%	5	6%	4	1	3	4	3.11	0.96	-0.1
Grp C w/o ISO9000	11	3%	5	45%	4	36%	1	9%	1	9%	4	1	3	4	3.18	0.98	-0.4

Part	Part 2 Purpose of the IT																
Topic	.																
Subject	Use of the telephone to communicate issue-related data/information																
Q.2.12.a	Response										Distribution Statistics						
Sample Sector	Nos	% o/a	No '4'	% '4'	No '3'	% '3'	No '2'	% '2'	No '1'	% '1'	H	L	Median	Mode	Mean	SD	Corr
All	234	74%	148	63%	60	26%	23	10%	3	1%	4	1	4	4	3.51	0.73	0.04
Group A	68	22%	50	74%	12	18%	5	7%	1	1%	4	1	4	4	3.63	0.69	-0.3
Group B	68	22%	37	54%	24	35%	6	9%	1	1%	4	1	4	4	3.43	0.72	0.05
Group C	99	31%	61	62%	25	25%	12	12%	1	1%	4	1	4	4	3.47	0.75	0.08
With ISO9000	104	33%	67	64%	23	22%	13	13%	1	1%	4	1	4	4	3.50	0.75	0.06
Without ISO9000	131	41%	81	62%	38	29%	10	8%	2	2%	4	1	4	4	3.51	0.71	0.01
Grp A w ISO9000	3	1%	2	67%	0	0%	1	33%	0	0%	4	2	4	4	3.33	1.15	-0.7
Grp A w/o ISO9000	68	22%	50	74%	12	18%	5	7%	1	1%	4	1	4	4	3.63	0.69	-0.3
Grp B w ISO9000	14	4%	9	64%	5	36%	0	0%	0	0%	4	3	4	4	3.64	0.50	0.11
Grp B w/o ISO9000	54	17%	28	52%	19	35%	6	11%	1	2%	4	1	4	4	3.37	0.76	-0
Grp C w ISO9000	87	28%	56	64%	18	21%	12	14%	1	1%	4	1	4	4	3.48	0.78	0.07
Grp C w/o ISO9000	12	4%	5	42%	7	58%	0	0%	0	0%	4	3	3	3	3.42	0.51	0.41

Results of the 1998 postal survey of Hong Kong Public Works Contractors.

Part	Part 2 Purpose of the IT																
Topic	.																
Subject	Use of the fax to communicate issue-related data/information																
Q.2.12.b	Response										Distribution Statistics						
Sample Sector	Nos	% o/a	No '4'	% '4'	No '3'	% '3'	No '2'	% '2'	No '1'	% '1'	H	L	Median	Mode	Mean	SD	Corr
All	233	74%	152	65%	66	28%	11	5%	4	2%	4	1	4	4	3.57	0.67	-0
Group A	67	21%	43	64%	18	27%	3	4%	3	4%	4	1	4	4	3.51	0.79	0.01
Group B	68	22%	41	60%	22	32%	5	7%	0	0%	4	2	4	4	3.53	0.63	0.2
Group C	99	31%	68	69%	26	26%	4	4%	1	1%	4	1	4	4	3.63	0.62	-0.1
With ISO9000	104	33%	73	70%	28	27%	2	2%	1	1%	4	1	4	4	3.66	0.57	-0.1
Without ISO9000	130	41%	79	61%	38	29%	10	8%	3	2%	4	1	4	4	3.48	0.74	0.13
Grp A w ISO9000	3	1%	3	100%	0	0%	0	0%	0	0%	4	4	4	4	4.00	0.00	nil
Grp A w/o ISO9000	67	21%	43	64%	18	27%	3	4%	3	4%	4	1	4	4	3.51	0.79	0.01
Grp B w ISO9000	14	4%	8	57%	6	43%	0	0%	0	0%	4	3	4	4	3.57	0.51	0.11
Grp B w/o ISO9000	54	17%	33	61%	16	30%	5	9%	0	0%	4	2	4	4	3.52	0.67	0.22
Grp C w ISO9000	87	28%	62	71%	22	25%	2	2%	1	1%	4	1	4	4	3.67	0.58	-0.1
Grp C w/o ISO9000	12	4%	6	50%	4	33%	2	17%	0	0%	4	2	3.5	4	3.33	0.78	0.32

Part	Part 2 Purpose of the IT																
Topic	.																
Subject	Use of e-mail to communicate issue-related data/information																
Q.2.12.c	Response										Distribution Statistics						
Sample Sector	Nos	% o/a	No '4'	% '4'	No '3'	% '3'	No '2'	% '2'	No '1'	% '1'	H	L	Median	Mode	Mean	SD	Corr
All	225	71%	4	2%	26	12%	46	20%	149	66%	4	1	1	1	1.49	0.77	0.26
Group A	65	21%	0	0%	4	6%	11	17%	50	77%	3	1	1	1	1.29	0.58	0.05
Group B	67	21%	0	0%	6	9%	15	22%	46	69%	3	1	1	1	1.40	0.65	0.19
Group C	94	30%	4	4%	17	18%	20	21%	53	56%	4	1	1	1	1.70	0.91	0.26
With ISO9000	100	32%	4	4%	17	17%	25	25%	54	54%	4	1	1	1	1.71	0.89	0.25
Without ISO9000	126	40%	0	0%	10	8%	21	17%	95	75%	3	1	1	1	1.33	0.62	0.24
Grp A w ISO9000	3	1%	0	0%	0	0%	2	67%	1	33%	2	1	2	2	1.67	0.58	-0.7
Grp A w/o ISO9000	65	21%	0	0%	4	6%	11	17%	50	77%	3	1	1	1	1.29	0.58	0.05
Grp B w ISO9000	13	4%	0	0%	2	15%	5	38%	6	46%	3	1	2	1	1.69	0.75	0.2
Grp B w/o ISO9000	54	17%	0	0%	4	7%	10	19%	40	74%	3	1	1	1	1.33	0.61	0.14
Grp C w ISO9000	84	27%	4	5%	15	18%	18	21%	47	56%	4	1	1	1	1.71	0.93	0.26
Grp C w/o ISO9000	10	3%	0	0%	2	20%	2	20%	6	60%	3	1	1	1	1.60	0.84	0.55

Results of the 1998 postal survey of Hong Kong Public Works Contractors.

Part	Part 2 Purpose of the IT																
Topic	.																
Subject	Use of hard-copy to communicate issue-related data/information																
Q.2.12.d	Response										Distribution Statistics						
Sample Sector	Nos	% o/a	No '4'	% '4'	No '3'	% '3'	No '2'	% '2'	No '1'	% '1'	H	L	Median	Mode	Mean	SD	Corr
All	232	73%	152	66%	50	22%	15	6%	14	6%	33	1	4	4	3.60	2.12	0.04
Group A	67	21%	38	57%	17	25%	5	7%	7	10%	4	1	4	4	3.28	1.00	0.01
Group B	68	22%	40	59%	20	29%	2	3%	5	7%	33	1	4	4	3.85	3.69	0.05
Group C	98	31%	74	76%	14	14%	8	8%	2	2%	4	1	4	4	3.63	0.72	0.13
With ISO9000	104	33%	77	74%	20	19%	5	5%	1	1%	33	1	4	4	3.96	2.94	0
Without ISO9000	129	41%	75	58%	31	24%	10	8%	13	10%	4	1	4	4	3.30	0.99	0.12
Grp A w ISO9000	3	1%	1	33%	2	67%	0	0%	0	0%	4	3	3	3	3.33	0.58	0.74
Grp A w/o ISO9000	67	21%	38	57%	17	25%	5	7%	7	10%	4	1	4	4	3.28	1.00	0.01
Grp B w ISO9000	14	4%	7	50%	6	43%	0	0%	0	0%	33	3	4	4	5.64	7.89	-0.1
Grp B w/o ISO9000	54	17%	33	61%	14	26%	2	4%	5	9%	4	1	4	4	3.39	0.94	0.15
Grp C w ISO9000	87	28%	69	79%	12	14%	5	6%	1	1%	4	1	4	4	3.71	0.63	0.11
Grp C w/o ISO9000	11	3%	5	45%	2	18%	3	27%	1	9%	4	1	3	4	3.00	1.10	0.33

Part	Part 2 Purpose of the IT																
Topic	.																
Subject	Transmission of 'names and addresses' ('company-related data) using IT																
Q.2.13.a	Response										Distribution Statistics						
Sample Sector	Nos	% o/a	No '4'	% '4'	No '3'	% '3'	No '2'	% '2'	No '1'	% '1'	H	L	Median	Mode	Mean	SD	Corr
All	232	73%	111	48%	77	33%	34	15%	10	4%	4	1	3	4	3.25	0.86	-0
Group A	68	22%	36	53%	22	32%	5	7%	5	7%	4	1	4	4	3.31	0.90	-0.4
Group B	68	22%	33	49%	25	37%	9	13%	1	1%	4	1	3	4	3.32	0.76	0.16
Group C	97	31%	42	43%	31	32%	20	21%	4	4%	4	1	3	4	3.14	0.89	-0
With ISO9000	102	32%	50	49%	30	29%	18	18%	4	4%	4	1	3	4	3.24	0.88	-0.1
Without ISO9000	131	41%	61	47%	48	37%	16	12%	6	5%	4	1	3	4	3.25	0.84	-0
Grp A w ISO9000	3	1%	2	67%	0	0%	0	0%	1	33%	4	1	4	4	3.00	1.73	-0.7
Grp A w/o ISO9000	68	22%	36	53%	22	32%	5	7%	5	7%	4	1	4	4	3.31	0.90	-0.4
Grp B w ISO9000	14	4%	9	64%	4	29%	1	7%	0	0%	4	2	4	4	3.57	0.65	0.28
Grp B w/o ISO9000	54	17%	24	44%	21	39%	8	15%	1	2%	4	1	3	4	3.26	0.78	0.1
Grp C w ISO9000	85	27%	39	46%	26	31%	17	20%	3	4%	4	1	3	4	3.19	0.88	-0.1
Grp C w/o ISO9000	12	4%	3	25%	5	42%	3	25%	1	8%	4	1	3	3	2.83	0.94	0.05

Results of the 1998 postal survey of Hong Kong Public Works Contractors.

Part	Part 2 Purpose of the IT																
Topic	.																
Subject	Transmission of 'file references' ('company-related data) using IT																
Q.2.13.b	Response										Distribution Statistics						
Sample Sector	Nos	% o/a	No '4'	% '4'	No '3'	% '3'	No '2'	% '2'	No '1'	% '1'	H	L	Median	Mode	Mean	SD	Corr
All	231	73%	83	36%	74	32%	55	24%	19	8%	4	1	3	4	2.96	0.96	-0
Group A	67	21%	27	40%	19	28%	11	16%	10	15%	4	1	3	4	2.94	1.09	-0.3
Group B	68	22%	23	34%	24	35%	17	25%	4	6%	4	1	3	3	2.97	0.91	0.09
Group C	97	31%	33	34%	32	33%	27	28%	5	5%	4	1	3	4	2.96	0.91	-0
With ISO9000	102	32%	34	33%	36	35%	27	26%	5	5%	4	1	3	3	2.97	0.90	-0
Without ISO9000	130	41%	49	38%	39	30%	28	22%	14	11%	4	1	3	4	2.95	1.01	0.02
Grp A w ISO9000	3	1%	1	33%	1	33%	0	0%	1	33%	4	1	3	nil	2.67	1.53	-0.9
Grp A w/o ISO9000	67	21%	27	40%	19	28%	11	16%	10	15%	4	1	3	4	2.9403	1.09	-0.3
Grp B w ISO9000	14	4%	3	21%	9	64%	2	14%	0	0%	4	2	3	3	3.07	0.62	-0.1
Grp B w/o ISO9000	54	17%	20	37%	15	28%	15	28%	4	7%	4	1	3	4	2.94	0.98	0.11
Grp C w ISO9000	85	27%	30	35%	26	31%	25	29%	4	5%	4	1	3	4	2.96	0.92	-0
Grp C w/o ISO9000	12	4%	3	25%	6	50%	2	17%	1	8%	4	1	3	3	2.92	0.90	0.01

Part	Part 2 Purpose of the IT																
Topic	.																
Subject	Transmission of 'telephone directories' ('company -related data) using IT																
Q.2.13.c	Response										Distribution Statistics						
Sample Sector	Nos	% o/a	No '4'	% '4'	No '3'	% '3'	No '2'	% '2'	No '1'	% '1'	H	L	Median	Mode	Mean	SD	Corr
All	230	73%	65	28%	74	32%	71	31%	20	9%	4	1	3	3	2.80	0.95	0.01
Group A	66	21%	18	27%	19	29%	21	32%	8	12%	4	1	3	2	2.71	1.00	-0.3
Group B	68	22%	18	26%	24	35%	20	29%	6	9%	4	1	3	3	2.79	0.94	0.13
Group C	97	31%	29	30%	31	32%	31	32%	6	6%	4	1	3	2	2.86	0.92	-0
With ISO9000	102	32%	29	28%	35	34%	32	31%	6	6%	4	1	3	3	2.85	0.91	-0
Without ISO9000	129	41%	36	28%	39	30%	40	31%	14	11%	4	1	3	2	2.75	0.98	-0
Grp A w ISO9000	3	1%	1	33%	0	0%	1	33%	1	33%	4	1	2	nil	2.33	1.53	-1
Grp A w/o ISO9000	66	21%	18	27%	19	29%	21	32%	8	12%	4	1	3	2	2.71	1.00	-0.3
Grp B w ISO9000	14	4%	3	21%	7	50%	4	29%	0	0%	4	2	3	3	2.93	0.73	0.14
Grp B w/o ISO9000	54	17%	15	28%	17	31%	16	30%	6	11%	4	1	3	3	2.76	0.99	0.11
Grp C w ISO9000	85	27%	25	29%	28	33%	27	32%	5	6%	4	1	3	3	2.86	0.91	-0
Grp C w/o ISO9000	12	4%	4	33%	3	25%	4	33%	1	8%	4	1	3	4	2.83	1.03	-0.3

Results of the 1998 postal survey of Hong Kong Public Works Contractors.

Part	Part 2 Purpose of the IT																
Topic	.																
Subject	Transmission of 'shared facilities eg meeting rooms' ('company -related data) using IT																
Q.2.13.d	Response										Distribution Statistics						
Sample Sector	Nos	% o/a	No '4'	% '4'	No '3'	% '3'	No '2'	% '2'	No '1'	% '1'	H	L	Median	Mode	Mean	SD	Corr
All	231	73%	39	17%	58	25%	87	38%	47	20%	4	1	2	2	2.39	0.99	0.06
Group A	67	21%	9	13%	15	22%	26	39%	17	25%	4	1	2	2	2.24	0.99	-0.3
Group B	68	22%	12	18%	19	28%	21	31%	16	24%	4	1	2	2	2.40	1.04	0.19
Group C	97	31%	18	19%	25	26%	40	41%	14	14%	4	1	2	2	2.48	0.96	0.05
With ISO9000	102	32%	19	19%	26	25%	43	42%	14	14%	4	1	2	2	2.49	0.95	0.03
Without ISO9000	130	41%	20	15%	33	25%	44	34%	33	25%	4	1	2	2	2.31	1.02	0.18
Grp A w ISO9000	3	1%	0	0%	0	0%	2	67%	1	33%	2	1	2	2	1.67	0.58	-0.7
Grp A w/o ISO9000	67	21%	9	13%	15	22%	26	39%	17	25%	4	1	2	2	2.24	0.99	-0.3
Grp B w ISO9000	14	4%	3	21%	5	36%	5	36%	1	7%	4	1	3	2	2.71	0.91	0.05
Grp B w/o ISO9000	54	17%	9	17%	14	26%	16	30%	15	28%	4	1	2	2	2.31	1.06	0.19
Grp C w ISO9000	85	27%	16	19%	21	25%	36	42%	12	14%	4	1	2	2	2.48	0.96	0.03
Grp C w/o ISO9000	12	4%	2	17%	4	33%	4	33%	2	17%	4	1	2.5	3	2.50	1.00	0.48

Part	Part 2 Purpose of the IT																
Topic	.																
Subject	Transmission of 'information registers' ('company -related data) using IT																
Q.2.13.e	Response										Distribution Statistics						
Sample Sector	Nos	% o/a	No '4'	% '4'	No '3'	% '3'	No '2'	% '2'	No '1'	% '1'	H	L	Median	Mode	Mean	SD	Corr
All	231	73%	45	19%	63	27%	86	37%	37	16%	4	1	2	2	2.50	0.98	0.04
Group A	67	21%	11	16%	16	24%	25	37%	15	22%	4	1	2	2	2.34	1.01	-0.1
Group B	68	22%	14	21%	22	32%	23	34%	9	13%	4	1	3	2	2.60	0.96	0.09
Group C	97	31%	20	21%	25	26%	39	40%	13	13%	4	1	2	2	2.54	0.97	0.05
With ISO9000	102	32%	22	22%	27	26%	41	40%	12	12%	4	1	2	2	2.58	0.96	0.03
Without ISO9000	130	41%	23	18%	36	28%	46	35%	25	19%	4	1	2	2	2.44	1.00	0.09
Grp A w ISO9000	3	1%	0	0%	0	0%	2	67%	1	33%	2	1	2	2	1.67	0.58	-0.7
Grp A w/o ISO9000	67	21%	11	16%	16	24%	25	37%	15	22%	4	1	2	2	2.34	1.01	-0.1
Grp B w ISO9000	14	4%	3	21%	7	50%	4	29%	0	0%	4	2	3	3	2.93	0.73	-0.2
Grp B w/o ISO9000	54	17%	11	20%	15	28%	19	35%	9	17%	4	1	2	2	2.52	1.00	0.1
Grp C w ISO9000	85	27%	19	22%	20	24%	35	41%	11	13%	4	1	2	2	2.55	0.98	0.04
Grp C w/o ISO9000	12	4%	1	8%	5	42%	4	33%	2	17%	4	1	2.5	3	2.42	0.90	0.24

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Part	Part 2 Purpose of the IT																
Topic	.																
Subject	Use of the telephone to communicate company-related data/information																
Q.2.14.a	Response										Distribution Statistics						
Sample Sector	Nos	% o/a	No '4'	% '4'	No '3'	% '3'	No '2'	% '2'	No '1'	% '1'	H	L	Median	Mode	Mean	SD	Corr
All	233	74%	152	65%	52	22%	23	10%	6	3%	4	1	4	4	3.50	0.78	0.03
Group A	67	21%	48	72%	15	22%	2	3%	2	3%	4	1	4	4	3.63	0.69	-0.2
Group B	69	22%	47	68%	18	26%	3	4%	1	1%	4	1	4	4	3.61	0.65	0.09
Group C	98	31%	57	58%	20	20%	18	18%	3	3%	4	1	4	4	3.34	0.88	0.1
With ISO9000	104	33%	66	63%	20	19%	16	15%	2	2%	4	1	4	4	3.44	0.82	0.08
Without ISO9000	130	41%	86	66%	33	25%	7	5%	4	3%	4	1	4	4	3.55	0.74	-0.2
Grp A w ISO9000	3	1%	3	100%	0	0%	0	0%	0	0%	4	4	4	4	4.00	0.00	nil
Grp A w/o ISO9000	67	21%	48	72%	15	22%	2	3%	2	3%	4	1	4	4	3.63	0.69	-0.2
Grp B w ISO9000	15	5%	13	87%	2	13%	0	0%	0	0%	4	3	4	4	3.87	0.35	0.21
Grp B w/o ISO9000	54	17%	34	63%	16	30%	3	6%	1	2%	4	1	4	4	3.54	0.69	0.02
Grp C w ISO9000	86	27%	50	58%	18	21%	16	19%	2	2%	4	1	4	4	3.35	0.86	0.11
Grp C w/o ISO9000	12	4%	7	58%	2	17%	2	17%	1	8%	4	1	4	4	3.25	1.06	-0.3

Part	Part 2 Purpose of the IT																
Topic	.																
Subject	Use of the fax to communicate company-related data/information																
Q.2.14.b	Response										Distribution Statistics						
Sample Sector	Nos	% o/a	No '4'	% '4'	No '3'	% '3'	No '2'	% '2'	No '1'	% '1'	H	L	Median	Mode	Mean	SD	Corr
All	233	74%	153	66%	63	27%	14	6%	3	1%	4	1	4	4	3.57	0.67	0.03
Group A	67	21%	43	64%	19	28%	3	4%	2	3%	4	1	4	4	3.54	0.72	-0
Group B	69	22%	47	68%	17	25%	5	7%	0	0%	4	2	4	4	3.61	0.62	0.08
Group C	98	31%	63	64%	28	29%	6	6%	1	1%	4	1	4	4	3.56	0.66	0.05
With ISO9000	104	33%	70	67%	27	26%	6	6%	1	1%	4	1	4	4	3.60	0.65	0.03
Without ISO9000	130	41%	83	64%	37	28%	8	6%	2	2%	4	1	4	4	3.55	0.68	0.02
Grp A w ISO9000	3	1%	3	100%	0	0%	0	0%	0	0%	4	4	4	4	4.00	0.00	nil
Grp A w/o ISO9000	67	21%	43	64%	19	28%	3	4%	2	3%	4	1	4	4	3.54	0.72	-0
Grp B w ISO9000	15	5%	10	67%	3	20%	2	13%	0	0%	4	2	4	4	3.53	0.74	-0.2
Grp B w/o ISO9000	54	17%	37	69%	14	26%	3	6%	0	0%	4	2	4	4	3.63	0.59	0.19
Grp C w ISO9000	86	27%	57	66%	24	28%	4	5%	1	1%	4	1	4	4	3.59	0.64	0.04
Grp C w/o ISO9000	12	4%	6	50%	4	33%	2	17%	0	0%	4	2	3.5	4	3.33	0.78	-0.1

Results of the 1998 postal survey of Hong Kong Public Works Contractors.

Part	Part 2 Purpose of the IT																
Topic	.																
Subject	Use of e-mail to communicate company-related data/information																
Q.2.14.c	Response										Distribution Statistics						
Sample Sector	Nos	% o/a	No '4'	% '4'	No '3'	% '3'	No '2'	% '2'	No '1'	% '1'	H	L	Median	Mode	Mean	SD	Corr
All	229	72%	9	4%	18	8%	52	23%	150	66%	4	1	1	1	1.50	0.80	0.19
Group A	66	21%	0	0%	3	5%	13	20%	50	76%	3	1	1	1	1.29	0.55	0.09
Group B	69	22%	2	3%	1	1%	18	26%	48	70%	4	1	1	1	1.38	0.67	0.2
Group C	95	30%	7	7%	14	15%	22	23%	52	55%	4	1	1	1	1.75	0.97	0.16
With ISO9000	103	33%	8	8%	13	13%	28	27%	54	52%	4	1	1	1	1.76	0.95	0.15
Without ISO9000	127	40%	1	1%	5	4%	25	20%	96	76%	4	1	1	1	1.30	0.58	0.13
Grp A w ISO9000	3	1%	0	0%	0	0%	2	67%	1	33%	2	1	2	2	1.67	0.58	-0.7
Grp A w/o ISO9000	66	21%	0	0%	3	5%	13	20%	50	76%	3	1	1	1	1.29	0.55	0.09
Grp B w ISO9000	15	5%	1	7%	1	7%	6	40%	7	47%	4	1	2	1	1.73	0.88	0.16
Grp B w/o ISO9000	54	17%	1	2%	0	0%	12	22%	41	76%	4	1	1	1	1.28	0.56	0.15
Grp C w ISO9000	85	27%	7	8%	12	14%	20	24%	46	54%	4	1	1	1	1.76	0.98	0.16
Grp C w/o ISO9000	10	3%	0	0%	2	20%	2	20%	6	60%	3	1	1	1	1.60	0.84	0.12

Part	Part 2 Purpose of the IT																
Topic	.																
Subject	Use of hard-copy to communicate company-related data/information																
Q.2.14.d	Response										Distribution Statistics						
Sample Sector	Nos	% o/a	No '4'	% '4'	No '3'	% '3'	No '2'	% '2'	No '1'	% '1'	H	L	Median	Mode	Mean	SD	Corr
All	229	72%	9	4%	10	4%	36	16%	174	76%	4	1	1	1	1.36	0.75	0.15
Group A	66	21%	1	2%	1	2%	9	14%	55	83%	4	1	1	1	1.21	0.54	0.08
Group B	69	22%	2	3%	0	0%	11	16%	56	81%	4	1	1	1	1.25	0.60	-0
Group C	95	30%	6	6%	9	9%	16	17%	64	67%	4	1	1	1	1.55	0.91	0.13
With ISO9000	102	32%	6	6%	8	8%	19	19%	69	68%	4	1	1	1	1.52	0.88	0.15
Without ISO9000	128	41%	3	2%	2	2%	17	13%	106	83%	4	1	1	1	1.23	0.60	-0.1
Grp A w ISO9000	3	1%	0	0%	0	0%	1	33%	2	67%	2	1	1	1	1.33	0.58	0.74
Grp A w/o ISO9000	66	21%	1	2%	1	2%	9	14%	55	83%	4	1	1	1	1.21	0.54	0.08
Grp B w ISO9000	15	5%	1	7%	0	0%	3	20%	11	73%	4	1	1	1	1.40	0.83	-0
Grp B w/o ISO9000	54	17%	1	2%	0	0%	8	15%	45	83%	4	1	1	1	1.20	0.53	-0.1
Grp C w ISO9000	84	27%	5	6%	8	10%	15	18%	56	67%	4	1	1	1	1.55	0.90	0.15
Grp C w/o ISO9000	11	3%	1	9%	1	9%	1	9%	8	73%	4	1	1	1	1.55	1.04	-0.2

Results of the 1998 postal survey of Hong Kong Public Works Contractors.

Part	Part 3 Use of the IT																
Topic	.																
Subject	Use of individual review of work-content data to combine together a portfolio view of projects																
Q.3.1.a	Response										Distribution Statistics						
Sample Sector	Nos	% o/a	No '4'	% '4'	No '3'	% '3'	No '2'	% '2'	No '1'	% '1'	H	L	Median	Mode	Mean	SD	Corr
All	231	73%	89	39%	91	39%	44	19%	7	3%	4	1	3	3	3.13	0.83	0.1
Group A	64	20%	23	36%	26	41%	12	19%	3	5%	4	1	3	3	3.08	0.86	0.21
Group B	72	23%	23	32%	32	44%	15	21%	2	3%	4	1	3	3	3.06	0.80	0.16
Group C	96	30%	43	45%	34	35%	17	18%	2	2%	4	1	3	4	3.23	0.81	0.11
With ISO9000	103	33%	42	41%	40	39%	18	17%	3	3%	4	1	3	4	3.17	0.82	0.13
Without ISO9000	129	41%	47	36%	52	40%	26	20%	4	3%	4	1	3	3	3.10	0.83	0.03
Grp A w ISO9000	3	1%	1	33%	1	33%	1	33%	0	0%	4	2	3	nil	3.00	1.00	0.98
Grp A w/o ISO9000	64	20%	23	36%	26	41%	12	19%	3	5%	4	1	3	3	3.08	0.86	0.21
Grp B w ISO9000	15	5%	2	13%	8	53%	4	27%	1	7%	4	1	3	3	2.7333	0.8	0.09
Grp B w/o ISO9000	57	18%	21	37%	24	42%	11	19%	1	2%	4	1	3	3	3.14	0.79	0.25
Grp C w ISO9000	85	27%	39	46%	31	36%	13	15%	2	2%	4	1	3	4	3.26	0.80	0.12
Grp C w/o ISO9000	11	3%	4	36%	3	27%	4	36%	0	0%	4	2	3	4	3.00	0.89	-0.4

Part	Part 3 Use of the IT																
Topic	.																
Subject	spreadsheets of numeric and date data of work-content data to combine together a portfolio view of projects																
Q.3.1.b	Response										Distribution Statistics						
Sample Sector	Nos	% o/a	No '4'	% '4'	No '3'	% '3'	No '2'	% '2'	No '1'	% '1'	H	L	Median	Mode	Mean	SD	Corr
All	232	73%	68	29%	98	42%	44	19%	22	9%	4	1	3	3	2.91	0.93	0.1
Group A	65	21%	18	28%	24	37%	10	15%	13	20%	4	1	3	3	2.72	1.08	0.1
Group B	72	23%	18	25%	30	42%	20	28%	4	6%	4	1	3	3	2.86	0.86	0.14
Group C	96	30%	32	33%	45	47%	14	15%	5	5%	4	1	3	3	3.08	0.83	0.1
With ISO9000	102	32%	31	30%	50	49%	16	16%	5	5%	4	1	3	3	3.049	0.81	0.12
Without ISO9000	131	41%	37	28%	49	37%	28	21%	17	13%	4	1	3	3	2.81	0.99	0.05
Grp A w ISO9000	3	1%	0	0%	1	33%	2	67%	0	0%	3	2	2	2	2.33	0.58	0.21
Grp A w/o ISO9000	65	21%	18	28%	24	37%	10	15%	13	20%	4	1	3	3	2.72	1.08	0.1
Grp B w ISO9000	15	5%	3	20%	8	53%	4	27%	0	0%	4	2	3	3	2.93	0.70	-0.1
Grp B w/o ISO9000	57	18%	15	26%	22	39%	16	28%	4	7%	4	1	3	3	2.84	0.90	0.2
Grp C w ISO9000	84	27%	28	33%	41	49%	10	12%	5	6%	4	1	3	3	3.10	0.83	0.11
Grp C w/o ISO9000	12	4%	4	33%	4	33%	4	33%	0	0%	4	2	3	4	3.00	0.85	-0.3

Results of the 1998 postal survey of Hong Kong Public Works Contractors.

Part	Part 3 Use of the IT																
Topic	.																
Subject	of database of alpha-numeric data of work-content data to combine together a portfolio view of projects																
Q.3.1.c	Response										Distribution Statistics						
Sample Sector	Nos	% o/a	No '4'	% '4'	No '3'	% '3'	No '2'	% '2'	No '1'	% '1'	H	L	Median	Mode	Mean	SD	Corr
All	231	73%	39	17%	68	29%	70	30%	54	23%	4	1	2	2	2.40	1.02	-0
Group A	65	21%	12	18%	19	29%	9	14%	25	38%	4	1	2	1	2.28	1.17	0.12
Group B	71	22%	8	11%	20	28%	24	34%	19	27%	4	1	2	2	2.24	0.98	0.11
Group C	96	30%	19	20%	30	31%	37	39%	10	10%	4	1	3	2	2.60	0.92	-0.1
With ISO9000	102	32%	17	17%	33	32%	38	37%	14	14%	4	1	2	2	2.52	0.93	-0.1
Without ISO9000	130	41%	22	17%	36	28%	32	25%	40	31%	4	1	2	1	2.31	1.08	0.06
Grp A w ISO9000	3	1%	0	0%	1	33%	1	33%	1	33%	3	1	2	nil	2.00	1.00	0.67
Grp A w/o ISO9000	65	21%	12	18%	19	29%	9	14%	25	38%	4	1	2	1	2.28	1.17	0.12
Grp B w ISO9000	15	5%	1	7%	5	33%	6	40%	3	20%	4	1	2	2	2.27	0.88	-0.1
Grp B w/o ISO9000	56	18%	7	13%	15	27%	18	32%	16	29%	4	1	2	2	2.23	1.01	0.16
Grp C w ISO9000	84	27%	16	19%	27	32%	31	37%	10	12%	4	1	3	2	2.58	0.93	-0.1
Grp C w/o ISO9000	12	4%	3	25%	3	25%	6	50%	0	0%	4	2	2.5	2	2.75	0.87	-0.2

Q.3.2 open question

Part	Part 3 Use of the IT																
Topic	.																
Subject	Use of individual review of time aspects data to combine together a portfolio view of projects																
Q.3.3.a	Response										Distribution Statistics						
Sample Sector	Nos	% o/a	No '4'	% '4'	No '3'	% '3'	No '2'	% '2'	No '1'	% '1'	H	L	Median	Mode	Mean	SD	Corr
All	231	73%	85	37%	99	43%	37	16%	10	4%	4	1	3	3	3.12	0.83	0.12
Group A	66	21%	22	33%	28	42%	10	15%	6	9%	4	1	3	3	3.00	0.93	0.17
Group B	70	22%	24	34%	33	47%	12	17%	1	1%	4	1	3	3	3.14	0.75	0.22
Group C	96	30%	39	41%	39	41%	15	16%	3	3%	4	1	3	3	3.19	0.81	0.15
With ISO9000	103	33%	39	38%	47	46%	15	15%	2	2%	4	1	3	3	3.19	0.75	0.15
Without ISO9000	129	41%	46	36%	53	41%	22	17%	8	6%	4	1	3	3	3.06	0.88	0.1
Grp A w ISO9000	3	1%	1	33%	2	67%	0	0%	0	0%	4	3	3	3	3.33	0.58	0.74
Grp A w/o ISO9000	66	21%	22	33%	28	42%	10	15%	6	9%	4	1	3	3	3.00	0.93	0.17
Grp B w ISO9000	15	5%	3	20%	10	67%	2	13%	0	0%	4	2	3	3	3.07	0.59	0.28
Grp B w/o ISO9000	55	17%	21	38%	23	42%	10	18%	1	2%	4	1	3	3	3.16	0.79	0.24
Grp C w ISO9000	85	27%	35	41%	35	41%	13	15%	2	2%	4	1	3	3	3.21	0.79	0.16
Grp C w/o ISO9000	11	3%	4	36%	4	36%	2	18%	1	9%	4	1	3	4	3.00	1.00	-0

Results of the 1998 postal survey of Hong Kong Public Works Contractors.

Part	Part 3 Use of the IT																	
Topic	.																	
Subject	spreadsheets of numeric and date data of time aspects data to combine together a portfolio view of projects																	
Q.3.3.b	Response										Distribution Statistics							
Sample Sector	Nos	% o/a	No '4'	% '4'	No '3'	% '3'	No '2'	% '2'	No '1'	% '1'	H	L	Median	Mode	Mean	SD	Corr	
All	230	73%	61	27%	100	43%	42	18%	27	12%	4	1	3	3	2.85	0.95	0.11	
Group A	66	21%	16	24%	24	36%	11	17%	15	23%	4	1	3	3	2.62	1.09	0.17	
Group B	70	22%	18	26%	31	44%	17	24%	4	6%	4	1	3	3	2.90	0.85	0.2	
Group C	95	30%	27	28%	46	48%	14	15%	8	8%	4	1	3	3	2.97	0.88	0.12	
With ISO9000	102	32%	28	27%	52	51%	15	15%	7	7%	4	1	3	3	2.99	0.84	0.12	
Without ISO9000	129	41%	33	26%	49	38%	27	21%	20	16%	4	1	3	3	2.74	1.01	0.1	
Grp A w ISO9000	3	1%	0	0%	2	67%	1	33%	0	0%	3	2	3	3	2.67	0.58	0.95	
Grp A w/o ISO9000	66	21%	16	24%	24	36%	11	17%	15	23%	4	1	3	3	2.62	1.09	0.17	
Grp B w ISO9000	15	5%	4	27%	9	60%	2	13%	0	0%	4	2	3	3	3.13	0.64	0.25	
Grp B w/o ISO9000	55	17%	14	25%	22	40%	15	27%	4	7%	4	1	3	3	2.84	0.90	0.16	
Grp C w ISO9000	84	27%	24	29%	41	49%	12	14%	7	8%	4	1	3	3	2.98	0.88	0.13	
Grp C w/o ISO9000	11	3%	3	27%	5	45%	2	18%	1	9%	4	1	3	3	2.91	0.94	0.02	

Part	Part 3 Use of the IT																
Topic	.																
Subject	of database of alpha-numeric data of time aspects data to combine together a portfolio view of projects																
Q.3.3.c	Response										Distribution Statistics						
Sample Sector	Nos	% o/a	No '4'	% '4'	No '3'	% '3'	No '2'	% '2'	No '1'	% '1'	H	L	Median	Mode	Mean	SD	Corr
All	230	73%	35	15%	64	28%	72	31%	59	26%	4	1	2	2	2.33	1.02	0.05
Group A	66	21%	12	18%	15	23%	12	18%	27	41%	4	1	2	1	2.18	1.16	0.11
Group B	70	22%	8	11%	20	29%	25	36%	17	24%	4	1	2	2	2.27	0.96	0.15
Group C	95	30%	15	16%	29	31%	36	38%	15	16%	4	1	2	2	2.46	0.94	0.02
With ISO9000	102	32%	13	13%	31	30%	41	40%	17	17%	4	1	2	2	2.39	0.91	0.04
Without ISO9000	129	41%	22	17%	33	26%	32	25%	42	33%	4	1	2	1	2.27	1.10	0.12
Grp A w ISO9000	3	1%	0	0%	0	0%	2	67%	1	33%	2	1	2	2	1.67	0.58	0.95
Grp A w/o ISO9000	66	21%	12	18%	15	23%	12	18%	27	41%	4	1	2	1	2.18	1.16	0.11
Grp B w ISO9000	15	5%	0	0%	6	40%	7	47%	2	13%	3	1	2	2	2.27	0.70	0.12
Grp B w/o ISO9000	55	17%	8	15%	14	25%	18	33%	15	27%	4	1	2	2	2.27	1.03	0.16
Grp C w ISO9000	84	27%	13	15%	25	30%	32	38%	14	17%	4	1	2	2	2.44	0.95	0.02
Grp C w/o ISO9000	11	3%	2	18%	4	36%	4	36%	1	9%	4	1	3	3	2.64	0.92	0.14

Q.3.4

open question

Part	Part 3 Use of the IT																
Topic	.																
Subject	Use of individual review of cost aspects data to combine together a portfolio view of projects																
Q.3.5.a	Response										Distribution Statistics						
Sample Sector	Nos	% o/a	No '4'	% '4'	No '3'	% '3'	No '2'	% '2'	No '1'	% '1'	H	L	Median	Mode	Mean	SD	Corr
All	227	72%	103	45%	87	38%	29	13%	8	4%	4	1	3	4	3.26	0.81	0.1
Group A	63	20%	29	46%	25	40%	6	10%	3	5%	4	1	3	4	3.27	0.83	0.05
Group B	69	22%	24	35%	33	48%	11	16%	1	1%	4	1	3	3	3.16	0.74	0.24
Group C	96	30%	50	52%	30	31%	12	13%	4	4%	4	1	4	4	3.31	0.85	0.11
With ISO9000	102	32%	48	47%	37	36%	14	14%	3	3%	4	1	3	4	3.27	0.81	0.12
Without ISO9000	126	40%	55	44%	51	40%	15	12%	5	4%	4	1	3	4	3.24	0.81	0.13
Grp A w ISO9000	3	1%	2	67%	1	33%	0	0%	0	0%	4	3	4	4	3.6667	0.58	-0.2
Grp A w/o ISO9000	63	20%	29	46%	25	40%	6	10%	3	5%	4	1	3	4	3.27	0.83	0.05
Grp B w ISO9000	14	4%	3	21%	8	57%	3	21%	0	0%	4	2	3	3	3.00	0.68	0.44
Grp B w/o ISO9000	55	17%	21	38%	25	45%	8	15%	1	2%	4	1	3	3	3.20	0.76	0.22
Grp C w ISO9000	85	27%	43	51%	28	33%	11	13%	3	4%	4	1	4	4	3.31	0.83	0.12
Grp C w/o ISO9000	11	3%	7	64%	2	18%	1	9%	1	9%	4	1	4	4	3.36	1.03	0.15

Part	Part 3 Use of the IT																
Topic	.																
Subject	spreadsheets of numeric and date data of cost aspects data to combine together a portfolio view of projects																
Q.3.5.b	Response										Distribution Statistics						
Sample Sector	Nos	% o/a	No '4'	% '4'	No '3'	% '3'	No '2'	% '2'	No '1'	% '1'	H	L	Median	Mode	Mean	SD	Corr
All	226	72%	76	34%	93	41%	34	15%	23	10%	4	1	3	3	2.98	0.95	0.04
Group A	63	20%	18	29%	23	37%	10	16%	12	19%	4	1	3	3	2.75	1.08	0.11
Group B	69	22%	20	29%	31	45%	15	22%	3	4%	4	1	3	3	2.99	0.83	0.15
Group C	95	30%	38	40%	40	42%	9	9%	8	8%	4	1	3	3	3.14	0.91	-0
With ISO9000	101	32%	36	36%	46	46%	12	12%	7	7%	4	1	3	3	3.10	0.87	0
Without ISO9000	126	40%	40	32%	48	38%	22	17%	16	13%	4	1	3	3	2.89	1.00	0.17
Grp A w ISO9000	3	1%	0	0%	2	67%	1	33%	0	0%	3	2	3	3	2.67	0.58	0.95
Grp A w/o ISO9000	63	20%	18	29%	23	37%	10	16%	12	19%	4	1	3	3	2.75	1.08	0.11
Grp B w ISO9000	14	4%	3	21%	7	50%	4	29%	0	0%	4	2	3	3	2.93	0.73	-0.1
Grp B w/o ISO9000	55	17%	17	31%	24	44%	11	20%	3	5%	4	1	3	3	3.00	0.86	0.21
Grp C w ISO9000	84	27%	33	39%	37	44%	7	8%	7	8%	4	1	3	3	3.14	0.89	-0
Grp C w/o ISO9000	11	3%	5	45%	3	27%	2	18%	1	9%	4	1	3	4	3.09	1.04	0.26

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Part	Part 3 Use of the IT																
Topic	.																
Subject	of database of alpha-numeric data of cost aspects data to combine together a portfolio view of projects																
Q.3.5.c	Response										Distribution Statistics						
Sample Sector	Nos	% o/a	No '4'	% '4'	No '3'	% '3'	No '2'	% '2'	No '1'	% '1'	H	L	Median	Mode	Mean	SD	Corr
All	226	72%	38	17%	65	29%	69	31%	54	24%	4	1	2	2	2.38	1.03	0.01
Group A	63	20%	10	16%	18	29%	13	21%	22	35%	4	1	2	1	2.25	1.11	0.12
Group B	69	22%	9	13%	20	29%	25	36%	15	22%	4	1	2	2	2.33	0.97	0.15
Group C	95	30%	19	20%	28	29%	31	33%	17	18%	4	1	2	2	2.52	1.01	-0
With ISO9000	101	32%	16	16%	32	32%	34	34%	19	19%	4	1	2	2	2.45	0.97	-0
Without ISO9000	126	40%	22	17%	34	27%	35	28%	35	28%	4	1	2	2	2.34	1.07	0.18
Grp A w ISO9000	3	1%	0	0%	1	33%	1	33%	1	33%	3	1	2	nil	2.00	1.00	0.67
Grp A w/o ISO9000	63	20%	10	16%	18	29%	13	21%	22	35%	4	1	2	1	2.25	1.11	0.12
Grp B w ISO9000	14	4%	1	7%	5	36%	6	43%	2	14%	4	1	2	2	2.36	0.84	0.15
Grp B w/o ISO9000	55	17%	8	15%	15	27%	19	35%	13	24%	4	1	2	2	2.33	1.00	0.15
Grp C w ISO9000	84	27%	15	18%	26	31%	27	32%	16	19%	4	1	2	2	2.48	1.00	-0
Grp C w/o ISO9000	11	3%	4	36%	2	18%	4	36%	1	9%	4	1	3	4	2.82	1.08	0.36

Q.3.6

open question

Part	Part 3 Use of the IT																
Topic	.																
Subject	Use of individual review of resource aspects data to combine together a portfolio view of projects																
Q.3.7.a	Response										Distribution Statistics						
Sample Sector	Nos	% o/a	No '4'	% '4'	No '3'	% '3'	No '2'	% '2'	No '1'	% '1'	H	L	Median	Mode	Mean	SD	Corr
All	230	73%	93	40%	93	40%	34	15%	10	4%	4	1	3	3	3.17	0.84	0.11
Group A	65	21%	25	38%	27	42%	9	14%	4	6%	4	1	3	3	3.12	0.88	0.06
Group B	71	22%	24	34%	35	49%	11	15%	1	1%	4	1	3	3	3.15	0.73	0.28
Group C	95	30%	44	46%	32	34%	14	15%	5	5%	4	1	3	4	3.21	0.89	0.14
With ISO9000	102	32%	44	43%	40	39%	14	14%	4	4%	4	1	3	4	3.22	0.83	0.14
Without ISO9000	129	41%	49	38%	54	42%	20	16%	6	5%	4	1	3	3	3.13	0.84	0.15
Grp A w ISO9000	3	1%	2	67%	1	33%	0	0%	0	0%	4	3	4	4	3.67	0.58	-0.2
Grp A w/o ISO9000	65	21%	25	38%	27	42%	9	14%	4	6%	4	1	3	3	3.12	0.88	0.06
Grp B w ISO9000	15	5%	4	27%	9	60%	2	13%	0	0%	4	2	3	3	3.13	0.64	0.54
Grp B w/o ISO9000	56	18%	20	36%	26	46%	9	16%	1	2%	4	1	3	3	3.16	0.76	0.24
Grp C w ISO9000	84	27%	38	45%	30	36%	12	14%	4	5%	4	1	3	4	3.21	0.87	0.14
Grp C w/o ISO9000	11	3%	6	55%	2	18%	2	18%	1	9%	4	1	4	4	3.18	1.08	0.22

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Part	Part 3 Use of the IT																
Topic	.																
Subject	preadsheets of numeric and date data of resource aspects data to combine together a portfolio view of projects																
Q.3.7.b	Response										Distribution Statistics						
Sample Sector	Nos	% o/a	No '4'	% '4'	No '3'	% '3'	No '2'	% '2'	No '1'	% '1'	H	L	Median	Mode	Mean	SD	Corr
All	228	72%	57	25%	99	43%	47	21%	25	11%	4	1	3	3	2.82	0.93	0.09
Group A	64	20%	16	25%	21	33%	14	22%	13	20%	4	1	3	3	2.63	1.08	0.08
Group B	71	22%	15	21%	34	48%	18	25%	4	6%	4	1	3	3	2.85	0.82	0.16
Group C	94	30%	26	28%	45	48%	15	16%	8	9%	4	1	3	3	2.95	0.88	0.1
With ISO9000	101	32%	24	24%	54	53%	16	16%	7	7%	4	1	3	3	2.94	0.82	0.09
Without ISO9000	128	41%	33	26%	46	36%	31	24%	18	14%	4	1	3	3	2.73	1.00	0.17
Grp A w ISO9000	3	1%	0	0%	1	33%	2	67%	0	0%	3	2	2	2	2.33	0.58	0.74
Grp A w/o ISO9000	64	20%	16	25%	21	33%	14	22%	13	20%	4	1	3	3	2.63	1.08	0.08
Grp B w ISO9000	15	5%	2	13%	11	73%	2	13%	0	0%	4	2	3	3	3.00	0.53	-0
Grp B w/o ISO9000	56	18%	13	23%	23	41%	16	29%	4	7%	4	1	3	3	2.80	0.88	0.18
Grp C w ISO9000	83	26%	22	27%	42	51%	12	14%	7	8%	4	1	3	3	2.95	0.87	0.09
Grp C w/o ISO9000	11	3%	4	36%	3	27%	3	27%	1	9%	4	1	3	4	2.91	1.04	0.34

Part	Part 3 Use of the IT																
Topic	.																
Subject	f database of alpha-numeric data of resource aspects data to combine together a portfolio view of projects																
Q.3.7.c	Response										Distribution Statistics						
Sample Sector	Nos	% o/a	No '4'	% '4'	No '3'	% '3'	No '2'	% '2'	No '1'	% '1'	H	L	Median	Mode	Mean	SD	Corr
All	228	72%	33	14%	69	30%	65	29%	61	27%	4	1	2	3	2.32	1.02	0.02
Group A	64	20%	11	17%	16	25%	12	19%	25	39%	4	1	2	1	2.20	1.14	0.07
Group B	71	22%	7	10%	24	34%	24	34%	16	23%	4	1	2	2	2.31	0.93	0.15
Group C	94	30%	15	16%	30	32%	29	31%	20	21%	4	1	2	3	2.43	1.00	-0
With ISO9000	101	32%	12	12%	35	35%	32	32%	22	22%	4	1	2	3	2.37	0.96	-0
Without ISO9000	128	41%	21	16%	35	27%	33	26%	39	30%	4	1	2	1	2.30	1.07	0.18
Grp A w ISO9000	3	1%	0	0%	0	0%	2	67%	1	33%	2	1	2	2	1.67	0.58	0.95
Grp A w/o ISO9000	64	20%	11	17%	16	25%	12	19%	25	39%	4	1	2	1	2.20	1.14	0.07
Grp B w ISO9000	15	5%	0	0%	7	47%	6	40%	2	13%	3	1	2	3	2.33	0.72	0.17
Grp B w/o ISO9000	56	18%	7	13%	17	30%	18	32%	14	25%	4	1	2	2	2.30	0.99	0.15
Grp C w ISO9000	83	26%	12	14%	28	34%	24	29%	19	23%	4	1	2	3	2.40	1.00	-0
Grp C w/o ISO9000	11	3%	3	27%	2	18%	5	45%	1	9%	4	1	2	2	2.64	1.03	0.45

Q.3.8

open question

Part	Part 4 Self-assessment of Strategic Use of Information Technology																
Topic	Competition and business strategy																
Subject	Does IT support your core capabilities																
Q.4.1.1	Response										Distribution Statistics						
Sample Sector	Nos	% o/a	No '4'	% '4'	No '3'	% '3'	No '2'	% '2'	No '1'	% '1'	H	L	Median	Mode	Mean	SD	Corr
All	217	69%	3	1%	70	32%	132	61%	12	6%	4	1	2	2	2.29	0.59	0.1
Group A	62	20%	1	2%	15	24%	40	65%	6	10%	4	1	2	2	2.18	0.61	0.06
Group B	65	21%	0	0%	19	29%	46	71%	0	0%	3	2	2	2	2.29	0.46	0.04
Group C	91	29%	2	2%	36	40%	47	52%	6	7%	4	1	2	2	2.37	0.64	0.11
With ISO9000	99	31%	1	1%	45	45%	48	48%	5	5%	4	1	2	2	2.42	0.61	0.09
Without ISO9000	119	38%	2	2%	25	21%	85	71%	7	6%	4	1	2	2	2.18	0.55	-0
Grp A w ISO9000	3	1%	0	0%	2	67%	1	33%	0	0%	3	2	3	3	2.67	0.58	-0.7
Grp A w/o ISO9000	62	20%	1	2%	15	24%	40	65%	6	10%	4	1	2	2	2.18	0.61	0.06
Grp B w ISO9000	15	5%	0	0%	8	53%	7	47%	0	0%	3	2	3	3	2.53	0.52	0.01
Grp B w/o ISO9000	50	16%	0	0%	11	22%	39	78%	0	0%	3	2	2	2	2.22	0.42	-0
Grp C w ISO9000	81	26%	1	1%	35	43%	40	49%	5	6%	4	1	2	2	2.40	0.63	0.12
Grp C w/o ISO9000	10	3%	1	10%	1	10%	7	70%	1	10%	4	1	2	2	2.20	0.79	-0.2

Part	Part 4 Self-assessment of Strategic Use of Information Technology																
Topic	Competition and business strategy																
Subject	How do you think IT could help you to compete																
Q.4.1.2	Response										Distribution Statistics						
Sample Sector	Nos	% o/a	No '4'	% '4'	No '3'	% '3'	No '2'	% '2'	No '1'	% '1'	H	L	Median	Mode	Mean	SD	Corr
All	217	69%	20	9%	74	34%	106	49%	17	8%	4	1	2	2	2.45	0.77	0.12
Group A	62	20%	6	10%	23	37%	25	40%	8	13%	4	1	2	2	2.44	0.84	0.04
Group B	65	21%	6	9%	21	32%	36	55%	2	3%	4	1	2	2	2.48	0.71	0.33
Group C	91	29%	8	9%	30	33%	46	51%	7	8%	4	1	2	2	2.43	0.76	0.18
With ISO9000	99	31%	11	11%	32	32%	52	53%	4	4%	4	1	2	2	2.51	0.75	0.14
Without ISO9000	119	38%	9	8%	42	35%	55	46%	13	11%	4	1	2	2	2.395	0.78	0.18
Grp A w ISO9000	3	1%	0	0%	2	67%	1	33%	0	0%	3	2	3	3	2.67	0.58	-0.7
Grp A w/o ISO9000	62	20%	6	10%	23	37%	25	40%	8	13%	4	1	2	2	2.44	0.84	0.04
Grp B w ISO9000	15	5%	4	27%	2	13%	9	60%	0	0%	4	2	2	2	2.67	0.90	0.11
Grp B w/o ISO9000	50	16%	2	4%	19	38%	27	54%	2	4%	4	1	2	2	2.42	0.64	0.4
Grp C w ISO9000	81	26%	7	9%	28	35%	42	52%	4	5%	4	1	2	2	2.47	0.73	0.17
Grp C w/o ISO9000	10	3%	1	10%	2	20%	4	40%	3	30%	4	1	2	2	2.10	0.99	0.28

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Part	Part 4 Self-assessment of Strategic Use of Information Technology																
Topic	Competition and business strategy																
Subject	What is the impact of IT on your corporate goals and objectives																
Q.4.1.3	Response										Distribution Statistics						
Sample Sector	Nos	% o/a	No '4'	% '4'	No '3'	% '3'	No '2'	% '2'	No '1'	% '1'	H	L	Median	Mode	Mean	SD	Corr
All	216	68%	12	6%	113	52%	82	38%	9	4%	4	1	3	3	2.59	0.66	0.17
Group A	62	20%	3	5%	28	45%	29	47%	2	3%	4	1	2.5	3	2.52	0.65	0.12
Group B	64	20%	2	3%	34	53%	25	39%	3	5%	4	1	3	3	2.55	0.64	0.23
Group C	91	29%	7	8%	51	56%	29	32%	4	4%	4	1	3	3	2.67	0.68	0.22
With ISO9000	99	31%	8	8%	59	60%	30	30%	2	2%	4	1	3	3	2.74	0.63	0.19
Without ISO9000	118	37%	4	3%	54	46%	53	45%	7	6%	4	1	2	3	2.47	0.66	0.14
Grp A w ISO9000	3	1%	0	0%	2	67%	1	33%	0	0%	3	2	3	3	2.67	0.58	-0.2
Grp A w/o ISO9000	62	20%	3	5%	28	45%	29	47%	2	3%	4	1	2.5	2	2.52	0.65	0.12
Grp B w ISO9000	15	5%	2	13%	9	60%	4	27%	0	0%	4	2	3	3	2.87	0.64	-0.1
Grp B w/o ISO9000	49	16%	0	0%	25	51%	21	43%	3	6%	3	1	3	3	2.45	0.61	0.26
Grp C w ISO9000	81	26%	6	7%	48	59%	25	31%	2	2%	4	1	3	3	2.72	0.64	0.22
Grp C w/o ISO9000	10	3%	1	10%	3	30%	4	40%	2	20%	4	1	2	2	2.30	0.95	0.2

Part	Part 4 Self-assessment of Strategic Use of Information Technology																
Topic	Competition and business strategy																
Subject	With regard to IT, what is your position compared to your competitors																
Q.4.1.4	Response										Distribution Statistics						
Sample Sector	Nos	% o/a	No '4'	% '4'	No '3'	% '3'	No '2'	% '2'	No '1'	% '1'	H	L	Median	Mode	Mean	SD	Corr
All	214	68%	15	7%	112	52%	53	25%	34	16%	4	1	3	3	2.50	0.84	0.2
Group A	62	20%	2	3%	27	44%	19	31%	14	23%	4	1	2	3	2.27	0.85	0.09
Group B	64	20%	3	5%	36	56%	15	23%	10	16%	4	1	3	3	2.50	0.82	0.01
Group C	89	28%	10	11%	50	56%	19	21%	10	11%	4	1	3	3	2.67	0.82	0.25
With ISO9000	97	31%	11	11%	54	56%	21	22%	11	11%	4	1	3	3	2.67	0.83	0.24
Without ISO9000	118	37%	4	3%	59	50%	32	27%	23	19%	4	1	3	3	2.37	0.84	0.04
Grp A w ISO9000	3	1%	0	0%	3	100%	0	0%	0	0%	3	3	3	3	3.00	0.00	nil
Grp A w/o ISO9000	62	20%	2	3%	27	44%	19	31%	14	23%	4	1	2	3	2.27	0.85	0.09
Grp B w ISO9000	15	5%	1	7%	7	47%	5	33%	2	13%	4	1	3	3	2.47	0.83	0.5
Grp B w/o ISO9000	49	16%	2	4%	29	59%	10	20%	8	16%	4	1	3	3	2.51	0.82	-0.1
Grp C w ISO9000	79	25%	10	13%	44	56%	16	20%	9	11%	4	1	3	3	2.70	0.84	0.25
Grp C w/o ISO9000	10	3%	0	0%	6	60%	3	30%	1	10%	3	1	3	3	2.50	0.71	0.29

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Part	Part 4 Self-assessment of Strategic Use of Information Technology																
Topic	Competition and business strategy																
Subject	What is the impact of your use of IT on your clients																
Q.4.1.5	Response										Distribution Statistics						
Sample Sector	Nos	% o/a	No '4'	% '4'	No '3'	% '3'	No '2'	% '2'	No '1'	% '1'	H	L	Median	Mode	Mean	SD	Corr
All	216	68%	21	10%	118	55%	58	27%	19	9%	4	1	3	3	2.65	0.77	-0
Group A	62	20%	7	11%	33	53%	15	24%	7	11%	4	1	3	3	2.65	0.83	0.08
Group B	64	20%	5	8%	37	58%	15	23%	7	11%	4	1	3	3	2.63	0.79	0.1
Group C	91	29%	9	10%	48	53%	29	32%	5	5%	4	1	3	3	2.67	0.73	-0
With ISO9000	99	31%	12	12%	53	54%	29	29%	5	5%	4	1	3	3	2.73	0.74	-0
Without ISO9000	118	37%	9	8%	65	55%	30	25%	14	12%	4	1	3	3	2.58	0.80	0.05
Grp A w ISO9000	3	1%	0	0%	2	67%	1	33%	0	0%	3	2	3	3	2.67	0.58	-0.7
Grp A w/o ISO9000	62	20%	7	11%	33	53%	15	24%	7	11%	4	1	3	3	2.65	0.83	0.08
Grp B w ISO9000	15	5%	3	20%	10	67%	1	7%	1	7%	4	1	3	3	3.00	0.76	-0.1
Grp B w/o ISO9000	49	16%	2	4%	27	55%	14	29%	6	12%	4	1	3	3	2.51	0.77	0.06
Grp C w ISO9000	81	26%	9	11%	41	51%	27	33%	4	5%	4	1	3	3	2.68	0.74	-0
Grp C w/o ISO9000	10	3%	0	0%	7	70%	2	20%	1	10%	3	1	3	3	2.60	0.70	0.15

Part	Part 4 Self-assessment of Strategic Use of Information Technology																
Topic	Competition and business strategy																
Subject	Do you think your company IT expertise will help it to win work																
Q.4.1.6	Response										Distribution Statistics						
Sample Sector	Nos	% o/a	No '4'	% '4'	No '3'	% '3'	No '2'	% '2'	No '1'	% '1'	H	L	Median	Mode	Mean	SD	Corr
All	216	68%	14	6%	59	27%	108	50%	35	16%	4	1	2	2	2.24	0.80	0.06
Group A	62	20%	2	3%	17	27%	31	50%	12	19%	4	1	2	2	2.15	0.76	0.09
Group B	64	20%	3	5%	13	20%	37	58%	11	17%	4	1	2	2	2.13	0.75	0.38
Group C	91	29%	9	10%	29	32%	41	45%	12	13%	4	1	2	2	2.38	0.84	0.01
With ISO9000	99	31%	9	9%	33	33%	47	47%	10	10%	4	1	2	2	2.41	0.80	0.01
Without ISO9000	118	37%	5	4%	26	22%	62	53%	25	21%	4	1	2	2	2.09	0.77	0.07
Grp A w ISO9000	3	1%	0	0%	1	33%	1	33%	1	33%	3	1	2	nil	2.00	1.00	-0.3
Grp A w/o ISO9000	62	20%	2	3%	17	27%	31	50%	12	19%	4	1	2	2	2.15	0.76	0.09
Grp B w ISO9000	15	5%	2	13%	4	27%	9	60%	0	0%	4	2	2	2	2.53	0.74	0.37
Grp B w/o ISO9000	49	16%	1	2%	9	18%	28	57%	11	22%	4	1	2	2	2.00	0.71	0.31
Grp C w ISO9000	81	26%	7	9%	28	35%	37	46%	9	11%	4	1	2	2	2.41	0.80	0.01
Grp C w/o ISO9000	10	3%	2	20%	1	10%	4	40%	3	30%	4	1	2	2	2.20	1.14	-0.1

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Part	Part 4 Self-assessment of Strategic Use of Information Technology																
Topic	Competition and business strategy																
Subject	How is IT used as a part of strategi/business alliances																
Q.4.1.7	Response										Distribution Statistics						
Sample Sector	Nos	% o/a	No '4'	% '4'	No '3'	% '3'	No '2'	% '2'	No '1'	% '1'	H	L	Median	Mode	Mean	SD	Corr
All	216	68%	14	6%	52	24%	137	63%	13	6%	4	1	2	2	2.31	0.68	0.14
Group A	62	20%	3	5%	13	21%	37	60%	9	15%	4	1	2	2	2.16	0.73	0.19
Group B	64	20%	1	2%	20	31%	41	64%	2	3%	4	1	2	2	2.31	0.56	0.04
Group C	91	29%	10	11%	19	21%	60	66%	2	2%	4	1	2	2	2.41	0.71	0.17
With ISO9000	99	31%	10	10%	22	22%	65	66%	2	2%	4	1	2	2	2.40	0.70	0.16
Without ISO9000	118	37%	4	3%	30	25%	73	62%	11	9%	4	1	2	2	2.23	0.66	0.13
Grp A w ISO9000	3	1%	0	0%	0	0%	3	100%	0	0%	2	2	2	2	2.00	0.00	nil
Grp A w/o ISO9000	62	20%	3	5%	13	21%	37	60%	9	15%	4	1	2	2	2.16	0.73	0.19
Grp B w ISO9000	15	5%	0	0%	6	40%	8	53%	1	7%	3	1	2	2	2.33	0.62	0.2
Grp B w/o ISO9000	49	16%	1	2%	14	29%	33	67%	1	2%	4	1	2	2	2.31	0.55	-0
Grp C w ISO9000	81	26%	10	12%	16	20%	54	67%	1	1%	4	1	2	2	2.43	0.72	0.16
Grp C w/o ISO9000	10	3%	0	0%	3	30%	6	60%	1	10%	3	1	2	2	2.20	0.63	0.47

Part	Part 4 Self-assessment of Strategic Use of Information Technology																
Topic	The role of IT																
Subject	How do you currently use IT in your company																
Q.4.2.1	Response										Distribution Statistics						
Sample Sector	Nos	% o/a	No '4'	% '4'	No '3'	% '3'	No '2'	% '2'	No '1'	% '1'	H	L	Median	Mode	Mean	SD	Corr
All	216	68%	19	9%	59	27%	110	51%	28	13%	4	1	2	2	2.32	0.81	0.2
Group A	62	20%	3	5%	11	18%	32	52%	16	26%	4	1	2	2	2.02	0.80	0.17
Group B	64	20%	4	6%	21	33%	34	53%	5	8%	4	1	2	2	2.38	0.72	0.26
Group C	91	29%	12	13%	27	30%	44	48%	8	9%	4	1	2	2	2.47	0.83	0.24
With ISO9000	99	31%	12	12%	32	32%	50	51%	5	5%	4	1	2	2	2.52	0.77	0.24
Without ISO9000	118	37%	7	6%	27	23%	60	51%	24	20%	4	1	2	2	2.14	0.81	0.1
Grp A w ISO9000	3	1%	0	0%	1	33%	2	67%	0	0%	3	2	2	2	2.33	0.58	-1
Grp A w/o ISO9000	62	20%	3	5%	11	18%	32	52%	16	26%	4	1	2	2	2.02	0.80	0.17
Grp B w ISO9000	15	5%	1	7%	6	40%	8	53%	0	0%	4	2	2	2	2.53	0.64	0.46
Grp B w/o ISO9000	49	16%	3	6%	15	31%	26	53%	5	10%	4	1	2	2	2.33	0.75	0.17
Grp C w ISO9000	81	26%	11	14%	25	31%	40	49%	5	6%	4	1	2	2	2.52	0.81	0.25
Grp C w/o ISO9000	10	3%	1	10%	2	20%	4	40%	3	30%	4	1	2	2	2.10	0.99	-0

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Part	Part 4 Self-assessment of Strategic Use of Information Technology																
Topic	The role of IT																
Subject	How would you describe the relationship between IT and your business strategy																
Q.4.2.2	Response										Distribution Statistics						
Sample Sector	Nos	% o/a	No '4'	% '4'	No '3'	% '3'	No '2'	% '2'	No '1'	% '1'	H	L	Median	Mode	Mean	SD	Corr
All	216	68%	7	3%	48	22%	135	63%	26	12%	4	1	2	2	2.17	0.67	0.06
Group A	62	20%	2	3%	12	19%	37	60%	11	18%	4	1	2	2	2.08	0.71	0.01
Group B	64	20%	2	3%	12	19%	43	67%	7	11%	4	1	2	2	2.14	0.64	0.16
Group C	91	29%	3	3%	24	26%	56	62%	8	9%	4	1	2	2	2.24	0.66	0.06
With ISO9000	99	31%	3	3%	27	27%	62	63%	7	7%	4	1	2	2	2.26	0.63	0.05
Without ISO9000	118	37%	4	3%	21	18%	74	63%	19	16%	4	1	2	2	2.08	0.69	0.05
Grp A w ISO9000	3	1%	0	0%	1	33%	2	67%	0	0%	3	2	2	2	2.33	0.58	-1
Grp A w/o ISO9000	62	20%	2	3%	12	19%	37	60%	11	18%	4	1	2	2	2.08	0.71	0.01
Grp B w ISO9000	15	5%	1	7%	2	13%	11	73%	1	7%	4	1	2	2	2.20	0.68	0.04
Grp B w/o ISO9000	49	16%	1	2%	10	20%	32	65%	6	12%	4	1	2	2	2.12	0.63	0.18
Grp C w ISO9000	81	26%	2	2%	24	30%	49	60%	6	7%	4	1	2	2	2.27	0.63	0.05
Grp C w/o ISO9000	10	3%	1	10%	0	0%	7	70%	2	20%	4	1	2	2	2.00	0.82	-0

Part	Part 4 Self-assessment of Strategic Use of Information Technology																
Topic	The role of IT																
Subject	What is the level of participation of your IT people in the development of your overall business strategy																
Q.4.2.3	Response										Distribution Statistics						
Sample Sector	Nos	% o/a	No '4'	% '4'	No '3'	% '3'	No '2'	% '2'	No '1'	% '1'	H	L	Median	Mode	Mean	SD	Corr
All	215	68%	4	2%	22	10%	123	57%	66	31%	4	1	2	2	1.83	0.68	0.09
Group A	62	20%	2	3%	4	6%	33	53%	23	37%	4	1	2	2	1.76	0.72	0.14
Group B	64	20%	0	0%	8	13%	37	58%	19	30%	3	1	2	2	1.83	0.63	0.28
Group C	90	28%	2	2%	10	11%	54	60%	24	27%	4	1	2	2	1.89	0.68	0.1
With ISO9000	98	31%	2	2%	10	10%	62	63%	24	24%	4	1	2	2	1.90	0.65	0.1
Without ISO9000	118	37%	2	2%	12	10%	62	53%	42	36%	4	1	2	2	1.78	0.69	0.11
Grp A w ISO9000	3	1%	0	0%	0	0%	3	100%	0	0%	2	2	2	2	2.00	0.00	nil
Grp A w/o ISO9000	62	20%	2	3%	4	6%	33	53%	23	37%	4	1	2	2	1.76	0.72	0.14
Grp B w ISO9000	15	5%	0	0%	1	7%	11	73%	3	20%	3	1	2	2	1.87	0.52	0.55
Grp B w/o ISO9000	49	16%	0	0%	7	14%	26	53%	16	33%	3	1	2	2	1.82	0.67	0.22
Grp C w ISO9000	80	25%	2	3%	9	11%	48	60%	21	26%	4	1	2	2	1.90	0.69	0.1
Grp C w/o ISO9000	10	3%	0	0%	1	10%	6	60%	3	30%	3	1	2	2	1.80	0.63	0.07

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Part	Part 4 Self-assessment of Strategic Use of Information Technology																
Topic	The role of IT																
Subject	Does IT have an impact on your operational strategy																
Q.4.2.4	Response										Distribution Statistics						
Sample Sector	Nos	% o/a	No '4'	% '4'	No '3'	% '3'	No '2'	% '2'	No '1'	% '1'	H	L	Median	Mode	Mean	SD	Corr
All	216	68%	6	3%	52	24%	107	50%	51	24%	4	1	2	2	2.06	0.77	0.14
Group A	62	20%	2	3%	14	23%	33	53%	13	21%	4	1	2	2	2.08	0.75	0.08
Group B	64	20%	0	0%	19	30%	32	50%	13	20%	3	1	2	2	2.09	0.71	0.27
Group C	91	29%	4	4%	19	21%	43	47%	25	27%	4	1	2	2	2.02	0.82	0.21
With ISO9000	99	31%	3	3%	25	25%	48	48%	23	23%	4	1	2	2	2.08	0.78	0.19
Without ISO9000	118	37%	3	3%	27	23%	60	51%	28	24%	4	1	2	2	2.04	0.76	0.12
Grp A w ISO9000	3	1%	0	0%	1	33%	2	67%	0	0%	3	2	2	2	2.33	0.58	-1
Grp A w/o ISO9000	62	20%	2	3%	14	23%	33	53%	13	21%	4	1	2	2	2.08	0.75	0.08
Grp B w ISO9000	15	5%	0	0%	6	40%	7	47%	2	13%	3	1	2	2	2.27	0.70	0.02
Grp B w/o ISO9000	49	16%	0	0%	13	27%	25	51%	11	22%	3	1	2	2	2.04	0.71	0.32
Grp C w ISO9000	81	26%	3	4%	18	22%	39	48%	21	26%	4	1	2	2	2.04	0.80	0.22
Grp C w/o ISO9000	10	3%	1	10%	1	10%	4	40%	4	40%	4	1	2	1	1.90	0.99	0.04

Part	Part 4 Self-assessment of Strategic Use of Information Technology																
Topic	The role of IT																
Subject	Does IT have any influence on the delivery of your marketing																
Q.4.2.5	Response										Distribution Statistics						
Sample Sector	Nos	% o/a	No '4'	% '4'	No '3'	% '3'	No '2'	% '2'	No '1'	% '1'	H	L	Median	Mode	Mean	SD	Corr
All	216	68%	3	1%	40	19%	116	54%	57	26%	4	1	2	2	1.95	0.71	0.12
Group A	62	20%	1	2%	8	13%	27	44%	26	42%	4	1	2	2	1.74	0.75	0.15
Group B	64	20%	0	0%	11	17%	38	59%	15	23%	3	1	2	2	1.94	0.64	0.31
Group C	91	29%	2	2%	21	23%	51	56%	17	19%	4	1	2	2	2.09	0.71	0.1
With ISO9000	99	31%	1	1%	21	21%	62	63%	15	15%	4	1	2	2	2.08	0.63	0.12
Without ISO9000	118	37%	2	2%	19	16%	54	46%	43	36%	4	1	2	2	1.83	0.75	0.13
Grp A w ISO9000	3	1%	0	0%	0	0%	3	100%	0	0%	2	2	2	2	2.00	0.00	nil
Grp A w/o ISO9000	62	20%	1	2%	8	13%	27	44%	26	42%	4	1	2	2	1.74	0.75	0.15
Grp B w ISO9000	15	5%	0	0%	3	20%	10	67%	2	13%	3	1	2	2	2.07	0.59	0.38
Grp B w/o ISO9000	49	16%	0	0%	8	16%	28	57%	13	27%	3	1	2	2	1.90	0.65	0.26
Grp C w ISO9000	81	26%	1	1%	18	22%	49	60%	13	16%	4	1	2	2	2.09	0.66	0.12
Grp C w/o ISO9000	10	3%	1	10%	3	30%	2	20%	4	40%	4	1	2	1	2.10	1.10	-0

Results of the 1998 postal survey of Hong Kong Public Works Contractors.

Part	Part 4 Self-assessment of Strategic Use of Information Technology																
Topic	IT strategy																
Subject	How would you describe the use of IT systems in your company																
Q.4.3.1	Response										Distribution Statistics						
Sample Sector	Nos	% o/a	No '4'	% '4'	No '3'	% '3'	No '2'	% '2'	No '1'	% '1'	H	L	Median	Mode	Mean	SD	Corr
All	215	68%	9	4%	21	10%	99	46%	86	40%	4	1	2	2	1.78	0.79	0.12
Group A	62	20%	4	6%	5	8%	25	40%	28	45%	4	1	2	1	1.76	0.86	0.15
Group B	64	20%	1	2%	4	6%	36	56%	23	36%	4	1	2	2	1.73	0.65	0.16
Group C	90	28%	5	6%	12	13%	38	42%	35	39%	4	1	2	2	1.86	0.86	0.14
With ISO9000	99	31%	4	4%	12	12%	48	48%	35	35%	4	1	2	2	1.85	0.79	0.15
Without ISO9000	117	37%	6	5%	9	8%	51	44%	51	44%	4	1	2	2	1.74	0.81	0.06
Grp A w ISO9000	3	1%	0	0%	0	0%	3	100%	0	0%	2	2	2	2	2.00	0.00	nil
Grp A w/o ISO9000	62	20%	4	6%	5	8%	25	40%	28	45%	4	1	2	1	1.76	0.86	0.15
Grp B w ISO9000	15	5%	0	0%	1	7%	11	73%	3	20%	3	1	2	2	1.87	0.52	0.26
Grp B w/o ISO9000	49	16%	1	2%	3	6%	25	51%	20	41%	4	1	2	2	1.69	0.68	0.12
Grp C w ISO9000	81	26%	4	5%	11	14%	34	42%	32	40%	4	1	2	2	1.84	0.84	0.16
Grp C w/o ISO9000	9	3%	1	11%	1	11%	4	44%	3	33%	4	1	2	2	2.00	1.00	-0

Part	Part 4 Self-assessment of Strategic Use of Information Technology																
Topic	IT strategy																
Subject	What are the objectives of your IT strategy																
Q.4.3.2	Response										Distribution Statistics						
Sample Sector	Nos	% o/a	No '4'	% '4'	No '3'	% '3'	No '2'	% '2'	No '1'	% '1'	H	L	Median	Mode	Mean	SD	Corr
All	213	67%	4	2%	51	24%	88	41%	70	33%	4	1	2	2	1.95	0.80	0.1
Group A	62	20%	2	3%	9	15%	29	47%	22	35%	4	1	2	2	1.85	0.79	0.06
Group B	64	20%	2	3%	15	23%	26	41%	21	33%	4	1	2	2	1.97	0.84	0.2
Group C	88	28%	0	0%	27	31%	33	38%	28	32%	3	1	2	2	1.99	0.80	0.13
With ISO9000	97	31%	0	0%	28	29%	41	42%	28	29%	3	1	2	2	2.00	0.76	0.13
Without ISO9000	117	37%	4	3%	23	20%	47	40%	43	37%	4	1	2	2	1.90	0.83	0.11
Grp A w ISO9000	3	1%	0	0%	0	0%	3	100%	0	0%	2	2	2	2	2.00	0.00	nil
Grp A w/o ISO9000	62	20%	2	3%	9	15%	29	47%	22	35%	4	1	2	2	1.85	0.79	0.06
Grp B w ISO9000	15	5%	0	0%	4	27%	7	47%	4	27%	3	1	2	2	2.00	0.76	0.16
Grp B w/o ISO9000	49	16%	2	4%	11	22%	19	39%	17	35%	4	1	2	2	1.96	0.87	0.21
Grp C w ISO9000	79	25%	0	0%	24	30%	31	39%	24	30%	3	1	2	2	2.00	0.78	0.14
Grp C w/o ISO9000	9	3%	0	0%	3	33%	2	22%	4	44%	3	1	2	1	1.89	0.93	0.08

Results of the 1998 postal survey of Hong Kong Public Works Contractors.

Part	Part 4 Self-assessment of Strategic Use of Information Technology																
Topic	IT strategy																
Subject	What is the thrust of your IT strategy																
Q.4.3.3	Response										Distribution Statistics						
Sample Sector	Nos	% o/a	No '4'	% '4'	No '3'	% '3'	No '2'	% '2'	No '1'	% '1'	H	L	Median	Mode	Mean	SD	Corr
All	212	67%	12	6%	49	23%	81	38%	70	33%	4	1	2	2	2.01	0.89	0.06
Group A	61	19%	2	3%	17	28%	18	30%	24	39%	4	1	2	1	1.95	0.90	0.12
Group B	63	20%	2	3%	12	19%	28	44%	21	33%	4	1	2	2	1.92	0.81	0.17
Group C	89	28%	8	9%	20	22%	36	40%	25	28%	4	1	2	2	2.12	0.93	0.05
With ISO9000	98	31%	8	8%	21	21%	45	46%	24	24%	4	1	2	2	2.13	0.88	0.05
Without ISO9000	115	36%	4	3%	28	24%	37	32%	46	40%	4	1	2	1	1.91	0.88	0.05
Grp A w ISO9000	3	1%	0	0%	0	0%	3	100%	0	0%	2	2	2	2	2.00	0.00	nil
Grp A w/o ISO9000	61	19%	2	3%	17	28%	18	30%	24	39%	4	1	2	1	1.95	0.90	0.12
Grp B w ISO9000	15	5%	1	7%	3	20%	10	67%	1	7%	4	1	2	2	2.27	0.70	-0
Grp B w/o ISO9000	48	15%	1	2%	9	19%	18	38%	20	42%	4	1	2	1	1.81	0.82	0.16
Grp C w ISO9000	80	25%	7	9%	18	23%	32	40%	23	29%	4	1	2	2	2.11	0.93	0.06
Grp C w/o ISO9000	9	3%	1	11%	2	22%	4	44%	2	22%	4	1	2	2	2.22	0.97	-0.1

Part	Part 4 Self-assessment of Strategic Use of Information Technology																
Topic	IT strategy																
Subject	How do you intend to manage IT in the future																
Q.4.3.4	Response										Distribution Statistics						
Sample Sector	Nos	% o/a	No '4'	% '4'	No '3'	% '3'	No '2'	% '2'	No '1'	% '1'	H	L	Median	Mode	Mean	SD	Corr
All	214	68%	14	7%	58	27%	87	41%	55	26%	4	1	2	2	2.14	0.88	0.11
Group A	62	20%	2	3%	18	29%	24	39%	18	29%	4	1	2	2	2.06	0.85	0.15
Group B	64	20%	4	6%	13	20%	27	42%	20	31%	4	1	2	2	2.02	0.88	0.36
Group C	89	28%	8	9%	27	30%	37	42%	17	19%	4	1	2	2	2.29	0.88	0.1
With ISO9000	98	31%	8	8%	32	33%	41	42%	17	17%	4	1	2	2	2.32	0.86	0.1
Without ISO9000	117	37%	6	5%	26	22%	47	40%	38	32%	4	1	2	2	2.00	0.87	0.12
Grp A w ISO9000	3	1%	0	0%	2	67%	1	33%	0	0%	3	2	3	3	2.67	0.58	-0.7
Grp A w/o ISO9000	62	20%	2	3%	18	29%	24	39%	18	29%	4	1	2	2	2.06	0.85	0.15
Grp B w ISO9000	15	5%	2	13%	5	33%	6	40%	2	13%	4	1	2	2	2.47	0.92	0.18
Grp B w/o ISO9000	49	16%	2	4%	8	16%	21	43%	18	37%	4	1	2	2	1.88	0.83	0.36
Grp C w ISO9000	80	25%	6	8%	25	31%	34	43%	15	19%	4	1	2	2	2.28	0.86	0.12
Grp C w/o ISO9000	9	3%	2	22%	2	22%	3	33%	2	22%	4	1	2	2	2.44	1.13	-0.2

Results of the 1998 postal survey of Hong Kong Public Works Contractors.

Part	Part 4 Self-assessment of Strategic Use of Information Technology																
Topic	IT strategy																
Subject	are the critical success factors for sustainable competitive advantage achieved through IT in your company																
Q.4.3.5	Response										Distribution Statistics						
Sample Sector	Nos	% o/a	No '4'	% '4'	No '3'	% '3'	No '2'	% '2'	No '1'	% '1'	H	L	Median	Mode	Mean	SD	Corr
All	215	68%	14	7%	44	20%	116	54%	41	19%	4	1	2	2	2.14	0.80	0.13
Group A	62	20%	5	8%	9	15%	27	44%	21	34%	4	1	2	2	1.97	0.90	0.1
Group B	64	20%	1	2%	13	20%	41	64%	9	14%	4	1	2	2	2.09	0.64	0.21
Group C	90	28%	8	9%	22	24%	48	53%	12	13%	4	1	2	2	2.29	0.81	0.14
With ISO9000	99	31%	9	9%	22	22%	56	57%	12	12%	4	1	2	2	2.28	0.80	0.14
Without ISO9000	117	37%	5	4%	22	19%	60	51%	30	26%	4	1	2	2	2.02	0.79	0.06
Grp A w ISO9000	3	1%	0	0%	0	0%	3	100%	0	0%	2	2	2	2	2.00	0.00	nil
Grp A w/o ISO9000	62	20%	5	8%	9	15%	27	44%	21	34%	4	1	2	2	1.97	0.90	0.1
Grp B w ISO9000	15	5%	1	7%	2	13%	12	80%	0	0%	4	2	2	2	2.27	0.59	0.25
Grp B w/o ISO9000	49	16%	0	0%	11	22%	29	59%	9	18%	3	1	2	2	2.04	0.64	0.16
Grp C w ISO9000	81	26%	8	10%	20	25%	41	51%	12	15%	4	1	2	2	2.30	0.84	0.14
Grp C w/o ISO9000	9	3%	0	0%	2	22%	7	78%	0	0%	3	2	2	2	2.22	0.44	-0.2

Part	Part 4 Self-assessment of Strategic Use of Information Technology																
Topic	IT strategy																
Subject	How do you intend to manage IT projects and innovations																
Q.4.3.6	Response										Distribution Statistics						
Sample Sector	Nos	% o/a	No '4'	% '4'	No '3'	% '3'	No '2'	% '2'	No '1'	% '1'	H	L	Median	Mode	Mean	SD	Corr
All	215	68%	16	7%	59	27%	83	39%	57	27%	4	1	2	2	2.16	0.90	0.23
Group A	62	20%	2	3%	10	16%	22	35%	28	45%	4	1	2	1	1.77	0.84	0.21
Group B	64	20%	2	3%	16	25%	33	52%	13	20%	4	1	2	2	2.11	0.76	0.12
Group C	90	28%	12	13%	33	37%	28	31%	17	19%	4	1	2.5	3	2.44	0.95	0.23
With ISO9000	99	31%	10	10%	39	39%	32	32%	18	18%	4	1	2	3	2.41	0.90	0.23
Without ISO9000	117	37%	6	5%	20	17%	51	44%	40	34%	4	1	2	2	1.93	0.85	0.23
Grp A w ISO9000	3	1%	0	0%	1	33%	2	67%	0	0%	3	2	2	2	2.33	0.58	0.74
Grp A w/o ISO9000	62	20%	2	3%	10	16%	22	35%	28	45%	4	1	2	1	1.77	0.84	0.21
Grp B w ISO9000	15	5%	0	0%	7	47%	5	33%	3	20%	3	1	2	3	2.27	0.80	0.26
Grp B w/o ISO9000	49	16%	2	4%	9	18%	28	57%	10	20%	4	1	2	2	2.06	0.75	0.03
Grp C w ISO9000	81	26%	10	12%	31	38%	25	31%	15	19%	4	1	3	3	2.44	0.94	0.24
Grp C w/o ISO9000	9	3%	2	22%	2	22%	3	33%	2	22%	4	1	2	2	2.44	1.13	0.53

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Part	Part 4 Self-assessment of Strategic Use of Information Technology																
Topic	IT strategy																
Subject	What is the level of R&D regarding IT in your company																
Q.4.3.7	Response										Distribution Statistics						
Sample Sector	Nos	% o/a	No '4'	% '4'	No '3'	% '3'	No '2'	% '2'	No '1'	% '1'	H	L	Median	Mode	Mean	SD	Corr
All	210	66%	14	7%	25	12%	66	31%	105	50%	4	1	1.5	1	1.75	0.91	0.18
Group A	60	19%	4	7%	6	10%	15	25%	35	58%	4	1	1	1	1.65	0.92	0.1
Group B	64	20%	1	2%	7	11%	23	36%	33	52%	4	1	1	1	1.63	0.75	0.33
Group C	87	28%	9	10%	12	14%	28	32%	38	44%	4	1	2	1	1.91	1.00	0.19
With ISO9000	97	31%	7	7%	13	13%	35	36%	42	43%	4	1	2	1	1.85	0.92	0.2
Without ISO9000	114	36%	7	6%	12	11%	31	27%	64	56%	4	1	1	1	1.67	0.90	0.36
Grp A w ISO9000	3	1%	0	0%	0	0%	1	33%	2	67%	2	1	1	1	1.33	0.58	0.21
Grp A w/o ISO9000	60	19%	4	7%	6	10%	15	25%	35	58%	4	1	1	1	1.65	0.92	0.1
Grp B w ISO9000	15	5%	0	0%	1	7%	7	47%	7	47%	3	1	2	1	1.60	0.63	-0.1
Grp B w/o ISO9000	49	16%	1	2%	6	12%	16	33%	26	53%	4	1	1	1	1.63	0.78	0.47
Grp C w ISO9000	79	25%	7	9%	12	15%	27	34%	33	42%	4	1	2	1	1.91	0.96	0.19
Grp C w/o ISO9000	8	3%	2	25%	0	0%	1	13%	5	63%	4	1	1	1	1.88	1.36	0.62

Part	Part 4 Self-assessment of Strategic Use of Information Technology																
Topic	IT strategy																
Subject	What is the nature of your IT department																
Q.4.3.8	Response										Distribution Statistics						
Sample Sector	Nos	% o/a	No '4'	% '4'	No '3'	% '3'	No '2'	% '2'	No '1'	% '1'	H	L	Median	Mode	Mean	SD	Corr
All	211	67%	5	2%	25	12%	8	4%	173	82%	4	1	1	1	1.35	0.78	0.12
Group A	60	19%	1	2%	2	3%	3	5%	54	90%	4	1	1	1	1.17	0.56	0.18
Group B	64	20%	2	3%	4	6%	2	3%	56	88%	4	1	1	1	1.25	0.71	-0
Group C	88	28%	2	2%	19	22%	3	3%	64	73%	4	1	1	1	1.53	0.91	0.1
With ISO9000	98	31%	1	1%	17	17%	5	5%	75	77%	4	1	1	1	1.43	0.81	0.13
Without ISO9000	114	36%	4	4%	8	7%	3	3%	99	87%	4	1	1	1	1.27	0.74	0.17
Grp A w ISO9000	3	1%	0	0%	0	0%	0	0%	3	100%	1	1	1	1	1.00	0.00	nil
Grp A w/o ISO9000	60	19%	1	2%	2	3%	3	5%	54	90%	4	1	1	1	1.17	0.56	0.18
Grp B w ISO9000	15	5%	0	0%	2	13%	2	13%	11	73%	3	1	1	1	1.40	0.74	0.03
Grp B w/o ISO9000	49	16%	2	4%	2	4%	0	0%	45	92%	4	1	1	1	1.20	0.71	-0.1
Grp C w ISO9000	80	25%	1	1%	15	19%	3	4%	61	76%	4	1	1	1	1.45	0.84	0.13
Grp C w/o ISO9000	8	3%	1	13%	4	50%	0	0%	3	38%	4	1	3	3	2.38	1.19	0.27

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Part	Part 4 Self-assessment of Strategic Use of Information Technology																
Topic	IT strategy																
Subject	How much importance do you attach to IT skills within your company																
Q.4.3.9	Response										Distribution Statistics						
Sample Sector	Nos	% o/a	No '4'	% '4'	No '3'	% '3'	No '2'	% '2'	No '1'	% '1'	H	L	Median	Mode	Mean	SD	Corr
All	213	67%	8	4%	32	15%	107	50%	66	31%	4	1	2	2	1.92	0.78	0.12
Group A	62	20%	2	3%	5	8%	30	48%	25	40%	4	1	2	2	1.74	0.75	0.06
Group B	63	20%	0	0%	6	10%	38	60%	19	30%	3	1	2	2	1.79	0.60	0.2
Group C	89	28%	6	7%	21	24%	39	44%	23	26%	4	1	2	2	2.11	0.87	0.09
With ISO9000	98	31%	6	6%	21	21%	41	42%	30	31%	4	1	2	2	2.03	0.88	0.11
Without ISO9000	116	37%	2	2%	11	9%	66	57%	37	32%	4	1	2	2	1.81	0.67	0.14
Grp A w ISO9000	3	1%	0	0%	0	0%	2	67%	1	33%	2	1	2	2	1.67	0.58	0.95
Grp A w/o ISO9000	62	20%	2	3%	5	8%	30	48%	25	40%	4	1	2	2	1.74	0.75	0.06
Grp B w ISO9000	14	4%	0	0%	2	14%	5	36%	7	50%	3	1	1.5	1	1.64	0.74	0.08
Grp B w/o ISO9000	49	16%	0	0%	4	8%	33	67%	12	24%	3	1	2	2	1.84	0.55	0.31
Grp C w ISO9000	81	26%	6	7%	19	23%	34	42%	22	27%	4	1	2	2	2.11	0.89	0.09
Grp C w/o ISO9000	8	3%	0	0%	2	25%	5	63%	1	13%	3	1	2	2	2.13	0.64	-0

Part	Part 4 Self-assessment of Strategic Use of Information Technology																
Topic	IT strategy																
Subject	Who is aware of your IT strategy																
Q.4.3.10	Response										Distribution Statistics						
Sample Sector	Nos	% o/a	No '4'	% '4'	No '3'	% '3'	No '2'	% '2'	No '1'	% '1'	H	L	Median	Mode	Mean	SD	Corr
All	213	67%	34	16%	66	31%	53	25%	60	28%	4	1	2	3	2.35	1.06	-0
Group A	62	20%	11	18%	15	24%	15	24%	21	34%	4	1	2	1	2.26	1.12	-0.1
Group B	63	20%	11	17%	22	35%	14	22%	16	25%	4	1	3	3	2.44	1.06	0.12
Group C	89	28%	12	13%	30	34%	24	27%	23	26%	4	1	2	3	2.35	1.01	-0
With ISO9000	98	31%	11	11%	31	32%	27	28%	29	30%	4	1	2	3	2.24	1.01	0.01
Without ISO9000	116	37%	23	20%	36	31%	26	22%	31	27%	4	1	3	3	2.44	1.09	0.06
Grp A w ISO9000	3	1%	0	0%	0	0%	1	33%	2	67%	2	1	1	1	1.00	nil	nil
Grp A w/o ISO9000	62	20%	11	18%	15	24%	15	24%	21	34%	4	1	2	1	2.26	1.12	-0.1
Grp B w ISO9000	15	5%	1	7%	5	33%	5	33%	4	27%	4	1	2	3	2.20	0.94	0.03
Grp B w/o ISO9000	48	15%	10	21%	17	35%	9	19%	12	25%	4	1	3	3	2.52	1.09	0.2
Grp C w ISO9000	80	25%	10	13%	26	33%	21	26%	23	29%	4	1	2	3	2.29	1.02	0
Grp C w/o ISO9000	9	3%	2	22%	4	44%	3	33%	0	0%	4	2	3	3	2.89	0.78	-0.4

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Part	Part 4 Self-assessment of Strategic Use of Information Technology																	
Topic	IT strategy																	
Subject	is the extent and nature of involvement of IT users in the development and implementation of your IT strategy																	
Q.4.3.11	Response										Distribution Statistics							
Sample Sector	Nos	% o/a	No '4'	% '4'	No '3'	% '3'	No '2'	% '2'	No '1'	% '1'	H	L	Median	Mode	Mean	SD	Corr	
All	214	68%	15	7%	18	8%	152	71%	29	14%	4	1	2	2	2.09	0.70	0.18	
Group A	62	20%	2	3%	4	6%	42	68%	14	23%	4	1	2	2	1.90	0.65	0.2	
Group B	64	20%	5	8%	4	6%	51	80%	4	6%	4	1	2	2	2.16	0.65	0.29	
Group C	89	28%	8	9%	10	11%	60	67%	11	12%	4	1	2	2	2.17	0.76	0.21	
With ISO9000	98	31%	6	6%	11	11%	69	70%	12	12%	4	1	2	2	2.11	0.69	0.24	
Without ISO9000	117	37%	9	8%	7	6%	84	72%	17	15%	4	1	2	2	2.07	0.72	0.21	
Grp A w ISO9000	3	1%	0	0%	0	0%	3	100%	0	0%	2	2	2	2	2.00	nil	nil	
Grp A w/o ISO9000	62	20%	2	3%	4	6%	42	68%	14	23%	4	1	2	2	1.90	0.65	0.2	
Grp B w ISO9000	15	5%	0	0%	1	7%	12	80%	2	13%	3	1	2	2	1.93	0.46	0.16	
Grp B w/o ISO9000	49	16%	5	10%	3	6%	39	80%	2	4%	4	1	2	2	2.22	0.69	0.39	
Grp C w ISO9000	80	25%	6	8%	10	13%	54	68%	10	13%	4	1	2	2	2.15	0.73	0.23	
Grp C w/o ISO9000	9	3%	2	22%	0	0%	6	67%	1	11%	4	1	2	2	2.33	1.00	-0.1	

Part	Part 4 Self-assessment of Strategic Use of Information Technology																	
Topic	IT strategy																	
Subject	What do you consider to be the risks associated with the implementation of your IT strategy																	
Q.4.3.12	Response										Distribution Statistics							
Sample Sector	Nos	% o/a	No '4'	% '4'	No '3'	% '3'	No '2'	% '2'	No '1'	% '1'	H	L	Median	Mode	Mean	SD	Corr	
All	211	67%	10	5%	40	19%	82	39%	79	37%	4	1	2	2	1.91	0.87	0.18	
Group A	61	19%	2	3%	3	5%	27	44%	29	48%	4	1	2	1	1.64	0.73	0.07	
Group B	63	20%	3	5%	13	21%	24	38%	23	37%	4	1	2	2	1.94	0.88	0.25	
Group C	88	28%	5	6%	24	27%	31	35%	28	32%	4	1	2	2	2.07	0.91	0.2	
With ISO9000	97	31%	5	5%	25	26%	31	32%	36	37%	4	1	2	1	1.99	0.92	0.2	
Without ISO9000	115	36%	5	4%	15	13%	51	44%	44	38%	4	1	2	2	1.83	0.82	0.29	
Grp A w ISO9000	3	1%	0	0%	0	0%	2	67%	1	33%	2	1	2	2	1.00	nil	nil	
Grp A w/o ISO9000	61	19%	2	3%	3	5%	27	44%	29	48%	4	1	2	1	1.64	0.73	0.07	
Grp B w ISO9000	15	5%	1	7%	3	20%	3	20%	8	53%	4	1	1	1	1.80	1.01	-0	
Grp B w/o ISO9000	48	15%	2	4%	10	21%	21	44%	15	31%	4	1	2	2	1.98	0.84	0.39	
Grp C w ISO9000	79	25%	4	5%	22	28%	26	33%	27	34%	4	1	2	1	2.04	0.91	0.22	
Grp C w/o ISO9000	9	3%	1	11%	2	22%	5	56%	1	11%	4	1	2	2	2.33	0.87	0.26	

Results of the 1998 postal survey of Hong Kong Public Works Contractors.

Part	Part 4 Self-assessment of Strategic Use of Information Technology																
Topic	IT strategy																
Subject	How often do you review your IT strategy																
Q.4.3.13	Response										Distribution Statistics						
Sample Sector	Nos	% o/a	No '4'	% '4'	No '3'	% '3'	No '2'	% '2'	No '1'	% '1'	H	L	Median	Mode	Mean	SD	Corr
All	208	66%	59	28%	69	33%	47	23%	33	16%	4	1	3	3	2.74	1.04	0.02
Group A	60	19%	8	13%	19	32%	18	30%	15	25%	4	1	2	3	2.33	1.00	0.05
Group B	61	19%	18	30%	20	33%	17	28%	6	10%	4	1	3	3	2.82	0.97	0.36
Group C	88	28%	33	38%	30	34%	12	14%	13	15%	4	1	3	4	2.94	1.05	-0.1
With ISO9000	96	30%	37	39%	34	35%	14	15%	11	11%	4	1	3	4	3.01	1.00	-0.1
Without ISO9000	113	36%	22	19%	35	31%	33	29%	23	20%	4	1	3	3	2.50	1.03	0.16
Grp A w ISO9000	3	1%	0	0%	3	100%	0	0%	0	0%	3	3	3	3	3.00	nil	nil
Grp A w/o ISO9000	60	19%	8	13%	19	32%	18	30%	15	25%	4	1	2	3	2.33	1.00	0.05
Grp B w ISO9000	14	4%	6	43%	5	36%	3	21%	0	0%	4	2	3	4	3.21	0.80	0.52
Grp B w/o ISO9000	47	15%	12	26%	15	32%	14	30%	6	13%	4	1	3	3	2.70	1.00	0.28
Grp C w ISO9000	79	25%	31	39%	26	33%	11	14%	11	14%	4	1	3	4	2.97	1.05	-0.1
Grp C w/o ISO9000	9	3%	2	22%	4	44%	1	11%	2	22%	4	1	3	3	2.67	1.12	0.11

Part	Part 4 Self-assessment of Strategic Use of Information Technology																
Topic	IT strategy																
Subject	How do you measure the IT performance of your company																
Q.4.3.14	Response										Distribution Statistics						
Sample Sector	Nos	% o/a	No '4'	% '4'	No '3'	% '3'	No '2'	% '2'	No '1'	% '1'	H	L	Median	Mode	Mean	SD	Corr
All	211	67%	18	9%	52	25%	107	51%	34	16%	4	1	2	2	2.26	0.83	0.05
Group A	61	19%	3	5%	14	23%	30	49%	14	23%	4	1	2	2	2.10	0.81	0.25
Group B	63	20%	6	10%	14	22%	36	57%	7	11%	4	1	2	2	2.30	0.80	0.26
Group C	88	28%	9	10%	24	27%	42	48%	13	15%	4	1	2	2	2.33	0.85	0.03
With ISO9000	97	31%	8	8%	25	26%	52	54%	12	12%	4	1	2	2	2.30	0.79	0.04
Without ISO9000	115	36%	10	9%	27	23%	56	49%	22	19%	4	1	2	2	2.22	0.86	0.16
Grp A w ISO9000	3	1%	0	0%	1	33%	2	67%	0	0%	3	2	2	2	3.00	nil	nil
Grp A w/o ISO9000	61	19%	3	5%	14	23%	30	49%	14	23%	4	1	2	2	2.10	0.81	0.25
Grp B w ISO9000	15	5%	1	7%	3	20%	10	67%	1	7%	4	1	2	2	2.27	0.70	-0
Grp B w/o ISO9000	48	15%	5	10%	11	23%	26	54%	6	13%	4	1	2	2	2.31	0.83	0.36
Grp C w ISO9000	79	25%	7	9%	21	27%	40	51%	11	14%	4	1	2	2	2.30	0.82	0.04
Grp C w/o ISO9000	9	3%	2	22%	3	33%	2	22%	2	22%	4	1	3	3	2.56	1.13	-0.1

Results of the 1998 postal survey of Hong Kong Public Works Contractors.

Part	Part 4 Self-assessment of Strategic Use of Information Technology																
Topic	IT strategy																
Subject	What are the characteristics of your IT strategy																
Q.4.3.15	Response										Distribution Statistics						
Sample Sector	Nos	% o/a	No '4'	% '4'	No '3'	% '3'	No '2'	% '2'	No '1'	% '1'	H	L	Median	Mode	Mean	SD	Corr
All	209	66%	55	26%	67	32%	38	18%	49	23%	4	1	3	3	2.61	1.11	0.08
Group A	62	20%	15	24%	18	29%	9	15%	20	32%	4	1	3	1	2.45	1.18	0.1
Group B	62	20%	15	24%	17	27%	16	26%	14	23%	4	1	3	3	2.53	1.10	0.17
Group C	86	27%	25	29%	33	38%	13	15%	15	17%	4	1	3	3	2.79	1.05	0.06
With ISO9000	95	30%	26	27%	42	44%	12	13%	15	16%	4	1	3	3	2.83	1.01	0.05
Without ISO9000	115	36%	29	25%	26	23%	26	23%	34	30%	4	1	2	1	2.43	1.16	0.12
Grp A w ISO9000	3	1%	0	0%	3	100%	0	0%	0	0%	3	3	3	3	3.00	nil	nil
Grp A w/o ISO9000	62	20%	15	24%	18	29%	9	15%	20	32%	4	1	3	1	2.45	1.18	0.1
Grp B w ISO9000	15	5%	2	13%	8	53%	3	20%	2	13%	4	1	3	3	2.67	0.90	-0.1
Grp B w/o ISO9000	47	15%	13	28%	9	19%	13	28%	12	26%	4	1	2	2	2.49	1.16	0.21
Grp C w ISO9000	77	24%	24	31%	31	40%	9	12%	13	17%	4	1	3	3	2.86	1.05	0.05
Grp C w/o ISO9000	9	3%	1	11%	2	22%	4	44%	2	22%	4	1	2	2	2.22	0.97	0.28

Part	Part 4 Self-assessment of Strategic Use of Information Technology																
Topic	IT strategy																
Subject	Who is the champion for IT projects in your company																
Q.4.3.16	Response										Distribution Statistics						
Sample Sector	Nos	% o/a	No '4'	% '4'	No '3'	% '3'	No '2'	% '2'	No '1'	% '1'	H	L	Median	Mode	Mean	SD	Corr
All	207	66%	72	35%	13	6%	63	30%	59	29%	4	1	2	4	2.47	1.23	-0
Group A	61	19%	20	33%	3	5%	16	26%	22	36%	4	1	2	1	2.34	1.28	0.04
Group B	62	20%	24	39%	3	5%	18	29%	17	27%	4	1	2	4	2.55	1.26	-0
Group C	85	27%	28	33%	7	8%	29	34%	21	25%	4	1	2	2	2.49	1.19	-0
With ISO9000	94	30%	30	32%	6	6%	34	36%	24	26%	4	1	2	2	2.45	1.19	-0
Without ISO9000	114	36%	42	37%	7	6%	29	25%	36	32%	4	1	2	4	2.48	1.28	0.08
Grp A w ISO9000	3	1%	0	0%	0	0%	3	100%	0	0%	2	2	2	2	2.00	nil	nil
Grp A w/o ISO9000	61	19%	20	33%	3	5%	16	26%	22	36%	4	1	2	1	2.34	1.28	0.04
Grp B w ISO9000	15	5%	3	20%	1	7%	5	33%	6	40%	4	1	2	1	2.07	1.16	0.2
Grp B w/o ISO9000	47	15%	21	45%	2	4%	13	28%	11	23%	4	1	2	4	2.70	1.27	-0
Grp C w ISO9000	76	24%	27	36%	5	7%	26	34%	18	24%	4	1	2	4	2.54	1.20	-0.1
Grp C w/o ISO9000	9	3%	1	11%	2	22%	3	33%	3	33%	4	1	2	1	2.11	1.05	0.41

Results of the 1998 postal survey of Hong Kong Public Works Contractors.

5.6 Summary of the results from the analysis of the open question response from the postal survey of a population sample of Hong Kong contractors – taken from ‘Appendices-datafile.xls’.

Please refer to the following pages.

Summary of the results from the analysis
of the open-question response in the
postal survey of a population sample of Hong Kong contractors

Items of data/information most important to HK Contractors for assessing the performance of a construction project								
All Contractors			Group A Contractors			Group B Contractors		
Keywords	Freq	Wt-Freq	Keywords	Freq	Wt-Freq	Keywords	Freq	Wt-Freq
Value	229	167.6	Value	70	50	Value	75	56.6
Work schedule	164	124.2	Work schedule	45	34.2	Work schedule	52	39
Financing	112	81.2	Resources	34	18.6	Resources	43	19.4
Resources	106	50.8	Financing	26	12.8	Financing	25	13
Quality	58	35.8	Cost-actuals	16	10.6	Safety	17	9.2
Safety	54	30	Quality	12	7.6	Quality	14	8.6
Cost-actuals	52	34.2	Safety	12	6.4	Cost-actuals	11	7
Variation	34	15.2	Variation	12	5.4	Variation	9	4.8
Employer-feedback	26	10.4	Employer-feedback	6	2.2	Employer-feedback	8	4.2
Performance	17	9.4	Risk-analysis	4	1.8	Documentation	6	2.6
Documentation	15	7.6	Subcontractor	4	1.2	Meetings-record	6	3
Forecast	15	8.6	Forecast	3	1.2	Performance	6	3.4
Site-management	11	3.2	Performance	3	1.2	Services	6	2.8
Risk-analysis	10	6	Project-information	3	2	Risk-analysis	5	3.6
Subcontractor	9	3.6	Site-management	3	0.6	Project-information	4	1.2
Project-information	8	4.2	Staff-skills	3	2	Site-management	4	1.6
Meetings-record	7	3.2	Time	3	1.4	Subcontractor	3	1.8
Time	7	3	Documentation	2	1.8	Approvals	2	1
Services	6	2.8	Meetings-record	1	0.2	Forecast	2	1
Staff-skills	6	2.8	Approvals	0	0	Environmental	1	0.2
Approvals	5	2.8	Environmental	0	0	Staff-skills	1	0.4
Environmental	2	0.4	Services	0	0	Time	1	0.2
Tenders	1	1	Tenders	0	0	Tenders	0	0
Total response	954		Total response	262		Total response	301	
% resp in top 10	89%		% resp in top 10	90%		% resp in top 10	86%	
Group C Contractors			w ISO9000 Contractors			w/o ISO9000 Contractors		
Keywords	Freq	Wt-Freq	Keywords	Freq	Wt-Freq	Keywords	Freq	Wt-Freq
Value	84	61	Value	94	68	Value	135	99.6
Work schedule	67	51	Work schedule	70	54.2	Work schedule	94	70
Financing	61	35.4	Financing	61	34.8	Resources	66	33
Quality	32	19.6	Resources	40	17.8	Financing	51	26.4
Resources	29	12.8	Quality	35	21	Cost-actuals	26	18
Cost-actuals	25	16.6	Safety	29	16.4	Safety	25	13.6
Safety	25	14.4	Cost-actuals	26	16.2	Quality	23	14.8
Variation	13	5	Variation	13	6.4	Variation	21	8.8
Employer-feedback	12	4	Employer-feedback	12	3.4	Employer-feedback	14	7
Forecast	10	6.4	Forecast	10	6.2	Risk-analysis	9	5.4
Performance	8	4.8	Performance	9	5.4	Performance	8	4
Documentation	7	3.2	Documentation	8	3.8	Documentation	7	3.8
Site-management	4	1	Site-management	5	1.8	Meetings-record	7	3.2
Approvals	3	1.8	Approvals	4	2.6	Project-information	7	3.2
Time	3	1.4	Staff-skills	2	0.4	Subcontractor	7	3
Staff-skills	2	0.4	Subcontractor	2	0.6	Services	6	2.8
Subcontractor	2	0.6	Environmental	1	0.2	Site-management	6	1.4
Environmental	1	0.2	Project-information	1	1	Time	6	2.8
Project-information	1	1	Risk-analysis	1	0.6	Forecast	5	2.4
Risk-analysis	1	0.6	Tenders	1	1	Staff-skills	4	2.4
Tenders	1	1	Time	1	0.2	Approvals	1	0.2
Meetings-record	0	0	Meetings-record	0	0	Environmental	1	0.2
Services	0	0	Services	0	0	Tenders	0	0
Total response	391		Total response	425		Total response	529	
% resp in top 10	92%		% resp in top 10	92%		% resp in top 10	88%	

Work-content criteria that are most important to HK Contractors for assessing overall performance of several construction projects								
All Contractors			Group A Contractors			Group B Contractors		
Keywords	Freq	Wt-Freq	Keywords	Freq	Wt-Freq	Keywords	Freq	Wt-Freq
Quality	69	42.2	Quality	22	11.4	Activity-schedules	25	18.4
Activity-schedules	54	40	Costs	18	10.4	Variations	21	11
Variations	48	27.6	Safety	14	8.4	Quality	16	9.8
Performance/progress	47	32.2	Performance/progress	13	9	Performance/progress	13	9.2
Safety	45	27	Construction-issues	11	7	Construction-issues	10	7
Construction-issues	33	22.6	Timing	9	6.6	Disputes	10	3.8
Costs	33	19.4	Value	8	6	Work schedule	10	7
Work schedule	30	22.4	Labour	6	3.6	Safety	9	5
Value	24	16.2	Resources	6	1.8	Material use	8	4.2
Disputes	23	8.4	Activity-schedules	5	4	Value	8	5.2
Material use	19	9.6	Management of work	5	4.2	Work achieved	8	5.8
Timing	19	13.4	Work achieved	5	4.2	Costs	7	4
Work achieved	19	14.8	Work schedule	5	3.6	Payments	7	3.4
Management of work	18	12.2	Client-involvement	4	1.2	Labour	6	5
Quantity	17	8.6	Profit	4	2.6	Resources	5	1.8
Labour	16	10.8	Variations	4	2.2	Documentation	4	1.8
Client-involvement	15	5.4	Communication	3	1.8	Management of work	4	2.8
Resources	15	5.4	Material use	3	1.8	Meeting reports	4	2.4
Profit	12	8.4	Quantity	3	1	Profit	4	2.6
Meeting reports	10	5.4	Site arrangements	3	2	Quantity	4	2
Payments	10	5.4	Cash flow	2	1	Site instructions	4	3.2
Site instructions	9	6	Disputes	2	0.6	Drawings	3	1.6
Documentation	8	3.8	Documentation	2	1.4	Finance	3	2
Finance	8	5	Finance	2	1.6	Claims	2	1
Site arrangements	8	4.4	Sub-contractor issues	2	0.6	Client-involvement	2	1
Sub-contractor issues	8	3.2	Environmental impact	1	0.4	Purchasing	2	1.6
Communication	6	4	Exceptions	1	0.6	Site arrangements	2	1.4
Cash flow	5	2	Inspection-reports	1	0.4	Timing	2	1.8
Drawings	5	3.2	Meeting reports	1	0.8	Approvals	1	0.2
Inspection-reports	5	2.6	Site instructions	1	0.4	Communication	1	0.2
Approvals	4	1.8	Approvals	0	0	Exceptions	1	0.2
Purchasing	4	3	Claims	0	0	Sub-contractor issues	1	0.2
Claims	3	1.2	Drawings	0	0	Cash flow	0	0
Environmental impact	3	1	Estimates	0	0	Environmental impact	0	0
Exceptions	3	1.4	Payments	0	0	Estimates	0	0
Estimates	1	0.4	Purchasing	0	0	Inspection-reports	0	0
Total response	656		Total response	166		Total response	207	
% resp in top 15	76%		% resp in top 15	81%		% resp in top 15	79%	
Group C Contractors			w ISO9000 Contractors			w/o ISO9000 Contractors		
Keywords	Freq	Wt-Freq	Keywords	Freq	Wt-Freq	Keywords	Freq	Wt-Freq
Quality	31	21	Activity-schedules	34	24.4	Quality	35	19.6
Activity-schedules	24	17.6	Quality	34	22.6	Performance/progress	26	17.4
Variations	23	14.4	Safety	27	15.8	Costs	22	12.6
Safety	22	13.6	Variations	26	15.2	Variations	22	12.4
Performance/progress	21	14	Performance/progress	21	14.8	Activity-schedules	20	15.6
Work schedule	15	11.8	Work schedule	19	14.2	Construction-issues	20	13.2
Construction-issues	12	8.6	Disputes	14	5.4	Safety	18	11.2
Disputes	11	4	Construction-issues	13	9.4	Value	14	9.4
Quantity	10	5.6	Costs	11	6.8	Labour	12	8.2
Client-involvement	9	3.2	Client-involvement	10	3.4	Work achieved	12	9
Management of work	9	5.2	Material use	10	5.2	Timing	11	7.6
Costs	8	5	Value	10	6.8	Work schedule	11	8.2
Material use	8	3.6	Management of work	9	5.2	Disputes	9	3
Timing	8	5	Quantity	9	4.8	Management of work	9	7
Value	8	5	Timing	8	5.8	Material use	9	4.4
Work achieved	6	4.8	Resources	7	3	Profit	8	5.2
Meeting reports	5	2.2	Work achieved	7	5.8	Quantity	8	3.8
Sub-contractor issues	5	2.4	Meeting reports	6	3	Resources	8	2.4
Inspection-reports	4	2.2	Sub-contractor issues	5	2.4	Finance	6	4.6
Labour	4	2.2	Drawings	4	2.6	Payments	6	2.8
Profit	4	3.2	Inspection-reports	4	2.2	Client-involvement	5	2
Resources	4	1.8	Labour	4	2.6	Documentation	5	2.2
Site instructions	4	2.4	Payments	4	2.6	Site instructions	5	3.6
Approvals	3	1.6	Profit	4	3.2	Communication	4	2
Cash flow	3	1	Site arrangements	4	1.2	Meeting reports	4	2.4
Finance	3	1.4	Site instructions	4	2.4	Site arrangements	4	3.2
Payments	3	2	Documentation	3	1.6	Cash flow	3	1.2
Site arrangements	3	1	Approvals	2	0.6	Exceptions	3	1.4
Communication	2	2	Cash flow	2	0.8	Sub-contractor issues	3	0.8
Documentation	2	0.6	Communication	2	2	Approvals	2	1.2
Drawings	2	1.6	Environmental impact	2	0.6	Claims	2	1
Environmental impact	2	0.6	Finance	2	0.4	Purchasing	2	1.6
Purchasing	2	1.4	Purchasing	2	1.4	Drawings	1	0.6
Claims	1	0.2	Claims	1	0.2	Environmental impact	1	0.4
Estimates	1	0.4	Estimates	1	0.4	Inspection-reports	1	0.4
Exceptions	1	0.6	Exceptions	0	0	Estimates	0	0
Total response	283		Total response	325		Total response	331	
% resp in top 15	77%		% resp in top 15	78%		% resp in top 15	76%	

Time-related criteria that are most important to HK Contractors for assessing overall performance of several construction projects								
All Contractors			Group A Contractors			Group B Contractors		
Keywords	Freq	Wt-Freq	Keywords	Freq	Wt-Freq	Keywords	Freq	Wt-Freq
Work schedule	75	58.8	Work schedule	21	17.4	Work schedule	22	16.8
Percent progress	57	41	End date issues	11	7.2	Percent progress	21	15.2
Progress	47	38	Progress vs schedule	9	7.2	Progress	19	15.2
Progress vs schedule	33	27	Time management	9	5.2	Progress vs schedule	7	6.4
End date issues	28	18.2	Material issues	9	4.6	Project data	7	4.6
EOT	27	12.8	Site related issues	8	5	Replanned work	7	3
Time management	22	13	Percent progress	8	4.2	Material issues	6	4
Approvals	21	10.6	Approvals	7	3.4	Management	6	3.6
Material issues	21	10.8	EOT	7	2.8	Delays	6	3
Delays	19	10	Progress	6	5.8	Variation	6	2.6
Replanned work	19	6.8	Valuation	5	3.4	Site related issues	6	2.6
Site related issues	19	10.2	Communications	5	3	EOT	5	3.4
Valuation	18	11.4	Performance	5	3	End date issues	5	3
Project data	17	11.8	Duration	5	2.4	Deliveries	4	3.4
Labour issues	14	7.4	Deliveries	4	3.6	Time management	4	3
Management	14	8.8	Start date issues	4	3	Approvals	4	2.6
Costs	11	7	Delays	4	2.6	Duration	3	2.6
Resource issues	11	7	Resource issues	4	2.6	Resource issues	3	2
Variation	11	5.6	Labour issues	4	2	CPM	3	1.8
Communications	10	6.2	Management	3	1.8	Labour issues	3	1.8
Deliveries	10	8.8	Costs	3	1.8	Subcontractor issues	2	1.6
Duration	10	6.6	Payments	3	1.2	Start date issues	2	1.4
Activities achieved	9	6	Activities achieved	2	2	Valuation	2	1.4
Start date issues	9	7.2	Work done	2	1.4	Schedule of activities	2	1.2
Payments	8	4	Quality	2	1.2	Activities achieved	2	0.8
Performance	8	5.4	Liquidated damages	2	1	Quality	2	0.6
Quality	8	4.6	Contingency issues	2	0.8	Communications	2	0.4
CPM	7	4.6	Replanned work	2	0.6	Safety	1	0.8
Safety	7	2.8	Safety	2	0.4	Payments	1	0.6
Subcontractor issues	6	3.8	Project data	1	1	Costs	1	0.4
Design schedule	5	4.2	Design schedule	1	0.8	Work done	1	0.4
Liquidated damages	4	1.8	Timely instruction	1	0.6	Maintenance	1	0.2
Contingency issues	3	1	Hinderance	1	0.4	Contingency issues	0	0
Hinderance	3	1	Rate of progress	1	0.4	Design schedule	0	0
Work done	3	1.8	Subcontractor issues	1	0.4	Hinderance	0	0
Work to go	3	1.6	Variation	1	0.4	Incentives	0	0
Key dates	2	2	CPM	1	0.2	Key dates	0	0
Maintenance	2	0.6	Incentives	1	0.2	Liquidated damages	0	0
Schedule of activities	2	1.2	Key dates	0	0	Performance	0	0
Incentives	1	0.2	Maintenance	0	0	Rate of progress	0	0
Rate of progress	1	0.4	Records	0	0	Records	0	0
Timely instruction	1	0.6	Schedule of activities	0	0	Timely instruction	0	0
Records	0	0	Work to go	0	0	Work to go	0	0
Total response	606		Total response	167		Total response	166	
% resp in top 15	72%		% resp in top 15	71%		% resp in top 15	79%	
Group C Contractors			w ISO9000 Contractors			w/o ISO9000 Contractors		
Keywords	Freq	Wt-Freq	Keywords	Freq	Wt-Freq	Keywords	Freq	Wt-Freq
Work schedule	32	24.6	Work schedule	40	30.6	Work schedule	35	28.2
Percent progress	28	21.6	Percent progress	35	26.4	Percent progress	22	14.6
Progress	22	17	Progress	26	19.8	Progress	21	18.2
Progress vs schedule	17	13.4	Progress vs schedule	18	14	Progress vs schedule	15	13
EOT	15	6.6	EOT	17	8.2	Material issues	14	8
End date issues	12	8	End date issues	15	9.6	End date issues	13	8.6
Valuation	11	6.6	Valuation	12	8	Time management	12	7.4
Approvals	10	4.6	Replanned work	11	4.2	Site related issues	12	7
Replanned work	10	3.2	Time management	10	5.6	Approvals	11	6
Project data	9	6.2	Approvals	10	4.6	Delays	10	5.2
Time management	9	4.8	Project data	9	6.2	EOT	10	4.6
Delays	9	4.4	Delays	9	4.8	Deliveries	8	7
Costs	7	4.8	Costs	7	4.6	Project data	8	5.6
Labour issues	7	3.6	Labour issues	7	3.6	Management	8	4.6
Material issues	6	2.2	Site related issues	7	3.2	Replanned work	8	2.6
Management	5	3.4	Material issues	7	2.8	Labour issues	7	3.8
Activities achieved	5	3.2	Management	6	4.2	Duration	7	3.8
Site related issues	5	2.6	Resource issues	6	3.8	Communications	7	3.4
Design schedule	4	3.4	CPM	5	3.6	Start date issues	6	4.4
Quality	4	2.8	Variation	5	3.2	Valuation	6	3.4
Variation	4	2.6	Activities achieved	5	3	Variation	6	2.4
Resource issues	4	2.4	Design schedule	4	3.4	Resource issues	5	3.2
Payments	4	2.2	Quality	4	2.8	Performance	5	3
Safety	4	1.6	Payments	4	2.2	Activities achieved	4	3
Communications	3	2.8	Safety	4	1.6	Costs	4	2.4
Start date issues	3	2.8	Communications	3	2.8	Payments	4	1.8
CPM	3	2.6	Duration	3	2.8	Quality	4	1.8
Performance	3	2.4	Start date issues	3	2.8	Subcontractor issues	3	2
Subcontractor issues	3	1.8	Performance	3	2.4	Work done	3	1.8
Work to go	3	1.6	Subcontractor issues	3	1.8	Safety	3	1.2
Key dates	2	2	Work to go	3	1.6	CPM	2	1
Deliveries	2	1.8	Liquidated damages	3	1.2	Contingency issues	2	0.8
Duration	2	1.6	Deliveries	2	1.8	Hinderance	2	0.8
Liquidated damages	2	0.8	Key dates	1	1	Key dates	1	1
Hinderance	2	0.6	Schedule of activities	1	0.6	Design schedule	1	0.8
Maintenance	1	0.4	Maintenance	1	0.4	Liquidated damages	1	0.6
Contingency issues	1	0.2	Contingency issues	1	0.2	Schedule of activities	1	0.6
Incentives	0	0	Hinderance	1	0.2	Timely instruction	1	0.6
Rate of progress	0	0	Incentives	1	0.2	Rate of progress	1	0.4
Records	0	0	Rate of progress	0	0	Maintenance	1	0.2
Schedule of activities	0	0	Records	0	0	Incentives	0	0
Timely instruction	0	0	Timely instruction	0	0	Records	0	0
Work done	0	0	Work done	0	0	Work to go	0	0
Total response	273		Total response	312		Total response	294	
% resp in top 15	75%		% resp in top 15	75%		% resp in top 15	70%	

Cost-related criteria that are most important to HK Contractors for assessing overall performance of several construction projects								
All Contractors			Group A Contractors			Group B Contractors		
Keywords	Freq	Wt-Freq	Keywords	Freq	Wt-Freq	Keywords	Freq	Wt-Freq
Categories-of-value	126	86.4	Categories-of-value	27	19.2	Categories-of-value	45	31.4
Categories-of-cost	95	54.6	Categories-of-cost	25	13.6	Categories-of-cost	28	16.2
Payment	73	42.8	Payment	18	10.8	Payment	20	10.4
Management	39	22.6	Management	14	7.8	Variation	12	7.2
Variation	33	18	Cost management	9	5.8	Management	10	6
Cost management	28	20.4	Material	8	5.4	Expenditure	7	5
Cash flow	24	15.6	Cash flow	7	4.8	Subcontractor	6	3.4
Material	19	14	Variation	7	3	Cost management	5	4.2
Expenditure	18	13.4	Budget	5	3.8	Budget	4	3
Profit/loss	18	12.4	Work schedule	5	3.4	Labour	4	3.4
Budget	15	12.8	Expenditure	4	2.6	Material	4	3
Subcontractor	14	7.4	Labour	4	3	Resource	4	2.2
Overhead	13	5.8	Overhead	4	1.8	Site	4	2
Labour	12	9.4	Profit/loss	4	2.4	Finance	3	3
Work schedule	10	6.6	Time	4	2.6	Overhead	3	1
Quality	9	5.2	Quality	3	1.4	Profit/loss	3	2.4
Safety	9	5	Subcontractor	3	2.2	Cash flow	2	1.2
Time	8	4	Finance	2	1.2	Daywork	2	0.8
Claims	7	3.4	Nature of work	2	1.2	Instruction	2	0.6
Price	7	3.4	Plant	2	1.2	Price	2	0.8
Resource	7	3.6	Resource	2	0.4	Reports	2	2
Plant	6	4.2	Safety	2	1.2	Safety	2	1.4
Site	6	3	Work done	2	1	Approvals	1	0.2
Finance	5	4.2	Capital	1	0.8	Capital	1	0.8
Nature of work	5	3.6	Communication	1	0.4	Claims	1	0.4
Communication	4	2.4	Contingency	1	0.4	Maintenance	1	0.4
Outturn	4	2.4	Price	1	0.6	Plant	1	0.6
Work done	4	2.6	Risks	1	1	Quality	1	0.8
Actuals	3	1.6	Site	1	0.8	Tendering	1	1
Capital	3	2.4	Tendering	1	1	Work done	1	0.8
Daywork	3	1	Actuals	0	0	Actuals	0	0
Reports	3	2.8	Approvals	0	0	Communication	0	0
Tendering	3	3	Claims	0	0	Contingency	0	0
Contingency	2	0.8	Daywork	0	0	Disputes	0	0
Disputes	2	0.6	Disputes	0	0	Nature of work	0	0
Instruction	2	0.6	Instruction	0	0	Outturn	0	0
Risks	2	1.4	Maintenance	0	0	Risks	0	0
Staff	2	0.6	Outturn	0	0	Staff	0	0
Approvals	1	0.2	Reports	0	0	Time	0	0
Maintenance	1	0.4	Staff	0	0	Work schedule	0	0
Total response	645		Total response	170		Total response	182	
% resp in top 15	83%		% resp in top 15	85%		% resp in top 15	87%	
Group C Contractors			w ISO9000 Contractors			w/o ISO9000 Contractors		
Keywords	Freq	Wt-Freq	Keywords	Freq	Wt-Freq	Keywords	Freq	Wt-Freq
Categories-of-value	54	35.8	Categories-of-value	70	47.4	Categories-of-value	56	39
Categories-of-cost	42	24.8	Categories-of-cost	50	29.2	Categories-of-cost	45	25.4
Payment	34	21.4	Payment	43	25.6	Payment	29	17
Cash flow	15	9.6	Variation	18	10.6	Management	24	14
Management	15	8.8	Cash flow	15	9.4	Cost management	15	10.4
Cost management	14	10.4	Management	15	8.6	Variation	15	7.4
Variation	14	7.8	Cost management	13	10	Material	11	7.4
Profit/loss	11	7.6	Profit/loss	12	8.2	Cash flow	9	6.2
Expenditure	7	5.8	Expenditure	9	7.6	Expenditure	9	5.8
Material	7	5.6	Overhead	9	4	Subcontractor	8	4.8
Overhead	7	3.2	Budget	8	8	Budget	7	4.8
Budget	6	6	Material	8	6.6	Labour	7	5.6
Claims	6	3	Subcontractor	6	2.6	Profit/loss	6	4.2
Quality	5	3	Claims	5	2.6	Overhead	5	2
Safety	5	2.4	Labour	5	3.8	Resource	5	2.2
Subcontractor	5	1.8	Price	5	2.2	Time	5	2.8
Work schedule	5	3.2	Quality	5	3	Work schedule	5	3.4
Labour	4	3	Safety	5	2.4	Finance	4	3.8
Outturn	4	2.4	Work schedule	5	3.2	Quality	4	2.2
Price	4	2	Actuals	3	1.6	Safety	4	2.6
Time	4	1.4	Communication	3	2	Site	4	2.2
Actuals	3	1.6	Nature of work	3	2.4	Plant	3	1.8
Communication	3	2	Outturn	3	1.4	Reports	3	2.8
Nature of work	3	2.4	Plant	3	2.4	Work done	3	1.8
Plant	3	2.4	Time	3	1.2	Capital	2	1.6
Disputes	2	0.6	Disputes	2	0.6	Claims	2	0.8
Staff	2	0.6	Resource	2	1.4	Contingency	2	0.8
Capital	1	0.8	Site	2	0.8	Daywork	2	0.8
Contingency	1	0.4	Staff	2	0.6	Instruction	2	0.6
Daywork	1	0.2	Capital	1	0.8	Nature of work	2	1.2
Reports	1	0.8	Daywork	1	0.2	Price	2	1.2
Resource	1	1	Finance	1	0.4	Tendering	2	2
Risks	1	0.4	Risks	1	0.4	Approvals	1	0.2
Site	1	0.2	Tendering	1	1	Communication	1	0.4
Tendering	1	1	Work done	1	0.8	Maintenance	1	0.4
Work done	1	0.8	Approvals	0	0	Outturn	1	1
Approvals	0	0	Contingency	0	0	Risks	1	1
Finance	0	0	Instruction	0	0	Actuals	0	0
Instruction	0	0	Maintenance	0	0	Disputes	0	0
Maintenance	0	0	Reports	0	0	Staff	0	0
Total response	293		Total response	338		Total response	307	
% resp in top 15	83%		% resp in top 15	85%		% resp in top 15	82%	

Resource-related criteria that are most important to HK Contractors for assessing overall performance of several construction projects								
All Contractors			Group A Contractors			Group B Contractors		
Keywords	Freq	Wt-Freq	Keywords	Freq	Wt-Freq	Keywords	Freq	Wt-Freq
Manpower resources	144	107.8	Manpower resources	41	31.2	Manpower resources	39	30.4
Plant	105	69	Plant	29	18.2	Plant	26	18.6
Management resources	80	44.2	Material resources	17	10.2	Management resources	26	15.6
Material resources	66	38	Management resources	14	7	Subcontractor	19	9.8
Subcontractor	61	36	Subcontractor	13	7.8	Material resources	16	7.6
Cost of resources	29	17.4	Information	10	5.4	Cost of resources	10	5.4
Resources	20	11	Cost of resources	9	4.8	Work schedule	7	5.2
Information	18	10.4	Production	6	3.6	Reports	6	3.8
QS	16	7	Resources	6	3	QS	5	2.8
Production	14	9.8	Finance	6	2.8	Information	5	2.6
Finance	14	7.4	Value	4	3.2	Finance	3	2
Work schedule	12	8.8	Site	4	1.6	Production	2	2
Value	10	7.2	Work schedule	3	2.2	Resources	2	1.4
Quality	6	4.4	Quality	3	1.8	Nature of work	0	0
Reports	6	3.8	Overhead	2	0.8	Overhead	0	0
Site	6	2.8	QS	2	0.6	Quality	0	0
Overhead	5	2.8	Risk	1	1	Risk	0	0
Supplier	3	1.2	Nature of work	1	0.8	Safety	0	0
Safety	3	0.8	Safety	1	0.2	Site	0	0
Risk	1	1	Supplier	1	0.2	Supplier	0	0
Nature of work	1	0.8	Reports	0	0	Value	0	0
Total response	620		Total response	173		Total response	166	
% resp in top 10	89%		% resp in top 10	87%		% resp in top 10	96%	
Group C Contractors			w ISO9000 Contractors			w/o ISO9000 Contractors		
Keywords	Freq	Wt-Freq	Keywords	Freq	Wt-Freq	Keywords	Freq	Wt-Freq
Manpower resources	64	46.2	Manpower resources	78	57	Manpower resources	66	50.8
Plant	50	32.2	Plant	64	42.6	Plant	41	26.4
Management resources	40	21.6	Management resources	43	21.4	Management resources	37	22.8
Material resources	33	20.2	Material resources	38	22.4	Material resources	28	15.6
Subcontractor	29	18.4	Subcontractor	33	21.4	Subcontractor	28	14.6
Resources	12	6.6	Cost of resources	13	8.4	Cost of resources	16	9
Cost of resources	10	7.2	Resources	11	6.2	Information	13	6.4
QS	9	3.6	QS	11	5	Work schedule	9	7
Production	6	4.2	Value	7	5	Resources	9	4.8
Value	6	4	Production	6	4.2	Production	8	5.6
Finance	5	2.6	Finance	6	3	Finance	8	4.4
Quality	3	2.6	Information	5	4	Reports	6	3.8
Information	3	2.4	Quality	3	2.6	QS	5	2
Overhead	3	2	Overhead	3	2	Site	4	1.6
Work schedule	2	1.4	Work schedule	3	1.8	Value	3	2.2
Site	2	1.2	Site	2	1.2	Quality	3	1.8
Supplier	2	1	Supplier	2	1	Overhead	2	0.8
Safety	2	0.6	Safety	2	0.6	Risk	1	1
Nature of work	0	0	Nature of work	0	0	Nature of work	1	0.8
Reports	0	0	Reports	0	0	Safety	1	0.2
Risk	0	0	Risk	0	0	Supplier	1	0.2
Total response	281		Total response	330		Total response	290	
% resp in top 10	92%		% resp in top 10	92%		% resp in top 10	88%	

5.7 Dendrogram of project performance keywords from the analysis of the open-question response in the postal survey of a population sample of Hong Kong contractors

Please refer to the following pages.

**Dendrogram of project-performance keywords
from the analysis of the open-question response in the
postal survey of a population sample of Hong Kong contractors**

<u>Keyword</u>	<u>Meaning</u>
Approvals	Approvals Status of critical statutory submissions Statutory requirements
Cost-actuals	Cost control Cost of additional materials Cost of labour Cost of labour and plant Cost of materials to date Cost of overheads Cost of work done to date Expenditure to date Quotations
Documentation	Correspondence/documentation Site records Site reports Site weather records
Employer-feedback	Architect feedback Client feedback Client/AP feedback Customer's complaints
Environmental	Environmental reports
Financing	Cash flow Financial ability of company Financial report Money owed Money received Money received/owed Payment certified Payment to subcontractors & suppliers Profit Profit/loss Profit/loss per working day Total revenue certified
Forecast	Forecast against timeplan Forecast cost in the coming month Forecast cost to completion Forecast progress and cost Forecast value to completion Outturn cost
Meetings-record	Minutes of progress meetings Minutes of site meetings Regular site progress meeting

Performance	Daily production of work Earned value H.K.H.A 'pass' system score Items to be done Progress
Project-information	Drawings Information on sub-letting Information on time Information outstanding
Quality	Quality and safety reports Quality non-conformance Quality Reports
Resources	Labour and material on site Labour and plant on site Labour and plant required Labour deployed Labour forecast Labour management Labour performance Labour reports Labour required Labour to complete Level of resources Material Material delivery Material on site Material used Material wastage Materials ordered Materials required Plant and materials required Plant deployed Plant required Plant resource Purchasing reports Quantity of material on site Quantity Reports Resource Resource allocation Resource deployed Resource useage Resources on site Resources required to complete
Risk-analysis	Exceptions Outstanding difficulties Problem analysis Problems on site Risk Type of work Type of work done to date

Safety	Safety reports
Services	Administrative services required Purchasing services required Q.S services required Site management services required
Site-management	Site management record
Staff-skills	Experience of site agent Experience of the site foreman Experience of the subcontractor Skill enhancement Staff recruitment
Subcontractor	Subcontractor disputes Subcontractor information Subcontractor liability Subcontractor progress Subcontractor status Subcontractors hired Subcontractor's value of work done to date
Tenders	Tenders
Time	Duration of the project Duration to completion Outturn duration Time elapse
Value	Value of additional resource Value of disputes Value of material delivered Value of material ordered Value of material waste Value of subcontractor / material's cost to date Value of subcontractor hired Value of variations Value of work behind schedule Value of work done to date Value of work to be done
Variation	Claims Claims record Dispute status Site instruction Variation cost and schedule Variation of cost Variation work performed Variations
Work schedule	Milestone targets Progress against timeplan Progress of work Schedule delay Work schedule

5.8 Dendrogram of work-related keywords for assessing portfolio performance from the analysis of the open-question response in the postal survey of a population sample of Hong Kong contractors

Please refer to the following pages.

**Dendrogram of work-related project performance keywords
from the analysis of the open-question response in the
postal survey of a population sample of Hong Kong contractors**

<u>Keyword</u>	<u>Meaning</u>
Activity-schedules	Activities done Activities outstanding Activities to be done Activity lists
Approvals	Approvals
Cash flow	Cash flow
Claims	Claims
Client-involvement	Client feedback Client relationship Client's satisfaction
Communication	Correspondence wth others Correspondence-client Correspondence-employer
Construction-issues	Scope of works Construction access Construction activities Construction alternatives Construction complexity Construction drawing Construction -drilling Construction falsework Construction maintenance Construction method Construction method statement Construction of falsework Construction of finishing work Construction problems Construction setting out Construction type Construction type foundations Construction type substructure Requests for information Site survey

Costs	Cost Cost addition Cost certified Cost control Cost of labour Cost of management Cost of material Cost of overheads Cost of site instructions Cost of site operations Cost of work done to date Cost requirements Expenditure
Disputes	Disputes Disputes and their status
Documentation	Documentation & correspondence Information on works Site records Site reports
Drawings	Drawings Drawings - sufficiency of information Drawings of construction projects
Environmental impact	Environmental impact
Estimates	Estimates
Exceptions	Significant issues Significant projects
Financial reports	Financial reports Financing
Financial-controls	Budget control
Inspection-reports	Audit and inspection Audit external Audit internal Audit reports
Labour	Labour Labour deployed Labour interface Labour skills Labour source Labour strength
Management of work	Management Management coordination Management procedures conformance Management services Monitoring

Material use	Material audit Material budget Material delivery Material on site Material procurement Material schedule Material testing Material usage Material wasted Materials to be used
Meeting reports	Meeting reports
Payments	Money owed Money received Payment Payment schedule QS
Performance reports	Performance Performance against programme Performance data Performance report
Profit	Profit
Progress reports	Progress Progress and programme Progress control Progress of each trades of work Progress of site activities Progress of work Progress reports
Purchasing	Buying Buying ease Buying schedule
Quality reports	Quality Quality - accuracy Quality and testiing Quality conformance Quality control Quality of trade work Quality testing of materials
Quality-control	Accuracy

Quantity	Quantity Quantity measurement Quantity of concrete Quantity of earthworks Quantity of external works Quantity of finishing work Quantity of fitting out work Quantity of formwork erected Quantity of structural work Quantity of variations Quantity of volume for storage Quantity of work Quantity of work done
Resources	Resource required Resources Resources deployed Resources plant Resources plant and labour Resources plant and materials required Resources plant hired
Safety	Safety Safety - accident prevention Safety -accident rates Safety -accident record Safety compliance Safety record Safety report
Site arrangements	Site management Site organisation Site supervision
Site instructions	Site instruction Site instruction - consultant
Sub-contractor issues	Labour sub-contractor deployed Labour sub-contractor management Labour subcontractor performance Labour subcontractor required
Timing	Time Time of construction Time targets Time targets achieved
Value	Value of disputes Value of liquidated damages Value of material Value of variations Value of work certified Value of work completed Value of work done Value of work to be done

Variations	Variation Variation and their status Variation value Variations Variations and their status
Work achieved	Work certified Work content stored database Work done Work done - percent Work done to date Work done/cost Work items to be done Work progress Work wasted Work schedule Work schedule interfaces Work to be done

5.9 Dendrogram of time-related keywords for assessing portfolio performance from the analysis of the open-question response in the postal survey of a population sample of Hong Kong contractors

Please refer to the following pages.

**Dendrogram of time-related project performance keywords
from the analysis of the open-question response in the
postal survey of a population sample of Hong Kong contractors**

<u>Keyword</u>	<u>Meaning</u>
Activities achieved	Achieving milestones Activities specials Activity schedule Milestones
Approvals	Approvals Client response Government regulations Head office feedback Professionals feedback Submission Submission of method statement on time
Communications	Communications Correspondence Fax Faxes subcontractors Faxes to client Liaison Response to Client Telephone
Contingency issues	Contingency plan Exception resolution Flexibility
Costs	Cash flow Cost Cost of plant Expenditure cf revenue Expenditure to date Money received Price Revenue
CPM	Critical path Critical path analysis Critical path satisfied
Delays	Delay impact Delay mitigation Delay percent Delay percent overall Delay trend Delays Delays due to engineer Delays due to subcontractors Delays notified / approvals

Deliveries	Delivery of drawings on time Delivery of information on time Delivery of materials on time Delivery plant/materials on time Delivery schedule Services ordering Supplier appointment
Design schedule	Design of work schedule Design schedule
Duration	Contract period Duration Duration and value of work to be done Duration to go Duration to go -percent Float
End date issues	Completion date Completion early Completion forecast Completion of work Completion of work -sections Completion on time Completion date of contract Substantial completion on time
EOT	EOT Weather
Hinderance	Hinderance Hinderance - potential
Incentives	Bonus
Key dates	Date of start and completion Date spreadsheets
Labour issues	Labour availablilty Labour control Labour hours of planned Labour on site Labour output Labour resource allocation Labour resources Labour statutory holidays Labour strength Labour-time Overtime worked Working hours
Liquidated damages	Liquidated damages
Maintenance	Maintenance Maintenance period

Management	Management Management availability Management of builders works Management of site and sub-contractors Management of utilities companies and public authority Periodic meetings Supervision staff
Material issues	Material availability Material control Material delivery Material delivery schedule Material purchase
Payments	Payment application Payment of suppliers Payment on time Payment schedule Payment valuation work done cf time Payments
Percent progress	Percent contract value done Percent work done Percent work to be done Work done -percent Work done percent cf time Work to be done -percent
Performance	Dependability Effectiveness Efficiency Efficiency of manpower Efficiency of plant Efficiency of supporting department Performance - subcontractor Performance cf objective
Progress	Progress Progress - subcontractor Progress cf milestone Progress cf work schedule Progress chart Progress -finishes Progress MSE installation Progress of E/M installation Progress of RC frame Progress of substructure Progress of superstructure Progress of work Progress on time Progress -rate Progress report Progress review Progress/performance Trends

Progress vs schedule	Actual cf forecast cashflow Actual cf planned work Interim statements on schedule Monitoring system Outputs Status Work done cf to programme Work outstanding -percent Work priorities Work progress
Project data	Database of alpha-numeric data Information Meetings Project manager's report Review of individual reports Spreadsheets of numeric and database Spreadsheets of time / date data Use data spread sheets to prepare report Working information / drawing
Quality	Quality Quality non-conformities Workmanship
Rate of progress	Acceleration proposals Speed
Records	Document record
Replanned work	Remedial work Re-planned work Re-planned work - percent Re-planned work schedule Re-schedule of work
Resource issues	Plant and material delivery as scheduled Plant and materials required Plant delivery Plant/equipment availability Purchasing Resources Resources levels Resources usage against progress
Safety	Safety Safety report Safety requirements
Schedule of activities	Schedule of activities

Site related issues	Location Nature of work Remove off-site surplus material and / or debris Site condition Site inspection Site instructions Site location Site management Site meeting report. Site overheads (staff) Site planning Site possession date Site report from QS Site reports Site survey Statutory requirements Statutory restrictions Utilities
Start date issues	Commencement date Commencement date of contract
Subcontractor issues	Subcontractor appointment Subcontractor claims Subcontractor coordination Subcontractor payment schedule Sub-contractors / supplies response Subletting of works
Time management	Time control Time deviation from completion Time deviation from schedule Time deviations Time elapsed Time elapsed-percent Time for assessment of tenders Time for fabrication work Time gone percent of contract Time of completion Time remaining Timely decisions Timely design of temporary work Timely inspections/testing Timely preparation of programmes Timely reporting Timely resolution of site problems Time-related costs amount
Timely instruction	Instruction in time

Valuation	QS Value certified Value of disputes Value of material delivered Value of material to be order Value of remaining works vs time remained Value of variation work Value of variations Value of work done per month Value of work done to date Value of work to be done Values of work certified per month
Variation	Variation duration Variation of work Variation percent Variation quotations Variations
Work done	Quantity of work Work done
Work schedule	Gantt chart Interfaces Planning of work trades Summary bar chart and "S" curve Work schedule Work schedule - precontract Work schedule 90day Work schedule change order Work schedule deviations Work schedule of activities Work schedule outstanding Work schedule -postcontract Work schedule requirements Work schedule resources/milestones Work schedule revisions Work schedule -short term Work schedule updates Work schedule-analysis Work schedule-master programme Work schedule-on time
Work to go	Forecast work to be done Work in progress Work to be done

5.10 Dendrogram of cost-related keywords for assessing portfolio performance from the analysis of the open-question response in the postal survey of a population sample of Hong Kong contractors

Please refer to the following pages.

**Dendrogram of cost-related project performance keywords
from the analysis of the open-question response in the
postal survey of a population sample of Hong Kong contractors**

<u>Keyword</u>	<u>Meaning</u>
Actuals	Actual staff cost Actual costs vs income Actual cost versus budgeted costs
Approvals	Approval from A/E
Budget	Budgeted cost Budget/project Budget review/month Budget of outstanding works Budget estimate/cost control Budget costs/actual costs Budget control Budget
Capital	Capital/fixed assets and depreciation Capital required
Cash flow	Cash position Cash flow status Cash flow forecast Cash flow as scheduled Cash flow
Categories-of-cost	Cost of work scheduled Cost of work done Cost of waste Cost of unit production for major items Cost of transportation Cost of time Cost of subcontractor Cost of staff Cost of site overhead Cost of site facilities Cost of site bonus Cost of site allowances Cost of site Cost of remedial works Cost of project management Cost of potential claims Cost of plant Cost of payroll of construction projects Cost of overtime Cost of materials, labour and plant Cost of material for major elements within budget Cost of material Cost of manpower Cost of labour plant and materials Cost of labour Cost of insurance Cost of fuel Cost of fabrication Cost of equipment Cost of currency exchange rates Cost of accidents

Categories-of-value	Value to date and to go Value of work to be done Value of work done Value of work completed in month Value of variations Value of subcontractor work Value of outstanding works Value of materials ordered/delivered Value of material to buy Value of material ordered Value of material delivered Value of material Value of disputes Value of contract
Claims	Claims management Claims agreed Claims
Communication	Communication with participants Client feedback
Contingency	Contingency sum Contingency costs
Cost management	Cost-to-date Costs savings Costs of subcontracted specialist works minimised Costs committed Costs - operational/project Cost-actuals Cost/project report Cost/budget Cost valuation records Cost trend Cost to date/budget Cost summary Cost savings Cost requirements Cost planned cf actual cost Cost outturn forecast Cost management Cost flow Cost control -within project budget Cost committed Cost checked Cost break-even Cost actual/budget Cost
Daywork	Day works by labourer Day work record
Disputes	Disputes
Expenditure	Expenditure/revenue Expenditure/month Expenditure to date Expenditure on site Expenditure on preliminary item Expenditure forecast Expenditure - preliminary Expenditure

Finance	Turn-over Monthly financial aspect Financial status Financial report/project Financial cost minimised
Instruction	Instruction from AP Instruction
Labour	Labours Labour use Labour turnover Labour resource Labour nos on daily wages Labour distribution Labour cost index Labour cost control Labour - use Labour
Maintenance	Maintenance
Management	Wastage Valuations agreed Utilities Supplier performance Supplier Skill of plant operators Sequence of works Regulations Quotations Purchasing Progress Productivity Production at lowest cost Priority Preliminary cost/time lapsed Monitoring Method of operation Management of site Management of quality and safety Management of preliminaries Management of plant/labour Management
Material	Materials to be used Materials cost index Materials Material wastage Material use Material procurement Material costs minimised Material cost fluctuation Material cost control Material
Nature of work	Nature of work -Steel fixer Nature of work - flexibility Nature of work - concrete Nature of work - carpentry Nature of work
Outturn	Out-turn cost/budget

Overhead	Percent overhead Overhead of head office Overhead cost control Overhead - sites Overhead
Payment	Payments outstanding Payment/month Payment will be received Payment valuation Payment terms Payment schedule Payment requested Payment received/time gone Payment received & owed Payment received Payment owed Payment of variations Payment Interim Payment dates vs achieved Payment certified Payment
Plant	Plant use Plant downtime Plant and materials required Plant & equipment - use Plant
Price	Price of sub-contractors Price fluctuations Price
Profit/loss	Profit/loss vs value of works subletted Profit value of the period - net Profit percentage Profit of work done Profit margins Profit from variation order Profit forecast Profit and loss Profit
Quality	Quantity of work Quality requirements Quality
Reports	Reports-individual review Reports from site agent foreman and subcontractors
Resource	Resources used Resource supply Resource Increase Resource allocation
Risks	Risks
Safety	Safety requirements Safety - no of avoidable accidents Safety

Site	Site survey Site supervision Site instruction Site cost records
Staff	Staff cost budget
Subcontractor	Subcontractor rates Subcontractor performance Subcontractor payment Subcontractor labour on day works Subcontractor fees Subcontractor Subcontract costs/budget
Tendering	Tender quotation accurate Tender budget/actual cost Tender assessment & subletting
Time	Time to completion Time factor Time extension Time - period of construction Time - delivery of materials Time - completion of key target dates Time
Variation	Variations Variation quotations Variation orders Variation cost Variation -comment by Engineer/Architect Variation amount Variation additional cost
Work done	Volume of work done to date Percent work done
Work schedule	Work to be done Work schedule re-planning Work schedule

5.11 Dendrogram of resource-related keywords for assessing portfolio performance from the analysis of the open-question response in the postal survey of a population sample of Hong Kong contractors

Please refer to the following pages.

**Dendrogram of resource-related project performance keywords
from the analysis of the open-question response in the
postal survey of a population sample of Hong Kong contractors**

<u>Keyword</u>	<u>Meaning</u>
Cost of resources	Cost Cost accounts Cost additional resource Cost of final preliminaries vs budget Cost of Insurance Cost of material Cost of materials ordered Cost of plant Cost of professional services Cost of remedial works Cost of resources Cost of subcontracts Cost of wages Cost per month Cost reports Cost requirements Cost savings Cost vs budget
Finance	Finance Finance - break-even point Finance - capital input Finance - cash received Finance adequacy
Information	Information Information - daily report Information - organisation charts Information - photos Information delivery Information from advertising Information from catalogues Information from previous job Information from product displays Information from professionals Information from staff Information from supplier Information on weather condition Information -statutory procedures Information technology equipment Information technology use

Management resources	Management Management - instruction from A.P Management - instruction from building services Management - ratio supervisors/labourers Management - administration Management - control of subcontractor Management - key personal on site Management - location Management - managerial staff Management - marketing Management - new technology Management - office equipment Management - optimum back-up resources Management - performance Management - PM arrangements Management - PM report Management - professional services Management - professional skills Management - purchasing services needed Management - strength of supervisory staff Management - supervision Management - supervision of organisation Management - supplier Management - technical backup Management capability Management of plant and equipment Management services required Management staff availability Management staff within tender budget Management system Management team Management within contract duration
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Manpower resources	Manpower Manpower - clerical resource Manpower - company staff Manpower - direct labour Manpower - Foremen Manpower - labourers Manpower - planning Manpower - professional costs Manpower - safety personal Manpower - skills Manpower - staff Manpower - sufficiency Manpower - surveyors Manpower - technical staff Manpower allocated to project activities Manpower and plant Manpower as scheduled Manpower available Manpower deployed Manpower efficiency Manpower -labour turnover Manpower of subcontractors Manpower on site Manpower on site actual vs budget Manpower on site vs work schedule Manpower production rates Manpower required Manpower required and employed Manpower staff retention Manpower -supervisory staff Manpower usage Manpower usage index
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Material resources	Material Material - building material Material - delivery on time Material - fuel Material - major items Material - overseas supply Material - raw material Material availability Material control Material delivery schedule Material failure Material forecasts Material index Material local supply Material on site Material on time for critical activities Material ordered Material ordering and delivery schedule Material orders placed Material purchased Material quality checks Material required Material supply Material used Material wastage Materials
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Nature of work	Nature of work
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Overhead	Overhead Overhead in head office Overhead of site office Overhead on resource Overhead usage
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Plant	Plant Plant - % company owned Plant - major items Plant - procurement Plant - shortage Plant allocated to project activities Plant availability Plant deployed Plant deployed / required Plant deployed vs work schedule Plant efficiency Plant for advance works Plant major items actual vs budget Plant news Plant on site Plant required Plant resource Plant use
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Production	Production Production - design Production - downtime Production - efficiency Production - flexibility Production - hours worked Production - meet the specification Production - offsite Production - output vs resources Production - progress of works Production delay Production of work vs resources
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Production productivity
Production vs programme

QS	QS reports QS resource efficient QS services QS services required
Quality	Quality Quality of work Quality requirement
Quantities	Quantities Quantity of additional works
Reports	Reports from Engineer/Architect's on resources Reports from site Reports from site senior foreman
Resources	Resource - offshore Resource availability Resource levels actual / planned Resource selection Resource service required Resource suitability Resource used vs plan Resource wastage Resources histogram Resources used vs plan
Risk	Risk
Safety	Safety Safety requirement
Site	Site - storage Site accommodation/transport Site establishment Site overheads Site staff work load
Subcontractor	Subcontractor Subcontractor - supplies Subcontractor - hired Subcontractor - labour Subcontractor - lowest cost Subcontractor - performance Subcontractor - plant Subcontractor - resources Subcontractor appointments Subcontractor availability Subcontractor cost Subcontractor deployed Subcontractor of administration Subcontractor performance Subcontractor program & progress Subcontractor required Subcontractor resources Subcontractor staff
Supplier	Supplier Supplier - performance Supplier - resources Supplier review

Value	Value of disputes Value of material delivered Value of plant used Value of subcontractor work done Value of variation Value of work done Value of work to be done
Work schedule	Work done Work schedule Work schedule - acceleration Work schedule - short term

5.12 References

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- ¹ Boughton, G., Fitcher, K., and Torbet, E. 1997. "Project-Information-Management-Systems Deployed in Anticipation of Disputes on Multi-Contract, Non-Traditional Infrastructure Procurement." in Drogemuller R. (ed) IT support for construction process re-engineering. Proc. CIB Publication 208. Proc. CIB/W78 conference, July 1997 Cairns, James Cook University of North Queensland, Australia.
- ² Archer, G., Fitcher, K., and McMahon, M. 1997. "Multi-participant Project Information Management System" in Drogemuller R. (ed) IT support for construction process re-engineering. Proc. Proc CIB Publication 208. CIB/W78 conference, July 1997 Cairns, James Cook University of North Queensland, Australia.
- ³ Fitcher, K., and Thorpe, T. 1998. "The significance of data 'held in context' in project information management systems." Proc. Second Singapore International Conference on Construction Project Management, Singapore, February 19-20 1998.

Chapter Six - Appendices

6 Chapter Six - Assessing The Current Practices Of Hong Kong Consultants For Managing Portfolios-Of-Projects

6.1 Layout of Appendices

For ease of reference, the Appendices for this Chapter of the Thesis are laid out in the order referenced within Thesis, Chapter Six.

6.2 Covering letter for the Questionnaire

WB(WM) 1/1/3 «CODE»
The Managing Director,
«COMPANY»
«ADD_1»

March 20, 1998

Dear Sir,

1998 Works Bureau Information Technology Survey

I will be grateful for your cooperation by completing the enclosed questionnaire. We are conducting a survey into the use of commonplace information technology by our public works consultants. The survey will provide important knowledge, which will help us ensure that the information technologies we use, to plan and manage public works projects, are developed at a pace, and in a manner, which is also useful to our consultants.

It is the Government's intention to apply information technologies where it provides improved performance and public benefit. However, this will be less satisfactory if we do it in isolation. Construction is a team effort and we want to be sure that our assumptions, about the use of information technology in the construction industry, are founded on fact. The results of this survey will help in identifying technologies that are mutually beneficial and suit the industry as a whole.

It is important that you complete this questionnaire so that we can take your response into account. The information you provide will be kept confidential: it will only be used for the purpose of this industry-wide appraisal. A final report, on the overall results of the survey, will be produced that will be also be used for academic purposes. It will contain summary statistical information, but not the data collected in the survey. In this manner, confidentiality will be maintained in all published reports on this survey.

Please complete the questionnaire and return it to the Works Bureau by April 9, 1998. If you have any queries about the survey then please contact Keith Futcher, Chief Assistant Secretary/Public Works Systems Administration at 28482437.

Thank you

(K.G.Futcher)
for the Secretary for Works

2nd Letter to respondents ~ requesting participation from the population sample of Hong Kong consultants

WB(WM) 1/1/3 «CODE»
The Managing Director,
«COMPANY»
«ADD_1»

April 9, 1998

Dear Sir,

1998 Works Bureau Information Technology Survey

I have not received from you, a response to the questionnaire, which I mailed to you on March 20, 1998. It is important that we include your response in this survey. I will be grateful if you complete the questionnaire and send it to me as soon as possible, at least by April 22, 1998.

If your response is already in the post then please ignore this letter.

As I mentioned in my earlier letter, this is a comprehensive and important survey. Your input is needed: it is important to the quality of this work. The results of the survey will provide important knowledge, which will help us ensure that the information technologies we use, to plan and manage public works projects, are developed at a pace, and in a manner, which is also useful to our consultants. Please complete the questionnaire so that we can take your response into account.

I assure you that the information you provide will be kept confidential: it will only be used for the purpose of this industry-wide appraisal. The final report will contain the summary statistical information, but not the data collected in the survey.

If you have any queries about the survey then please contact Keith Futcher, Chief Assistant Secretary/Public Works Systems Administration at 28482437.

Thank you

(K.G.Futcher)
for the Secretary for Works

Final reminder to the Hong Kong consultants.....

WB(WM) 1/1/3 ACERBS-E31

The Managing Director,
Hyder Consulting Ltd
3/F Somerset House Tai Koo Place
979 King's Road
Quarry Bay
Hong Kong

April 23, 1998

Dear Sir,

1998 Works Bureau Information Technology Survey

I notice from our records that we have not received from you, a response to the questionnaire, which I mailed to you on March 20, 1998. Enclosed is another copy of the questionnaire in case the one supplied earlier has gone astray. I will be grateful if you complete the questionnaire and send it to me as soon as possible, at least by April 30, 1998. If your response is already in the post then please ignore this letter. I am grateful for your support.

As I have stated in my earlier letter, this is a comprehensive and important survey. Your input is needed: it is important to the quality of this work. The results of the survey will provide important knowledge, which will help us ensure that the information technologies we use, to plan and manage public works projects, are developed at a pace, and in a manner, which is also useful to our consultants. Please complete the questionnaire so that we can take your response into account.

I assure you that the information you provide will be kept confidential: it will only be used for the purpose of this industry-wide appraisal. The final report will contain the summary statistical information, but not the data collected in the survey.

If you have any queries about the survey then please contact Keith Futcher, Chief Assistant Secretary/Public Works Systems Administration at 28482437.

Thank you

(K.G.Futcher)
for the Secretary for Works

6.3 Questionnaire survey of a population sample of Hong Kong consultants

A copy of the printed questionnaire is enclosed in the following pages.

6.4 Question-by-question statistical analysis of the survey response and interpretative commentary

A summary of the analysis of the results for each ‘tick-it’ question is provided here. The mode is taken to be the most useful indicator of the prevalent response. If the median value and the mean value are close to the mode then no further comment is made on the distribution. If they are not close, then the bias in the distribution is noted in the summary comments.

Questionnaire Section 1.1 Telephone communication

Q.1.1.1. Does your company provide telephones for communication?

The questionnaire is to investigate the use of technology, which supports communication. Telephones are the most obvious devices that fall within this category. Although the supply and use of telephone for construction personnel is self-evident, the question does query the supply of this technology to four categories of staff: managerial, professional, supervisory, and labour. Telephones for this latter category cannot be assumed to be self-evident- especially for the smaller contractor doing more piecemeal work.

The response is as expected: consultants provide telephones to their managerial, professional, supervisory, clerical and administrative staff as a norm.

Q.1.1.2 Which telephone services does your company use?

This question measures the use of commercial add-on telephone services. It is expected that the response would be universally commercial services, although remote sites or high security requirements may require private services. The survey found that Consultants use public services in general, with about 44% using leased line services as well. Radio telephone services are used by less than 10% of the respondents.

Q.1.1.3. Does your company provide/use mobile telephones for communication?

The supply of mobile telephones for senior staff is frequently an assumed norm but not for other categories of staff. Nor is the supply of mobile telephones self-evident.

- Fifty two percent of the respondent consultant firms provide mobile telephones to their managerial staff.
- Twenty two percent provide them for professional staff. Six percent extend the supply to supervisory staff.
- Clerical/administrative staff are not supplied except in a few cases.
- The provision of mobile telephones is less than measured in contractor firms.

Q.1.1.4 Which special mobile telephone services does your company use?

Queries the use of enhanced communication services- messaging being a form of electronic-mail. Thirty eight percent of the respondents use 'message services' and thirty five percent use 'call forwarding'. The use of message services is similar for the sample sectors.

Q.1.1.5 Is it your company policy/instruction that important telephone communications are recorded?

Indicates a respect for recording those voice communications, which have a material bearing on project issues. It also shows an understanding of the need for fully documented records of contract dialogues. The mode response is 'yes'. A range of 50% to 35% of the respondents for the eight sample sectors state that it is company policy/instruction to record important telephone communications. Forty nine percent of the firms with ISO9000 certification state that they have this arrangement compared to thirty five percent without certification. However, an almost equal number of firms say that it is not company policy with a further fourteen percent saying 'mostly no'. The median and the mean indicate a 'mostly no' response. These results indicate a biased distribution towards 'yes' but in general it is not company policy/instruction to record important telephone communications.

Q.1.1.6. How does your company make a record of important telephone communications?

Measures the use of technology to satisfy this rudimentary need. Anything other than a written note of the communication indicates a recognition of the importance of information management. The mode response is 'no' for the use of message recording facilities/services or recording from a speaker telephone. The mode response is 'yes' for recording telephone messages on a written note. The percent response shows that the Architecture (12%) and the Landscaping (17%) sample sectors and the firms with ISO9000 certification (9%) are using recording services/facilities to a greater extent than the others including the non-ISO9000 firms (4%).

Questionnaire Section 1.2 Fax communication

Q.1.2.1 Does your company use facsimile (fax) for communication?

An apparently self-evident question but less so than for telephones and none-the-less a bona fide query in that it has not been tested elsewhere in Hong Kong. More than ninety-two percent of the response in all sample sectors state the use of facsimile in their head office. This falls to more than seventy-one percent in other company offices. It is greater than forty-three percent in assignment offices – more than eighty percent for architectural and building consultants.

Q.1.2.2 Does your company use facsimile (fax) to and from personal computers (PC's) for communication?

PC's to fax machines is a readily available service that is likely to be used only in circumstances where PC skills are good. It also requires the use of PC's with modem connectivity to the telephone network. The response to the use of faxing message to PC's is 'no'. Similarly, for sending faxes from PC's. Less than ten percent of the sample sectors state that they use PC's to send faxes.

Questionnaire Section 1.3 Meetings for communication

Q.1.3.1 Does your company use formal, regular, face-to-face meetings for the communication of project information?

The use of formally arranged project meetings as a means of communicating project information is an established good practice that is tested, as a foundation question, for the purposes of the follow-on questions. The mode response is 'yes' for the use of meeting in the company head office. Sixty-one to ninety-two percent of the sector samples gave a 'yes' response. The affirmative is nearly 100% is the 'mostly yes' response is added. This positive response is maintained for the use of meetings in other company offices and in assignment offices although the range is fifty-five to ninety-one percent and forty-seven to ninety-two percent respectively. The positive response is reduced in the case of fax between assignment offices and other offices: thirty-three to fifty-two percent.

Q.1.3.2 Is it your company policy/instruction that minutes/notes of meetings are recorded?

Measures the extent that standard good practice is used and leads to the following question, which measures the ways in which meeting notes are recorded. The mode response is 'yes'. A response of more than fifty-nine percent is recorded for all the sample sectors excepting Quantity Surveyors who has a response of forty percent however their 'mostly yes' is sixty percent.

Q.1.3.3 How does your company record minutes/notes of meetings?

This question measures the use of manual or technology-aided methods in a routine project task. The prevalent means of recording the minutes/notes of meetings is by hand written means. The mode was 'yes' for this approach. 'Yes' (40%-88%) or 'mostly yes' (10%-40%) responses across the sector samples. The use of tape recorders (0%-8%), word-processors (31%-62%), or electronic notice boards (0-2%) to record notes/minutes of meetings is slight.

Questionnaire section 1.4, Video-conferencing for communication

Q.1.4.1 Does your company use video-conference facilities for communication?

The question is asked on the assumption that it is unlikely that video-conferencing is used within Hong Kong unless the systems are low-cost, such as Internet enabled, and the communication otherwise difficult, such as a remote high-tech site. For communication outside of Hong Kong, the likelihood is much greater as video-conferencing services are well established in the SAR. The mode response is 'no' to the use of video-conferencing within Hong Kong (72%-95% 'noes') or internationally (63-87% 'noes').

Q.1.4.2 Which video-conference services does your company use?

Measures the extent that companies have installed video-conferencing or are using Internet arrangements. The use of commercially hired video-conferencing (0-8%) or company-owned services is slight (3-17%). Using the Internet for video-conferencing has about the same as company-owned services leading to the supposition that the Internet is the company-owned service.

Questionnaire section 1.5, Images used for communication

Q.1.5.1 How does your company produce construction drawings?

Measures the extent that CAD is used in company main offices and on their construction sites. A higher use in the main offices is expected, with a low use on site. There is a wider distribution of response in this series of questions. Looking at the total response.

- The use of manual drafting methods in company offices is eight percent 'yes' and twenty-two percent 'mostly yes'. With a median of 'mostly yes' and a mode of 'no'. The civil (5% 'yes') sample sectors has a lesser use of manual drawing methods whilst architectural (17% 'yes') and building services (17% 'yes') sample sectors state a lesser use of manual drafting methods
- The use of CAD in company offices is sixty-three percent 'yes' and nineteen percent 'mostly yes'. The median and mode is 'yes', the mode is 'no' and the mean is on the positive side of 'mostly yes'. Quantity Surveyors (9% 'yes' – 82% 'no') and 'without ISO9000' consultants (51% 'yes') have a lesser use of CAD.
- Hiring of manual drafting services has a median and mode of 'no' across all the sample sectors.
- Hiring of CAD services also has a median of 'mostly no' for most sample sectors otherwise a median of 'no'. The is 'no' across most sample sectors, otherwise 'mostly no'.
- The use of manual drafting methods on assignment locations is less than in the company head offices. Two percent overall, state 'yes' and thirteen percent 'mostly yes'. The mode is 'no'. There is a greater use of manual methods on site for Building Services consultants (8% and a mode of 'no').

- The use of CAD methods in assignment locations is less than in the company head office. Twenty percent state 'no'. The mode is 'no' across all of the sample sectors except for Landscaping (14% 'yes' and 43% 'mostly yes' and mode of 'mostly yes').

Q.1.5.2 How does your company distribute construction drawings?

Tests the extent that an electronic inter-change of construction drawing is used. The question avoids issue of inter-operability, but infers an understanding, on the part of the respondent, that there are obvious benefits to CAD portability.

- All but one of the sample sectors state a mode of 'yes' for the distribution of construction drawings by hardcopy. The 'yes' response was received, in a range of twenty-seven percent to ninety-seven-nine percent. The exception was Quantity Surveyors who state 'no' (55%). However they state 'no' to a greater extent for all other methods of distribution – in general, the production and distribution of drawings is not a requirement of Quantity Surveyors.
- Distribution of construction drawings as electronic files on disk received a narrower distribution of response. The mode and the median is 'mostly yes' for all sample sectors except Architectural ('yes') and Quantity Surveyors ('no').
- A mode of 'no' from most of the sample sectors is the response to the distribution of construction drawings across a LAN. Building Services and the Landscaping sample sectors say 'yes'.
- A mode of 'no' from most of the sample sectors is the response to the distribution of construction drawings as electronic files via a modem. A positive response is received from the Building Services ('mostly yes') and the Landscaping consultants certification' group ('yes').
- A mode of 'yes' or 'mostly yes' for most of the sample sectors is the response to the distribution of construction drawings as electronic files via the Internet. The exceptions are: Architecture ('mostly no') and Quantity Surveyors ('no').

Q.1.5.3 How does your company record the distribution of construction drawings?

This question measures the use of manual or electronic registers of transmittals. A mode of 'yes' and a response of seventy percent to a hundred percent across the sample sectors (excepting Quantity Surveyors) state that a record of transmittal is by hardcopy. In contrast a mode of 'no' and a response of fourteen to twenty-four percent 'yes' and fourteen to thirty percent 'mostly yes' across the sample sectors (excepting Quantity Surveyors) state that a record of transmittal is by an electronic database register.

Q.1.5.4 How does your company check/revise construction drawings?

Measures the use of electronic interchange of drawings for checking and revision purposes.

- Drawings are revised/checked in hardcopy form received a 'yes' response in a range of forty-three to seventy-three percent, 'mostly yes' in a range of eighteen to forty-three percent across the sample sectors. The mode is 'yes' except for landscaping ('mostly yes').

- Drawings revised/checked in electronic form received the opposite response. A range of thirteen to forty-two percent 'no' and three to twenty-seven percent 'mostly no' across the sample sectors excepting Quantity Surveyors. Architectural and the landscaping sample sectors have a mode of 'yes'. The positive response: thirteen to thirty-eight percent 'yes' plus eight to twenty-eight percent 'mostly yes' indicate a balanced range of use of this technology. The 'with ISO9000' sample sector have a more positive response than the 'without ISO9000' sample sector.

Q.1.5.5 Does your company use picture images for communication?

Measures the extent that photographs and video clips are used as a record of construction issues.

- Use of photographs. A mode of 'yes' and a response range of twenty-seven to sixty-two percent 'yes' and thirteen to thirty-one percent 'mostly yes' was stated across the sample sectors.
- Use of digital photographs. A mode of 'no' and a response range of thirteen to fifty-eight percent 'no' and eight to twenty-six percent 'mostly no' was stated across the sample sectors. Landscaping was an exception with a mode of 'yes'.
- Use of video images. A mode of 'no' and a response range of forty-two to sixty-five percent 'no' and zero to forty-eight percent 'mostly no' was stated across the sample sectors.

Q.1.5.6 How does your company distribute picture images for communication?

This measures the extent that digital images are used on electronic media as a means of communication and as part of a communication process.

- Distribution of picture images in the original physical form has a mode of 'yes' and a response range of forty to sixty-one percent 'yes' and seventeen to fifty-seven percent 'mostly yes' stated across the sample sectors. Landscaping has a mode of 'mostly yes'.
- Distribution of picture images in electronic digital form has a mode of 'no' overall and for the sample sectors of building, civil, structural, quantity surveyors and the certification sectors. Architecture and structural sectors have a mode of 'mostly yes' whereas landscaping is 'mostly no'.

Questionnaire section 1.6, Written communication

Q.1.6.1 Does your company produce written documents according to company standards and pre-determined document formats?

This is a foundation question in preparation for the subsequent questions in this section of the questionnaire. The use of a style library of documents is taken to be indicative of an well-ordered approach to process control, and document management. Whilst this is more likely in company main offices a less controlled arrangement may occur on site.

- Company standards/formats for written documents in the company offices has a mode of 'yes' and a response range of seventy-nine to one-hundred percent 'yes' across the sample sectors.
- Company standards/formats for written documents in assignment locations has a mode of 'yes' and a response range of forty-three to eighty-three percent 'yes' and zero to forty-three percent 'mostly yes' was stated across the sample sectors.

Q.1.6.2 Does your company use printed proforma and forms for routine documents?

This is a sequential foundation question from the previous one.

- Use of printed proforma/documents in the company offices has a mode of 'yes' and a response range of sixty-three to eighty-one percent 'yes' and seven to twenty-five percent 'mostly yes' stated across the sample sectors.
- Use of printed proforma/documents in the assignment offices has a mode of 'yes' and a response range of forty-three to seventy-seven percent 'yes' and fifteen to thirty-four percent 'mostly yes' stated across the sample sectors.

Q.1.6.3 Does your company have a procedure/instruction for the filing of all written documents in a logically organised filing system?

This question measures good practice in the company offices and in the site offices. For example, the HKG has published a works Branch Technical Circular No 19/93, (1993) 'Filing practice for works-contracts'. This dictates a hierarchical topic breakdown so that construction documents are always filed in the same file location within the site-office filing system. An arrangement that makes the discovery of documents easier.

- Company procedure/instruction for the filing of written documents in an organised filing system in the company offices has a mode of 'yes' and a response range of eighty-two to one-hundred percent 'yes' stated across the sample sectors.
- Company procedure/instruction for the filing of written documents in an organised filing system in the assignment offices has a mode of 'yes' and a response range of forty-five to ninety-two percent 'yes' stated across the sample sectors.

Q.1.6.4 Is the same document filing system used on all sites?

A positive answer indicates an understanding of the need for consistency to suit discovery of information by any staff member. This is the practice of the HKG according to WBTC 19/93 (1993)¹ but may not be commonplace elsewhere. The mode answer is 'yes' except for Architecture, but the median is 'mostly yes' whilst the mean is on the positive side of 'mostly yes'. The range of response is narrow across all sample sectors: thirty-one to fifty-four percent for 'yes', twenty-seven to forty-six percent for 'mostly yes', one to twenty-three percent for 'mostly no', and eight to thirty-eight percent for 'no'.

Q.1.6.5 Does your company use a computer-based document management system to record the location of filed written documents?

Leading on from the previous question. Whilst such computerised techniques are commonplace in legal offices and encouraged on public works by HKG's Works Branch Technical Circular No 8/95 (1995)² 'Computer aided document management system for works contracts', their prevalence needs to be measured across a broader sample of Hong Kong Contractors. The researcher has reported on the results achieved in this aspect of project-information-management systems (PIMS) used by the HKG in the management of their airport-core-programme of projects (ACP)^{3,4,5}. It is argued in these cases that the use of computer aided 'discovery' was a fundamental benefit to the resolution of construction disputes

- Company uses a computer-based document management system to record the location of filed written documents in the company offices has a mode of 'no' for the total response with a median of 'mostly no' or 'no' and mean on the positive side of 'mostly no'. The response shows a balanced response biased towards a negative answer for all the sample sectors.
- Company uses a computer-based document management system to record the location of filed written documents in the assignment offices has a mode of 'no' for the total response with a median and mean of 'mostly no'. In this case the answer is more definitely biased towards the negative response.

Q.1.6.6 Does your company use a system of keywords to record the contents of written documents and to find them in the future?

This question measures the extent that a sophisticated approach to document management is used.

- In the company offices has a mode of 'yes', a median of 'mostly yes' and a mean on the negative side of 'mostly yes' for all sample sectors.
- In the assignment locations has a mode of 'no', a median of 'mostly no' and a mean on the positive side of 'mostly no' for all sample sectors.

Q.1.6.7 Does your company employ staff to organise and maintain a filing system of written documents?

This is thought to be likely in company main offices but less likely in the assignment offices unless the project is very large and managed by a major consultant.

- In the company offices has a mode and a median of 'yes', with a mean on the positive side of 'mostly yes' for all sample sectors except for a more negative median for architecture and quantity surveyor sample sectors.
- In the assignment locations has a varied response. Overall the mode is 'yes', the median is 'mostly yes' and the mean is on the positive side of 'mostly yes'. This is true of building services, structural and firms with ISO9000 certification. The response is more finely balanced for the other sectors with a mode of 'no' and a median of 'mostly yes'.

Q.1.6.8 Does your company employ someone as an 'information manager' to organise and maintain the filing system of written documents and their contents, and also their distribution and use?

Recent developments on government sites have shown that this is a positive benefit. Testing for evidence elsewhere is helpful in measuring the widespread acceptance of this relatively new concept in Hong Kong. Use of an 'information manager' in the company offices and on assignment has a mode of 'no' in general. However, the architectural, building services, and the quantity surveyor sample sectors have a mode of 'yes' for company offices.

Questionnaire section 1.7, Electronic communication

Q.1.7.1 Does your company use electronic-mail for communication?

The question is the obvious indicator of the prevalence of computer-based IT used for communication purposes.

- E-mail in the company offices has a mode of 'yes' overall. The percent response varies within the sample sectors.
 - Architectural consultants have a thirty-eight percent 'no' response compared to a twenty-four percent 'yes'.
 - Building Services consultants have a thirty-three percent 'no' response compared to a twenty-five percent 'yes'.
 - Civil consultants have a twenty-five percent 'no' response compared to forty-nine percent 'yes'.
 - Landscaping consultants have fourteen percent 'no' compared to forty-three percent 'yes' response
 - Structural consultants have thirty-eight percent 'no' and the same percent 'yes'.
 - Quantity surveyors have fifty-three percent 'no' compared to thirteen percent 'yes' response.
 - Consultants with ISO9000 certification have a twenty-nine percent 'no' compared to forty-one percent 'yes' response.
 - Consultants without ISO9000 certification have a thirty-eight percent 'no' compared to forty-one percent 'yes' response.
- E-mail in the assignment locations has a mode of 'no' except for civil and landscaping consultants. The percent response varies within the sample sectors.
 - Architectural consultants have a fifty-five percent 'no' response compared to a three percent 'yes'.
 - Building Services consultants have a thirty-three percent 'no' response compared to a twenty-five percent 'yes'.
 - Civil consultants have a twenty-eight percent 'no' response compared to thirty-six percent 'yes'.
 - Landscaping consultants have fourteen percent 'no' compared to twenty-nine percent 'yes' response
 - Structural consultants have thirty-eight percent 'no' and seven percent 'yes'.

- Quantity surveyors have fifty-seven percent ‘no’ compared to seven percent ‘yes’ response.
- Consultants with ISO9000 certification have a thirty-four percent ‘no’ compared to twenty-nine percent ‘yes’ response.
- Consultants without ISO9000 certification have a forty-four percent ‘no’ compared to twenty-six percent ‘yes’ response.
- E-mail via modems has a mode of ‘yes’ except for building services and quantity surveyors who record a ‘mostly yes’ response
- E-mail via the Internet has a similar response. A mode of ‘yes’ except for building services, quantity surveyors, and structural consultants.

Q.1.7.2 Does your company have a local-area-network (LAN) of computers for office automation purposes, which includes electronic mail for communication?

The question provides a measurement of the prevalence of this technology used within the various categories of consultant management staff.

- E-mail provided for office-based managerial staff has a mode of ‘yes’ with a consistent response across all sample sectors.
- E-mail provided for office-based professional staff has a mode of ‘yes’ with the exception of architecture (‘no’) and building services (‘mostly yes’).
- E-mail provided for office-based supervisory staff has a mode of ‘yes’ overall with a range of response within the sample sectors.
 - Architecture has a mode of ‘no’.
 - Building services has a mode of ‘mostly no’.
 - Civil has a mode of ‘yes’.
 - Landscaping has a mode of ‘yes’.
 - Structural has a mode of ‘no’.
 - Quantity surveyors have a mode of ‘no’.
 - Consultants with ISO9000 certification, have a mode of ‘yes’.
 - Consultants without certification have a mode of ‘yes’.
- E-mail provided for office-based clerical staff has a mode of ‘no’ overall with a range of response within the sample sectors.
 - Architecture has a mode of ‘no’.
 - Building services has a mode of ‘no’.
 - Civil has a mode of ‘mostly no’.
 - Landscaping has a mode of ‘yes’.
 - Structural has a mode of ‘mostly yes’.
 - Quantity surveyors has a mode of ‘no’.
 - Consultants with ISO9000 certification, have a mode of ‘no’.
 - Consultants without certification have a mode of ‘yes’.
- E-mail provided for assignment-based managerial staff has a mode of ‘no’ overall but the percent response varies within the sample sectors.
 - Architecture has a mode of ‘no’.
 - Building services has a mode of ‘mostly yes’.
 - Civil has a mode of ‘yes’.
 - Landscaping has a mode of ‘mostly yes’.
 - Structural has a mode of ‘no’.

- Quantity surveyors have a mode of 'no'.
- Consultants with ISO9000 certification, have a mode of 'no'.
- Consultants without certification have a mode of 'no'.
- E-mail provided for assignment-based professional staff has a mode of 'no' except for civil which records 'yes'
- E-mail provided for assignment-based supervisory staff has a mode of 'no' with a range of forty-two to seventy-two 'no' response within the sample sectors.
- E-mail provided for assignment-based clerical staff has a mode of 'no' with a range of response of forty-six to seventy-two percent within the sample sectors.

Q.1.7.3 Does your company employ staff to administer your information technology?

As the level of investment in IT increases, so the complexity is likely to increase. Systems administration then becomes a necessity. Rather than count the number of PC's used within a company: measurement of the level-of-user support is more indicative of technology deployment. It indicated the level of user-support recognised, by the company, to be worthwhile - if not essential - within the company.

- Are staff employed to administer IT in company offices has a mode and median of 'yes', and a mean on the positive side of 'mostly yes' for all sample sectors.
- Are staff employed to administer IT in assignment offices has a mode of 'no', a median of 'mostly no' and a mean on the positive side of 'mostly no'. Except for structural sample sector: mode of 'yes' but median of 'mostly no'.

Q.1.7.4 What is the highest level of management of information technology, in the company?

The question is a key indicator of the relative importance of IT within the company. The results are shown in Table 6-1.

- Five percent of the total response states 'no' IT management, but forty-seven percent has the highest level of IT management at Director level (35% full-time, 15% part-time). Twenty-one percent has the highest level at a Manager level (14% full-time, 7% part-time).
- Three percent of the Architectural Consultant firm have 'no' IT management, but forty-two percent has the highest level of IT management at Director level (14% full-time, 28% part-time). Thirteen percent has the highest level at a Manager level (10% full-time, 3% part-time).
- Building Services consultants firms do not have enough in the sample-sector for frequency analysis to be meaningful.
- Seven percent of the Civil consultants firms have 'no' IT management, but fifty-three has the highest level of IT management at Director level (17% full-time, 36% part-time). Twenty-three percent has the highest level at Manager level (17% full-time, 6% part-time).
- Landscaping consultants firms do not have enough in the sample-sector for frequency analysis to be meaningful.
- Zero percent of the Structural consultant firms have 'no' IT management, but sixty-one percent has the highest level of IT management at Director level (19% full-time, 42% part-time). Twenty-seven percent has the highest level at a Manager level (19% full-time, 8% part-time).

- Quantity Surveying consultants firms do not have enough in the sample-sector for frequency analysis to be meaningful.
- Three percent of the consultants firms 'with ISO9000 certification' have 'no' IT management, but fifty-two percent has the highest level of IT management at Director level (38% full-time, 14% part-time). Twenty-one percent has the highest level at a Manager level (15% full-time, 6% part-time).
- Eight percent of the consultants firms 'without ISO9000 certification' have 'no' IT management, but forty-nine percent has the highest level of IT management at Director level (17% full-time, 32% part-time). Twenty-three percent has the highest level at a Manager level (13% full-time, 10% part-time).

Q1.7.4 Frequency of Levels of IT Management in Consultant Firms								
All survey response			Architectural Consultants			Building Services Consultants		
IT Management	Freq	%	IT Management	Freq	%	IT Management	Freq	%
Part-time Director	52	35%	Part-time Director	8	28%	Part-time Director	8	67%
Full-time Director	22	15%	Full-time IT Professional	5	17%	Full-time Manager	3	25%
Full-time Manager	21	14%	Full-time Director	4	14%	Full-time Director	1	8%
Part-time Manager	11	7%	Full-time Manager	3	10%	Part-time Manager	0	0%
Full-time IT Professional	11	7%	Part-time Senior Professional	2	7%	Full-time Senior Professional	0	0%
Part-time Senior Professional	9	6%	Full-time operative	2	7%	Part-time Senior Professional	0	0%
None	8	5%	Part-time operative	2	7%	Full-time IT Professional	0	0%
Part-time IT Professional	4	3%	Part-time Manager	1	3%	Part-time IT Professional	0	0%
Part-time operative	4	3%	Full-time Senior Professional	1	3%	Full-time operative	0	0%
Full-time Senior Professional	2	1%	None	1	3%	Part-time operative	0	0%
Full-time operative	2	1%	Part-time IT Professional	0	0%	Full-time subcontractor	0	0%
Part-time subcontractor	2	1%	Full-time subcontractor	0	0%	Part-time subcontractor	0	0%
Full-time subcontractor	0	0%	Part-time subcontractor	0	0%	None	0	0%
Civil Consultants			Landscaping Consultants			Structural Consultants		
IT Management	Freq	%	IT Management	Freq	%	IT Management	Freq	%
Part-time Director	36	36%	Part-time Director	3	38%	Part-time Director	11	42%
Full-time Director	17	17%	Full-time Director	1	13%	Full-time Director	5	19%
Full-time Manager	17	17%	Full-time Manager	1	13%	Full-time Manager	5	19%
None	7	7%	Part-time Manager	1	13%	Part-time Manager	2	8%
Part-time Manager	6	6%	Part-time IT Professional	1	13%	Part-time Senior Professional	1	4%
Full-time IT Professional	6	6%	None	1	13%	Part-time operative	1	4%
Part-time Senior Professional	3	3%	Full-time Senior Professional	0	0%	Part-time subcontractor	1	4%
Part-time IT Professional	3	3%	Part-time Senior Professional	0	0%	Full-time Senior Professional	0	0%
Full-time Senior Professional	2	2%	Full-time IT Professional	0	0%	Full-time IT Professional	0	0%
Part-time operative	2	2%	Full-time operative	0	0%	Part-time IT Professional	0	0%
Part-time subcontractor	1	1%	Part-time operative	0	0%	Full-time operative	0	0%
Full-time operative	0	0%	Full-time subcontractor	0	0%	Full-time subcontractor	0	0%
Full-time subcontractor	0	0%	Part-time subcontractor	0	0%	None	0	0%
Quantity Surveyors			Consultants with ISO9000			Consultants without ISO9000		
IT Management	Freq	%	IT Management	Freq	%	IT Management	Freq	%
Part-time Director	7	47%	Part-time Director	33	38%	Part-time Director	19	32%
Part-time Senior Professional	4	27%	Part-time Manager	13	15%	Full-time Director	10	17%
Full-time Manager	2	13%	Full-time Director	12	14%	Full-time Manager	8	13%
Part-time Manager	1	7%	Full-time IT Professional	7	8%	Part-time Manager	6	10%
Part-time subcontractor	1	7%	Part-time Senior Professional	6	7%	None	5	8%
Full-time Director	0	0%	Part-time Manager	5	6%	Full-time IT Professional	4	7%
Full-time Senior Professional	0	0%	Part-time operative	3	3%	Part-time Senior Professional	3	5%
Full-time IT Professional	0	0%	None	3	3%	Part-time IT Professional	3	5%
Part-time IT Professional	0	0%	Full-time operative	2	2%	Full-time Senior Professional	1	2%
Full-time operative	0	0%	Part-time subcontractor	2	2%	Part-time operative	1	2%
Part-time operative	0	0%	Full-time Senior Professional	1	1%	Full-time operative	0	0%
Full-time subcontractor	0	0%	Part-time IT Professional	1	1%	Full-time subcontractor	0	0%
None	0	0%	Full-time subcontractor	0	0%	Part-time subcontractor	0	0%

Table 6-1 The frequency of the highest level of IT management in the Hong Kong consultant firms.

In general, a small percent of the consultant firms (5%) have no IT management. Part-time Director-level IT management is most frequent in every sample sector of the population and overall. The use of Manager-level personnel for the highest level of IT management in the second most frequent level of IT management.

Q.1.7.5 Does your company use electronic mail in company offices for the following purposes?

This question measures the use of electronic-mail as an increasingly sophisticated means of information distribution and also indicates if work-groups exist within the main company offices.

- Use of E-mail in company offices for sending written messages has a mode of 'yes' overall but the percent response varies within the sample sectors.
 - Architectural consultant firms have a thirty-one percent 'yes' response.
 - Building Service consultant firms a mode of 'mostly yes' and fifty-eight percent 'mostly yes' compared to seventeen percent 'mostly no' and seventeen percent 'yes'.
 - Civil consultant firms have a mode and median of 'yes'.
 - Landscaping firms have a mode and median of 'yes'.
 - Structural consultant firms have a mode and median of 'mostly yes'.
 - Quantity surveyor firms have a mode of 'no' and median of 'mostly yes': forty percent responding 'yes' and 'no'.
 - Consultant firms with ISO9000 certification have a mode of 'yes' whilst those without also have a mode of 'yes'.
- Use of E-mail in company offices for agreeing drafting text of written messages has a mode of 'no' overall but the percent response varies within the sample sectors.
 - Architectural consultant firms have a fifty-five percent 'no' response.
 - Building Service consultant firms a mode of 'mostly yes' and forty-two percent 'mostly yes' compared to twenty-five percent 'mostly no' and thirty-three percent 'no'.
 - Civil consultant firms have a mode of 'yes' and a median of 'mostly yes'.
 - Landscaping firms have a mode and median of 'yes'.
 - Structural consultant firms have a mode 'no' and median of 'mostly no'.
 - Quantity surveyor firms have a mode and median of 'no'.
 - Consultant firms with ISO9000 certification have a mode of 'no' whilst those without have a mode of 'yes'.
- Use of E-mail in company offices for marking up/amending written messages of others has a mode of 'no' with a range of response within the sample sectors.
 - Architectural consultant firms have a fifty-nine percent 'no' response.
 - Building Service consultant firms a mode of 'no' and median of 'mostly no'.
 - Civil consultant firms have a mode and median of 'mostly yes'.
 - Landscaping firms have a mode and median of 'mostly yes'.
 - Structural consultant firms have a mode 'no' and median of 'mostly no'.
 - Quantity surveyor firms have a mode and median of 'no'.
 - Consultant firms with ISO9000 certification have a mode of 'no' whilst those without have a mode of 'yes'.
- Use of E-mail in company offices for attaching other written messages to written messages has a mode of 'yes' with a range of response within the sample sectors.
 - Architectural consultant firms have a forty-eight percent 'no' response.
 - Building Service consultant firms a mode and median of 'mostly no'.
 - Civil consultant firms have a mode of 'yes' and a median of 'mostly yes'.
 - Landscaping firms have a mode and median of 'yes'.

- Structural consultant firms have a mode 'no' and median of 'mostly yes'.
- Quantity surveyor firms have a mode of 'no' and a median of 'mostly no'.
- Consultant firms with ISO9000 certification have a mode of 'no' whilst those without have a mode of 'yes'.
- Use of E-mail in company offices for attaching drawing files to written messages has a mode of 'no' but the percent response varies within the sample sectors.
 - Architectural consultant firms have a mode of 'no' and a thirty-one percent 'no' response.
 - Building Service consultant firms a mode and median of 'mostly yes'.
 - Civil consultant firms have a mode of 'yes' and a median of 'mostly yes'.
 - Landscaping firms have a mode 'yes' and a median of 'mostly yes'.
 - Structural consultant firms have a mode 'no' and median of 'mostly yes'.
 - Quantity surveyor firms have a mode and median of 'no'.
 - Consultant firms with ISO9000 certification have a mode of 'no' whilst those without have a mode of 'yes'.
- Use of E-mail in company offices for attaching digital photographs to written messages has a mode of 'no' for all sample sectors except landscaping with a mode of 'yes' and median of 'mostly no'.
- Use of E-mail in company offices for attaching video images to written messages has a mode of 'no' with a range of sixty-three to ninety percent 'no' response within the sample sectors.
- Use of E-mail in company offices for attaching digital sound files to written messages has a mode of 'no' with a range of response of seventy-one to one-hundred percent 'no' within the sample sectors.
- Use of E-mail in company offices for assigning/delegating an action has a mode of 'no' within the sample sectors except for landscaping with a mode of 'mostly yes'. 'no' response with an eight to seven percent 'yes'.

Q.1.7.6 Does your company use electronic mail on construction sites for the following purposes?

Measures the extent that an IT approach to work-group techniques are being repeated on the construction sites.

- Use of E-mail in assignment offices for sending written messages has a mode of 'yes' overall but the percent response varies within the sample sectors.
 - Architectural consultant firms have a sixty-two percent 'no' response.
 - Building Service consultant firms a mode and median of 'mostly yes'
 - Civil consultant firms have a mode of 'yes' and a median of 'mostly yes'.
 - Landscaping firms have a mode and median of 'mostly yes'.
 - Structural consultant firms have a mode of 'no' and a median of 'mostly no'.
 - Quantity surveyor firms have a mode of 'no' and median of 'no'.
 - Consultant firms with ISO9000 certification have a mode of 'no' whilst those without certification also have a mode of 'no'.
- Use of E-mail in assignment offices for agreeing drafting text of written messages has a mode of 'no' for all sample sectors except civil firms. They record a mode of 'yes' and median of 'mostly no'.
- Use of E-mail in assignment offices for marking up/amending written messages of others has a mode of 'no' for all sample sectors.

- Use of E-mail in assignment offices for attaching other written messages to written messages has a mode of 'no' with a range of response within the sample sectors.
 - Architectural consultant firms have a seventy-two percent 'no' response.
 - Building Service consultant firms a mode and median of 'mostly yes'.
 - Civil consultant firms have a mode of 'yes' and a median of 'mostly yes'.
 - Landscaping firms have a mode of 'yes' and a median of 'mostly yes'.
 - Structural consultant firms have a mode 'no' and median of 'mostly yes'.
 - Quantity surveyor firms have a mode of 'no' and a median of 'no'.
 - Consultant firms with ISO9000 certification have a mode of 'no' whilst those without certification also have a mode of 'no'.
- Use of E-mail in assignment offices for attaching drawing files to written messages has a mode of 'no' but the percent response varies within the sample sectors.
 - Architectural consultant firms have a sixty-six percent 'no' response.
 - Building Service consultant firms a mode and median of 'mostly yes'.
 - Civil consultant firms have a mode of 'no' and a median of 'mostly no'.
 - Landscaping firms have a mode 'yes' and a median of 'mostly yes'.
 - Structural consultant firms have a mode 'no' and median of 'mostly no'.
 - Quantity surveyor firms have a mode and median of 'no'.
 - Consultant firms with ISO9000 certification have a mode of 'no' whilst those without certification also have a mode of 'no'.
- Use of E-mail in assignment offices for attaching digital photographs to written messages has a mode of 'no' for all sample sectors except landscaping with a mode and median of 'mostly no'.
- Use of E-mail in assignment offices for attaching video images to written messages has a mode of 'no' with a range of seventy-one to one-hundred percent 'no' response within the sample sectors.
- Use of E-mail in assignment offices for attaching digital sound files to written messages has a mode of 'no' with a range of response of seventy-one to one-hundred percent 'no' within the sample sectors.
- Use of E-mail in assignment offices for assigning/delegating an action has a mode of 'no' within the sample sectors.

Q.1.7.7 Does your company have a homepage on the Internet?

Used as an indicator of IT awareness. Has a mode of 'no' with a range of response of fifty-four to eighty-three percent 'no' within the sample sectors except for landscaping firms whose mode is 'yes' but the median is mid way between 'mostly yes' and 'mostly no'.

Q.1.7.8 Does your company have it's own Internet server?

This question is used as an indicator of greater IT sophistication and use than the previous question. Has a mode of 'no' and a 'no' response in the range of sixty-two to seventy-six percent excepting landscaping firms. Their mode is 'yes' but the median is mid way between 'mostly yes' and 'mostly no'.

Q.1.7.9 Does your company provide an Internet service for the following categories of staff, for communication purposes?

This measures the extent that Internet services are used as a communication aid. Service costs in Hong Kong are low because of the zero cost of local telephone calls. Internet providers are competitive. These factors make Internet services one of the cheapest forms of communication available.

- Internet services provided to managerial staff has a mode of 'yes' for all sample sectors.
- Internet services provided to professional staff has a mode of 'yes' overall but the percent response varies within the sample sectors.
 - Architectural consultant firms have a mode of 'no' and a median of 'mostly no'.
 - Building Service consultant firms a mode and median of 'mostly no'.
 - Civil consultant firms have a mode of 'no' and a median of 'mostly no'.
 - Landscaping firms have a mode 'yes' and a median of 'mostly yes'.
 - Structural consultant firms have a mode and median of 'mostly yes'.
 - Quantity surveyor firms have a mode 'yes' and a median of 'mostly yes'.
 - Consultant firms with ISO9000 certification have a mode of 'yes' whilst those without certification also have a mode of 'yes'.
- Internet services provided for supervisory staff has a mode of 'no' overall but the percent response varies within the sample sectors.
 - Architectural consultant firms have a mode and median of 'no'.
 - Building Service consultant firms a mode and median of 'mostly no'.
 - Civil consultant firms have a mode of 'yes' and a median of 'mostly yes'.
 - Landscaping firms have a mode and a median of 'mostly yes'.
 - Structural consultant firms have a mode of 'no' and a median of 'mostly no'.
 - Quantity surveyor firms have a mode of 'no' and a median of 'mostly no'.
 - Consultant firms with ISO9000 certification have a mode of 'no' whilst those without certification have a mode of 'yes'.
- Internet services provided for administrative, clerical and other staff has a mode of 'no' with a range of 'no' response of twenty-five to fifty-five percent 'no'.

Part 2 of the Questionnaire, Purpose of the information technology

Q.2.1 Does your company communicate/transmit to head office and vice versa, using information technology, data/information on the following list of work-content related topics?

Probes the flow of named, common, work-related data to see if there is a communication of these fundamental data items.

- Transmission of lists of 'activities' (work-content data) using IT has a mode and median of 'mostly yes'. This response is consistent for the sector samples except for architectural and building services who respond with a mode and median of 'mostly no'.
- Transmission of lists of 'deliverables' (work-content data) using IT has a mode of 'mostly no' and a median 'mostly yes' overall, but a response of twenty-two

percent 'yes', thirty percent 'mostly yes', thirty-one percent 'mostly no', and sixteen percent 'no'. The percent response varies within the sample sectors.

- Architectural consultant firms have a mode and median of 'mostly no'.
- Building Service consultant firms a mode of 'mostly no' and a median of 'mostly yes'.
- Civil consultant firms have a mode and median of 'mostly yes'.
- Landscaping firms have a mode of 'no' and a median of 'mostly no'.
- Structural consultant firms have a mode and median of 'mostly yes'.
- Quantity surveyor firms have a mode of 'no' and a median of 'mostly no'.
- Consultant firms with ISO9000 certification have a mode of 'mostly no' whilst those without certification have a mode of 'mostly yes'.
- Transmission of lists of 'changes in scope/standards' (work-content data) using IT has a mode and median of 'mostly yes' overall, but the response is balanced due to a response of nineteen percent 'yes', thirty percent 'mostly yes', thirty-one percent 'mostly no', and twenty-one percent 'no'. The percent response varies within the sample sectors.
 - Architectural consultant firms have a mode of 'no' and a median of 'mostly no'.
 - Building Service consultant firms a mode and median of 'mostly no'.
 - Civil consultant firms have a mode and median of 'mostly yes'.
 - Landscaping firms have a mode and median of 'no'.
 - Structural consultant firms have a mode and median of 'mostly yes'.
 - Quantity surveyor firms have a mode of 'mostly no' and a median of 'mostly yes'.
 - Consultant firms with ISO9000 certification have a mode of 'mostly no' whilst those without certification have a mode of 'mostly yes'.
- Transmission of lists of 'disputes and their status' (work-content data) using IT has a mode and median of 'mostly no' overall, but a response of sixteen percent 'yes', twenty-six percent 'mostly yes', thirty percent 'mostly no', and twenty-eight percent 'no'. The percent response varies within the sample sectors.
 - Architectural consultant firms have a mode of 'no' and a median of 'mostly no'.
 - Building Service consultant firms a mode and median of 'mostly no'.
 - Civil consultant firms have a mode and median of 'mostly yes'.
 - Landscaping firms have a mode and median of 'no'.
 - Structural consultant firms have a mode of 'no' and a median of 'mostly no'.
 - Quantity surveyor firms have a mode and a median of 'mostly no'.
 - Consultant firms with ISO9000 certification have a mode of 'mostly no' whilst those without certification have a mode of 'no'.

Q.2.2 What information technology does your company use to communicate/transmit to head office and vice versa, work-content related data/information?

This question measures the extent that telephone, fax, electronic-mail or hardcopy is used to exchange information on work-content of the project.

- Use of telephone to communicate/transmit work-content related data/information has a mode and median of 'yes' for all sample sectors, with a range of 'yes' response of forty-four to sixty-nine percent.

- Use of fax to communicate/transmit work-content related data/information has a mode and median of 'yes' for all sample sectors except building services who respond 'mostly yes'.
- Use of e-mail to communicate/transmit work-content related data/information has a mode and median of 'mostly yes' for all sample sectors except architectural firms whose mode and median is 'mostly no'
- Use of hardcopy/letter/report/form to communicate/transmit work-content related data/information has a mode and median of 'yes' for all sample sectors with a range of 'yes' response of sixty-four to eighty-three percent.

Q.2.3 Does your company communicate/transmit to head office and vice versa, using information technology, data/information on the following list of time related topics?

The same line of questioning as Q.2.1, but for time related data. It is assumed that the project work-scheduling process is not duplicated in each location.

- Transmission of 'work schedule of activities' (time-content data) using IT has a mode and median of 'mostly yes' for all sample sector except landscaping whose mode is 'no' but median is 'mostly yes'.
- Transmission of '% work done' (time-content data) using IT has a mode and median of 'mostly yes' for all sample sector except landscaping whose mode is 'no' but median is 'mostly yes'.
- Transmission of '% work to be done' (time-content data) using IT has a mode and median of 'mostly yes' for all sample sector except landscaping (mode 'no' but median 'mostly yes') and quantity surveyors (mode and median 'mostly no').
- Transmission of lists of 'replanned work' (time-content data) using IT has a mode and median of 'mostly yes' for all sample sector except landscaping (mode 'no' but median 'mostly yes') and quantity surveyors (mode 'yes' and median 'mostly yes').

Q.2.4 What information technology does your company use to communicate/transmit to head office and vice versa, time related data/information?

Measures the means that the data in Q2.3 is communicated.

- Use of telephone to communicate/transmit time-content related data/information has a mode of 'yes' and median of 'mostly yes' for all sample sectors, except for architectural and firms with ISO9000 certification whose mode and median is 'yes'. The range of 'yes' response is thirty-five to sixty-six percent.
- Use of fax to communicate/transmit work-content related data/information has a mode and median of 'yes' for all sample sectors except building services who respond 'mostly yes'.
- Use of e-mail to communicate/transmit work-content related data/information has a mode and median of 'yes' or mostly yes' for all sample sectors. The range of 'yes' response is zero to twenty-six percent. 'Mostly yes' ranges from twenty-one to sixty-seven percent.
- Use of hardcopy/letter/report/form to communicate/transmit work-content related data/information has a mode and median of 'yes' for all sample sectors with a range of 'yes' response of forty-five to eighty-eight percent.

Q.2.5 Does your company communicate/transmit to head office and vice versa, using information technology, data/information on the following list of cost related topics?

The same line of questioning as Q.2.1, but for cost-related data. This is thought to be the most prevalent indicator of project performance and the measure that can be most easily combined together to gauge overall performance.

- Transmission of 'value of work done' (cost-content data) using IT has a mode of 'mostly no' and a median and mean of 'mostly yes' overall with a response of twenty-seven percent 'yes', twenty-eight percent 'mostly yes', thirty percent 'mostly no', and fifteen percent 'no'. The percent response varies within the sample sectors.
 - Architectural consultant firms have a mode and a median of 'mostly no'.
 - Building Service consultant firms a mode and median of 'mostly yes'.
 - Civil consultant firms have a mode of 'mostly no' and median of 'mostly yes'.
 - Landscaping firms have a mode and median of 'mostly no'.
 - Structural consultant firms have a mode of 'no' and a median of 'mostly yes'.
 - Quantity surveyor firms have a mode of 'yes' and a median of 'mostly yes'.
 - Consultant firms with ISO9000 certification have a mode of 'mostly yes' whilst those without certification have a mode of 'mostly no'.
- Transmission of 'value of work to be done' (cost-content data) using IT has a mode of 'mostly no' and a median and mean of 'mostly yes' overall. The response is: twenty-five percent 'yes', twenty-nine percent 'mostly yes', thirty-one percent 'mostly no', and fifteen percent 'no'. The percent response varies within the sample sectors.
 - Architectural consultant firms have a mode and a median of 'mostly no'.
 - Building Service consultant firms a mode of 'yes' and median of 'mostly yes'.
 - Civil consultant firms have a mode and a median of 'mostly yes'.
 - Landscaping firms have a mode and median of 'mostly no'.
 - Structural consultant firms have a mode of 'mostly yes' and mode of 'mostly no'.
 - Quantity surveyor firms have a mode of 'yes' and a median of 'mostly yes'.
 - Consultant firms with ISO9000 certification have a mode of 'mostly no' whilst those without certification also have a mode of 'mostly no'.
- Transmission of 'expenditure' (cost-content data) using IT has a mode of 'yes', median and mean of 'mostly yes' overall. The response is: twenty-five percent 'yes', twenty-eight percent 'mostly yes', thirty percent 'mostly no', and seventeen percent 'no'. The percent response varies within the sample sectors.
 - Architectural consultant firms have a mode and a median of 'mostly no'.
 - Building Service consultant firms a mode and a median of 'mostly yes'.
 - Civil consultant firms have a mode of 'mostly no' and a median of 'mostly yes'.
 - Landscaping firms have a mode and median of 'mostly yes'.
 - Structural consultant firms have a mode and median of 'mostly no'.
 - Quantity surveyor firms have a mode of 'yes' and a median of 'mostly yes'.
 - Consultant firms with ISO9000 certification have a mode of 'mostly no' whilst those without certification have a mode of 'mostly yes'.
- Transmission of 'commitment' (cost-content data) using IT has a mode and median of 'mostly yes' overall. The response is: twenty percent 'yes', thirty-two

percent ‘mostly yes’, thirty percent ‘mostly no’, and eighteen percent ‘no’. The percent response varies within the sample sectors.

- Architectural consultant firms have a mode and a median of ‘mostly no’.
- Building Service consultant firms a mode and a median of ‘mostly yes’.
- Civil consultant firms have a mode and median of ‘mostly yes’.
- Landscaping firms have a mode ‘no’ and median of ‘mostly yes’.
- Structural consultant firms have a mode of ‘no’ and a median of ‘mostly no’.
- Quantity surveyor firms have a mode of ‘yes’ and a median of ‘mostly no’.
- Consultant firms with ISO9000 certification have a mode of ‘mostly yes’ whilst those without certification also have a mode of ‘mostly yes’.
- Transmission of ‘value of variations’ (cost-content data) using IT has a mode of ‘mostly no’ and a median and mean of ‘mostly yes’ overall with a response of twenty-two percent ‘yes’, thirty percent ‘mostly yes’, thirty-two percent ‘mostly no’, and seventeen percent ‘no’. The percent response varies within the sample sectors.
 - Architectural consultant firms have a mode and a median of ‘mostly no’.
 - Building Service consultant firms a mode and a median of ‘mostly yes’.
 - Civil consultant firms have a mode and median of ‘mostly yes’.
 - Landscaping firms have a mode ‘no’ and median of ‘mostly no’.
 - Structural consultant firms have a mode and a median of ‘mostly no’.
 - Quantity surveyor firms have a mode of ‘yes’ and a median of ‘mostly yes’.
 - Consultant firms with ISO9000 certification have a mode of ‘mostly yes’ whilst those without certification have a mode of ‘mostly no’.
- Transmission of ‘value of disputes’ (cost-content data) using IT has a mode, median and mean of ‘mostly no’ overall. The response is: eighteen percent ‘yes’, twenty-nine percent ‘mostly yes’, thirty-five percent ‘mostly no’, and eighteen percent ‘no’. The percent response varies within the sample sectors.
 - Architectural consultant firms have a mode and a median of ‘mostly no’.
 - Building Service consultant firms a mode and a median of ‘mostly yes’.
 - Civil consultant firms have a mode and median of ‘mostly no’.
 - Landscaping firms have a mode ‘no’ and median of ‘mostly no’.
 - Structural consultant firms have a mode of ‘mostly no’ and a median of ‘mostly yes’.
 - Quantity surveyor firms have a mode of ‘no’ and a median of ‘mostly no’.
 - Consultant firms with ISO9000 certification have a mode of ‘mostly no’ whilst those without certification also have a mode of ‘mostly no’.
- Transmission of ‘money received’ (cost-content data) using IT has a mode of ‘mostly no’, median and mean of ‘mostly no’ overall. The response is: twenty-eight percent ‘yes’, twenty-five percent ‘mostly yes’, twenty-nine percent ‘mostly no’, and eighteen percent ‘no’. The percent response varies within the sample sectors.
 - Architectural consultant firms have a mode and a median of ‘mostly no’.
 - Building Service consultant firms a mode of ‘yes’ and a median of ‘mostly yes’.
 - Civil consultant firms have a mode and median of ‘mostly yes’.
 - Landscaping firms have a mode ‘no’ and median of ‘mostly no’.
 - Structural consultant firms have a mode of ‘no’ and a median of ‘mostly no’.
 - Quantity surveyor firms have a mode of ‘yes’ and a median of ‘mostly no’.
 - Consultant firms with ISO9000 certification have a mode of ‘yes’ whilst those without certification have a mode of ‘mostly yes’.

- Transmission of lists of ‘money received’ (cost-content data) using IT has a mode of ‘mostly no’, median and mean of ‘mostly yes’ overall. The response is: twenty-eight percent ‘yes’, twenty-five percent ‘mostly yes’, twenty-nine percent ‘mostly no’, and eighteen percent ‘no’. The percent response varies within the sample sectors.
 - Architectural consultant firms have a mode and a median of ‘mostly no’.
 - Building Service consultant firms a mode of ‘yes’ and a median of ‘mostly yes’.
 - Civil consultant firms have a mode and median of ‘mostly yes’.
 - Landscaping firms have a mode ‘no’ and median of ‘mostly yes’.
 - Structural consultant firms have a mode of ‘no’ and a median of ‘mostly no’.
 - Quantity surveyor firms have a mode of ‘yes’ and a median of ‘mostly no’.
 - Consultant firms with ISO9000 certification have a mode of ‘yes’ whilst those without certification have a mode of ‘mostly yes’.
- Transmission of lists of ‘money outstanding’ (cost-content data) using IT has a mode of ‘mostly no’, median and mean of ‘mostly yes’ overall. The response is: twenty-nine percent ‘yes’, twenty-five percent ‘mostly yes’, twenty-nine percent ‘mostly no’, and eighteen percent ‘no’. The percent response varies within the sample sectors.
 - Architectural consultant firms have a mode and a median of ‘mostly no’.
 - Building Service consultant firms a mode of ‘yes’ and a median of ‘mostly yes’.
 - Civil consultant firms have a mode and median of ‘mostly yes’.
 - Landscaping firms have a mode and median of ‘mostly yes’.
 - Structural consultant firms have a mode of ‘no’ and a median of ‘mostly yes’.
 - Quantity surveyor firms have a mode of ‘no’ and a median of ‘mostly no’.
 - Consultant firms with ISO9000 certification have a mode of ‘yes’ whilst those without certification have a mode of ‘mostly yes’.

Q.2.6 What information technology does your company use to communicate/transmit to head office and vice versa, cost related data/information?

Measures the means that the data in Q2.5 is communicated

- Use of telephone to communicate/transmit time-content related data/information has a mode of ‘yes’ and median of ‘mostly yes’ for all sample sectors, except for building services (mode of ‘mostly no’), structural (mode of ‘mostly yes’), and firms without ISO9000 certification (mode of ‘mostly no’).
- Use of fax to communicate/transmit work-content related data/information has a mode of ‘yes’ and a median of ‘mostly yes’ for all sample sectors except building services and landscaping who respond ‘mostly yes’.
- Use of e-mail to communicate/transmit work-content related data/information has a mode and median of ‘mostly no’ overall. The percent response varies within the sample sectors.
 - Architectural consultant firms have a mode and a median of ‘yes’.
 - Building Service consultant firms a mode and a median of ‘mostly yes’.
 - Civil consultant firms have a mode and median of ‘mostly yes’.
 - Landscaping firms have a mode and median of ‘mostly yes’.
 - Structural consultant firms have a mode of ‘no’ and a median of ‘mostly no’.
 - Quantity surveyor firms have a mode and a median of ‘mostly yes’.

- Consultant firms with ISO9000 certification have a mode of ‘mostly no’ whilst those without certification have a mode of ‘no’.
- Use of hardcopy/letter/report/form to communicate/transmit work-content related data/information has a mode and median of ‘yes’ for all sample sectors except for architectural who respond with a mode and median of ‘mostly no’. The range of ‘yes’ response is zero to seventy-five percent.

Q.2.7 Does your company communicate/transmit to head office and vice versa, using information technology, data/information on the following list of resource related topics?

Questions the flow of resource-related information.

- Transmission of ‘personnel deployed’ (resource-content data) using IT has a mode and median of ‘mostly no’ overall with a response of twenty percent ‘yes’, twenty-nine percent ‘mostly yes’, thirty-five percent ‘mostly no’, and seventeen percent ‘no’. The percent response varies within the sample sectors.
 - Architectural consultant firms have a mode and a median of ‘yes’.
 - Building Service consultant firms a mode and median of ‘mostly no’.
 - Civil consultant firms have a mode of ‘mostly no’ and median of ‘mostly no’.
 - Landscaping firms have a mode and median of ‘mostly no’.
 - Structural consultant firms have a mode of ‘no’ and a median of ‘mostly yes’.
 - Quantity surveyor firms have a mode of ‘no’ and a median of ‘mostly no’.
 - Consultant firms with ISO9000 certification have a mode of ‘mostly no’ whilst those without certification also have a mode of ‘mostly no’.
- Transmission of ‘personnel required’ (resource-content data) using IT has a mode and median of ‘mostly yes’ overall. The response is: nineteen percent ‘yes’, thirty-four percent ‘mostly yes’, thirty percent ‘mostly no’, and seventeen percent ‘no’. The percent response varies within the sample sectors.
 - Architectural consultant firms have a mode and a median of ‘mostly yes’.
 - Building Service consultant firms a mode and median of ‘mostly yes’.
 - Civil consultant firms have a mode and a median of ‘mostly yes’.
 - Landscaping firms have a mode and median of ‘mostly yes’.
 - Structural consultant firms have a mode of ‘no’ and mode of ‘mostly no’.
 - Quantity surveyor firms have a mode and a median of ‘mostly yes’.
 - Consultant firms with ISO9000 certification have a mode of ‘mostly yes’ whilst those without certification have a mode of ‘mostly no’.
- Transmission of ‘facilities employed’ (resource-content data) using IT has a mode and a median and mean of ‘mostly no’ overall and for the following sample sectors: civil; landscaping; structural; and firms without ISO9000 certification. The other sample sectors: architecture; building services; and firms with ISO9000 certification have a mode and median of ‘mostly yes’.
- Transmission of ‘facilities required’ (resource-content data) using IT has a mode and a median and mean of ‘mostly no’ overall and for the following sample sectors: civil; landscaping; structural; and firms without ISO9000 certification. The other sample sectors: architecture; building services (mode ‘mostly no’); and firms with ISO9000 certification have a mode and median of ‘mostly yes’.
- Transmission of ‘sub-consultants hired’ (resource-content data) using IT has a mode and a median and mean of ‘mostly no’ for all sample sectors except architecture (mode and median of ‘mostly yes’), and structural (mode of ‘mostly yes’).

- Transmission of ‘purchasing services required’ (resource-content data) using IT has a mode, median and mean of ‘mostly no’ overall. The response is: seventeen percent ‘yes’, twenty-eight percent ‘mostly yes’, thirty-eight percent ‘mostly no’, and seventeen percent ‘no’. The percent response varies within the sample sectors.
 - Architectural consultant firms have a mode and a median of ‘mostly no’.
 - Building Service consultant firms a mode of ‘yes’ and a median of ‘mostly yes’.
 - Civil consultant firms have a mode and median of ‘mostly no’.
 - Landscaping firms have a mode and median of ‘mostly yes’.
 - Structural consultant firms have a mode of ‘no’ and a median of ‘mostly no’.
 - Quantity surveyor firms have a mode and median of ‘mostly no’.
 - Consultant firms with ISO9000 certification have a mode of ‘mostly yes’ whilst those without certification also have a mode of ‘mostly no’.
- Transmission of ‘QS services required’ (resource-content data) using IT has a mode, median and mean of ‘mostly no’ for all sample sectors except quantity surveyors mode ‘no’).
- Transmission of ‘Legal services required’ (resource-content data) using IT has a mode, median and mean of ‘mostly no’ for all sample sectors.
- Transmission of ‘management services required’ (resource-content data) using IT has a mode, median and mean of ‘mostly no’ for all sample sectors.
- Transmission of ‘administration services required’ (resource-content data) using IT has a mode, median and mean of ‘mostly no’ for all sample sectors.
- Transmission of ‘other out-sourced services required’ (resource-content data) using IT has a mode, median and mean of ‘mostly no’ for all sample sectors.

Q.2.8 What information technology does your company use to communicate/transmit to head office and vice versa, resource related data/information?

As before, this question measures the manner in which the data is communicated.

- Use of telephone to communicate/transmit resource-content related data/information has a mode of ‘yes’ and median of ‘mostly yes’ for all sample sectors.
- Use of fax to communicate/transmit resource-content related data/information has a mode and a median of ‘mostly yes’ for all sample sectors except architecture (mode ‘yes’), building services (mode ‘yes’), quantity surveyors (mode and median ‘yes’), and firms with ISO9000 certification (mode ‘yes’).
- Use of e-mail to communicate/transmit resource-content related data/information has a mode and median of ‘mostly no’ for all sample sectors except civil (median ‘mostly yes’) and quantity surveyor firms (mode ‘no’).
- Use of hardcopy/letter/report/form to communicate/transmit resource-content related data/information has a mode and median of ‘yes’ for all sample sectors except for civil (median ‘mostly yes’), landscaping (‘mode and median of ‘mostly yes’’) and firms without ISO9000 certification (mode and median of ‘mostly yes’).

Q.2.9..What five items of data/information is most important in your company for assessing the performance of a construction project?

This question allows the respondent to state, in order of importance, their indicators of performance. It is anticipated that cost values will predominate. Table 6-2 states the level of response to this question.

	Pop. Sample	Max Response Possible	Actual Response	Response %
All Consultants	207	1035	463	45%
Architectural firms	35	175	82	47%
Building Services firms	17	85	44	52%
Civil firms	147	735	317	43%
Landscape firms	9	45	21	47%
Structural firms	32	160	102	64%
Quantity Surveyors	15	75	45	60%
Consultants with ISO9000	100	500	279	56%
Consultants w/o ISO9000	107	535	184	34%

Table 6-2 Level of response from HK consultants regarding data/information for assessing project performance.

After the removal of unclear responses and semantic differences, 195 unique responses were listed. The ratio of the number of unique response to the actual number of responses is taken as a measure of the variability in the level of response received. In this case the variability is 42%. Twenty-four response-keywords were derive from the one hundred and ninety-five unique responses. A dendrogram of the response-keywords and their derivatives is provided in Section 6.7. A summary table of the results of the frequency analysis is in Section 6.6. More than eighty-two percent of the response is within the ten most frequent responses. These responses are mostly consistent across all nine groupings of the consultant population sample. The weighted-frequency analysis does not change the order of the ten most frequent responses.

The landscape-sector of the population is nine firms. This is insufficient to provide a significant response. The results from this sector is not included in an overall assessment of results although it is shown in the tabulations for information. At the bottom-end of the list of the ten most frequent responses there are a few differences in the results. The significant keywords for each of the groups of Consultants in the population sample and their frequency order are listed on Table 6-3.

The measurement of these items for each assignment project are the most important elements of data/information used by HK consultants to assess the performance of each project.

Keyword	Consultant Groups								
	All	Arch	Bldg	Civil	Land	Struct	QS	ISO	W/o ISO
Work controls	1	1	1	1	1	1	4	1	1
Costs	2	2	3	3	4	2	1	2	3
Value	3	3	6	2	2	3	3	3	2
Fees	4	5	2	4		5	2	4	6
Quality	5	4	4	5		7	6	5	5
Resources	6	7	9	6	7	4	9	6	7
Time	7	8	10	7	6	10	7	7	8
Client feedback	8	9		8			10		4
Man-power	9			9	8		5	8	10
Staffing	10	10	8	10	10	9		9	
Drawings		6							
Correspondence			5					4	
Profit			7			6			
Deliverables					3				
Project attributes					5	8			9
Performance reports					9				
Resources							8		

Table 6-3 Priority order of the ten most important project performance data/information for HK consultants.

Q.2.10. What information technology does your company use to communicate/transmit to head office and vice versa, the five items of data/information stated in 2.9?

Measures the use of the telephone, fax, electronic-mail, or hardcopy to communicate the items named by the respondent in the open-ended question Q2.9.

- Use of telephone to communicate/transmit five most important items of data/information stated in Q 2.9 has a mode of 'yes' and median of 'mostly yes' for all sample sectors except landscaping and quantity surveyors whose mode is 'mostly yes'.
- Use of fax to communicate/transmit five most important items of data/information stated in Q 2.9 has a mode of 'yes' and a median of 'mostly yes' for all sample sectors except architecture (median 'yes').
- Use of e-mail to communicate/transmit five most important items of data/information stated in Q 2.9 has a mode and median of 'mostly yes' overall. The percent response varies within the sample sectors.
 - Architectural consultant firms have a mode and a median of 'mostly no'.
 - Building Service consultant firms a mode of 'mostly no' and a median of 'mostly yes'.
 - Civil consultant firms have a mode and median of 'mostly yes'.
 - Landscaping firms have a mode of 'mostly no' and median of 'mostly yes'.
 - Structural consultant firms have a mode and a median of 'mostly no'.
 - Quantity surveyor firms have a mode and median of 'mostly no'.
 - Consultant firms with ISO9000 certification have a mode of 'mostly no' whilst those without certification also have a mode of 'mostly yes'.

- Use of hardcopy/letter/report/form to communicate/transmit five most important items of data/information stated in Q 2.9 has a mode and median of 'yes' for all sample sectors.

*Q.2.11..Does your company communicate/transmit to head office and vice versa, using information technology, the following **issue related** data/information items?*

Questions the flow of issue-related information.

- Transmission of 'requests for information' (issue-related data) using IT has a mode and median of 'mostly yes' for all sample sectors except landscaping (mode 'yes'), quantity surveyors (mode and median 'yes'), and firms with ISO9000 certification (mode 'yes').
- Transmission of 'variation quotations' (issue-related data) using IT has a mode and median of 'mostly yes' for all sample sectors except landscaping (mode 'yes'), quantity surveyors (mode and median 'yes'), and firms with ISO9000 certification (mode 'yes').
- Transmission of 'change order proposals' (issue-related data) using IT has a mode of 'yes' and a median of 'mostly yes' for all sample sectors except civil, landscaping, and firms without ISO9000 with mode and median of 'mostly yes'.
- Transmission of lists of 'quality conformance' (issue-related data) using IT has a mode, median and mean of 'mostly yes' overall. The response is: thirty percent 'yes', thirty-two percent 'mostly yes', twenty-five percent 'mostly no', and fourteen percent 'no'. The percent response varies within the sample sectors.
 - Architectural consultant firms have a mode of 'yes' and a median of 'mostly yes'.
 - Building Service consultant firms a mode of 'mostly no' and a median of 'mostly yes'.
 - Civil consultant firms have a mode and median of 'mostly yes'.
 - Landscaping firms have a mode of 'yes' and median of 'mostly yes'.
 - Structural consultant firms have a mode and median of 'mostly no'.
 - Quantity surveyor firms have a mode of 'mostly no' and median of 'mostly yes'.
 - Consultant firms with ISO9000 certification have a mode of 'yes' whilst those without certification have a mode of 'mostly no'.
- Transmission of lists of 'approvals' (issue-related data) using IT has a mode and a median and mean of 'mostly yes' for all sample sectors except architecture, quantity surveyors, and firms with ISO9000 certification with mode of 'yes'.

*Q.2.12..What information technology does your company use to communicate/transmit to head office and vice versa, the **issue-related** items of data/information stated in 2.11?*

As earlier, this question measures the manner in which the data is communicated.

- Use of telephone to communicate/transmit issue-related items of data/information has a mode of 'yes' and median of 'mostly yes' for all sample sectors except architecture, landscaping, and quantity surveyors with a median of 'mostly yes'.
- Use of fax to communicate/transmit issue-related items of data/information has a mode of 'yes' and median of 'mostly yes' for all sample sectors except architecture, landscaping, quantity surveyors and firm with ISO9000 certification with a median of 'mostly yes'.

- Use of e-mail to communicate/transmit issue-related items of data/information has a mode and median of 'mostly no' for all sample sectors except civil, landscaping, and firms without ISO9000 certification with a mode and median of 'mostly yes'.
- Use of hardcopy/letter/report/form to communicate/transmit issue-related items of data/information has a mode and median of 'yes' for all sample sectors.

*Q.2.13 Does your company communicate/transmit to head office and vice versa, using information technology, the following **company-related** data/information items?*

Questions the flow of company-related information.

- Transmission of 'names and addresses' (company-related data) using IT has a mode of 'yes' and a median of 'mostly yes' for all sample sectors except architectural, landscaping and structural with mode and median of 'mostly 'yes')'.
- Transmission of 'file references' (company-related data) using IT has a mode and of 'yes' and a median of 'mostly yes' for all sample sectors except building services (mode and median of 'mostly no'), landscaping (mode 'mostly no' and median 'mostly yes'), and structural (mode and median of 'mostly yes').
- Transmission of 'telephone directories' (company-related data) using IT has a mode of 'mostly no' and a median of 'mostly no', or 'mostly yes' in the case of building services, quantity surveyors, and firms with ISO9000.
- Transmission of lists of 'shared facilities' (company-related data) using IT has a mode and median of 'mostly no' overall and for the other sample sectors except architectural (mode 'no'), building services (mode and median of 'mostly yes'), and firms without ISO9000 (mode of 'no').
- Transmission of 'information registers' (company-related data) using IT has a mode and a median of 'mostly no' for all sample sectors except building services (median of 'mostly yes'), quantity surveyors (mode and median of 'mostly yes').

*Q.2.14..What information technology does your company use to communicate/transmit to head office and vice versa, the **company-related** items of data/information stated in 2.13?*

As earlier, this question measures the manner in which the data is communicated.

- Use of telephone to communicate/transmit company-related items of data/information has a mode of 'yes' and median of 'mostly yes' overall. The response varies for the sample sectors.
 - Architectural consultant firms have a mode and median of 'yes'.
 - Building Service consultant firms a mode and median of 'mostly yes'.
 - Civil consultant firms have a mode of 'yes' and median of 'mostly yes'.
 - Landscaping firms have a mode and median of 'yes'.
 - Structural consultant firms have a mode of 'yes' and median of 'mostly yes'.
 - Quantity surveyor firms have a mode and median of 'yes'.
 - Consultant firms with ISO9000 certification have a mode of 'yes' whilst those without certification also have a mode of 'yes'.
- Use of fax to communicate/transmit issue-related items of data/information has a mode of 'yes' and median of 'mostly yes' overall. The response varies for the sample sectors.
 - Architectural consultant firms have a mode and median of 'yes'.

- Building Service consultant firms a mode and median of ‘mostly yes’.
- Civil consultant firms have a mode of ‘yes’ and median of ‘mostly yes’.
- Landscaping firms have a mode and median of ‘yes’.
- Structural consultant firms have a mode of ‘yes’ and median of ‘mostly yes’.
- Quantity surveyor firms have a mode and median of ‘yes’.
- Consultant firms with ISO9000 certification have a mode of ‘yes’ whilst those without certification have a mode of ‘mostly yes’.
- Use of e-mail to communicate/transmit issue-related items of data/information has a mode and median of ‘mostly no’ overall. The response varies for the sample sectors.
 - Architectural consultant firms have a mode and median of ‘mostly no’.
 - Building Service consultant firms a mode and median of ‘mostly no’.
 - Civil consultant firms have a mode and median of ‘mostly no’.
 - Landscaping firms have a mode and median of ‘mostly yes’.
 - Structural consultant firms have a mode and median of ‘mostly yes’.
 - Quantity surveyor firms have a mode of ‘no’ and a median of ‘mostly no’.
 - Consultant firms with ISO9000 certification have a mode of ‘mostly no’ whilst those without certification have a mode of ‘mostly yes’.
- Use of an intranet to communicate/transmit company-related items of data/information has a mode and median of ‘no’ for all sample sectors except building services and civil whose median is ‘mostly no’.
- Use of hardcopy/letter/report/form to communicate/transmit issue-related items of data/information has a mode and median of ‘yes’ for all sample sectors.

*Q.2.15..Does your company communicate/transmit to head office and vice versa, using information technology, the following **project related** data/information items?*

Questions the flow of project-related information.

- Transmission of ‘specifications’ (project-related data) using IT has a mode and median of ‘yes’ and a median of ‘mostly yes’ for all sample sectors except quantity surveyors (mode and median ‘yes’).
- Transmission of ‘Bills of Quantities’ (project-related data) using IT has a mode and median of ‘mostly no’ overall. The response varies for the sample sectors.
 - Architectural consultant firms have a mode and median of ‘mostly no’.
 - Building Service consultant firms a mode of ‘yes’ and median of ‘mostly yes’.
 - Civil consultant firms have a mode and median of ‘mostly no’.
 - Landscaping firms have a mode of ‘yes’ and median of ‘mostly yes’.
 - Structural consultant firms have a mode and median of ‘mostly yes’.
 - Quantity surveyor firms have a mode and a median of ‘mostly no’.
 - Consultant firms with ISO9000 certification have a mode of ‘yes’ whilst those without certification have a mode of ‘mostly no’.
- Transmission of ‘Tender drawings’ (project-related data) using IT has a mode of ‘yes’ and a median of ‘mostly yes’ overall. The response varies for the sample sectors.
 - Architectural consultant firms have a mode of ‘yes’ and a median of ‘mostly yes’.
 - Building Service consultant firms a mode and median of ‘yes’.
 - Civil consultant firms have a mode of ‘yes’ and median of ‘mostly yes’.
 - Landscaping firms have a mode of and median of ‘mostly no’.

- Structural consultant firms have a mode of 'yes' and median of 'mostly yes'.
- Quantity surveyor firms have a mode of 'no' and a median of 'mostly no'.
- Consultant firms with ISO9000 certification have a mode of 'yes' whilst those without certification have a mode of 'mostly no'.
- Transmission of 'Construction drawings' (project-related data) using IT has a mode of 'yes' and median of 'mostly yes' overall. The response varies for the sample sectors.
 - Architectural consultant firms have a mode of 'yes' and a median of 'mostly yes'.
 - Building Service consultant firms a mode of 'yes' and median of 'mostly yes'.
 - Civil consultant firms have a mode of 'yes' and median of 'mostly no'.
 - Landscaping firms have a mode of and median of 'mostly no'.
 - Structural consultant firms have a mode of 'yes' and median of 'mostly yes'.
 - Quantity surveyor firms have a mode of 'yes' and a median of 'mostly yes'.
 - Consultant firms with ISO9000 certification have a mode of 'yes' whilst those without certification have a mode of 'mostly no'.
- Transmission of 'as-built drawings' (project-related data) using IT has a mode of 'yes' and a median and mean of 'mostly no' overall. The response varies for the sample sectors.
 - Architectural consultant firms have a mode of 'yes' and a median of 'mostly yes'.
 - Building Service consultant firms a mode of 'yes' and median of 'mostly yes'.
 - Civil consultant firms have a mode of 'no' and median of 'mostly no'.
 - Landscaping firms have a mode of 'no' and median of 'mostly no'.
 - Structural consultant firms have a mode and median of 'mostly yes'.
 - Quantity surveyor firms have a mode of 'no' and a median of 'mostly no'.
 - Consultant firms with ISO9000 certification have a mode of 'yes' whilst those without certification have a mode of 'mostly no'.
- Transmission of 'Contract correspondence' (project-related data) using IT has a mode of 'yes' and median of 'mostly yes' for all sample sectors except architecture, and quantity surveyors with mode and median of 'yes'.
- Transmission of 'Routine correspondence' (project-related data) using IT has a mode of 'yes' and median of 'mostly yes' for all sample sectors except architecture, and quantity surveyors with mode and median of 'yes'.
- Transmission of 'Instructions' (project-related data) using IT has a mode of 'yes' and median of 'mostly yes' for all sample sectors except architecture (median of 'yes'), civil (mode of 'mostly yes'), and quantity surveyors (mode and median of 'mostly no').
- Transmission of 'monthly and other reports' (project-related data) using IT has a mode of 'yes' and a median of 'mostly yes' for all sample sectors except architecture (median of 'yes'), and structural (median of 'yes').
- Transmission of 'method statements' (project-related data) using IT has a mode and median of 'mostly yes' overall. The response varies for the sample sectors.
 - Architectural consultant firms have a mode of 'mostly no' and a median of 'mostly yes'.
 - Building Service consultant firms a mode of 'mostly no' and median of 'mostly yes'.
 - Civil consultant firms have a mode and median of 'mostly yes'.
 - Landscaping firms have a mode and median of 'mostly yes'.
 - Structural consultant firms have a mode of 'yes' and median of 'mostly yes'.

- Quantity surveyor firms have a mode and a median of ‘mostly no’.
- Consultant firms with ISO9000 certification have a mode of ‘yes’ whilst those without certification also have a mode of ‘mostly no’.
- Transmission of ‘Quality Conformance Statements’ (project-related data) using IT has a mode and median of ‘mostly yes’ overall. The response varies for the sample sectors.
 - Architectural consultant firms have a mode of ‘yes’ and a median of ‘mostly yes’.
 - Building Service consultant firms a mode of ‘yes’ and median of ‘mostly yes’.
 - Civil consultant firms have a mode and median of ‘mostly yes’.
 - Landscaping firms have a mode and median of ‘mostly no’.
 - Structural consultant firms have a mode of ‘yes’ and median of ‘mostly yes’.
 - Quantity surveyor firms have a mode and a median of ‘mostly no’.
 - Consultant firms with ISO9000 certification have a mode of ‘mostly yes’ whilst those without certification also have a mode of ‘mostly yes’.
- Transmission of ‘Manuals and procedures’ (project-related data) using IT has a mode of ‘mostly no’ and median of ‘mostly yes’ overall. The response varies for the sample sectors.
 - Architectural consultant firms have a mode and a median of ‘mostly no’.
 - Building Service consultant firms a mode and median of ‘mostly yes’.
 - Civil consultant firms have a mode and median of ‘mostly no’.
 - Landscaping firms have a mode and median of ‘mostly no’.
 - Structural consultant firms have a mode and median of ‘mostly yes’.
 - Quantity surveyor firms have a mode and a median of ‘mostly no’.
 - Consultant firms with ISO9000 certification have a mode of ‘mostly yes’ whilst those without certification have a mode of ‘mostly no’.
- Transmission of ‘Cost Reports’ (project-related data) using IT has a mode of ‘mostly no’ and median of ‘mostly yes’ overall. The response varies for the sample sectors.
 - Architectural consultant firms have a mode of ‘yes’ and a median of ‘mostly yes’.
 - Building Service consultant firms a mode and median of ‘yes’.
 - Civil consultant firms have a mode of ‘mostly no’ and median of ‘mostly yes’.
 - Landscaping firms have a mode of ‘yes’ and median of ‘mostly yes’.
 - Structural consultant firms have a mode and median of ‘mostly yes’.
 - Quantity surveyor firms have a mode and a median of ‘yes’.
 - Consultant firms with ISO9000 certification have a mode of ‘yes’ whilst those without certification have a mode of ‘mostly no’.
- Transmission of ‘Programmes and barcharts’ (project-related data) using IT has a mode of ‘yes’ and a median of ‘mostly yes’ for all sample sectors except civil, landscaping, and firms without ISO9000 with mode of ‘mostly yes’

*Q.2.16..What information technology does your company use to communicate/transmit to head office and vice versa, the **project-related** items of data/information stated in 2.15?*

As earlier, this question measures the manner in which the data is communicated.

- Use of telephone to communicate/transmit project-related items of data/information has a mode of 'yes' and median of 'mostly yes' for all sample sectors except building services, and structural whose mode is 'mostly yes'.
- Use of fax to communicate/transmit project-related items of data/information has a mode and median of 'yes' overall. The response varies for the sample sectors.
 - Architectural consultant firms have a mode and median of 'yes'.
 - Building Service consultant firms a mode and median of 'yes'.
 - Civil consultant firms have a mode and median of 'yes'.
 - Landscaping firms have a mode and median of 'mostly yes'.
 - Structural consultant firms have a mode and median of 'yes'.
 - Quantity surveyor firms have a mode and median of 'yes'.
 - Consultant firms with ISO9000 certification have a mode of 'yes' whilst those without certification have a mode of 'mostly yes'.
- Use of e-mail to communicate/transmit project-related items of data/information has a mode and median of 'mostly no' for all sample sectors except building services (mode and median of 'mostly yes') and landscaping, structural, quantity surveyors and firms with ISO9000 whose mode and median is 'mostly no'.
- Use of hardcopy/letter/report/form to communicate/transmit project-related items of data/information has a mode and median of 'yes' for all sample sectors.

Part 3 of the Questionnaire, Use of the information technology

Q.3.1..How does your company use information technology to combine together data/information relating to the work-content of your construction projects, to get an overview of performance?

This question measures the method for combination of work-content project information.

- Use of individual review of work-content data to combine together a portfolio view of projects has a mode and median of 'mostly yes' for all sample sectors except building services (mode of 'yes'), structural (mode and median of 'yes'), and quantity surveyors (mode of 'yes').
- Use of spreadsheets of numeric and date data of work-content to combine together a portfolio view of projects has a mode and median of 'mostly yes' for all sample sectors except quantity surveyors (mode of 'yes').
- Use of database of alpha-numeric data of work-content to combine together a portfolio view of projects has a mode of 'mostly no' overall but the percent response varies within the sample sectors.
 - Architectural consultant firms have a mode and median of 'mostly no'.
 - Building Service consultant firms a mode and median of 'mostly yes'.
 - Civil consultant firms have a mode and median of 'mostly no'.
 - Landscaping firms have a mode and median of 'mostly no'.
 - Structural consultant firms have a mode and median of 'mostly yes'.
 - Quantity surveyor firms have a mode and median of 'mostly yes'.
 - Consultant firms with ISO9000 certification have a mode of 'mostly yes' whilst those without certification have a mode of 'mostly no'.

Q.3.2..What five, work-content related, criterion are most important in your company for assessing the overall performance of several construction projects?

Invites respondent to state, in order of importance, the five items of information for summary into an overall view of performance. Table 6-4 states the level of response to this question.

After the removal of unclear responses and semantic differences, 220 unique responses were listed. The ratio of the number of unique response to the actual number of responses is taken as a measure of the variability in the level of response received. In this case the variability is 70%. Twenty-eight response-keywords were derived from the two hundred and twenty unique responses. A dendrogram of the response-keywords and their derivatives is in Section 6.8.

	Pop. Sample	Max Response Possible	Actual Response	Response %
All Consultants	207	1035	310	30%
Architectural firms	35	175	52	30%
Building Services firms	17	85	38	45%
Civil firms	147	735	216	29%
Landscape firms	9	45	12	27%
Structural firms	32	160	98	61%
Quantity Surveyors	15	75	33	44%
Consultants with ISO9000	100	500	210	42%
Consultants w/o ISO9000	107	535	100	19%

Table 6-4 Level of response from HK consultants regarding work-related data/information for assessing the performance of several projects.

A summary table of the results of the frequency analysis is in Section 6.6. More than sixty-three percent of the response is within the ten most frequent responses. These responses vary across the nine sectors of the consultant population sample. The weighted-frequency analysis does not significantly change the order of the ten most frequent responses for each sector. The landscape-sector of the population is nine firms. This is insufficient to provide a significant response. The result from this sector is not included in an overall assessment of results although it is shown in the tabulations for information. At the bottom-end of the list of the ten most frequent responses there are a many differences in the results. The significant keywords for each of the groups of Consultants in the population sample and their frequency order are listed on Table 6-5. The measurement of these work-related items of data/information for each assignment, are the most important elements of data/information used by HK consultants to assess the overall performance of several projects.

Keyword	Consultant Groups								
	All	Arch	Bldg	Civil	Land	Struct	QS	ISO	W/o ISO
Quality	1	2	3	1	3	1	2	1	1
<i>Project attributes</i>	2	6		2	1	3		3	2
Work progress	3	1		3	5	2		2	4
<i>Scope</i>	4	8	1	4		4		4	3
Costs	5	4		7	8		1	5	6
<i>Client issues</i>	6	5	6	8	4		7	8	10
<i>Management</i>	7			5			4	6	
Deliverables	8		5	10			5	7	
Time	9	3							5
<i>Documentation</i>	10	9		6		10		10	7
Quantities		7							
Manpower		10							
<i>Claims/disputes</i>			4				6	9	
Activities			2		9	6	8		
<i>Design</i>			7			5	9		
Progress			8		2				
Value			9		7				
<i>Approvals</i>			10		10				
<i>Communication</i>				9					8
Resources					6		3		
Drawings					7				
<i>Information</i>						8			
<i>Variations</i>						9			9
<i>Correspondence</i>						10			

Table 6-5 Priority order of the ten most important work-content related performance criteria used by HK consultants to assess several projects.

Q.3.3..How does your company use information technology to combine together data/information relating to the time aspects of your construction projects, to get an overview of performance?

Similar question to Q3.1 but for time-related information.

- Use of individual review of time-content data to combine together a portfolio view of projects has a mode and median of ‘mostly yes’ for all sample sectors except building services (mode of ‘yes’), landscaping (mode and median of ‘mostly no’), structural (mode and median of ‘mostly no’), and firms without ISO9000 certification (mode of ‘mostly no’).
- Use of spreadsheets of numeric and date data of time-content to combine together a portfolio view of projects has a mode and median of ‘mostly yes’ for all sample sectors except quantity surveyors (mode of ‘yes’).
- Use of database of alpha-numeric data of time-content to combine together a portfolio view of projects has a mode of ‘mostly no’ overall but the percent response varies within the sample sectors.
 - Architectural consultant firms have a mode of ‘mostly no’ and median of ‘mostly yes’.

- Building Service consultant firms have mode and median of ‘mostly no’.
- Civil consultant firms have a mode and median of ‘mostly no’.
- Landscaping firms have a mode and median of ‘mostly no’.
- Structural consultant firms have a mode and median of ‘mostly yes’.
- Quantity surveyor firms have a mode of ‘no’ and median of ‘mostly no’.
- Consultant firms with ISO9000 certification have a mode of ‘mostly yes’ whilst those without certification have a mode of ‘mostly no’.

Q.3.4..What five, time-related, criterion are most important in your company for assessing the overall performance of several construction projects?

This question invites the respondent to state, in order of importance, the five items of time information for summary into an overall view of performance. Table 6-6 states the level of response to this question.

	Pop. Sample	Max Response Possible	Actual Response	Response %
All Consultants	207	1035	252	24%
Architectural firms	35	175	34	19%
Building Services firms	17	85	27	32%
Civil firms	147	735	178	24%
Landscape firms	9	45	4	9%
Structural firms	32	160	81	51%
Quantity Surveyors	15	75	27	36%
Consultants with ISO9000	100	500	165	33%
Consultants w/o ISO9000	107	535	87	16%

Table 6-6 Level of response from HK consultants regarding time-related data/information for assessing the performance of several projects.

After the removal of unclear responses and semantic differences, 173 unique responses were listed. The ratio of the number of unique response to the actual number of responses is taken as a measure of the variability in the level of response received. In this case the variability is 18%. Thirty-one response-keywords were derived from the one hundred and seventy-three unique responses. A dendrogram of the response-keywords and their derivatives is at Section 6.9.

A summary table of the results of the frequency analysis is in Section 6.6. More than sixty-one percent of the response is within the ten most frequent responses. These responses vary across the nine sectors of the consultant population sample. The weighted-frequency analysis does not significantly change the order of the ten most frequent responses for each sector. The landscape-sector of the population is nine firms. This is insufficient to provide a significant response. The result from this sector is not included in an overall assessment of results although it is shown in the tabulations for information. There are many differences in the list of the ten most frequent results. The significant keywords for each of the groups of Consultants in the population sample and their frequency order are listed on Table 6-7.

Keyword	Consultant Groups								
	All	Arch	Bldg	Civil	Land	Struct	QS	ISO	W/o ISO
Work schedule	1	1	1	1		1	1	1	3
Work progress	2	8	2	2		2	3	2	6
Completion factors	3		10	4		5	5	4	2
Time	4	2		5		6	10	8	1
Information	5			3	1	8		3	7
Re-planning	6	3	3	7		3		5	4
Costs	7	5		10					5
Project factors	8			6					
Milestone	9		4	8		4	4	7	
Manhours	10			9			8		
Duration		4				10	7	10	
Delay		6	7					9	
Drawing time		7							
Staff		9				7			8
Production		10							9
Critical actions			5				2	6	
Participant performance			6						
Quality			8						
Scope			9						
Timesheets					2				
Deliverables					3				
Design time						9			10
Resources							6		
Client actions							9		

Table 6-7 Priority order of the ten most important time-content related performance criteria used by HK consultants to assess several projects.

The measurement of these time-related items for each assignment project, are the most important elements of data/information used by HK consultants to assess the overall performance of several projects.

Q.3.5 How does your company use information technology to combine together data/information relating to the cost aspects of your construction projects, to get an overview of performance?

Measures the frequency of technique for combining this information

- Use of individual review of cost-content data to combine together a portfolio view of projects has a mode and median of ‘mostly yes’ for all sample sectors except architecture (mode of ‘yes’), landscaping (mode and median of ‘mostly no’), and structural (mode and median of ‘mostly no’).
- Use of spreadsheets of numeric and date data of cost-content to combine together a portfolio view of projects has a mode and median of ‘mostly yes’ for all sample sectors except architectural (mode of ‘yes’).
- Use of database of alpha-numeric data of time-content to combine together a portfolio view of projects has a mode of ‘mostly no’ overall but the percent response varies within the sample sectors.

- Architectural consultant firms have a mode and median of ‘mostly yes’.
- Building Service consultant firms have a mode and median of ‘mostly yes’.
- Civil consultant firms have a mode and median of ‘mostly no’.
- Landscaping firms have a mode and median of ‘mostly no’.
- Structural consultant firms have a mode and median of ‘mostly yes’.
- Quantity surveyor firms have a mode and median of ‘mostly no’.
- Consultant firms with ISO9000 certification have a mode of ‘mostly yes’ whilst those without certification have a mode of ‘mostly no’.

Q.3.6 What cost-related, criterion are most important in your company for assessing the overall performance of several construction projects?

Invites respondent to state, in order of importance, the five items of cost information for summary into an overall view of performance. Table 6-8 states the level of response to this question.

	Pop. Sample	Max Response Possible	Actual Response	Response %
All Consultants	207	1035	284	27%
Architectural firms	35	175	56	32%
Building Services firms	17	85	32	38%
Civil firms	147	735	180	24%
Landscape firms	9	45	6	13%
Structural firms	32	160	86	54%
Quantity Surveyors	15	75	35	47%
Consultants with ISO9000	100	500	206	41%
Consultants w/o ISO9000	107	535	78	15%

Table 6-8 Level of response from HK consultants regarding cost-related data/information for assessing the performance of several projects.

After the removal of unclear responses and semantic differences, 184 unique responses were listed. The ratio of the number of unique response to the actual number of responses is taken as a measure of the variability in the level of response received. In this case the variability is 13%. Twenty-four response-keywords were derived from the one hundred and eighty-four unique responses. A dendrogram of the cost-related response-keywords and their derivatives is in Section 6.10. A summary table of the results of the frequency analysis is in Section 6.6. More than seventy percent of the response is within the ten most frequent responses. These responses vary across the nine sectors of the consultant population sample. The weighted-frequency analysis does not significantly change the order of the ten most frequent responses for each sector. The landscape-sector of the population is nine firms. This is insufficient to provide a significant response. The result from this sector is not included in an overall assessment of results although it is shown in the tabulations for information. There are differences in the list of the ten most frequent results. The significant keywords for each of the groups of Consultants in the population sample and their frequency order are listed on Table 6-9.

Keyword	Consultant Groups								
	All	Arch	Bldg	Civil	Land	Struct	QS	ISO	W/o ISO
Valuation	1	3	1	1	4	6	2	1	2
Management factors	2	5		2	1	2	9	2	5
Cost of work	3	2		3		4		6	3
Fees	4	7	4	8		1	4	7	4
Payments	5	4	2	9		7	3	3	
Cost uncertainties	6	1	10	4				5	7
Budget	7	8	3	5		3	5		1
Profit	8		5	6	2	5	1	4	
Expenditure	9	10	7	7		9		10	6
Cost of resources	10	6	8	10			10	8	9
Cost of overheads		9				10	6	9	
Cost management			6						
Quality			9						
Production factors					3				
Work progress						8			8
Resources							7		
Cashflow							8		
Expenses									10

Table 6-9 Priority order of the ten most important cost related performance criteria used by HK consultants to assess several projects.

The measurement of these cost-related items for each assignment project, are the most important elements of data/information used by HK consultants to assess the overall performance of several projects.

Q.3.7 How does your company use information technology to combine together data/information relating to the resource aspects of your construction projects, to get an overview of performance?

Measures the frequency of the fundamental methods of combining the resource information.

- Use of individual review of resource-content data to combine together a portfolio view of projects has a mode and median of ‘mostly yes’ for all sample sectors except building services (mode of ‘yes’), and quantity surveyors (mode and median of ‘yes’).
- Use of spreadsheets of numeric and date data of resource-content to combine together a portfolio view of projects has a mode and median of ‘mostly yes’ for all sample sectors except quantity surveyors (mode of ‘yes’).
- Use of database of alpha-numeric data of time-content to combine together a portfolio view of projects has a mode of ‘mostly no’ overall but the percent response varies within the sample sectors.
 - Architectural consultant firms have a mode and median of ‘mostly no’.
 - Building Service consultant firms have a mode and median of ‘mostly yes’.
 - Civil consultant firms have a mode and median of ‘mostly no’.
 - Landscaping firms have a mode and median of ‘mostly no’.
 - Structural consultant firms have a mode and median of ‘mostly yes’.
 - Quantity surveyor firms have a mode of ‘no’ and median of ‘mostly no’.

- Consultant firms with ISO9000 certification have a mode of ‘mostly no’ whilst those without certification also have a mode of ‘mostly no’.

Q.3.8 What five, resource-related, criterion are most important in your company for assessing the overall performance of several construction projects?

Invites respondent to state, in order of importance, the five items of resource information for summary into an overall view of performance. Table 6-10 states the level of response to this question.

	Pop. Sample	Max Response Possible	Actual Response	Response %
All Consultants	207	1035	284	27%
Architectural firms	35	175	50	29%
Building Services firms	17	85	32	38%
Civil firms	147	735	164	22%
Landscape firms	9	45	4	9%
Structural firms	32	160	87	54%
Quantity Surveyors	15	75	30	40%
Consultants with ISO9000	100	500	181	36%
Consultants w/o ISO9000	107	535	79	15%

Table 6-10 Level of response from HK consultants regarding resource-related data/information for assessing the performance of several projects.

After the removal of unclear responses and semantic differences, 201 unique responses were listed. The ratio of the number of unique response to the actual number of responses is taken as a measure of the variability in the level of response received. In this case the variability is 12%. Twenty-four response keywords were derived from the one hundred and eighty-four unique responses. A dendrogram of resource-related response-keywords and their derivatives is at Section 6.11. A summary table of the results of the frequency analysis is in Section 6.6. More than sixty-two percent of the response is within the ten most frequent responses. These responses vary across the nine sectors of the consultant population sample. The weighted-frequency analysis does not significantly change the order of the ten most frequent responses for each sector. The landscape-sector of the population is nine firms. This is insufficient to provide a significant response. The result from this sector is not included in an overall assessment of results although it is shown in the tabulations for information. There are differences in the bottom-end list of the ten most frequent results. The significant keywords for each of the groups of Consultants in the population sample and their frequency order are listed on Table 6-11.

Keyword	Consultant Groups								
	All	Arch	Bldg	Civil	Land	Struct	QS	ISO	W/o ISO
Staffing	1	1	1	1		1		1	1
Facilities	2	6	5	4		7		3	2
IT	3	8		2	1	9		5	5
Resources	4	4	8	3	2	2		6	4
Management factors	5	2	3	8		8		2	
Cost	6	3	2	6		5		4	9
Productivity	7	9		9		3		7	6
Specialist services	8	7		10				8	
Competance	9		4	5					3
Manpower	10					4		9	
Manhours		5						10	
Time		10							
Sub-contractor			6						8
Communication			7						
Abortive work			9						
Quality			10						
Information				7		6			
Plant/equipment						10			10
Sub-consultant									7

Table 6-11 Priority order of the ten most important resource related performance criteria used by HK consultants to assess several projects.

The measurement of these resource-related items for each assignment project, are the most important elements of data/information used by HK consultants to assess the overall performance of several projects.

Part 4 of the Questionnaire, Strategic use of information technology

Competition and business strategy

Q.4.1.1 Does IT support your core capabilities?

The response for all sample sectors has a mode, median and mean of ‘IT is critical to our core capabilities’. The range of this response is fifty-seven to sixty-seven percent; a range of ten percent variance in the response.

Q.4.1.2 How do you think IT could help you to compete?

The response for all sample sectors has a mode, median and mean of ‘changing our competitive behaviour and supporting our capabilities’. The range of this response is fifty-eight to eighty-six percent.

Q.4.1.3 What is the impact of IT on your corporate goals and objectives?

The response for all sample sectors has a mode, median and mean of 'IT supports our corporate objectives through business efficiency and cost reduction'. The range of this response is fifty-four to seventy-three percent.

Q.4.1.4 With regard to IT, what is your position compared to your competitor?

The response for all sample sectors has a mode, median and mean of 'the same level as other companies'. The range of this response is fifty to eighty percent.

Q.4.1.5 What is the impact of your use of IT on your clients?

The overall response mode is 'IT is essential for meeting clients requirements', but the percent response varies within the sample sectors.

- Architectural consultants: has a mode of 'IT is important to some clients';
- Building services consultants: has a mode of 'IT is essential for meeting clients requirements';
- Civil consultants: has a mode of 'IT is essential for meeting clients requirements';
- Landscaping consultants: : has a mode of 'IT is important to some clients';
- Structural consultants: has a mode of 'IT is good for presentation and communication to clients';
- Quantity surveyors: has a mode of 'IT is good for presentation and communication to clients';
- Consultants with ISO9000 certification: has a mode of 'IT is essential for meeting clients requirements';
- Consultants without ISO9000 certification: has a mode of 'IT is good for presentation and communication to clients'.

Q.4.1.6 Do you think your company IT expertise will help it to win work?

The response for all sample sectors has a mode, median and mean of 'IT can be instrumental in winning work'. The range of this response is forty to eighty-six percent.

Q.4.1.7 How is IT used as a part of strategic/business alliances?

The overall response mode is 'business efficiency', but the percent response varies within the sample sectors.

- Architectural consultants: has a mode of 'improving combined competitive behaviour';
- Building services consultants: has a mode of 'business efficiency';
- Civil consultants: has a mode of 'improving combined competitive behaviour';
- Landscaping consultants: has a mode of 'improving combined competitive behaviour';
- Structural consultants: has a mode of 'improving combined competitive behaviour';
- Quantity surveyors: has a mode of 'business efficiency';
- Consultants with ISO9000 certification: has a mode of 'business efficiency';

- Consultants without ISO9000 certification: has a mode of ‘improving combined competitive behaviour’.

The role of IT

Q.4.2.1 How do you currently use IT in your company?

The overall response mode is ‘use IT after proven and satisfactory results from other users and other companies’, but the percent response varies within the sample sectors.

- Architectural consultants: has a mode of ‘pro-actively seek to use IT as part of a well thought through strategy for achieving competitive advantage’;
- Building services consultants: has a mode of ‘use IT after proven and satisfactory results from other users and other companies’;
- Civil consultants: has a mode of ‘use IT after proven and satisfactory results from other users and other companies’;
- Landscaping consultants: has a mode of ‘pro-actively seek to use IT as part of a well thought through strategy for achieving competitive advantage’;
- Structural consultants: has a mode of ‘pro-actively seek to use IT as part of a well thought through strategy for achieving competitive advantage’;
- Quantity surveyors: has a mode of ‘use IT after proven and satisfactory results from other users and other companies’;
- Consultants with ISO9000 certification: has a mode of ‘use IT after proven and satisfactory results from other users and other companies’;
- Consultants without ISO9000 certification: has a mode of ‘pro-actively seek to use IT as part of a well thought through strategy for achieving competitive advantage’.

Q.4.2.2 How would you describe the relationship between IT and your business strategy?

The overall response mode is ‘IT plays a central role in our business strategy’, but the percent response varies within the sample sectors.

- Architectural consultants: has a mode of ‘IT is indirectly addressed through its supportive role’;
- Building services consultants: has a mode of ‘IT is indirectly addressed through its supportive role’;
- Civil consultants: has a mode of ‘IT plays a central role in our business strategy’;
- Landscaping consultants: has a mode of ‘IT plays a central role in our business strategy’;
- Structural consultants: has a mode of ‘IT is indirectly addressed through its supportive role’;
- Quantity surveyors: has a mode of ‘IT is indirectly addressed through its supportive role’;
- Consultants with ISO9000 certification: has a mode of ‘IT is indirectly addressed through its supportive role’;
- Consultants without ISO9000 certification: has a mode of ‘IT plays a central role in our business strategy’.

Q.4.2.3 What is the level of participation of your IT people in the development of your overall business strategy?

The response for all sample sectors has a mode, median and mean of ‘IT people simply informed of the business strategy’. The range of this response is forty-three to sixty-four percent.

Q.4.2.4 Does IT have an impact on your operational strategy?

The response for all sample sectors has a mode, median and mean of ‘IT assists us to improve quality to meet client’s requirements within budget’. The range of this response is twenty-one to forty-three percent.

Q.4.2.5 Does IT have any influence on the delivery of your marketing?

The response for all sample sectors, except civil and landscaping, have a mode, median and mean of ‘IT has some impact on marketing strategy’. The mode, median and mean of civil and landscaping sample sectors is ‘IT is important to the success of marketing strategy’.

IT strategy

Q.4.3.1 How would you describe the use of IT systems in your company?

The response for all sample sectors has a mode, median and mean of ‘mainly functional applications with some integrated systems’. The range of this response is thirty-eight to sixty-four percent.

Q.4.3.2 What are the objectives of your IT strategy?

The overall response mode is ‘business efficiency, improving quality, and improving communications with internal and external stakeholders’, but the percent response varies within the sample sectors.

- Architectural consultants: has a mode of ‘business efficiency, improving quality, and improving communications with internal and external stakeholders’;
- Building services consultants: has a mode of ‘providing support for business strategy’;
- Civil consultants: has a mode of ‘providing support for business strategy’;
- Landscaping consultants: has a mode of ‘business efficiency, improving quality, and improving communications with internal and external stakeholders’;
- Structural consultants: has a mode of ‘providing support for business strategy’;
- Quantity surveyors: has a mode of ‘business efficiency, improving quality, and improving communications with internal and external stakeholders’;
- Consultants with ISO9000 certification: has a mode of ‘business efficiency, improving quality, and improving communications with internal and external stakeholders’;
- Consultants without ISO9000 certification: has a mode of ‘providing support for business strategy’.

Q.4.3.3 What is the thrust of your IT strategy?

The overall response mode is ‘support for business strategy and user participation and empowerment’, but the percent response varies within the sample sectors.

- Architectural consultants: has a mode of ‘competent IT skill level within the company and required IT facilities’;
- Building services consultants: has a mode of ‘competent IT skill level within the company and required IT facilities’;
- Civil consultants: has a mode of ‘support for business strategy and user participation and empowerment’;
- Landscaping consultants: has a mode of ‘competent IT skill level within the company and required IT facilities’;
- Structural consultants: has a mode of ‘support for business strategy and user participation and empowerment’;
- Quantity surveyors: has a mode of ‘up-to-date IT facilities’;
- Consultants with ISO9000 certification: has a mode of ‘competent IT skill level within the company and required IT facilities’;
- Consultants without ISO9000 certification: has a mode of ‘support for business strategy and user participation and empowerment’.

Q.4.3.4 How do you intend to manage IT in the future?

The response for all sample sectors, except building services, have a mode, median and mean of ‘to do much the same as other companies at about the same time as them’. The mode, median and mean of building services sample sector is ‘to experiment and develop new technology’.

Q.4.3.5 What are the critical success factors for sustainable competitive advantage achieved through IT in your company?

The response for all sample sectors, except landscaping, have a mode, median and mean of ‘acquisition of the right technology’. The mode, median and mean of landscaping sample sector is ‘to use the strategic and innovative IT opportunities that arises’.

Q.4.3.6 How do you intend to manage IT projects and innovations?

The response for all sample sectors, except landscaping, have a mode, median and mean of ‘IT professionals and external innovators’. The mode, median and mean of landscaping sample sector is ‘out-sourcing’.

Q.4.3.7 What is the level of R&D regarding IT in your company?

The response for all sample sectors, except architecture and building services, have a mode, median and mean of ‘planned R&D’. The mode, median and mean of architecture and building services is ‘no interest’.

Q.4.3.8 What is the nature of your IT department?

The mode and median response is 'small technical providing group technical services'. The response is consistent with sixty-three percent overall stating this response.

Q.4.3.9 How much importance do you attach to IT skills within your company?

The response for all sample sectors, except civil, landscaping, and firms without ISO9000 certification, have a mode, median and mean of 'provide IT training when required'. The mode, median and mean of civil, landscaping, and firms without ISO9000 certification is 'seeking and upgrading the quality if IT training in our company'.

Q.4.3.10 Who is aware of your IT strategy?

The overall response mode is 'IT professionals and users', but the percent response varies within the sample sectors.

- Architectural consultants: has a mode of 'IT professionals and users';
- Building services consultants: has a mode of 'IT professionals and users';
- Civil consultants: has a mode of 'all key internal and external personnel';
- Landscaping consultants: has a mode of 'IT professionals and users';
- Structural consultants: has a mode of 'IT professionals and users';
- Quantity surveyors: has a mode of 'business managers';
- Consultants with ISO9000 certification: has a mode of 'IT professionals and users';
- Consultants without ISO9000 certification: has a mode of 'all key internal and external personnel'.

Q.4.3.11 What is the extent and nature on involvement of IT users in the development and implementation of your IT?

The response for all sample sectors, except landscaping, have a mode, median and mean of 'involved when required'. The mode of landscaping is 'involved throughout the whole process'.

Q.4.3.12 What do you consider to be the risks associated with the implementation of your IT strategy?

The overall response mode is 'technological risks', but the percent response varies within the sample sectors.

- Architectural consultants: has a mode of 'technological risks';
- Building services consultants: has a mode of 'financial risks';
- Civil consultants: has a mode of 'technological risks';
- Landscaping consultants: has a mode of 'financial risks';
- Structural consultants: has a mode of 'business environment risks';
- Quantity surveyors: has a mode of 'technological risks';
- Consultants with ISO9000 certification: has a mode of 'technological risks';
- Consultants without ISO9000 certification: has a mode of 'financial risks'.

Q.4.3.13 How often do you review your IT strategy?

The overall response mode is 'IT strategy is reviewed continuously', but the percent response varies within the sample sectors.

- Architectural consultants: has a mode of 'IT strategy is reviewed continuously';
- Building services consultants: has a mode of 'every year';
- Civil consultants: has a mode of 'IT strategy is reviewed continuously';
- Landscaping consultants: has a mode of 'every year';
- Structural consultants: has a mode of 'every year';
- Quantity surveyors: has a mode of 'IT strategy is reviewed continuously';
- Consultants with ISO9000 certification: has a mode of 'IT strategy is reviewed continuously';
- Consultants without ISO9000 certification: has a mode of 'every year'.

Q.4.3.14 How do you measure the IT performance of your company?

The response for all sample sectors, except landscaping, have a mode, median and mean of 'value adding properties of IT'. The mode of landscaping is 'the cost reducing aspects of IT'.

Q.4.3.15 What are the characteristics of your IT strategy?

The response for all sample sectors, except architecture, have a mode of 'IT is managed from the top'. The mode of architecture is 'IT is driven by middle-managers'.

Q.4.3.16 Who are the champions for IT projects in your company?

The response for all sample sectors, except architecture and building services, have a mode of 'senior management'. The mode of architecture and building services is 'functional managers'.

6.5 Summary tabulated statistical attributes of the analysis in terms of strata of the population sample – tick-it questions – taken from ‘Appendices-datafile.xls’.

Please refer to the following pages.

**Summary of the tabulated statistical attributes of the analysis
in terms of strata of the population sample
from the 'tick-it' questions of the postal survey of Hong Kong consultant firms**

Part	Part 1 Use of IT to assist project communication																
Topic	Telephone communication																
Subject	Managers access to telephones																
Q.1.1.1.a	Response										Distribution Statistics						
Sample Sector	Nos	% o/a	No '4'	% '4'	No '3'	% '3'	No '2'	% '2'	No '1'	% '1'	H	L	Median	Mode	Mean	SD	Corr
All	149	72%	140	94%	7	5%	0	0%	2	1%	4	1	4	4	3.91	0.40	-0.001
Architecture	29	14%	28	97%	0	0%	0	0%	1	3%	4	1	4	4	3.90	0.56	0.0879
Building Services	12	6%	12	100%	0	0%	0	0%	0	0%	4	4	4	4	4.00	0.00	na
Civil	101	49%	93	92%	7	7%	0	0%	1	1%	4	1	4	4	3.90	0.39	-0.015
Landscaping	8	4%	6	75%	2	25%	0	0%	0	0%	4	3	4	4	3.75	0.46	0.0847
Structural	26	13%	24	92%	2	8%	0	0%	0	0%	4	3	4	4	3.92	0.27	-0.111
Quantity Surveyors	15	7%	15	100%	0	0%	0	0%	0	0%	4	4	4	4	4.00	0.00	na
With ISO9000	88	43%	85	97%	3	3%	0	0%	0	0%	4	3	4	4	3.97	0.18	-0.1
Without ISO9000	61	29%	55	90%	4	7%	0	0%	2	3%	4	1	4	4	3.84	0.58	-0.047

Part	Part 1 Use of IT to assist project communication																
Topic	Telephone communication																
Subject	Professionals access to telephones																
Q.1.1.1.b	Response										Distribution Statistics						
Sample Sector	Nos	% o/a	No '4'	% '4'	No '3'	% '3'	No '2'	% '2'	No '1'	% '1'	H	L	Median	Mode	Mean	SD	Corr
All	149	72%	139	93%	7	5%	1	1%	2	1%	4	1	4	4	3.90	0.43	0.0223
Architecture	29	14%	26	90%	1	3%	1	3%	1	3%	4	1	4	4	3.79	0.68	0.0805
Building Services	12	6%	11	92%	1	8%	0	0%	0	0%	4	3	4	4	3.92	0.29	0.2807
Civil	101	49%	94	93%	5	5%	1	1%	1	1%	4	1	4	4	3.90	0.41	0.0131
Landscaping	8	4%	7	88%	1	13%	0	0%	0	0%	4	3	4	4	3.88	0.35	0.5286
Structural	26	13%	25	96%	1	4%	0	0%	0	0%	4	3	4	4	3.96	0.20	-0.294
Quantity Surveyors	15	7%	15	100%	0	0%	0	0%	0	0%	4	4	4	4	4.00	0.00	na
With ISO9000	88	43%	83	94%	4	5%	1	1%	0	0%	4	2	4	4	3.93	0.30	-0.024
Without ISO9000	61	29%	56	92%	3	5%	0	0%	2	3%	4	1	4	4	3.85	0.57	-0.008

Results of the 1998 postal survey of Hong Kong Public Works Consultants

Part	Part 1 Use of IT to assist project communication																	
Q.1.1.1.c	Telephone communication																	
Subject	Technical staff access to telephones																	
	Response										Distribution Statistics							
Sample Sector	Nos	% o/a	No '4'	% '4'	No '3'	% '3'	No '2'	% '2'	No '1'	% '1'	H	L	Median	Mode	Mean	SD	Corr	
All	149	72%	87	58%	54	36%	3	2%	5	3%	4	1	4	4	3.50	0.70	-0.011	
Architecture	29	14%	11	38%	14	48%	2	7%	2	7%	4	1	3	3	3.17	0.85	-0.118	
Building Services	12	6%	5	42%	7	58%	0	0%	0	0%	4	3	3	3	3.42	0.51	0.0543	
Civil	101	49%	62	61%	34	34%	1	1%	4	4%	4	1	4	4	3.52	0.72	0.0024	
Landscaping	8	4%	5	63%	3	38%	0	0%	0	0%	4	3	4	4	3.63	0.52	-0.311	
Structural	26	13%	12	46%	13	50%	1	4%	0	0%	4	2	3	3	3.42	0.58	0.2077	
Quantity Surveyors	15	7%	12	80%	3	20%	0	0%	0	0%	4	3	4	4	3.80	0.41	0.2216	
With ISO9000	88	43%	49	56%	36	41%	1	1%	2	2%	4	1	4	4	3.50	0.64	0.0166	
Without ISO9000	61	29%	38	62%	18	30%	2	3%	3	5%	4	1	4	4	3.49	0.79	-0.07	

Part	Part 1 Use of IT to assist project communication																
Topic	Telephone communication																
Subject	Administrative/clerical access to telephones																
Q.1.1.1.d	Response										Distribution Statistics						
Sample Sector	Nos	% o/a	No '4'	% '4'	No '3'	% '3'	No '2'	% '2'	No '1'	% '1'	H	L	Median	Mode	Mean	SD	Corr
All	149	72%	101	68%	41	28%	3	2%	4	3%	4	1	4	4	3.60	0.67	-0.079
Architecture	29	14%	18	62%	10	34%	0	0%	1	3%	4	1	4	4	3.55	0.69	-0.152
Building Services	12	6%	6	50%	6	50%	0	0%	0	0%	4	3	3.5	4	3.50	0.52	-0.416
Civil	101	49%	70	69%	26	26%	2	2%	3	3%	4	1	4	4	3.61	0.68	-0.072
Landscaping	8	4%	6	75%	2	25%	0	0%	0	0%	4	3	4	4	3.75	0.46	0.0847
Structural	26	13%	14	54%	12	46%	0	0%	0	0%	4	3	4	4	3.54	0.51	-0.026
Quantity Surveyors	15	7%	9	60%	5	33%	1	7%	0	0%	4	2	4	4	3.53	0.64	0.1666
With ISO9000	88	43%	57	65%	29	33%	1	1%	1	1%	4	1	4	4	3.61	0.58	-0.058
Without ISO9000	61	29%	44	72%	12	20%	2	3%	3	5%	4	1	4	4	3.59	0.78	-0.219

Results of the 1998 postal survey of Hong Kong Public Works Consultants

Part	Part 1 Use of IT to assist project communication																	
Topic	Telephone communication																	
Subject	Use of public telephone services																	
Q.1.1.2.a	Response										Distribution Statistics							
Sample Sector	Nos	% o/a	No '4'	% '4'	No '3'	% '3'	No '2'	% '2'	No '1'	% '1'	H	L	Median	Mode	Mean	SD	Corr	
All	140	68%	120	86%	1	1%	5	4%	14	10%	4	1	4	4	3.62	0.96	0.0817	
Architecture	29	14%	26	90%	0	0%	0	0%	3	10%	4	1	4	4	3.69	0.93	0.1372	
Building Services	12	6%	6	50%	6	50%	0	0%	0	0%	4	3	3.5	4	3.50	0.52	-0.416	
Civil	96	46%	82	85%	0	0%	5	5%	9	9%	4	1	4	4	3.61	0.96	0.0805	
Landscaping	8	4%	8	100%	0	0%	0	0%	0	0%	4	4	4	4	4.00	0.00	na	
Structural	24	12%	23	96%	0	0%	0	0%	1	4%	4	1	4	4	3.88	0.61	0.1429	
Quantity Surveyors	12	6%	10	83%	0	0%	0	0%	2	17%	4	1	4	4	3.50	1.17	0.192	
With ISO9000	82	40%	69	84%	1	1%	2	2%	10	12%	4	1	4	4	3.57	1.02	0.1422	
Without ISO9000	58	28%	51	88%	0	0%	3	5%	4	7%	4	1	4	4	3.69	0.86	0.0474	

Part	Part 1 Use of IT to assist project communication																
Topic	Telephone communication																
Subject	Use of telephone leased line services																
Q.1.1.2.b	Response										Distribution Statistics						
Sample Sector	Nos	% o/a	No '4'	% '4'	No '3'	% '3'	No '2'	% '2'	No '1'	% '1'	H	L	Median	Mode	Mean	SD	Corr
All	133	64%	59	44%	0	0%	11	8%	63	47%	4	1	2	1	2.41	1.45	0.1032
Architecture	27	13%	11	41%	0	0%	5	19%	11	41%	4	1	2	1	2.41	1.39	-0.151
Building Services	12	6%	10	83%	1	8%	1	8%	0	0%	4	2	4	4	3.75	0.62	0.377
Civil	92	44%	42	46%	0	0%	5	5%	45	49%	4	1	2	1	2.42	1.47	0.1428
Landscaping	8	4%	2	25%	0	0%	2	25%	4	50%	4	1	1.5	1	2.00	1.31	-0.479
Structural	24	12%	9	38%	0	0%	2	8%	13	54%	4	1	1	1	2.21	1.44	0.1427
Quantity Surveyors	11	5%	6	55%	0	0%	0	0%	5	45%	4	1	4	4	2.64	1.57	0.2537
With ISO9000	81	39%	36	44%	0	0%	8	10%	37	46%	4	1	2	1	2.43	1.44	0.103
Without ISO9000	52	25%	23	44%	0	0%	3	6%	26	50%	4	1	1.5	1	2.38	1.47	0.1227

Results of the 1998 postal survey of Hong Kong Public Works Consultants

Part	Part 1 Use of IT to assist project communication																
Topic	Telephone communication																
Subject	Use of radio telephone services																
Q.1.1.2.c	Response										Distribution Statistics						
Sample Sector	Nos	% o/a	No '4'	% '4'	No '3'	% '3'	No '2'	% '2'	No '1'	% '1'	H	L	Median	Mode	Mean	SD	Corr
All	125	60%	10	8%	0	0%	8	6%	107	86%	4	1	1	1	1.30	0.83	0.0455
Architecture	26	13%	2	8%	0	0%	2	8%	22	85%	4	1	1	1	1.31	0.84	-0.046
Building Services	10	5%	1	10%	0	0%	1	10%	8	80%	4	1	1	1	1.40	0.97	-0.229
Civil	89	43%	8	9%	0	0%	6	7%	75	84%	4	1	1	1	1.34	0.88	0.0439
Landscaping	7	3%	0	0%	0	0%	0	0%	7	100%	1	1	1	1	1.00	0.00	na
Structural	23	11%	1	4%	0	0%	3	13%	19	83%	4	1	1	1	1.26	0.69	-0.057
Quantity Surveyors	8	4%	0	0%	0	0%	0	0%	8	100%	1	1	1	1	1.00	0.00	na
With ISO9000	72	35%	4	6%	0	0%	6	8%	62	86%	4	1	1	1	1.25	0.73	0.1257
Without ISO9000	53	26%	6	11%	0	0%	2	4%	45	85%	4	1	1	1	1.38	0.97	-0.084

Part	Part 1 Use of IT to assist project communication																	
Topic	Telephone communication																	
Subject	Provide/use mobile telephones by managerial staff																	
Q.1.1.3.a	Response										Distribution Statistics							
Sample Sector	Nos	% o/a	No '4'	% '4'	No '3'	% '3'	No '2'	% '2'	No '1'	% '1'	H	L	Median	Mode	Mean	SD	Corr	
All	148	71%	77	52%	32	22%	17	11%	22	15%	4	1	4	4	3.11	1.11	-0.001	
Architecture	28	14%	13	46%	7	25%	4	14%	4	14%	4	1	3	4	3.04	1.10	-0.196	
Building Services	12	6%	7	58%	2	17%	1	8%	2	17%	4	1	4	4	3.17	1.19	0.0778	
Civil	101	49%	55	54%	20	20%	11	11%	15	15%	4	1	4	4	3.14	1.11	0.005	
Landscaping	8	4%	7	88%	1	13%	0	0%	0	0%	4	3	4	4	3.88	0.35	0.1146	
Structural	26	13%	10	38%	10	38%	3	12%	3	12%	4	1	3	4	3.04	1.00	-0.108	
Quantity Surveyors	15	7%	6	40%	4	27%	3	20%	2	13%	4	1	3	4	2.93	1.10	0.1629	
With ISO9000	88	43%	48	55%	19	22%	11	13%	10	11%	4	1	4	4	3.19	1.05	-0.081	
Without ISO9000	60	29%	29	48%	13	22%	6	10%	12	20%	4	1	3	4	2.98	1.19	0.145	

Part	Part 1 Use of IT to assist project communication																
Topic	Telephone communication																
Subject	Provide/use mobile telephones by professional staff																
Q.1.1.3.b	Response										Distribution Statistics						
Sample Sector	Nos	% o/a	No '4'	% '4'	No '3'	% '3'	No '2'	% '2'	No '1'	% '1'	H	L	Median	Mode	Mean	SD	Corr
All	148	71%	32	22%	31	21%	43	29%	42	28%	4	1	2	2	2.36	1.11	-0.033
Architecture	29	14%	9	31%	6	21%	7	24%	7	24%	4	1	3	4	2.59	1.18	-0.429
Building Services	12	6%	1	8%	3	25%	5	42%	3	25%	4	1	2	2	2.17	0.94	-0.208
Civil	101	49%	22	22%	22	22%	28	28%	29	29%	4	1	2	1	2.37	1.12	-0.005
Landscaping	7	3%	1	14%	1	14%	3	43%	2	29%	4	1	2	2	2.14	1.07	0.0604
Structural	26	13%	3	12%	5	19%	13	50%	5	19%	4	1	2	2	2.23	0.91	-0.179
Quantity Surveyors	15	7%	1	7%	2	13%	6	40%	6	40%	4	1	2	1	1.87	0.92	0.167
With ISO9000	87	42%	16	18%	20	23%	29	33%	22	25%	4	1	2	2	2.34	1.05	-0.085
Without ISO9000	61	29%	16	26%	11	18%	14	23%	20	33%	4	1	2	1	2.38	1.20	0.1924

Part	Part 1 Use of IT to assist project communication																
Topic	Telephone communication																
Subject	Provide/use mobile telephones by technical staff																
Q.1.1.3.c	Response										Distribution Statistics						
Sample Sector	Nos	% o/a	No '4'	% '4'	No '3'	% '3'	No '2'	% '2'	No '1'	% '1'	H	L	Median	Mode	Mean	SD	Corr
All	145	70%	9	6%	18	12%	43	30%	75	52%	4	1	1	1	1.73	0.91	-0.072
Architecture	28	14%	0	0%	3	11%	9	32%	16	57%	3	1	1	1	1.54	0.69	-0.356
Building Services	12	6%	1	8%	0	0%	5	42%	6	50%	4	1	1.5	1	1.67	0.89	-0.437
Civil	99	48%	9	9%	13	13%	27	27%	50	51%	4	1	1	1	1.81	0.99	-0.061
Landscaping	7	3%	0	0%	0	0%	2	29%	5	71%	2	1	1	1	1.29	0.49	0.0894
Structural	26	13%	0	0%	4	15%	7	27%	15	58%	3	1	1	1	1.58	0.76	-0.092
Quantity Surveyors	15	7%	0	0%	1	7%	5	33%	9	60%	3	1	1	1	1.47	0.64	0.2083
With ISO9000	86	42%	4	5%	10	12%	29	34%	43	50%	4	1	1.5	1	1.71	0.85	-0.141
Without ISO9000	59	29%	5	8%	8	14%	14	24%	32	54%	4	1	1	1	1.76	0.99	0.2007

Results of the 1998 postal survey of Hong Kong Public Works Consultants

Part	Part 1 Use of IT to assist project communication																
Topic	Telephone communication																
Subject	Provide/use mobile telephones for administrative/clerical staff																
Q.1.1.3.d	Response										Distribution Statistics						
Sample Sector	Nos	% o/a	No '4'	% '4'	No '3'	% '3'	No '2'	% '2'	No '1'	% '1'	H	L	Median	Mode	Mean	SD	Corr
All	147	71%	4	3%	6	4%	33	22%	104	71%	4	1	1	1	1.39	0.70	0.0318
Architecture	28	14%	0	0%	1	4%	8	29%	19	68%	3	1	1	1	1.36	0.56	-0.211
Building Services	12	6%	0	0%	0	0%	3	25%	9	75%	2	1	1	1	1.25	0.45	0.0552
Civil	101	49%	4	4%	5	5%	21	21%	71	70%	4	1	1	1	1.43	0.77	0.0349
Landscaping	7	3%	0	0%	0	0%	0	0%	7	100%	1	1	1	1	1.00	0.00	na
Structural	26	13%	0	0%	2	8%	4	15%	20	77%	3	1	1	1	1.31	0.62	0.1448
Quantity Surveyors	15	7%	0	0%	0	0%	4	27%	11	73%	2	1	1	1	1.27	0.46	0.4749
With ISO9000	87	42%	2	2%	4	5%	25	29%	56	64%	4	1	1	1	1.45	0.69	-0.02
Without ISO9000	60	29%	2	3%	2	3%	8	13%	48	80%	4	1	1	1	1.30	0.70	0.0671

Part	Part 1 Use of IT to assist project communication																
Topic	Telephone communication																
Subject	Use of mobile telephone message services																
Q.1.1.4.a	Response										Distribution Statistics						
Sample Sector	Nos	% o/a	No '4'	% '4'	No '3'	% '3'	No '2'	% '2'	No '1'	% '1'	H	L	Median	Mode	Mean	SD	Corr
All	144	70%	54	38%	0	0%	38	26%	52	36%	4	1	2	4	2.39	1.31	0.0731
Architecture	28	14%	11	39%	0	0%	5	18%	12	43%	4	1	2	1	2.36	1.39	-0.179
Building Services	12	6%	6	50%	0	0%	5	42%	1	8%	4	1	3	4	2.92	1.16	-0.144
Civil	99	48%	36	36%	0	0%	24	24%	39	39%	4	1	2	1	2.33	1.32	0.1244
Landscaping	7	3%	3	43%	0	0%	1	14%	3	43%	4	1	2	4	2.43	1.51	0.3381
Structural	25	12%	10	40%	0	0%	11	44%	4	16%	4	1	2	2	2.64	1.19	-0.054
Quantity Surveyors	14	7%	3	21%	0	0%	7	50%	4	29%	4	1	2	2	2.14	1.10	0.0561
With ISO9000	83	40%	35	42%	0	0%	24	29%	24	29%	4	1	2	4	2.55	1.30	0.0198
Without ISO9000	61	29%	19	31%	0	0%	14	23%	28	46%	4	1	2	1	2.16	1.31	0.0192

Part	Part 1 Use of IT to assist project communication																
Topic	Telephone communication																
Subject	Use of mobile telephone call forwarding services																
Q.1.1.4.b	Response										Distribution Statistics						
Sample Sector	Nos	% o/a	No '4'	% '4'	No '3'	% '3'	No '2'	% '2'	No '1'	% '1'	H	L	Median	Mode	Mean	SD	Corr
All	142	69%	49	35%	0	0%	38	27%	55	39%	4	1	2	1	2.30	1.30	0.0036
Architecture	28	14%	10	36%	0	0%	6	21%	12	43%	4	1	2	1	2.29	1.36	-0.206
Building Services	12	6%	4	33%	0	0%	5	42%	3	25%	4	1	2	2	2.42	1.24	0.0289
Civil	98	47%	37	38%	0	0%	23	23%	38	39%	4	1	2	1	2.37	1.33	0.0275
Landscaping	7	3%	4	57%	0	0%	1	14%	2	29%	4	1	4	4	2.86	1.46	0.3063
Structural	24	12%	8	33%	0	0%	9	38%	7	29%	4	1	2	2	2.38	1.24	-0.16
Quantity Surveyors	13	6%	1	8%	0	0%	7	54%	5	38%	4	1	2	2	1.77	0.83	0.0848
With ISO9000	81	39%	27	33%	0	0%	26	32%	28	35%	4	1	2	1	2.32	1.26	-0.001
Without ISO9000	61	29%	22	36%	0	0%	12	20%	27	44%	4	1	2	1	2.28	1.36	-0.018

Part	Part 1 Use of IT to assist project communication																
Topic	Telephone communication																
Subject	Company policy /instruction to record important telephone communications																
Q.1.1.5.	Response										Distribution Statistics						
Sample Sector	Nos	% o/a	No '4'	% '4'	No '3'	% '3'	No '2'	% '2'	No '1'	% '1'	H	L	Median	Mode	Mean	SD	Corr
All	148	71%	64	43%	0	0%	21	14%	63	43%	4	1	2	4	2.44	1.41	-0.033
Architecture	29	14%	14	48%	0	0%	4	14%	11	38%	4	1	2	4	2.59	1.43	0.1197
Building Services	12	6%	5	42%	0	0%	2	17%	5	42%	4	1	2	1	2.42	1.44	0.156
Civil	100	48%	44	44%	0	0%	15	15%	41	41%	4	1	2	4	2.47	1.40	-0.061
Landscaping	8	4%	4	50%	0	0%	1	13%	3	38%	4	1	3	4	2.63	1.51	0.1571
Structural	26	13%	10	38%	0	0%	5	19%	11	42%	4	1	2	1	2.35	1.38	-0.079
Quantity Surveyors	15	7%	6	40%	0	0%	2	13%	7	47%	4	1	2	1	2.33	1.45	-0.166
With ISO9000	88	43%	43	49%	0	0%	11	13%	34	39%	4	1	2	4	2.59	1.42	-0.132
Without ISO9000	60	29%	21	35%	0	0%	10	17%	29	48%	4	1	2	1	2.22	1.37	0.1158

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Part	Part 1 Use of IT to assist project communication																
Topic	Telephone communication																
Subject	Telephone communications recorded on message recording services/facilities																
Q.1.1.6.a	Response										Distribution Statistics						
Sample Sector	Nos	% o/a	No '4'	% '4'	No '3'	% '3'	No '2'	% '2'	No '1'	% '1'	H	L	Median	Mode	Mean	SD	Corr
All	135	65%	9	7%	0	0%	9	7%	117	87%	4	1	1	1	1.27	0.77	0.0692
Architecture	26	13%	3	12%	0	0%	1	4%	22	85%	4	1	1	1	1.38	0.98	-0.154
Building Services	10	5%	0	0%	0	0%	1	10%	9	90%	2	1	1	1	1.10	0.32	0.3069
Civil	94	45%	6	6%	0	0%	8	9%	80	85%	4	1	1	1	1.28	0.77	0.0948
Landscaping	6	3%	1	17%	0	0%	0	0%	5	83%	4	1	1	1	1.50	1.22	-0.205
Structural	25	12%	0	0%	0	0%	2	8%	23	92%	2	1	1	1	1.08	0.28	0.1667
Quantity Surveyors	13	6%	0	0%	0	0%	0	0%	13	100%	1	1	1	1	1.00	0.00	na
With ISO9000	79	38%	7	9%	0	0%	6	8%	66	84%	4	1	1	1	1.34	0.88	0.0425
Without ISO9000	56	27%	2	4%	0	0%	3	5%	51	91%	4	1	1	1	1.16	0.60	-0.064

Part	Part 1 Use of IT to assist project communication																
Topic	Telephone communication																
Subject	Telephone communications recorded of speaker phone																
Q.1.1.6.b	Response										Distribution Statistics						
Sample Sector	Nos	% o/a	No '4'	% '4'	No '3'	% '3'	No '2'	% '2'	No '1'	% '1'	H	L	Median	Mode	Mean	SD	Corr
All	136	66%	4	3%	0	0%	9	7%	123	90%	4	1	1	1	1.15	0.56	-0.055
Architecture	26	13%	0	0%	0	0%	2	8%	24	92%	2	1	1	1	1.08	0.27	-0.052
Building Services	10	5%	0	0%	0	0%	0	0%	10	100%	1	1	1	1	1.00	0.00	na
Civil	95	46%	4	4%	0	0%	7	7%	84	88%	4	1	1	1	1.20	0.65	-0.069
Landscaping	6	3%	0	0%	0	0%	1	17%	5	83%	2	1	1	1	1.17	0.41	-0.205
Structural	26	13%	1	4%	0	0%	1	4%	24	92%	4	1	1	1	1.15	0.61	-0.176
Quantity Surveyors	13	6%	0	0%	0	0%	0	0%	13	100%	1	1	1	1	1.00	0.00	na
With ISO9000	80	39%	2	3%	0	0%	5	6%	73	91%	4	1	1	1	1.14	0.52	-0.044
Without ISO9000	56	27%	2	4%	0	0%	4	7%	50	89%	4	1	1	1	1.18	0.61	-0.074

Results of the 1998 postal survey of Hong Kong Public Works Consultants

Part	Part 1 Use of IT to assist project communication																
Topic	Telephone communication																
Subject	Telephone communications recorded on a written note																
Q.1.1.6.c	Response										Distribution Statistics						
Sample Sector	Nos	% o/a	No '4'	% '4'	No '3'	% '3'	No '2'	% '2'	No '1'	% '1'	H	L	Median	Mode	Mean	SD	Corr
All	148	71%	118	80%	0	0%	24	16%	6	4%	4	1	4	4	3.55	0.91	0.1566
Architecture	29	14%	27	93%	0	0%	1	3%	1	3%	4	1	4	4	3.83	0.66	0.1239
Building Services	12	6%	11	92%	0	0%	0	0%	1	8%	4	1	4	4	3.75	0.87	0.2944
Civil	100	48%	76	76%	0	0%	20	20%	4	4%	4	1	4	4	3.48	0.95	0.1639
Landscaping	7	3%	5	71%	0	0%	2	29%	0	0%	4	2	4	4	3.43	0.98	0.3767
Structural	26	13%	23	88%	0	0%	2	8%	1	4%	4	1	4	4	3.73	0.78	0.0217
Quantity Surveyors	15	7%	13	87%	0	0%	2	13%	0	0%	4	2	4	4	3.73	0.70	0.2175
With ISO9000	88	43%	75	85%	0	0%	10	11%	3	3%	4	1	4	4	3.67	0.81	0.0956
Without ISO9000	60	29%	43	72%	0	0%	14	23%	3	5%	4	1	4	4	3.38	1.01	0.2331

Part	Part 1 Use of IT to assist project communication																
Topic	Fax communication																
Subject	Use of fax in Head Office																
Q.1.2.1.a	Response										Distribution Statistics						
Sample Sector	Nos	% o/a	No '4'	% '4'	No '3'	% '3'	No '2'	% '2'	No '1'	% '1'	H	L	Median	Mode	Mean	SD	Corr
All	149	72%	141	95%	6	4%	0	0%	2	1%	4	1	4	4	3.92	0.39	0.0916
Architecture	29	14%	29	100%	0	0%	0	0%	0	0%	4	4	4	4	4.00	0.00	na
Building Services	12	6%	12	100%	0	0%	0	0%	0	0%	4	4	4	4	4.00	0.00	na
Civil	101	49%	95	94%	5	5%	0	0%	1	1%	4	1	4	4	3.92	0.37	0.1057
Landscaping	8	4%	8	100%	0	0%	0	0%	0	0%	4	4	4	4	4.00	0.00	na
Structural	26	13%	24	92%	1	4%	0	0%	1	4%	4	1	4	4	3.85	0.61	0.2049
Quantity Surveyors	15	7%	14	93%	1	7%	0	0%	0	0%	4	3	4	4	3.93	0.26	0.1051
With ISO9000	88	43%	85	97%	2	2%	0	0%	1	1%	4	1	4	4	3.94	0.35	0.0825
Without ISO9000	61	29%	56	92%	4	7%	0	0%	1	2%	4	1	4	4	3.89	0.45	0.0793

Results of the 1998 postal survey of Hong Kong Public Works Consultants

Part	Part 1 Use of IT to assist project communication																	
Topic	Fax communication																	
Subject	Use of fax in other company offices																	
Q.1.2.1.b	Response										Distribution Statistics							
Sample Sector	Nos	% o/a	No '4'	% '4'	No '3'	% '3'	No '2'	% '2'	No '1'	% '1'	H	L	Median	Mode	Mean	SD	Corr	
All	143	69%	114	80%	13	9%	0	0%	16	11%	4	1	4	4	3.57	0.96	0.1976	
Architecture	29	14%	22	76%	4	14%	0	0%	3	10%	4	1	4	4	3.55	0.95	0.1198	
Building Services	11	5%	11	100%	0	0%	0	0%	0	0%	4	4	4	4	4.00	0.00	na	
Civil	98	47%	81	83%	6	6%	0	0%	11	11%	4	1	4	4	3.60	0.96	0.2081	
Landscaping	7	3%	7	100%	0	0%	0	0%	0	0%	4	4	4	4	4.00	0.00	na	
Structural	26	13%	23	88%	1	4%	0	0%	2	8%	4	1	4	4	3.73	0.83	0.2514	
Quantity Surveyors	14	7%	10	71%	3	21%	0	0%	1	7%	4	1	4	4	3.57	0.85	0.292	
With ISO9000	85	41%	73	86%	6	7%	0	0%	6	7%	4	1	4	4	3.72	0.80	0.185	
Without ISO9000	58	28%	41	71%	7	12%	0	0%	10	17%	4	1	4	4	3.36	1.13	0.1598	

Part	Part 1 Use of IT to assist project communication																
Topic	Fax communication																
Subject	Use of fax in assignment locations																
Q.1.2.1.c	Response										Distribution Statistics						
Sample Sector	Nos	% o/a	No '4'	% '4'	No '3'	% '3'	No '2'	% '2'	No '1'	% '1'	H	L	Median	Mode	Mean	SD	Corr
All	143	69%	90	63%	29	20%	4	3%	20	14%	4	1	4	4	3.32	1.06	0.2503
Architecture	29	14%	24	83%	2	7%	0	0%	3	10%	4	1	4	4	3.62	0.94	-0.134
Building Services	12	6%	10	83%	0	0%	1	8%	1	8%	4	1	4	4	3.58	1.00	-0.012
Civil	97	47%	60	62%	20	21%	3	3%	14	14%	4	1	4	4	3.30	1.07	0.2879
Landscaping	7	3%	3	43%	4	57%	0	0%	0	0%	4	3	3	3	3.43	0.53	-0.095
Structural	26	13%	15	58%	7	27%	0	0%	4	15%	4	1	4	4	3.27	1.08	0.3241
Quantity Surveyors	14	7%	8	57%	5	36%	0	0%	1	7%	4	1	4	4	3.43	0.85	0.3995
With ISO9000	85	41%	62	73%	13	15%	2	2%	8	9%	4	1	4	4	3.52	0.93	0.2198
Without ISO9000	58	28%	28	48%	16	28%	2	3%	12	21%	4	1	3	4	3.03	1.17	0.2206

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Part	Part 1 Use of IT to assist project communication																
Topic	Fax communication																
Subject	Use of fax to PC's																
Q.1.2.2.a	Response										Distribution Statistics						
Sample Sector	Nos	% o/a	No '4'	% '4'	No '3'	% '3'	No '2'	% '2'	No '1'	% '1'	H	L	Median	Mode	Mean	SD	Corr
All	148	71%	8	5%	10	7%	43	29%	87	59%	4	1	1	1	1.59	0.84	-0.022
Architecture	28	14%	1	4%	1	4%	9	32%	17	61%	4	1	1	1	1.50	0.75	0.035
Building Services	12	6%	0	0%	0	0%	3	25%	9	75%	2	1	1	1	1.25	0.45	0.5291
Civil	100	48%	6	6%	8	8%	32	32%	54	54%	4	1	1	1	1.66	0.87	-0.087
Landscaping	8	4%	0	0%	0	0%	4	50%	4	50%	2	1	1.5	1	1.50	0.53	-0.303
Structural	26	13%	0	0%	3	12%	7	27%	16	62%	3	1	1	1	1.50	0.71	-0.015
Quantity Surveyors	15	7%	1	7%	1	7%	4	27%	9	60%	4	1	1	1	1.60	0.91	0.3049
With ISO9000	87	42%	4	5%	6	7%	24	28%	53	61%	4	1	1	1	1.55	0.82	0.0108
Without ISO9000	61	29%	4	7%	4	7%	19	31%	34	56%	4	1	1	1	1.64	0.88	-0.043

Part	Part 1 Use of IT to assist project communication																
Topic	Fax communication																
Subject	Use of PC's to fax																
Q.1.2.1.b	Response										Distribution Statistics						
Sample Sector	Nos	% o/a	No '4'	% '4'	No '3'	% '3'	No '2'	% '2'	No '1'	% '1'	H	L	Median	Mode	Mean	SD	Corr
All	148	71%	12	8%	13	9%	46	31%	77	52%	4	1	1	1	1.73	0.93	-0.046
Architecture	28	14%	2	7%	1	4%	8	29%	17	61%	4	1	1	1	1.57	0.88	0.0099
Building Services	12	6%	0	0%	0	0%	3	25%	9	75%	2	1	1	1	1.25	0.45	0.5291
Civil	100	48%	9	9%	11	11%	34	34%	46	46%	4	1	2	1	1.83	0.95	-0.086
Landscaping	8	4%	0	0%	1	13%	4	50%	3	38%	3	1	2	2	1.75	0.71	0.1589
Structural	26	13%	1	4%	2	8%	9	35%	14	54%	4	1	1	1	1.62	0.80	-0.146
Quantity Surveyors	15	7%	0	0%	1	7%	6	40%	8	53%	3	1	1	1	1.53	0.64	0.2967
With ISO9000	87	42%	3	3%	5	6%	29	33%	50	57%	4	1	1	1	1.55	0.76	0.011
Without ISO9000	61	29%	9	15%	8	13%	17	28%	27	44%	4	1	2	1	1.98	1.09	0.195

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Part	Part 1 Use of IT to assist project communication																
Topic	Meetings for communication																
Subject	Use of formal meetings for project communication in head office																
Q.1.3.1.a	Response										Distribution Statistics						
Sample Sector	Nos	% o/a	No '4'	% '4'	No '3'	% '3'	No '2'	% '2'	No '1'	% '1'	H	L	Median	Mode	Mean	SD	Corr
All	149	72%	110	74%	26	17%	12	8%	1	1%	4	1	4	4	3.64	0.66	0.1567
Architecture	29	14%	23	79%	6	21%	0	0%	0	0%	4	3	4	4	3.79	0.41	0.1107
Building Services	12	6%	11	92%	0	0%	1	8%	0	0%	4	2	4	4	3.83	0.58	0.2944
Civil	101	49%	76	75%	15	15%	9	9%	1	1%	4	1	4	4	3.64	0.69	0.1603
Landscaping	8	4%	7	88%	1	13%	0	0%	0	0%	4	3	4	4	3.88	0.35	-0.418
Structural	26	13%	18	69%	7	27%	1	4%	0	0%	4	2	4	4	3.65	0.56	0.2603
Quantity Surveyors	15	7%	10	67%	4	27%	1	7%	0	0%	4	2	4	4	3.60	0.63	0.1888
With ISO9000	88	43%	69	78%	17	19%	2	2%	0	0%	4	2	4	4	3.76	0.48	0.1334
Without ISO9000	61	29%	41	67%	9	15%	10	16%	1	2%	4	1	4	4	3.48	0.83	0.0968

Part	Part 1 Use of IT to assist project communication																
Topic	Meetings for communication																
Subject	Use of formal meetings for project communication in other company offices																
Q.1.3.1.b	Response										Distribution Statistics						
Sample Sector	Nos	% o/a	No '4'	% '4'	No '3'	% '3'	No '2'	% '2'	No '1'	% '1'	H	L	Median	Mode	Mean	SD	Corr
All	145	70%	92	63%	35	24%	12	8%	6	4%	4	1	4	4	3.47	0.82	0.1645
Architecture	29	14%	20	69%	8	28%	1	3%	0	0%	4	2	4	4	3.66	0.55	-0.101
Building Services	11	5%	10	91%	0	0%	1	9%	0	0%	4	2	4	4	3.82	0.60	0.3295
Civil	98	47%	62	63%	23	23%	7	7%	6	6%	4	1	4	4	3.44	0.87	0.208
Landscaping	8	4%	6	75%	2	25%	0	0%	0	0%	4	3	4	4	3.75	0.46	0.0847
Structural	26	13%	18	69%	8	31%	0	0%	0	0%	4	3	4	4	3.69	0.47	0.233
Quantity Surveyors	15	7%	9	60%	3	20%	3	20%	0	0%	4	2	4	4	3.40	0.83	0.1275
With ISO9000	87	42%	60	69%	21	24%	6	7%	0	0%	4	2	4	4	3.62	0.61	0.1295
Without ISO9000	58	28%	32	55%	14	24%	6	10%	6	10%	4	1	4	4	3.24	1.01	0.1278

Results of the 1998 postal survey of Hong Kong Public Works Consultants

Part	Part 1 Use of IT to assist project communication																
Topic	Meetings for communication																
Subject	Use of formal meetings for project communication in assignment locations																
Q.1.3.1.c	Response										Distribution Statistics						
Sample Sector	Nos	% o/a	No '4'	% '4'	No '3'	% '3'	No '2'	% '2'	No '1'	% '1'	H	L	Median	Mode	Mean	SD	Corr
All	144	70%	79	55%	42	29%	15	10%	8	6%	4	1	4	4	3.33	0.88	0.1868
Architecture	29	14%	17	59%	9	31%	2	7%	1	3%	4	1	4	4	3.45	0.78	0.2187
Building Services	12	6%	11	92%	0	0%	1	8%	0	0%	4	2	4	4	3.83	0.58	0.2944
Civil	97	47%	51	53%	30	31%	10	10%	6	6%	4	1	4	4	3.30	0.89	0.2121
Landscaping	8	4%	6	75%	1	13%	1	13%	0	0%	4	2	4	4	3.63	0.74	-0.146
Structural	26	13%	16	62%	9	35%	1	4%	0	0%	4	2	4	4	3.58	0.58	0.3069
Quantity Surveyors	14	7%	8	57%	2	14%	3	21%	1	7%	4	1	4	4	3.21	1.05	0.1802
With ISO9000	86	42%	52	60%	24	28%	8	9%	2	2%	4	1	4	4	3.47	0.76	0.1654
Without ISO9000	58	28%	27	47%	18	31%	7	12%	6	10%	4	1	3	4	3.14	1.00	0.1572

Part	Part 1 Use of IT to assist project communication																
Topic	Meetings for communication																
Subject	Use of formal meetings for project communication between assignment locations and other offices																
Q.1.3.1.d	Response										Distribution Statistics						
Sample Sector	Nos	% o/a	No '4'	% '4'	No '3'	% '3'	No '2'	% '2'	No '1'	% '1'	H	L	Median	Mode	Mean	SD	Corr
All	142	69%	59	42%	41	29%	28	20%	14	10%	4	1	3	4	3.02	1.01	0.2173
Architecture	29	14%	15	52%	9	31%	4	14%	1	3%	4	1	4	4	3.31	0.85	0.1424
Building Services	11	5%	8	73%	0	0%	3	27%	0	0%	4	2	4	4	3.45	0.93	0.3141
Civil	96	46%	36	38%	29	30%	20	21%	11	11%	4	1	3	4	2.94	1.02	0.2441
Landscaping	8	4%	6	75%	1	13%	1	13%	0	0%	4	2	4	4	3.63	0.74	-0.216
Structural	26	13%	11	42%	9	35%	5	19%	1	4%	4	1	3	4	3.15	0.88	0.2863
Quantity Surveyors	14	7%	7	50%	1	7%	5	36%	1	7%	4	1	3.5	4	3.00	1.11	0.2456
With ISO9000	85	41%	40	47%	24	28%	18	21%	3	4%	4	1	3	4	3.19	0.89	0.1706
Without ISO9000	57	28%	19	33%	17	30%	10	18%	11	19%	4	1	3	4	2.77	1.12	0.2673

Results of the 1998 postal survey of Hong Kong Public Works Consultants

Part	Part 1 Use of IT to assist project communication																
Topic	Meetings for communication																
Subject	Company policy/instruction that notes/minutes of meetings are recorded																
Q.1.3.2.a	Response										Distribution Statistics						
Sample Sector	Nos	% o/a	No '4'	% '4'	No '3'	% '3'	No '2'	% '2'	No '1'	% '1'	H	L	Median	Mode	Mean	SD	Corr
All	149	72%	97	65%	43	29%	7	5%	2	1%	4	1	4	4	3.58	0.65	0.177
Architecture	29	14%	23	79%	6	21%	0	0%	0	0%	4	3	4	4	3.79	0.41	0.2366
Building Services	12	6%	10	83%	1	8%	1	8%	0	0%	4	2	4	4	3.75	0.62	0.4032
Civil	101	49%	67	66%	26	26%	6	6%	2	2%	4	1	4	4	3.56	0.70	0.1946
Landscaping	8	4%	5	63%	2	25%	1	13%	0	0%	4	2	4	4	3.50	0.76	0.0346
Structural	26	13%	20	77%	5	19%	0	0%	1	4%	4	1	4	4	3.69	0.68	0.1171
Quantity Surveyors	15	7%	6	40%	9	60%	0	0%	0	0%	4	3	3	3	3.40	0.51	0.1136
With ISO9000	88	43%	61	69%	24	27%	2	2%	1	1%	4	1	4	4	3.65	0.59	0.1601
Without ISO9000	61	29%	36	59%	19	31%	5	8%	1	2%	4	1	4	4	3.48	0.72	0.1521

Part	Part 1 Use of IT to assist project communication																
Topic	Meetings for communication																
Subject	Use of hand-written notes/minutes of meetings																
Q.1.3.3.a	Response										Distribution Statistics						
Sample Sector	Nos	% o/a	No '4'	% '4'	No '3'	% '3'	No '2'	% '2'	No '1'	% '1'	H	L	Median	Mode	Mean	SD	Corr
All	146	71%	78	53%	34	23%	25	17%	9	6%	4	1	4	4	3.24	0.95	-0.161
Architecture	29	14%	20	69%	3	10%	5	17%	1	3%	4	1	4	4	3.45	0.91	-0.216
Building Services	12	6%	6	50%	4	33%	1	8%	1	8%	4	1	3.5	4	3.25	0.97	-0.048
Civil	98	47%	52	53%	23	23%	18	18%	5	5%	4	1	4	4	3.24	0.93	-0.22
Landscaping	8	4%	7	88%	0	0%	1	13%	0	0%	4	2	4	4	3.75	0.71	0.1737
Structural	26	13%	10	38%	6	23%	8	31%	2	8%	4	1	3	4	2.92	1.02	-0.306
Quantity Surveyors	15	7%	6	40%	6	40%	1	7%	2	13%	4	1	3	4	3.07	1.03	0.17
With ISO9000	86	42%	46	53%	21	24%	12	14%	7	8%	4	1	4	4	3.23	0.98	-0.193
Without ISO9000	60	29%	32	53%	13	22%	13	22%	2	3%	4	1	4	4	3.25	0.91	-0.16

Results of the 1998 postal survey of Hong Kong Public Works Consultants

Part	Part 1 Use of IT to assist project communication																
Topic	Meetings for communication																
Subject	Use of tape recorder to record notes/minutes of meetings																
Q.1.3.3.b	Response										Distribution Statistics						
Sample Sector	Nos	% o/a	No '4'	% '4'	No '3'	% '3'	No '2'	% '2'	No '1'	% '1'	H	L	Median	Mode	Mean	SD	Corr
All	140	68%	4	3%	5	4%	30	21%	101	72%	4	1	1	1	1.37	0.69	0.0631
Architecture	28	14%	1	4%	0	0%	7	25%	20	71%	4	1	1	1	1.36	0.68	-0.004
Building Services	12	6%	0	0%	0	0%	4	33%	8	67%	2	1	1	1	1.33	0.49	0.3134
Civil	95	46%	2	2%	5	5%	22	23%	66	69%	4	1	1	1	1.40	0.69	0.0163
Landscaping	7	3%	0	0%	1	14%	1	14%	5	71%	3	1	1	1	1.43	0.79	-0.359
Structural	26	13%	0	0%	0	0%	8	31%	18	69%	2	1	1	1	1.31	0.47	0.0527
Quantity Surveyors	13	6%	1	8%	0	0%	2	15%	10	77%	4	1	1	1	1.38	0.87	0.5076
With ISO9000	82	40%	2	2%	5	6%	22	27%	53	65%	4	1	1	1	1.46	0.72	-0.014
Without ISO9000	58	28%	2	3%	0	0%	8	14%	48	83%	4	1	1	1	1.24	0.63	0.1291

Part	Part 1 Use of IT to assist project communication																
Topic	Meetings for communication																
Subject	Use of word-processor to record notes/minutes of meetings																
Q.1.3.3.c	Response										Distribution Statistics						
Sample Sector	Nos	% o/a	No '4'	% '4'	No '3'	% '3'	No '2'	% '2'	No '1'	% '1'	H	L	Median	Mode	Mean	SD	Corr
All	143	69%	62	43%	31	22%	16	11%	34	24%	4	1	3	4	2.85	1.22	0.1384
Architecture	28	14%	15	54%	4	14%	2	7%	7	25%	4	1	4	4	2.96	1.29	-0.148
Building Services	12	6%	5	42%	2	17%	1	8%	4	33%	4	1	3	4	2.67	1.37	0.1311
Civil	98	47%	36	37%	27	28%	11	11%	24	24%	4	1	3	4	2.77	1.19	0.1931
Landscaping	7	3%	3	43%	2	29%	1	14%	1	14%	4	1	3	4	3.00	1.15	-0.434
Structural	26	13%	13	50%	6	23%	2	8%	5	19%	4	1	3.5	4	3.04	1.18	0.1859
Quantity Surveyors	13	6%	8	62%	0	0%	3	23%	2	15%	4	1	4	4	3.08	1.26	0.313
With ISO9000	84	41%	44	52%	15	18%	9	11%	16	19%	4	1	4	4	3.04	1.19	0.082
Without ISO9000	59	29%	18	31%	16	27%	7	12%	18	31%	4	1	3	4	2.58	1.22	0.1037

Results of the 1998 postal survey of Hong Kong Public Works Consultants

Part	Part 1 Use of IT to assist project communication																
Topic	Meetings for communication																
Subject	Use of electronic notice board to record minutes/notes of meetings																
Q.1.3.3.d	Response										Distribution Statistics						
Sample Sector	Nos	% o/a	No '4'	% '4'	No '3'	% '3'	No '2'	% '2'	No '1'	% '1'	H	L	Median	Mode	Mean	SD	Corr
All	141	68%	1	1%	3	2%	14	10%	123	87%	4	1	1	1	1.16	0.47	-0.01
Architecture	28	14%	0	0%	0	0%	1	4%	27	96%	2	1	1	1	1.04	0.19	-0.059
Building Services	12	6%	0	0%	0	0%	3	25%	9	75%	2	1	1	1	1.25	0.45	0.3181
Civil	96	46%	1	1%	3	3%	12	13%	80	83%	4	1	1	1	1.22	0.55	-0.019
Landscaping	7	3%	0	0%	0	0%	1	14%	6	86%	2	1	1	1	1.14	0.38	-0.249
Structural	26	13%	0	0%	0	0%	5	19%	21	81%	2	1	1	1	1.19	0.40	0.1645
Quantity Surveyors	13	6%	0	0%	0	0%	1	8%	12	92%	2	1	1	1	1.08	0.28	0.9128
With ISO9000	83	40%	0	0%	1	1%	11	13%	71	86%	3	1	1	1	1.16	0.40	0.024
Without ISO9000	58	28%	1	2%	2	3%	3	5%	52	90%	4	1	1	1	1.17	0.57	-0.097

Part	Part 1 Use of IT to assist project communication																
Topic	Video-conferencing for communication																
Subject	Use of video-conferencing for communication within Hong Kong																
Q.1.4.1.a	Response										Distribution Statistics						
Sample Sector	Nos	% o/a	No '4'	% '4'	No '3'	% '3'	No '2'	% '2'	No '1'	% '1'	H	L	Median	Mode	Mean	SD	Corr
All	149	72%	7	5%	0	0%	12	8%	130	87%	4	1	1	1	1.22	0.68	-0.016
Architecture	29	14%	2	7%	0	0%	1	3%	26	90%	4	1	1	1	1.24	0.79	-0.075
Building Services	12	6%	1	8%	0	0%	2	17%	9	75%	4	1	1	1	1.42	0.90	0.031
Civil	101	49%	5	5%	0	0%	10	10%	86	85%	4	1	1	1	1.25	0.70	-0.018
Landscaping	8	4%	1	13%	0	0%	0	0%	7	88%	4	1	1	1	1.38	1.06	-0.174
Structural	26	13%	0	0%	0	0%	4	15%	22	85%	2	1	1	1	1.15	0.37	-0.032
Quantity Surveyors	15	7%	0	0%	0	0%	2	13%	13	87%	2	1	1	1	1.13	0.35	0.5157
With ISO9000	88	43%	5	6%	0	0%	11	13%	72	82%	4	1	1	1	1.30	0.75	-0.079
Without ISO9000	61	29%	2	3%	0	0%	1	2%	58	95%	4	1	1	1	1.11	0.55	-0.018

Part	Part 1 Use of IT to assist project communication																
Topic	Video-conferencing for communication																
Subject	Use of video-conferencing for international communication																
Q.1.4.1.b	Response										Distribution Statistics						
Sample Sector	Nos	% o/a	No '4'	% '4'	No '3'	% '3'	No '2'	% '2'	No '1'	% '1'	H	L	Median	Mode	Mean	SD	Corr
All	149	72%	9	6%	5	3%	17	11%	118	79%	4	1	1	1	1.36	0.82	0.119
Architecture	29	14%	3	10%	0	0%	3	10%	23	79%	4	1	1	1	1.41	0.95	-0.098
Building Services	12	6%	1	8%	3	25%	1	8%	7	58%	4	1	1	1	1.83	1.11	0.328
Civil	101	49%	6	6%	5	5%	14	14%	76	75%	4	1	1	1	1.42	0.84	0.1403
Landscaping	8	4%	0	0%	1	13%	2	25%	5	63%	3	1	1	1	1.50	0.76	-0.048
Structural	26	13%	1	4%	2	8%	4	15%	19	73%	4	1	1	1	1.42	0.81	0.1588
Quantity Surveyors	15	7%	0	0%	1	7%	1	7%	13	87%	3	1	1	1	1.20	0.56	0.7149
With ISO9000	88	43%	6	7%	4	5%	13	15%	65	74%	4	1	1	1	1.44	0.87	0.0899
Without ISO9000	61	29%	3	5%	1	2%	4	7%	53	87%	4	1	1	1	1.25	0.72	0.0874

Part	Part 1 Use of IT to assist project communication																
Topic	Video-conferencing for communication																
Subject	Use of commercially hired video-conferencing services																
Q.1.4.2.a	Response										Distribution Statistics						
Sample Sector	Nos	% o/a	No '4'	% '4'	No '3'	% '3'	No '2'	% '2'	No '1'	% '1'	H	L	Median	Mode	Mean	SD	Corr
All	138	67%	3	2%	0	0%	6	4%	129	93%	4	1	1	1	1.11	0.48	0.1269
Architecture	27	13%	0	0%	0	0%	0	0%	27	100%	1	1	1	1	1.00	0.00	na
Building Services	12	6%	1	8%	0	0%	0	0%	11	92%	4	1	1	1	1.25	0.87	0.0086
Civil	94	45%	3	3%	0	0%	6	6%	85	90%	4	1	1	1	1.16	0.57	0.123
Landscaping	8	4%	0	0%	0	0%	0	0%	8	100%	1	1	1	1	1.00	0.00	na
Structural	25	12%	1	4%	0	0%	1	4%	23	92%	4	1	1	1	1.16	0.62	-0.057
Quantity Surveyors	13	6%	0	0%	0	0%	0	0%	13	100%	1	1	1	1	1.00	0.00	na
With ISO9000	80	39%	1	1%	0	0%	5	6%	74	93%	4	1	1	1	1.10	0.41	0.0897
Without ISO9000	58	28%	2	3%	0	0%	1	2%	55	95%	4	1	1	1	1.12	0.56	0.497

Results of the 1998 postal survey of Hong Kong Public Works Consultants

Part	Part 1 Use of IT to assist project communication																
Topic	Video-conferencing for communication																
Subject	Use of company-owned private video-conferencing services																
Q.1.4.2.b	Response										Distribution Statistics						
Sample Sector	Nos	% o/a	No '4'	% '4'	No '3'	% '3'	No '2'	% '2'	No '1'	% '1'	H	L	Median	Mode	Mean	SD	Corr
All	138	67%	9	7%	0	0%	5	4%	124	90%	4	1	1	1	1.23	0.76	0.1332
Architecture	27	13%	2	7%	0	0%	0	0%	25	93%	4	1	1	1	1.22	0.80	-0.092
Building Services	12	6%	2	17%	0	0%	0	0%	10	83%	4	1	1	1	1.50	1.17	0.7054
Civil	94	45%	7	7%	0	0%	5	5%	82	87%	4	1	1	1	1.28	0.81	0.1524
Landscaping	8	4%	1	13%	0	0%	0	0%	7	88%	4	1	1	1	1.38	1.06	-0.174
Structural	25	12%	2	8%	0	0%	0	0%	23	92%	4	1	1	1	1.24	0.83	0.2994
Quantity Surveyors	13	6%	1	8%	0	0%	0	0%	12	92%	4	1	1	1	1.23	0.83	0.8999
With ISO9000	80	39%	7	9%	0	0%	1	1%	72	90%	4	1	1	1	1.28	0.86	0.1478
Without ISO9000	58	28%	2	3%	0	0%	4	7%	52	90%	4	1	1	1	1.17	0.60	-0.04

Part	Part 1 Use of IT to assist project communication																
Topic	Video-conferencing for communication																
Subject	Use of the Internet for video-conferencing services																
Q.1.4.2.c	Response										Distribution Statistics						
Sample Sector	Nos	% o/a	No '4'	% '4'	No '3'	% '3'	No '2'	% '2'	No '1'	% '1'	H	L	Median	Mode	Mean	SD	Corr
All	138	67%	8	6%	0	0%	14	10%	116	84%	4	1	1	1	1.28	0.74	-0.114
Architecture	26	13%	2	8%	0	0%	4	15%	20	77%	4	1	1	1	1.38	0.85	-0.194
Building Services	12	6%	1	8%	0	0%	1	8%	10	83%	4	1	1	1	1.33	0.89	-0.212
Civil	95	46%	6	6%	0	0%	11	12%	78	82%	4	1	1	1	1.31	0.77	-0.142
Landscaping	8	4%	1	13%	0	0%	2	25%	5	63%	4	1	1	1	1.63	1.06	-0.092
Structural	25	12%	0	0%	0	0%	3	12%	22	88%	2	1	1	1	1.12	0.33	-0.082
Quantity Surveyors	13	6%	0	0%	0	0%	0	0%	13	100%	1	1	1	1	1.00	0.00	na
With ISO9000	79	38%	5	6%	0	0%	9	11%	65	82%	4	1	1	1	1.30	0.77	-0.161
Without ISO9000	59	29%	3	5%	0	0%	5	8%	51	86%	4	1	1	1	1.24	0.70	-0.102

Results of the 1998 postal survey of Hong Kong Public Works Consultants

Part	Part 1 Use of IT to assist project communication																
Topic	Images used for communication																
Subject	Use of manual drawing methods in company offices																
Q.1.5.1.a	Response										Distribution Statistics						
Sample Sector	Nos	% o/a	No '4'	% '4'	No '3'	% '3'	No '2'	% '2'	No '1'	% '1'	H	L	Median	Mode	Mean	SD	Corr
All	134	65%	11	8%	29	22%	47	35%	47	35%	4	1	2	1	2.03	0.95	1E-04
Architecture	29	14%	5	17%	9	31%	12	41%	3	10%	4	1	2	2	2.55	0.91	0.2307
Building Services	12	6%	2	17%	1	8%	4	33%	5	42%	4	1	2	1	2.00	1.13	0.0331
Civil	91	44%	5	5%	18	20%	34	37%	34	37%	4	1	2	1	1.93	0.89	-0.054
Landscaping	7	3%	1	14%	3	43%	2	29%	1	14%	4	1	3	3	2.57	0.98	0.0644
Structural	26	13%	2	8%	5	19%	12	46%	7	27%	4	1	2	2	2.08	0.89	-0.004
Quantity Surveyors	11	5%	0	0%	0	0%	3	27%	8	73%	2	1	1	1	1.27	0.47	0.6714
With ISO9000	80	39%	8	10%	16	20%	30	38%	26	33%	4	1	2	2	2.08	0.96	-0.025
Without ISO9000	54	26%	3	6%	13	24%	17	31%	21	39%	4	1	2	1	1.96	0.93	-0.024

Part	Part 1 Use of IT to assist project communication																
Topic	Images used for communication																
Subject	Use of CAD systems in company offices																
Q.1.5.1.b	Response										Distribution Statistics						
Sample Sector	Nos	% o/a	No '4'	% '4'	No '3'	% '3'	No '2'	% '2'	No '1'	% '1'	H	L	Median	Mode	Mean	SD	Corr
All	139	67%	87	63%	26	19%	0	0%	26	19%	4	1	4	4	3.25	1.15	0.1965
Architecture	29	14%	24	83%	5	17%	0	0%	0	0%	4	3	4	4	3.83	0.38	0.0309
Building Services	12	6%	11	92%	1	8%	0	0%	0	0%	4	3	4	4	3.92	0.29	0.2793
Civil	95	46%	60	63%	18	19%	0	0%	17	18%	4	1	4	4	3.27	1.13	0.1902
Landscaping	8	4%	5	63%	3	38%	0	0%	0	0%	4	3	4	4	3.63	0.52	-0.088
Structural	26	13%	23	88%	3	12%	0	0%	0	0%	4	3	4	4	3.88	0.33	0.1728
Quantity Surveyors	11	5%	1	9%	1	9%	0	0%	9	82%	4	1	1	1	1.45	1.04	0.9711
With ISO9000	84	41%	59	70%	13	15%	0	0%	12	14%	4	1	4	4	3.42	1.06	0.1655
Without ISO9000	55	27%	28	51%	13	24%	0	0%	14	25%	4	1	4	4	3.00	1.25	0.1768

Results of the 1998 postal survey of Hong Kong Public Works Consultants

Part	Part 1 Use of IT to assist project communication																
Topic	Images used for communication																
Subject	Hiring manual drafting services																
Q.1.5.1.c	Response										Distribution Statistics						
Sample Sector	Nos	% o/a	No '4'	% '4'	No '3'	% '3'	No '2'	% '2'	No '1'	% '1'	H	L	Median	Mode	Mean	SD	Corr
All	133	64%	2	2%	8	6%	32	24%	91	68%	4	1	1	1	1.41	0.67	0.0135
Architecture	29	14%	1	3%	1	3%	9	31%	18	62%	4	1	1	1	1.48	0.74	0.0442
Building Services	11	5%	0	0%	0	0%	1	9%	10	91%	2	1	1	1	1.09	0.30	0.3295
Civil	90	43%	1	1%	7	8%	23	26%	59	66%	4	1	1	1	1.44	0.69	-0.015
Landscaping	7	3%	0	0%	1	14%	1	14%	5	71%	3	1	1	1	1.43	0.79	-0.049
Structural	25	12%	0	0%	1	4%	6	24%	18	72%	3	1	1	1	1.32	0.56	0.1609
Quantity Surveyors	10	5%	0	0%	0	0%	0	0%	10	100%	1	1	1	1	1.00	0.00	na
With ISO9000	79	38%	1	1%	4	5%	20	25%	54	68%	4	1	1	1	1.39	0.65	0.0261
Without ISO9000	54	26%	1	2%	4	7%	12	22%	37	69%	4	1	1	1	1.43	0.72	0.0426

Part	Part 1 Use of IT to assist project communication																
Topic	Images used for communication																
Subject	Hiring CAD drafting services																
Q.1.5.1.d	Response										Distribution Statistics						
Sample Sector	Nos	% o/a	No '4'	% '4'	No '3'	% '3'	No '2'	% '2'	No '1'	% '1'	H	L	Median	Mode	Mean	SD	Corr
All	134	65%	8	6%	25	19%	40	30%	61	46%	4	1	2	1	1.85	0.93	0.1023
Architecture	29	14%	1	3%	5	17%	13	45%	10	34%	4	1	2	2	1.90	0.82	0.0771
Building Services	12	6%	0	0%	3	25%	4	33%	5	42%	3	1	2	1	1.83	0.83	0.7233
Civil	91	44%	7	8%	19	21%	27	30%	38	42%	4	1	2	1	1.95	0.97	0.0783
Landscaping	7	3%	0	0%	2	29%	0	0%	5	71%	3	1	1	1	1.57	0.98	0.1144
Structural	26	13%	1	4%	4	15%	15	58%	6	23%	4	1	2	2	2.00	0.75	-0.026
Quantity Surveyors	11	5%	0	0%	1	9%	0	0%	10	91%	3	1	1	1	1.18	0.60	0.9244
With ISO9000	81	39%	5	6%	17	21%	27	33%	32	40%	4	1	2	1	1.94	0.93	0.062
Without ISO9000	53	26%	3	6%	8	15%	13	25%	29	55%	4	1	1	1	1.72	0.93	0.1416

Results of the 1998 postal survey of Hong Kong Public Works Consultants

Part	Part 1 Use of IT to assist project communication																
Topic	Images used for communication																
Subject	Manual methods in assignment locations																
Q.1.5.1.e	Response										Distribution Statistics						
Sample Sector	Nos	% o/a	No '4'	% '4'	No '3'	% '3'	No '2'	% '2'	No '1'	% '1'	H	L	Median	Mode	Mean	SD	Corr
All	134	65%	3	2%	18	13%	40	30%	73	54%	4	1	1	1	1.63	0.80	0.1368
Architecture	29	14%	1	3%	6	21%	7	24%	15	52%	4	1	1	1	1.76	0.91	0.0293
Building Services	12	6%	1	8%	1	8%	3	25%	7	58%	4	1	1	1	1.67	0.98	0.1115
Civil	91	44%	1	1%	14	15%	31	34%	45	49%	4	1	2	1	1.68	0.77	0.1395
Landscaping	7	3%	0	0%	3	43%	1	14%	3	43%	3	1	2	3	2.00	1.00	0.2931
Structural	26	13%	0	0%	2	8%	12	46%	12	46%	3	1	2	1	1.62	0.64	0.3791
Quantity Surveyors	11	5%	0	0%	1	9%	2	18%	8	73%	3	1	1	1	1.36	0.67	0.8786
With ISO9000	80	39%	2	3%	13	16%	24	30%	41	51%	4	1	1	1	1.70	0.83	0.1123
Without ISO9000	54	26%	1	2%	5	9%	16	30%	32	59%	4	1	1	1	1.54	0.75	0.1309

Part	Part 1 Use of IT to assist project communication																
Topic	Images used for communication																
Subject	CAD systems in assignment locations																
Q.1.5.1.f	Response										Distribution Statistics						
Sample Sector	Nos	% o/a	No '4'	% '4'	No '3'	% '3'	No '2'	% '2'	No '1'	% '1'	H	L	Median	Mode	Mean	SD	Corr
All	134	65%	27	20%	29	22%	13	10%	65	49%	4	1	2	1	2.13	1.22	0.3442
Architecture	29	14%	8	28%	3	10%	5	17%	13	45%	4	1	2	1	2.21	1.29	-0.145
Building Services	12	6%	3	25%	3	25%	1	8%	5	42%	4	1	2.5	1	2.33	1.30	0.6588
Civil	91	44%	20	22%	27	30%	7	8%	37	41%	4	1	3	1	2.33	1.22	0.3797
Landscaping	7	3%	1	14%	3	43%	0	0%	3	43%	4	1	3	3	2.29	1.25	0.4245
Structural	26	13%	7	27%	5	19%	4	15%	10	38%	4	1	2	1	2.35	1.26	0.5547
Quantity Surveyors	11	5%	2	18%	0	0%	0	0%	9	82%	4	1	1	1	1.55	1.21	0.8987
With ISO9000	80	39%	19	24%	15	19%	9	11%	37	46%	4	1	2	1	2.20	1.26	0.3758
Without ISO9000	54	26%	8	15%	14	26%	4	7%	28	52%	4	1	1	1	2.04	1.18	0.354

Results of the 1998 postal survey of Hong Kong Public Works Consultants

Part	Part 1 Use of IT to assist project communication																
Topic	Images used for communication																
Subject	Distribution of construction drawings as hardcopy																
Q.1.5.2.a	Response										Distribution Statistics						
Sample Sector	Nos	% o/a	No '4'	% '4'	No '3'	% '3'	No '2'	% '2'	No '1'	% '1'	H	L	Median	Mode	Mean	SD	Corr
All	137	66%	91	66%	30	22%	5	4%	11	8%	4	1	4	4	3.47	0.90	0.1323
Architecture	29	14%	28	97%	1	3%	0	0%	0	0%	4	3	4	4	3.97	0.19	0.1695
Building Services	12	6%	8	67%	4	33%	0	0%	0	0%	4	3	4	4	3.67	0.49	0.3029
Civil	93	45%	59	63%	25	27%	4	4%	5	5%	4	1	4	4	3.48	0.82	0.0922
Landscaping	8	4%	7	88%	1	13%	0	0%	0	0%	4	3	4	4	3.88	0.35	0.5286
Structural	26	13%	20	77%	5	19%	1	4%	0	0%	4	2	4	4	3.73	0.53	-0.084
Quantity Surveyors	11	5%	3	27%	1	9%	1	9%	6	55%	4	1	1	1	2.09	1.38	0.6324
With ISO9000	83	40%	56	67%	16	19%	4	5%	7	8%	4	1	4	4	3.46	0.93	0.1384
Without ISO9000	54	26%	35	65%	14	26%	1	2%	4	7%	4	1	4	4	3.48	0.86	0.2516

Part	Part 1 Use of IT to assist project communication																
Topic	Images used for communication																
Subject	Distribution of construction drawings as electronic files on disk																
Q.1.5.2.b	Response										Distribution Statistics						
Sample Sector	Nos	% o/a	No '4'	% '4'	No '3'	% '3'	No '2'	% '2'	No '1'	% '1'	H	L	Median	Mode	Mean	SD	Corr
All	137	66%	45	33%	49	36%	21	15%	22	16%	4	1	3	3	2.85	1.05	0.1323
Architecture	29	14%	16	55%	7	24%	5	17%	1	3%	4	1	4	4	3.31	0.89	-0.361
Building Services	12	6%	4	33%	7	58%	1	8%	0	0%	4	2	3	3	3.25	0.62	0.52
Civil	93	45%	29	31%	38	41%	13	14%	13	14%	4	1	3	3	2.89	1.01	0.1656
Landscaping	8	4%	5	63%	3	38%	0	0%	0	0%	4	3	4	4	3.63	0.52	0.1944
Structural	26	13%	5	19%	13	50%	4	15%	4	15%	4	1	3	3	2.73	0.96	0.3423
Quantity Surveyors	11	5%	1	9%	0	0%	2	18%	8	73%	4	1	1	1	1.45	0.93	0.9535
With ISO9000	83	40%	26	31%	29	35%	16	19%	12	14%	4	1	3	3	2.83	1.03	0.1338
Without ISO9000	54	26%	19	35%	20	37%	5	9%	10	19%	4	1	3	3	2.89	1.09	0.3104

Results of the 1998 postal survey of Hong Kong Public Works Consultants

Part	Part 1 Use of IT to assist project communication																	
Topic	Images used for communication																	
Subject	Distribution of construction drawings as electronic files across a LAN																	
Q.1.5.2.c	Response										Distribution Statistics							
Sample Sector	Nos	% o/a	No '4'	% '4'	No '3'	% '3'	No '2'	% '2'	No '1'	% '1'	H	L	Median	Mode	Mean	SD	Corr	
All	135	65%	44	33%	26	19%	15	11%	50	37%	4	1	3	1	2.47	1.29	0.161	
Architecture	29	14%	10	34%	2	7%	6	21%	11	38%	4	1	2	1	2.38	1.32	-0.049	
Building Services	12	6%	7	58%	3	25%	1	8%	1	8%	4	1	4	4	3.33	0.98	-0.303	
Civil	92	44%	29	32%	23	25%	9	10%	31	34%	4	1	3	1	2.54	1.25	0.1856	
Landscaping	7	3%	3	43%	1	14%	2	29%	1	14%	4	1	3	4	2.86	1.21	-0.314	
Structural	26	13%	8	31%	7	27%	3	12%	8	31%	4	1	3	1	2.58	1.24	0.3105	
Quantity Surveyors	11	5%	1	9%	1	9%	1	9%	8	73%	4	1	1	1	1.55	1.04	0.9419	
With ISO9000	82	40%	27	33%	18	22%	9	11%	28	34%	4	1	3	1	2.54	1.27	0.1464	
Without ISO9000	53	26%	17	32%	8	15%	6	11%	22	42%	4	1	2	1	2.38	1.32	0.231	

Part	Part 1 Use of IT to assist project communication																
Topic	Images used for communication																
Subject	Distribution of construction drawings as electronic files via a modem																
Q.1.5.2.d	Response										Distribution Statistics						
Sample Sector	Nos	% o/a	No '4'	% '4'	No '3'	% '3'	No '2'	% '2'	No '1'	% '1'	H	L	Median	Mode	Mean	SD	Corr
All	136	66%	27	20%	33	24%	27	20%	49	36%	4	1	2	1	2.28	1.15	0.1692
Architecture	29	14%	6	21%	5	17%	8	28%	10	34%	4	1	2	1	2.24	1.15	-0.147
Building Services	12	6%	3	25%	4	33%	4	33%	1	8%	4	1	3	3	2.75	0.97	-0.055
Civil	92	44%	20	22%	24	26%	19	21%	29	32%	4	1	2	1	2.38	1.15	0.1836
Landscaping	8	4%	4	50%	2	25%	1	13%	1	13%	4	1	3.5	4	3.13	1.13	0.3633
Structural	26	13%	2	8%	8	31%	6	23%	10	38%	4	1	2	1	2.08	1.02	0.4375
Quantity Surveyors	11	5%	1	9%	1	9%	1	9%	8	73%	4	1	1	1	1.55	1.04	0.9419
With ISO9000	82	40%	15	18%	23	28%	20	24%	24	29%	4	1	2	1	2.35	1.09	0.1616
Without ISO9000	54	26%	12	22%	10	19%	7	13%	25	46%	4	1	2	1	2.17	1.24	0.1811

Results of the 1998 postal survey of Hong Kong Public Works Consultants

Part	Part 1 Use of IT to assist project communication																
Topic	Images used for communication																
Subject	Distribution of construction drawings as electronic files via the Internet																
Q.1.5.2.e	Response										Distribution Statistics						
Sample Sector	Nos	% o/a	No '4'	% '4'	No '3'	% '3'	No '2'	% '2'	No '1'	% '1'	H	L	Median	Mode	Mean	SD	Corr
All	135	65%	26	19%	50	37%	21	16%	38	28%	4	1	3	3	2.47	1.10	0.088
Architecture	29	14%	6	21%	8	28%	8	28%	7	24%	4	1	2	2	2.45	1.09	-0.439
Building Services	12	6%	5	42%	4	33%	1	8%	2	17%	4	1	3	4	3.00	1.13	0.2545
Civil	91	44%	19	21%	37	41%	12	13%	23	25%	4	1	3	3	2.57	1.09	0.1362
Landscaping	8	4%	4	50%	3	38%	1	13%	0	0%	4	2	3.5	4	3.38	0.74	0.2723
Structural	26	13%	4	15%	11	42%	4	15%	7	27%	4	1	3	3	2.46	1.07	0.3037
Quantity Surveyors	11	5%	1	9%	1	9%	1	9%	8	73%	4	1	1	1	1.55	1.04	0.8309
With ISO9000	83	40%	15	18%	29	35%	15	18%	24	29%	4	1	3	3	2.42	1.09	0.0985
Without ISO9000	52	25%	11	21%	21	40%	6	12%	14	27%	4	1	3	3	2.56	1.11	0.2431

Part	Part 1 Use of IT to assist project communication																
Topic	Images used for communication																
Subject	Record of drawing transmittal by hardcopy																
Q.1.5.3.a	Response										Distribution Statistics						
Sample Sector	Nos	% o/a	No '4'	% '4'	No '3'	% '3'	No '2'	% '2'	No '1'	% '1'	H	L	Median	Mode	Mean	SD	Corr
All	137	66%	103	75%	17	12%	4	3%	13	9%	4	1	4	4	3.53	0.94	0.0776
Architecture	29	14%	29	100%	0	0%	0	0%	0	0%	4	4	4	4	4.00	0.00	na
Building Services	12	6%	11	92%	1	8%	0	0%	0	0%	4	3	4	4	3.92	0.29	-0.29
Civil	93	45%	67	72%	14	15%	4	4%	8	9%	4	1	4	4	3.51	0.93	0.0421
Landscaping	8	4%	7	88%	1	13%	0	0%	0	0%	4	3	4	4	3.88	0.35	0.5286
Structural	26	13%	20	77%	6	23%	0	0%	0	0%	4	3	4	4	3.77	0.43	-0.13
Quantity Surveyors	11	5%	4	36%	2	18%	0	0%	5	45%	4	1	3	1	2.45	1.44	0.5004
With ISO9000	83	40%	65	78%	10	12%	1	1%	7	8%	4	1	4	4	3.60	0.88	0.088
Without ISO9000	54	26%	38	70%	7	13%	3	6%	6	11%	4	1	4	4	3.43	1.02	-0.074

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Part	Part 1 Use of IT to assist project communication																
Topic	Images used for communication																
Subject	Record of drawing transmittal by electronic database register																
Q.1.5.3.b	Response										Distribution Statistics						
Sample Sector	Nos	% o/a	No '4'	% '4'	No '3'	% '3'	No '2'	% '2'	No '1'	% '1'	H	L	Median	Mode	Mean	SD	Corr
All	134	65%	25	19%	29	22%	18	13%	62	46%	4	1	2	1	2.13	1.19	0.2635
Architecture	29	14%	7	24%	4	14%	7	24%	11	38%	4	1	2	1	2.24	1.21	0.0167
Building Services	12	6%	2	17%	2	17%	1	8%	7	58%	4	1	1	1	1.92	1.24	0.4126
Civil	92	44%	19	21%	20	22%	13	14%	40	43%	4	1	2	1	2.20	1.21	0.2993
Landscaping	7	3%	1	14%	2	29%	1	14%	3	43%	4	1	2	1	2.14	1.21	-0.258
Structural	26	13%	5	19%	6	23%	6	23%	9	35%	4	1	2	1	2.27	1.15	0.4377
Quantity Surveyors	10	5%	0	0%	3	30%	1	10%	6	60%	3	1	1	1	1.70	0.95	0.4704
With ISO9000	81	39%	17	21%	20	25%	12	15%	32	40%	4	1	2	1	2.27	1.19	0.2244
Without ISO9000	53	26%	8	15%	9	17%	6	11%	30	57%	4	1	1	1	1.91	1.16	0.3592

Part	Part 1 Use of IT to assist project communication																
Topic	Images used for communication																
Subject	Drawings are revised /checked in hardcopy form																
Q.1.5.4.a	Response										Distribution Statistics						
Sample Sector	Nos	% o/a	No '4'	% '4'	No '3'	% '3'	No '2'	% '2'	No '1'	% '1'	H	L	Median	Mode	Mean	SD	Corr
All	135	65%	78	58%	35	26%	10	7%	12	9%	4	1	4	4	3.33	0.95	0.097
Architecture	29	14%	20	69%	6	21%	2	7%	1	3%	4	1	4	4	3.55	0.78	0.1533
Building Services	12	6%	8	67%	3	25%	1	8%	0	0%	4	2	4	4	3.58	0.67	0.0593
Civil	92	44%	51	55%	25	27%	8	9%	8	9%	4	1	4	4	3.29	0.96	0.0903
Landscaping	7	3%	3	43%	3	43%	1	14%	0	0%	4	2	3	3	3.29	0.76	0.4778
Structural	26	13%	19	73%	6	23%	1	4%	0	0%	4	2	4	4	3.69	0.55	-0.366
Quantity Surveyors	11	5%	6	55%	2	18%	0	0%	3	27%	4	1	4	4	3.00	1.34	0.3432
With ISO9000	81	39%	52	64%	20	25%	4	5%	5	6%	4	1	4	4	3.47	0.85	0.0289
Without ISO9000	54	26%	26	48%	15	28%	6	11%	7	13%	4	1	3	4	3.11	1.06	0.0871

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Part	Part 1 Use of IT to assist project communication																
Topic	Images used for communication																
Subject	Drawings are revised /checked in electronic form																
Q.1.5.4.b	Response										Distribution Statistics						
Sample Sector	Nos	% o/a	No '4'	% '4'	No '3'	% '3'	No '2'	% '2'	No '1'	% '1'	H	L	Median	Mode	Mean	SD	Corr
All	136	66%	27	20%	27	20%	29	21%	53	39%	4	1	2	1	2.21	1.16	0.0036
Architecture	29	14%	11	38%	3	10%	6	21%	9	31%	4	1	2	4	2.55	1.30	-0.255
Building Services	12	6%	3	25%	1	8%	3	25%	5	42%	4	1	2	1	2.17	1.27	0.2713
Civil	91	44%	16	18%	21	23%	22	24%	32	35%	4	1	2	1	2.23	1.12	0.0178
Landscaping	8	4%	3	38%	2	25%	2	25%	1	13%	4	1	3	4	2.88	1.13	-0.373
Structural	26	13%	5	19%	5	19%	7	27%	9	35%	4	1	2	1	2.23	1.14	0.0331
Quantity Surveyors	12	6%	1	8%	0	0%	0	0%	11	92%	4	1	1	1	1.25	0.87	-0.017
With ISO9000	83	40%	20	24%	12	14%	20	24%	31	37%	4	1	2	1	2.25	1.20	-0.037
Without ISO9000	53	26%	7	13%	15	28%	9	17%	22	42%	4	1	2	1	2.13	1.11	0.0811

Part	Part 1 Use of IT to assist project communication																
Topic	Images used for communication																
Subject	Use of photograph images for communication																
Q.1.5.5.a	Response										Distribution Statistics						
Sample Sector	Nos	% o/a	No '4'	% '4'	No '3'	% '3'	No '2'	% '2'	No '1'	% '1'	H	L	Median	Mode	Mean	SD	Corr
All	147	71%	67	46%	37	25%	18	12%	25	17%	4	1	3	4	2.99	1.13	0.0708
Architecture	29	14%	18	62%	9	31%	1	3%	1	3%	4	1	4	4	3.52	0.74	0.0626
Building Services	12	6%	6	50%	2	17%	1	8%	3	25%	4	1	3.5	4	2.92	1.31	0.5324
Civil	100	48%	46	46%	27	27%	11	11%	16	16%	4	1	3	4	3.03	1.11	0.0502
Landscaping	7	3%	4	57%	2	29%	0	0%	1	14%	4	1	4	4	3.29	1.11	0.5331
Structural	26	13%	11	42%	7	27%	7	27%	1	4%	4	1	3	4	3.08	0.93	-0.039
Quantity Surveyors	15	7%	4	27%	2	13%	3	20%	6	40%	4	1	2	1	2.27	1.28	0.321
With ISO9000	87	42%	39	45%	25	29%	11	13%	12	14%	4	1	3	4	3.05	1.07	0.0282
Without ISO9000	60	29%	28	47%	12	20%	7	12%	13	22%	4	1	3	4	2.92	1.21	0.1892

Results of the 1998 postal survey of Hong Kong Public Works Consultants

Part	Part 1 Use of IT to assist project communication																	
Topic	Images used for communication																	
Subject	Use of digital photograph images for communication																	
Q.1.5.5.b	Response										Distribution Statistics							
Sample Sector	Nos	% o/a	No '4'	% '4'	No '3'	% '3'	No '2'	% '2'	No '1'	% '1'	H	L	Median	Mode	Mean	SD	Corr	
All	148	71%	24	16%	25	17%	32	22%	67	45%	4	1	2	1	2.04	1.13	0.1295	
Architecture	29	14%	9	31%	6	21%	4	14%	10	34%	4	1	3	1	2.48	1.27	-0.136	
Building Services	12	6%	2	17%	2	17%	1	8%	7	58%	4	1	1	1	1.92	1.24	0.5354	
Civil	100	48%	16	16%	18	18%	24	24%	42	42%	4	1	2	1	2.08	1.12	0.1551	
Landscaping	8	4%	3	38%	2	25%	2	25%	1	13%	4	1	3	4	2.88	1.13	0.0917	
Structural	26	13%	4	15%	6	23%	4	15%	12	46%	4	1	2	1	2.08	1.16	0.1776	
Quantity Surveyors	15	7%	0	0%	2	13%	2	13%	11	73%	3	1	1	1	1.40	0.74	0.6653	
With ISO9000	88	43%	13	15%	17	19%	23	26%	35	40%	4	1	2	1	2.09	1.09	0.1177	
Without ISO9000	60	29%	11	18%	8	13%	9	15%	32	53%	4	1	1	1	1.97	1.19	0.1683	

Part	Part 1 Use of IT to assist project communication																
Topic	Images used for communication																
Subject	Use of video images for communication																
Q.1.5.5.c	Response										Distribution Statistics						
Sample Sector	Nos	% o/a	No '4'	% '4'	No '3'	% '3'	No '2'	% '2'	No '1'	% '1'	H	L	Median	Mode	Mean	SD	Corr
All	147	71%	14	10%	8	5%	44	30%	81	55%	4	1	1	1	1.69	0.95	0.171
Architecture	29	14%	2	7%	0	0%	14	48%	13	45%	4	1	2	2	1.69	0.81	0.3052
Building Services	12	6%	3	25%	1	8%	3	25%	5	42%	4	1	2	1	2.17	1.27	0.415
Civil	100	48%	10	10%	8	8%	32	32%	50	50%	4	1	1.5	1	1.78	0.97	0.1622
Landscaping	7	3%	0	0%	0	0%	3	43%	4	57%	2	1	1	1	1.43	0.53	-0.346
Structural	26	13%	3	12%	2	8%	8	31%	13	50%	4	1	1.5	1	1.81	1.02	0.336
Quantity Surveyors	15	7%	1	7%	1	7%	0	0%	13	87%	4	1	1	1	1.33	0.90	0.4623
With ISO9000	87	42%	8	9%	4	5%	33	38%	42	48%	4	1	2	1	1.75	0.92	0.1974
Without ISO9000	60	29%	6	10%	4	7%	11	18%	39	65%	4	1	1	1	1.62	0.99	0.0165

Results of the 1998 postal survey of Hong Kong Public Works Consultants

Part	Part 1 Use of IT to assist project communication																
Topic	Images used for communication																
Subject	Distribution of picture images in original physical form																
Q.1.5.6.a	Response										Distribution Statistics						
Sample Sector	Nos	% o/a	No '4'	% '4'	No '3'	% '3'	No '2'	% '2'	No '1'	% '1'	H	L	Median	Mode	Mean	SD	Corr
All	145	70%	73	50%	41	28%	11	8%	20	14%	4	1	4	4	3.15	1.06	0.126
Architecture	28	14%	17	61%	9	32%	0	0%	2	7%	4	1	4	4	3.46	0.84	0.0215
Building Services	12	6%	6	50%	2	17%	0	0%	4	33%	4	1	3.5	4	2.83	1.40	0.558
Civil	99	48%	49	49%	29	29%	10	10%	11	11%	4	1	3	4	3.17	1.01	0.1141
Landscaping	7	3%	2	29%	4	57%	1	14%	0	0%	4	2	3	3	3.14	0.69	0.6422
Structural	26	13%	15	58%	8	31%	3	12%	0	0%	4	2	4	4	3.46	0.71	0.03
Quantity Surveyors	15	7%	6	40%	4	27%	0	0%	5	33%	4	1	3	4	2.73	1.33	0.4253
With ISO9000	86	42%	42	49%	26	30%	6	7%	12	14%	4	1	3	4	3.14	1.05	0.1538
Without ISO9000	59	29%	31	53%	15	25%	5	8%	8	14%	4	1	4	4	3.17	1.07	0.1595

Part	Part 1 Use of IT to assist project communication																
Topic	Images used for communication																
Subject	Distribution of picture images in electronic digital form																
Q.1.5.6.b	Response										Distribution Statistics						
Sample Sector	Nos	% o/a	No '4'	% '4'	No '3'	% '3'	No '2'	% '2'	No '1'	% '1'	H	L	Median	Mode	Mean	SD	Corr
All	146	71%	21	14%	31	21%	39	27%	55	38%	4	1	2	1	2.12	1.08	0.1522
Architecture	28	14%	3	11%	9	32%	8	29%	8	29%	4	1	2	3	2.25	1.00	-0.327
Building Services	12	6%	3	25%	1	8%	2	17%	6	50%	4	1	1.5	1	2.08	1.31	0.357
Civil	99	48%	16	16%	22	22%	29	29%	32	32%	4	1	2	1	2.22	1.07	0.1977
Landscaping	8	4%	2	25%	2	25%	4	50%	0	0%	4	2	2.5	2	2.75	0.89	-0.333
Structural	26	13%	2	8%	10	38%	5	19%	9	35%	4	1	2	3	2.19	1.02	0.2885
Quantity Surveyors	15	7%	1	7%	1	7%	2	13%	11	73%	4	1	1	1	1.47	0.92	0.4953
With ISO9000	87	42%	12	14%	24	28%	22	25%	29	33%	4	1	2	1	2.22	1.06	0.1311
Without ISO9000	59	29%	9	15%	7	12%	17	29%	26	44%	4	1	2	1	1.98	1.09	0.1117

Results of the 1998 postal survey of Hong Kong Public Works Consultants

Part	Part 1 Use of IT to assist project communication																
Topic	Written communication																
Subject	Company standards/formats for written documents in company offices																
Q.1.6.1.a	Response										Distribution Statistics						
Sample Sector	Nos	% o/a	No '4'	% '4'	No '3'	% '3'	No '2'	% '2'	No '1'	% '1'	H	L	Median	Mode	Mean	SD	Corr
All	149	72%	127	85%	20	13%	0	0%	2	1%	4	1	4	4	3.83	0.48	0.0871
Architecture	29	14%	26	90%	3	10%	0	0%	0	0%	4	3	4	4	3.90	0.31	-0.264
Building Services	12	6%	12	100%	0	0%	0	0%	0	0%	4	4	4	4	4.00	0.00	na
Civil	101	49%	82	81%	17	17%	0	0%	2	2%	4	1	4	4	3.77	0.55	0.1245
Landscaping	8	4%	7	88%	1	13%	0	0%	0	0%	4	3	4	4	3.88	0.35	0.5286
Structural	26	13%	24	92%	2	8%	0	0%	0	0%	4	3	4	4	3.92	0.27	0.1582
Quantity Surveyors	15	7%	14	93%	1	7%	0	0%	0	0%	4	3	4	4	3.93	0.26	0.163
With ISO9000	88	43%	79	90%	9	10%	0	0%	0	0%	4	3	4	4	3.90	0.30	0.0015
Without ISO9000	61	29%	48	79%	11	18%	0	0%	2	3%	4	1	4	4	3.72	0.64	0.0865

Part	Part 1 Use of IT to assist project communication																
Topic	Written communication																
Subject	Company standards/formats for written documents in assignment locations																
Q.1.6.1.b	Response										Distribution Statistics						
Sample Sector	Nos	% o/a	No '4'	% '4'	No '3'	% '3'	No '2'	% '2'	No '1'	% '1'	H	L	Median	Mode	Mean	SD	Corr
All	144	70%	90	63%	25	17%	10	7%	19	13%	4	1	4	4	3.29	1.07	0.2471
Architecture	29	14%	21	72%	3	10%	4	14%	1	3%	4	1	4	4	3.52	0.87	0.0552
Building Services	12	6%	10	83%	0	0%	0	0%	2	17%	4	1	4	4	3.50	1.17	0.3959
Civil	99	48%	60	61%	19	19%	6	6%	14	14%	4	1	4	4	3.26	1.08	0.2804
Landscaping	7	3%	3	43%	3	43%	0	0%	1	14%	4	1	3	4	3.14	1.07	0.0832
Structural	26	13%	20	77%	2	8%	2	8%	2	8%	4	1	4	4	3.54	0.95	0.2825
Quantity Surveyors	13	6%	8	62%	3	23%	1	8%	1	8%	4	1	4	4	3.38	0.96	0.2595
With ISO9000	84	41%	59	70%	14	17%	4	5%	7	8%	4	1	4	4	3.49	0.92	0.2373
Without ISO9000	60	29%	31	52%	11	18%	6	10%	12	20%	4	1	4	4	3.02	1.20	0.158

Results of the 1998 postal survey of Hong Kong Public Works Consultants

Part	Part 1 Use of IT to assist project communication																
Topic	Written communication																
Subject	Use of printed proforma for routine documents in company offices																
Q.1.6.2.a	Response										Distribution Statistics						
Sample Sector	Nos	% o/a	No '4'	% '4'	No '3'	% '3'	No '2'	% '2'	No '1'	% '1'	H	L	Median	Mode	Mean	SD	Corr
All	149	72%	117	79%	25	17%	3	2%	4	3%	4	1	4	4	3.71	0.64	0.1504
Architecture	29	14%	23	79%	6	21%	0	0%	0	0%	4	3	4	4	3.79	0.41	-0.163
Building Services	12	6%	10	83%	2	17%	0	0%	0	0%	4	3	4	4	3.83	0.39	0.0587
Civil	101	49%	78	77%	18	18%	2	2%	3	3%	4	1	4	4	3.69	0.66	0.177
Landscaping	8	4%	5	63%	2	25%	0	0%	1	13%	4	1	4	4	3.38	1.06	0.4768
Structural	26	13%	23	88%	3	12%	0	0%	0	0%	4	3	4	4	3.88	0.33	0.064
Quantity Surveyors	15	7%	13	87%	1	7%	1	7%	0	0%	4	2	4	4	3.80	0.56	0.1979
With ISO9000	88	43%	75	85%	11	13%	1	1%	1	1%	4	1	4	4	3.82	0.49	0.0778
Without ISO9000	61	29%	42	69%	14	23%	2	3%	3	5%	4	1	4	4	3.56	0.79	0.1835

Part	Part 1 Use of IT to assist project communication																
Topic	Written communication																
Subject	Use of printed proforma for routine documents in assignment locations																
Q.1.6.2.b	Response										Distribution Statistics						
Sample Sector	Nos	% o/a	No '4'	% '4'	No '3'	% '3'	No '2'	% '2'	No '1'	% '1'	H	L	Median	Mode	Mean	SD	Corr
All	143	69%	88	62%	31	22%	8	6%	16	11%	4	1	4	4	3.34	1.01	0.2287
Architecture	29	14%	17	59%	10	34%	1	3%	1	3%	4	1	4	4	3.48	0.74	-0.065
Building Services	12	6%	9	75%	2	17%	0	0%	1	8%	4	1	4	4	3.58	0.90	0.1125
Civil	98	47%	58	59%	21	21%	6	6%	13	13%	4	1	4	4	3.27	1.06	0.2751
Landscaping	7	3%	3	43%	3	43%	0	0%	1	14%	4	1	3	4	3.14	1.07	-0.054
Structural	26	13%	16	62%	7	27%	1	4%	2	8%	4	1	4	4	3.42	0.90	0.2771
Quantity Surveyors	13	6%	10	77%	2	15%	1	8%	0	0%	4	2	4	4	3.69	0.63	0.2192
With ISO9000	84	41%	58	69%	19	23%	3	4%	4	5%	4	1	4	4	3.56	0.78	0.1767
Without ISO9000	59	29%	30	51%	12	20%	5	8%	12	20%	4	1	4	4	3.02	1.20	0.2136

Results of the 1998 postal survey of Hong Kong Public Works Consultants

Part	Part 1 Use of IT to assist project communication																
Topic	Written communication																
Subject	Use of procedure/instruction for filing of written documents in company offices																
Q.1.6.3.a	Response										Distribution Statistics						
Sample Sector	Nos	% o/a	No '4'	% '4'	No '3'	% '3'	No '2'	% '2'	No '1'	% '1'	H	L	Median	Mode	Mean	SD	Corr
All	149	72%	135	91%	13	9%	0	0%	1	1%	4	1	4	4	3.89	0.37	0.0557
Architecture	29	14%	28	97%	1	3%	0	0%	0	0%	4	3	4	4	3.97	0.19	0.1491
Building Services	12	6%	12	100%	0	0%	0	0%	0	0%	4	4	4	4	4.00	0.00	na
Civil	101	49%	88	87%	12	12%	0	0%	1	1%	4	1	4	4	3.85	0.43	0.0653
Landscaping	8	4%	8	100%	0	0%	0	0%	0	0%	4	4	4	4	4.00	0.00	na
Structural	26	13%	25	96%	1	4%	0	0%	0	0%	4	3	4	4	3.96	0.20	0.054
Quantity Surveyors	15	7%	15	100%	0	0%	0	0%	0	0%	4	4	4	4	4.00	0.00	na
With ISO9000	88	43%	85	97%	3	3%	0	0%	0	0%	4	3	4	4	3.97	0.18	-0.11
Without ISO9000	61	29%	50	82%	10	16%	0	0%	1	2%	4	1	4	4	3.79	0.52	0.0523

Part	Part 1 Use of IT to assist project communication																
Topic	Written communication																
Subject	Use of procedure/instruction for filing of written documents in assignment locations																
Q.1.6.3.b	Response										Distribution Statistics						
Sample Sector	Nos	% o/a	No '4'	% '4'	No '3'	% '3'	No '2'	% '2'	No '1'	% '1'	H	L	Median	Mode	Mean	SD	Corr
All	144	70%	91	63%	29	20%	4	3%	20	14%	4	1	4	4	3.33	1.06	0.2446
Architecture	29	14%	19	66%	7	24%	2	7%	1	3%	4	1	4	4	3.52	0.78	0.071
Building Services	12	6%	11	92%	0	0%	0	0%	1	8%	4	1	4	4	3.75	0.87	0.2807
Civil	99	48%	61	62%	20	20%	2	2%	16	16%	4	1	4	4	3.27	1.10	0.2852
Landscaping	7	3%	4	57%	2	29%	0	0%	1	14%	4	1	4	4	3.29	1.11	0.138
Structural	26	13%	21	81%	3	12%	1	4%	1	4%	4	1	4	4	3.69	0.74	0.2826
Quantity Surveyors	13	6%	10	77%	2	15%	0	0%	1	8%	4	1	4	4	3.62	0.87	0.0852
With ISO9000	84	41%	64	76%	14	17%	2	2%	4	5%	4	1	4	4	3.64	0.75	0.159
Without ISO9000	60	29%	27	45%	15	25%	2	3%	16	27%	4	1	3	4	2.88	1.25	0.2186

Results of the 1998 postal survey of Hong Kong Public Works Consultants

Part	Part 1 Use of IT to assist project communication																
Topic	Written communication																
Subject	Use of the same procedure/instruction for filing of written documents on all sites																
Q.1.6.4	Response										Distribution Statistics						
Sample Sector	Nos	% o/a	No '4'	% '4'	No '3'	% '3'	No '2'	% '2'	No '1'	% '1'	H	L	Median	Mode	Mean	SD	Corr
All	143	69%	65	45%	46	32%	9	6%	23	16%	4	1	3	4	3.07	1.08	0.1906
Architecture	29	14%	9	31%	13	45%	4	14%	3	10%	4	1	3	3	2.97	0.94	0.1055
Building Services	12	6%	6	50%	4	33%	0	0%	2	17%	4	1	3.5	4	3.17	1.11	0.1386
Civil	97	47%	47	48%	30	31%	5	5%	15	15%	4	1	3	4	3.12	1.07	0.2139
Landscaping	8	4%	3	38%	2	25%	0	0%	3	38%	4	1	3	4	2.63	1.41	-0.04
Structural	25	12%	14	56%	7	28%	2	8%	2	8%	4	1	4	4	3.32	0.95	0.144
Quantity Surveyors	13	6%	6	46%	6	46%	0	0%	1	8%	4	1	3	4	3.31	0.85	-0.15
With ISO9000	84	41%	43	51%	30	36%	4	5%	7	8%	4	1	4	4	3.30	0.90	0.1035
Without ISO9000	59	29%	22	37%	16	27%	5	8%	16	27%	4	1	3	4	2.75	1.23	0.1923

Part	Part 1 Use of IT to assist project communication																
Topic	Written communication																
Subject	Use of a computer-based document management system in the company offices																
Q.1.6.5.a	Response										Distribution Statistics						
Sample Sector	Nos	% o/a	No '4'	% '4'	No '3'	% '3'	No '2'	% '2'	No '1'	% '1'	H	L	Median	Mode	Mean	SD	Corr
All	149	72%	46	31%	19	13%	26	17%	58	39%	4	1	2	1	2.36	1.28	-0.075
Architecture	29	14%	8	28%	3	10%	7	24%	11	38%	4	1	2	1	2.28	1.25	-0.149
Building Services	12	6%	2	17%	0	0%	1	8%	9	75%	4	1	1	1	1.58	1.16	-0.049
Civil	101	49%	35	35%	13	13%	14	14%	39	39%	4	1	2	1	2.44	1.31	-0.087
Landscaping	8	4%	1	13%	1	13%	1	13%	5	63%	4	1	1	1	1.75	1.16	0.0875
Structural	26	13%	5	19%	5	19%	3	12%	13	50%	4	1	1.5	1	2.08	1.23	-0.056
Quantity Surveyors	15	7%	3	20%	2	13%	7	47%	3	20%	4	1	2	2	2.33	1.05	-0.166
With ISO9000	88	43%	22	25%	12	14%	20	23%	34	39%	4	1	2	1	2.25	1.22	-0.032
Without ISO9000	61	29%	24	39%	7	11%	6	10%	24	39%	4	1	3	4	2.51	1.36	-0.115

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Part	Part 1 Use of IT to assist project communication																
Topic	Written communication																
Subject	Use of a computer-based document management system in the assignment locations																
Q.1.6.5.b	Response										Distribution Statistics						
Sample Sector	Nos	% o/a	No '4'	% '4'	No '3'	% '3'	No '2'	% '2'	No '1'	% '1'	H	L	Median	Mode	Mean	SD	Corr
All	144	70%	23	16%	19	13%	28	19%	74	51%	4	1	1	1	1.94	1.14	0.0773
Architecture	29	14%	5	17%	1	3%	9	31%	14	48%	4	1	2	1	1.90	1.11	-0.253
Building Services	12	6%	1	8%	0	0%	1	8%	10	83%	4	1	1	1	1.33	0.89	0.2097
Civil	99	48%	18	18%	15	15%	17	17%	49	49%	4	1	2	1	2.02	1.18	0.1166
Landscaping	7	3%	0	0%	1	14%	2	29%	4	57%	3	1	1	1	1.57	0.79	-0.075
Structural	26	13%	4	15%	6	23%	2	8%	14	54%	4	1	1	1	2.00	1.20	0.0653
Quantity Surveyors	13	6%	1	8%	1	8%	5	38%	6	46%	4	1	2	1	1.77	0.93	0.0712
With ISO9000	84	41%	15	18%	9	11%	19	23%	41	49%	4	1	2	1	1.98	1.15	0.0931
Without ISO9000	60	29%	8	13%	10	17%	9	15%	33	55%	4	1	1	1	1.88	1.12	-0.024

Part	Part 1 Use of IT to assist project communication																
Topic	Written communication																
Subject	Use of a system of keywords to record contents of filed documents in the company offices																
Q.1.6.6.a	Response										Distribution Statistics						
Sample Sector	Nos	% o/a	No '4'	% '4'	No '3'	% '3'	No '2'	% '2'	No '1'	% '1'	H	L	Median	Mode	Mean	SD	Corr
All	149	72%	58	39%	23	15%	25	17%	43	29%	4	1	3	4	2.64	1.26	-0.036
Architecture	29	14%	11	38%	3	10%	6	21%	9	31%	4	1	2	4	2.55	1.30	-0.433
Building Services	12	6%	5	42%	0	0%	2	17%	5	42%	4	1	2	4	2.42	1.44	0.0086
Civil	101	49%	39	39%	15	15%	18	18%	29	29%	4	1	3	4	2.63	1.26	0.0106
Landscaping	8	4%	2	25%	1	13%	3	38%	2	25%	4	1	2	2	2.38	1.19	-0.023
Structural	26	13%	10	38%	3	12%	5	19%	8	31%	4	1	2.5	4	2.58	1.30	-0.15
Quantity Surveyors	15	7%	3	20%	5	33%	3	20%	4	27%	4	1	3	3	2.47	1.13	-0.082
With ISO9000	88	43%	32	36%	17	19%	17	19%	22	25%	4	1	3	4	2.67	1.21	-0.103
Without ISO9000	61	29%	26	43%	6	10%	8	13%	21	34%	4	1	3	4	2.61	1.35	0.216

Results of the 1998 postal survey of Hong Kong Public Works Consultants

Part	Part 1 Use of IT to assist project communication																
Topic	Written communication																
Subject	Use of a system of keywords to record contents of filed documents in the assignment locations																
Q.1.6.6.b	Response										Distribution Statistics						
Sample Sector	Nos	% o/a	No '4'	% '4'	No '3'	% '3'	No '2'	% '2'	No '1'	% '1'	H	L	Median	Mode	Mean	SD	Corr
All	143	69%	32	22%	26	18%	26	18%	59	41%	4	1	2	1	2.22	1.21	0.1276
Architecture	29	14%	5	17%	1	3%	9	31%	14	48%	4	1	2	1	1.90	1.11	-0.253
Building Services	12	6%	4	33%	0	0%	2	17%	6	50%	4	1	1.5	1	2.17	1.40	0.182
Civil	99	48%	22	22%	18	18%	19	19%	40	40%	4	1	2	1	2.22	1.20	0.1955
Landscaping	7	3%	1	14%	0	0%	4	57%	2	29%	4	1	2	2	2.00	1.00	0.3542
Structural	25	12%	8	32%	2	8%	5	20%	10	40%	4	1	2	1	2.32	1.31	0.0644
Quantity Surveyors	13	6%	2	15%	3	23%	2	15%	6	46%	4	1	2	1	2.08	1.19	0.0825
With ISO9000	83	40%	19	23%	19	23%	18	22%	27	33%	4	1	2	1	2.36	1.16	0.057
Without ISO9000	60	29%	13	22%	7	12%	8	13%	32	53%	4	1	1	1	2.02	1.24	0.2832

Part	Part 1 Use of IT to assist project communication																
Topic	Written communication																
Subject	Use of employed staff to maintain a filing system in the company offices																
Q.1.6.7.a	Response										Distribution Statistics						
Sample Sector	Nos	% o/a	No '4'	% '4'	No '3'	% '3'	No '2'	% '2'	No '1'	% '1'	H	L	Median	Mode	Mean	SD	Corr
All	147	71%	103	70%	22	15%	6	4%	16	11%	4	1	4	4	3.44	0.99	0.0756
Architecture	29	14%	11	38%	3	10%	6	21%	9	31%	4	1	2	4	2.55	1.30	-0.433
Building Services	12	6%	11	92%	0	0%	0	0%	1	8%	4	1	4	4	3.75	0.87	-0.29
Civil	100	48%	70	70%	15	15%	2	2%	13	13%	4	1	4	4	3.42	1.04	0.1351
Landscaping	8	4%	5	63%	2	25%	0	0%	1	13%	4	1	4	4	3.38	1.06	0.3093
Structural	25	12%	20	80%	3	12%	0	0%	2	8%	4	1	4	4	3.64	0.86	-0.07
Quantity Surveyors	15	7%	7	47%	5	33%	2	13%	1	7%	4	1	3	4	3.20	0.94	0.104
With ISO9000	86	42%	65	76%	12	14%	4	5%	5	6%	4	1	4	4	3.59	0.83	0.0031
Without ISO9000	61	29%	38	62%	10	16%	2	3%	11	18%	4	1	4	4	3.23	1.16	0.0609

Results of the 1998 postal survey of Hong Kong Public Works Consultants

Part	Part 1 Use of IT to assist project communication																	
Topic	Written communication																	
Subject	Use of employed staff to maintain a filing system in the assignment locations																	
Q.1.6.7.b	Response										Distribution Statistics							
Sample Sector	Nos	% o/a	No '4'	% '4'	No '3'	% '3'	No '2'	% '2'	No '1'	% '1'	H	L	Median	Mode	Mean	SD	Corr	
All	143	69%	49	34%	24	17%	24	17%	46	32%	4	1	3	4	2.53	1.26	0.3124	
Architecture	29	14%	6	21%	5	17%	7	24%	11	38%	4	1	2	1	2.21	1.18	-0.4	
Building Services	12	6%	5	42%	2	17%	3	25%	2	17%	4	1	3	4	2.83	1.19	0.4253	
Civil	98	47%	34	35%	17	17%	11	11%	36	37%	4	1	3	1	2.50	1.30	0.3974	
Landscaping	7	3%	0	0%	2	29%	1	14%	4	57%	3	1	1	1	1.71	0.95	0.3137	
Structural	26	13%	13	50%	4	15%	4	15%	5	19%	4	1	3.5	4	2.96	1.22	0.373	
Quantity Surveyors	13	6%	4	31%	2	15%	5	38%	2	15%	4	1	2	2	2.62	1.12	0.2176	
With ISO9000	83	40%	36	43%	14	17%	16	19%	17	20%	4	1	3	4	2.83	1.20	0.2892	
Without ISO9000	60	29%	13	22%	10	17%	8	13%	29	48%	4	1	2	1	2.12	1.24	0.1595	

Part	Part 1 Use of IT to assist project communication																
Topic	Written communication																
Subject	Use of employed staff as Information Manager in the company offices																
Q.1.6.8.a	Response										Distribution Statistics						
Sample Sector	Nos	% o/a	No '4'	% '4'	No '3'	% '3'	No '2'	% '2'	No '1'	% '1'	H	L	Median	Mode	Mean	SD	Corr
All	149	72%	46	31%	12	8%	19	13%	72	48%	4	1	2	1	2.21	1.33	0.2162
Architecture	29	14%	24	83%	2	7%	2	7%	1	3%	4	1	4	4	3.69	0.76	-0.36
Building Services	12	6%	6	50%	0	0%	1	8%	5	42%	4	1	3	4	2.58	1.51	0.0335
Civil	101	49%	31	31%	6	6%	14	14%	50	50%	4	1	2	1	2.18	1.33	0.2852
Landscaping	8	4%	0	0%	1	13%	1	13%	6	75%	3	1	1	1	1.38	0.74	0.2863
Structural	26	13%	10	38%	1	4%	3	12%	12	46%	4	1	2	1	2.35	1.41	0.2377
Quantity Surveyors	15	7%	7	47%	2	13%	1	7%	5	33%	4	1	3	4	2.73	1.39	-0.386
With ISO9000	88	43%	32	36%	11	13%	11	13%	34	39%	4	1	2	1	2.47	1.33	0.0956
Without ISO9000	61	29%	14	23%	1	2%	8	13%	38	62%	4	1	1	1	1.85	1.25	0.4877

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Part	Part 1 Use of IT to assist project communication																
Topic	Written communication																
Subject	Use of employed staff as Information Manager in the assignment locations																
Q.1.6.8.b	Response										Distribution Statistics						
Sample Sector	Nos	% o/a	No '4'	% '4'	No '3'	% '3'	No '2'	% '2'	No '1'	% '1'	H	L	Median	Mode	Mean	SD	Corr
All	143	69%	20	14%	16	11%	23	16%	84	59%	4	1	1	1	1.80	1.11	0.3249
Architecture	29	14%	10	34%	6	21%	7	24%	6	21%	4	1	3	4	2.69	1.17	-0.054
Building Services	12	6%	1	8%	2	17%	4	33%	5	42%	4	1	2	1	1.92	1.00	0.1636
Civil	99	48%	14	14%	11	11%	15	15%	59	60%	4	1	1	1	1.80	1.12	0.3885
Landscaping	7	3%	0	0%	1	14%	1	14%	5	71%	3	1	1	1	1.43	0.79	0.2306
Structural	25	12%	4	16%	2	8%	5	20%	14	56%	4	1	1	1	1.84	1.14	0.5286
Quantity Surveyors	13	6%	4	31%	1	8%	3	23%	5	38%	4	1	2	1	2.31	1.32	-0.259
With ISO9000	83	40%	15	18%	15	18%	15	18%	38	46%	4	1	2	1	2.08	1.17	0.2194
Without ISO9000	60	29%	5	8%	1	2%	8	13%	46	77%	4	1	1	1	1.42	0.89	0.4923

Part	Part 1 Use of IT to assist project communication																
Topic	Electronic communication																
Subject	Use of e-mail in the company offices																
Q.1.7.1.a	Response										Distribution Statistics						
Sample Sector	Nos	% o/a	No '4'	% '4'	No '3'	% '3'	No '2'	% '2'	No '1'	% '1'	H	L	Median	Mode	Mean	SD	Corr
All	148	71%	61	41%	21	14%	18	12%	48	32%	4	1	3	4	2.64	1.31	0.2296
Architecture	29	14%	7	24%	2	7%	9	31%	11	38%	4	1	2	1	2.17	1.20	-0.196
Building Services	12	6%	3	25%	3	25%	2	17%	4	33%	4	1	2.5	1	2.42	1.24	0.2954
Civil	101	49%	49	49%	18	18%	9	9%	25	25%	4	1	3	4	2.90	1.25	0.2881
Landscaping	7	3%	3	43%	2	29%	1	14%	1	14%	4	1	3	4	3.00	1.15	0.0635
Structural	26	13%	10	38%	4	15%	2	8%	10	38%	4	1	3	1	2.54	1.36	0.3994
Quantity Surveyors	15	7%	2	13%	2	13%	3	20%	8	53%	4	1	1	1	1.87	1.13	0.4077
With ISO9000	87	42%	36	41%	12	14%	14	16%	25	29%	4	1	3	4	2.68	1.28	0.2749
Without ISO9000	61	29%	25	41%	9	15%	4	7%	23	38%	4	1	3	4	2.59	1.36	0.2134

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Part	Part 1 Use of IT to assist project communication																
Topic	Electronic communication																
Subject	Use of e-mail in the assignment locations																
Q.1.7.1.b	Response										Distribution Statistics						
Sample Sector	Nos	% o/a	No '4'	% '4'	No '3'	% '3'	No '2'	% '2'	No '1'	% '1'	H	L	Median	Mode	Mean	SD	Corr
All	146	71%	41	28%	24	16%	25	17%	56	38%	4	1	2	1	2.34	1.25	0.1932
Architecture	29	14%	1	3%	6	21%	6	21%	16	55%	4	1	1	1	1.72	0.92	-0.374
Building Services	12	6%	3	25%	2	17%	3	25%	4	33%	4	1	2	1	2.33	1.23	0.2297
Civil	100	48%	36	36%	17	17%	19	19%	28	28%	4	1	3	4	2.61	1.24	0.2554
Landscaping	7	3%	2	29%	3	43%	1	14%	1	14%	4	1	3	3	2.86	1.07	-0.415
Structural	26	13%	6	23%	4	15%	6	23%	10	38%	4	1	2	1	2.23	1.21	0.4071
Quantity Surveyors	14	7%	1	7%	3	21%	2	14%	8	57%	4	1	1	1	1.79	1.05	0.4232
With ISO9000	85	41%	25	29%	13	15%	18	21%	29	34%	4	1	2	1	2.40	1.24	0.2321
Without ISO9000	61	29%	16	26%	11	18%	7	11%	27	44%	4	1	2	1	2.26	1.28	0.1419

Part	Part 1 Use of IT to assist project communication																
Topic	Electronic communication																
Subject	Use of dial-up e-mail from company/assignment locations to others via modems																
Q.1.7.1.c	Response										Distribution Statistics						
Sample Sector	Nos	% o/a	No '4'	% '4'	No '3'	% '3'	No '2'	% '2'	No '1'	% '1'	H	L	Median	Mode	Mean	SD	Corr
All	148	71%	73	49%	39	26%	15	10%	21	14%	4	1	3	4	3.11	1.08	0.1284
Architecture	29	14%	12	41%	10	34%	3	10%	4	14%	4	1	3	4	3.03	1.05	-0.124
Building Services	12	6%	3	25%	5	42%	3	25%	1	8%	4	1	3	3	2.83	0.94	0.3854
Civil	101	49%	56	55%	25	25%	8	8%	12	12%	4	1	4	4	3.24	1.03	0.1368
Landscaping	7	3%	5	71%	1	14%	1	14%	0	0%	4	2	4	4	3.57	0.79	0.7318
Structural	26	13%	8	31%	8	31%	4	15%	6	23%	4	1	3	4	2.69	1.16	0.4093
Quantity Surveyors	15	7%	5	33%	5	33%	2	13%	3	20%	4	1	3	3	2.80	1.15	0.1738
With ISO9000	87	42%	40	46%	26	30%	11	13%	10	11%	4	1	3	4	3.10	1.02	0.1737
Without ISO9000	61	29%	33	54%	13	21%	4	7%	11	18%	4	1	4	4	3.11	1.16	0.124

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Part	Part 1 Use of IT to assist project communication																
Topic	Electronic communication																
Subject	Use of Internet e-mail																
Q.1.7.1.d	Response										Distribution Statistics						
Sample Sector	Nos	% o/a	No '4'	% '4'	No '3'	% '3'	No '2'	% '2'	No '1'	% '1'	H	L	Median	Mode	Mean	SD	Corr
All	149	72%	82	55%	40	27%	13	9%	14	9%	4	1	4	4	3.28	0.97	0.0295
Architecture	29	14%	13	45%	8	28%	6	21%	2	7%	4	1	3	4	3.10	0.98	-0.306
Building Services	12	6%	5	42%	6	50%	1	8%	0	0%	4	2	3	3	3.33	0.65	0.0189
Civil	101	49%	62	61%	25	25%	6	6%	8	8%	4	1	4	4	3.40	0.92	0.0689
Landscaping	8	4%	7	88%	1	13%	0	0%	0	0%	4	3	4	4	3.88	0.35	0.1737
Structural	26	13%	10	38%	10	38%	3	12%	3	12%	4	1	3	3	3.04	1.00	0.2817
Quantity Surveyors	15	7%	4	27%	6	40%	2	13%	3	20%	4	1	3	3	2.73	1.10	0.0107
With ISO9000	88	43%	45	51%	27	31%	11	13%	5	6%	4	1	4	4	3.27	0.89	0.0342
Without ISO9000	61	29%	37	61%	13	21%	2	3%	9	15%	4	1	4	4	3.28	1.08	0.0885

Part	Part 1 Use of IT to assist project communication																
Topic	Electronic communication																
Subject	Provision of e-mail to office-based managerial staff																
Q.1.7.2.a	Response										Distribution Statistics						
Sample Sector	Nos	% o/a	No '4'	% '4'	No '3'	% '3'	No '2'	% '2'	No '1'	% '1'	H	L	Median	Mode	Mean	SD	Corr
All	148	71%	97	66%	16	11%	8	5%	27	18%	4	1	4	4	3.24	1.18	0.1225
Architecture	29	14%	13	45%	2	7%	4	14%	10	34%	4	1	3	4	2.62	1.37	-0.094
Building Services	12	6%	7	58%	2	17%	2	17%	1	8%	4	1	4	4	3.25	1.06	0.558
Civil	100	48%	73	73%	13	13%	3	3%	11	11%	4	1	4	4	3.48	0.99	0.1364
Landscaping	8	4%	7	88%	0	0%	0	0%	1	13%	4	1	4	4	3.63	1.06	-0.418
Structural	26	13%	17	65%	3	12%	0	0%	6	23%	4	1	4	4	3.19	1.27	0.3763
Quantity Surveyors	15	7%	8	53%	0	0%	0	0%	7	47%	4	1	4	4	2.60	1.55	0.4227
With ISO9000	88	43%	54	61%	8	9%	6	7%	20	23%	4	1	4	4	3.09	1.27	0.245
Without ISO9000	60	29%	43	72%	8	13%	2	3%	7	12%	4	1	4	4	3.45	1.02	-0.023

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Part	Part 1 Use of IT to assist project communication																
Topic	Electronic communication																
Subject	Provision of e-mail to office-based professional staff																
Q.1.7.2.b	Response										Distribution Statistics						
Sample Sector	Nos	% o/a	No '4'	% '4'	No '3'	% '3'	No '2'	% '2'	No '1'	% '1'	H	L	Median	Mode	Mean	SD	Corr
All	148	71%	83	56%	23	16%	10	7%	32	22%	4	1	4	4	3.06	1.22	0.0997
Architecture	29	14%	9	31%	3	10%	5	17%	12	41%	4	1	2	1	2.31	1.31	-0.315
Building Services	12	6%	3	25%	4	33%	3	25%	2	17%	4	1	3	3	2.67	1.07	0.2494
Civil	100	48%	65	65%	18	18%	3	3%	14	14%	4	1	4	4	3.34	1.07	0.1328
Landscaping	8	4%	6	75%	0	0%	0	0%	2	25%	4	1	4	4	3.25	1.39	-0.186
Structural	26	13%	13	50%	4	15%	2	8%	7	27%	4	1	3.5	4	2.88	1.31	0.343
Quantity Surveyors	15	7%	8	53%	0	0%	0	0%	7	47%	4	1	4	4	2.60	1.55	0.4205
With ISO9000	88	43%	45	51%	13	15%	8	9%	22	25%	4	1	4	4	2.92	1.27	0.2064
Without ISO9000	60	29%	38	63%	10	17%	2	3%	10	17%	4	1	4	4	3.27	1.13	0.0322

Part	Part 1 Use of IT to assist project communication																
Topic	Electronic communication																
Subject	Provision of e-mail to office-based technical staff																
Q.1.7.2.c	Response										Distribution Statistics						
Sample Sector	Nos	% o/a	No '4'	% '4'	No '3'	% '3'	No '2'	% '2'	No '1'	% '1'	H	L	Median	Mode	Mean	SD	Corr
All	148	71%	60	41%	26	18%	18	12%	44	30%	4	1	3	4	2.69	1.28	0.1401
Architecture	29	14%	5	17%	2	7%	7	24%	15	52%	4	1	1	1	1.90	1.14	-0.18
Building Services	12	6%	2	17%	3	25%	5	42%	2	17%	4	1	2	2	2.42	1.00	0.2496
Civil	100	48%	48	48%	24	24%	8	8%	20	20%	4	1	3	4	3.00	1.17	0.1456
Landscaping	8	4%	4	50%	3	38%	0	0%	1	13%	4	1	3.5	4	3.25	1.04	-0.038
Structural	26	13%	9	35%	5	19%	3	12%	9	35%	4	1	3	1	2.54	1.30	0.4328
Quantity Surveyors	15	7%	5	33%	0	0%	1	7%	9	60%	4	1	1	1	2.07	1.44	0.6527
With ISO9000	88	43%	31	35%	14	16%	15	17%	28	32%	4	1	3	4	2.55	1.27	0.2529
Without ISO9000	60	29%	29	48%	12	20%	3	5%	16	27%	4	1	3	4	2.90	1.27	0.117

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Part	Part 1 Use of IT to assist project communication																
Topic	Electronic communication																
Subject	Provision of e-mail to office-based clerical staff																
Q.1.7.2.d	Response										Distribution Statistics						
Sample Sector	Nos	% o/a	No '4'	% '4'	No '3'	% '3'	No '2'	% '2'	No '1'	% '1'	H	L	Median	Mode	Mean	SD	Corr
All	148	71%	44	30%	24	16%	29	20%	51	34%	4	1	2	1	2.41	1.24	0.1185
Architecture	29	14%	5	17%	1	3%	7	24%	16	55%	4	1	1	1	1.83	1.14	-0.272
Building Services	12	6%	0	0%	2	17%	6	50%	4	33%	3	1	2	2	1.83	0.72	0.5111
Civil	100	48%	35	35%	23	23%	18	18%	24	24%	4	1	3	4	2.69	1.19	0.1318
Landscaping	8	4%	3	38%	3	38%	1	13%	1	13%	4	1	3	3	3.00	1.07	-0.352
Structural	26	13%	6	23%	5	19%	6	23%	9	35%	4	1	2	1	2.31	1.19	0.3173
Quantity Surveyors	15	7%	3	20%	2	13%	1	7%	9	60%	4	1	1	1	1.93	1.28	0.5113
With ISO9000	88	43%	23	26%	13	15%	21	24%	31	35%	4	1	2	1	2.32	1.21	0.2212
Without ISO9000	60	29%	21	35%	11	18%	8	13%	20	33%	4	1	3	4	2.55	1.28	0.0282

Part	Part 1 Use of IT to assist project communication																
Topic	Electronic communication																
Subject	Provision of e-mail to assignment-based managerial staff																
Q.1.7.2.e	Response										Distribution Statistics						
Sample Sector	Nos	% o/a	No '4'	% '4'	No '3'	% '3'	No '2'	% '2'	No '1'	% '1'	H	L	Median	Mode	Mean	SD	Corr
All	145	70%	44	30%	26	18%	17	12%	58	40%	4	1	2	1	2.39	1.29	0.2156
Architecture	29	14%	3	10%	2	7%	7	24%	17	59%	4	1	1	1	1.69	1.00	0.0063
Building Services	12	6%	2	17%	4	33%	2	17%	4	33%	4	1	2.5	3	2.33	1.15	0.6915
Civil	99	48%	41	41%	23	23%	7	7%	28	28%	4	1	3	4	2.78	1.26	0.2286
Landscaping	7	3%	1	14%	3	43%	0	0%	3	43%	4	1	3	3	2.29	1.25	-0.54
Structural	26	13%	9	35%	5	19%	2	8%	10	38%	4	1	3	1	2.50	1.33	0.4703
Quantity Surveyors	14	7%	2	14%	1	7%	2	14%	9	64%	4	1	1	1	1.71	1.14	0.6244
With ISO9000	85	41%	24	28%	12	14%	14	16%	35	41%	4	1	2	1	2.29	1.27	0.3259
Without ISO9000	60	29%	20	33%	14	23%	3	5%	23	38%	4	1	3	1	2.52	1.31	0.1633

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Part	Part 1 Use of IT to assist project communication																
Topic	Electronic communication																
Subject	Provision of e-mail to assignment-based professional staff																
Q.1.7.2.f	Response										Distribution Statistics						
Sample Sector	Nos	% o/a	No '4'	% '4'	No '3'	% '3'	No '2'	% '2'	No '1'	% '1'	H	L	Median	Mode	Mean	SD	Corr
All	145	70%	40	28%	27	19%	19	13%	59	41%	4	1	2	1	2.33	1.26	0.2029
Architecture	29	14%	3	10%	1	3%	7	24%	18	62%	4	1	1	1	1.62	0.98	-0.212
Building Services	12	6%	2	17%	2	17%	3	25%	5	42%	4	1	2	1	2.08	1.16	0.5427
Civil	99	48%	38	38%	25	25%	8	8%	28	28%	4	1	3	4	2.74	1.24	0.2275
Landscaping	7	3%	0	0%	3	43%	0	0%	4	57%	3	1	1	1	1.86	1.07	-0.369
Structural	26	13%	8	31%	5	19%	4	15%	9	35%	4	1	2.5	1	2.46	1.27	0.3916
Quantity Surveyors	14	7%	1	7%	1	7%	2	14%	10	71%	4	1	1	1	1.50	0.94	0.8996
With ISO9000	85	41%	21	25%	12	14%	15	18%	37	44%	4	1	2	1	2.20	1.24	0.3277
Without ISO9000	60	29%	19	32%	15	25%	4	7%	22	37%	4	1	3	1	2.52	1.28	0.1732

Part	Part 1 Use of IT to assist project communication																
Topic	Electronic communication																
Subject	Provision of e-mail to assignment-based technical staff																
Q.1.7.2.g	Response										Distribution Statistics						
Sample Sector	Nos	% o/a	No '4'	% '4'	No '3'	% '3'	No '2'	% '2'	No '1'	% '1'	H	L	Median	Mode	Mean	SD	Corr
All	144	70%	27	19%	24	17%	23	16%	70	49%	4	1	2	1	2.06	1.19	0.1332
Architecture	29	14%	2	7%	0	0%	6	21%	21	72%	4	1	1	1	1.41	0.82	-0.218
Building Services	12	6%	1	8%	2	17%	4	33%	5	42%	4	1	2	1	1.92	1.00	0.5356
Civil	98	47%	26	27%	22	22%	15	15%	35	36%	4	1	2	1	2.40	1.22	0.1324
Landscaping	7	3%	0	0%	1	14%	2	29%	4	57%	3	1	1	1	1.57	0.79	-0.557
Structural	26	13%	3	12%	5	19%	7	27%	11	42%	4	1	2	1	2.00	1.06	0.4093
Quantity Surveyors	14	7%	1	7%	1	7%	2	14%	10	71%	4	1	1	1	1.50	0.94	0.8996
With ISO9000	85	41%	12	14%	12	14%	18	21%	43	51%	4	1	1	1	1.92	1.10	0.2295
Without ISO9000	59	29%	15	25%	12	20%	5	8%	27	46%	4	1	2	1	2.25	1.28	0.2224

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Part	Part 1 Use of IT to assist project communication																
Topic	Electronic communication																
Subject	Provision of e-mail to assignment-based clerical staff																
Q.1.7.2.h	Response										Distribution Statistics						
Sample Sector	Nos	% o/a	No '4'	% '4'	No '3'	% '3'	No '2'	% '2'	No '1'	% '1'	H	L	Median	Mode	Mean	SD	Corr
All	144	70%	22	15%	21	15%	28	19%	73	51%	4	1	1	1	1.94	1.13	0.146
Architecture	29	14%	2	7%	0	0%	6	21%	21	72%	4	1	1	1	1.41	0.82	-0.218
Building Services	12	6%	0	0%	2	17%	3	25%	7	58%	3	1	1	1	1.58	0.79	0.3283
Civil	98	47%	21	21%	20	20%	19	19%	38	39%	4	1	2	1	2.24	1.18	0.144
Landscaping	7	3%	0	0%	1	14%	2	29%	4	57%	3	1	1	1	1.57	0.79	-0.557
Structural	26	13%	2	8%	6	23%	6	23%	12	46%	4	1	2	1	1.92	1.02	0.3775
Quantity Surveyors	14	7%	0	0%	2	14%	2	14%	10	71%	3	1	1	1	1.43	0.76	0.8183
With ISO9000	85	41%	11	13%	11	13%	18	21%	45	53%	4	1	1	1	1.86	1.08	0.2438
Without ISO9000	59	29%	11	19%	10	17%	10	17%	28	47%	4	1	2	1	2.07	1.19	0.089

Part	Part 1 Use of IT to assist project communication																
Topic	Electronic communication																
Subject	Employment of staff to administer IT in company offices																
Q.1.7.3.a	Response										Distribution Statistics						
Sample Sector	Nos	% o/a	No '4'	% '4'	No '3'	% '3'	No '2'	% '2'	No '1'	% '1'	H	L	Median	Mode	Mean	SD	Corr
All	148	71%	84	57%	23	16%	6	4%	35	24%	4	1	4	4	3.05	1.25	0.3505
Architecture	29	14%	20	69%	2	7%	2	7%	5	17%	4	1	4	4	3.28	1.19	0.3357
Building Services	12	6%	8	67%	2	17%	0	0%	2	17%	4	1	4	4	3.33	1.15	0.5548
Civil	100	48%	55	55%	18	18%	4	4%	23	23%	4	1	4	4	3.05	1.23	0.3877
Landscaping	8	4%	4	50%	3	38%	0	0%	1	13%	4	1	3.5	4	3.25	1.04	-0.038
Structural	26	13%	16	62%	3	12%	1	4%	6	23%	4	1	4	4	3.12	1.28	0.5418
Quantity Surveyors	15	7%	9	60%	1	7%	0	0%	5	33%	4	1	4	4	2.93	1.44	0.3123
With ISO9000	88	43%	61	69%	9	10%	3	3%	15	17%	4	1	4	4	3.32	1.15	0.3375
Without ISO9000	60	29%	23	38%	14	23%	3	5%	20	33%	4	1	3	4	2.67	1.30	0.271

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Part	Part 1 Use of IT to assist project communication																
Topic	Electronic communication																
Subject	Employment of staff to administer IT in assignment locations																
Q.1.7.3.b	Response										Distribution Statistics						
Sample Sector	Nos	% o/a	No '4'	% '4'	No '3'	% '3'	No '2'	% '2'	No '1'	% '1'	H	L	Median	Mode	Mean	SD	Corr
All	145	70%	38	26%	21	14%	28	19%	58	40%	4	1	2	1	2.27	1.24	0.3586
Architecture	29	14%	9	31%	4	14%	5	17%	11	38%	4	1	2	1	2.38	1.29	0.4161
Building Services	12	6%	2	17%	2	17%	3	25%	5	42%	4	1	2	1	2.08	1.16	0.5666
Civil	99	48%	27	27%	18	18%	18	18%	36	36%	4	1	2	1	2.36	1.23	0.376
Landscaping	7	3%	0	0%	1	14%	2	29%	4	57%	3	1	1	1	1.57	0.79	-0.37
Structural	26	13%	8	31%	4	15%	6	23%	8	31%	4	1	2	4	2.46	1.24	0.584
Quantity Surveyors	14	7%	4	29%	0	0%	4	29%	6	43%	4	1	2	1	2.14	1.29	0.3565
With ISO9000	85	41%	27	32%	10	12%	19	22%	29	34%	4	1	2	1	2.41	1.26	0.3678
Without ISO9000	60	29%	11	18%	11	18%	9	15%	29	48%	4	1	2	1	2.07	1.19	0.3346

Part	Part 1 Use of IT to assist project communication																
Topic	Electronic communication																
Subject	Full time Director is the highest level of IT management in the company																
Q.1.7.4 a	Response										Distribution Statistics						
Sample Sector	Nos	% o/a	No	%	na	na	na	na	na	na	H	L	Median	Mode	Mean	SD	Corr
All	148	71%	22	15%	na	na	na	na	na	na	13	1	11.5	12	10.00	3.30	0.2641
Architecture	29	14%	4	14%	na	na	na	na	na	na	13	1	11	12	9.31	3.35	0.4475
Building Services	12	6%	1	8%	na	na	na	na	na	na	13	11	12	12	11.83	0.58	-0.26
Civil	100	48%	17	17%	na	na	na	na	na	na	13	1	12	12	10.19	3.38	0.2505
Landscaping	8	4%	1	13%	na	na	na	na	na	na	13	1	11.5	12	9.63	4.10	0.287
Structural	26	13%	5	19%	na	na	na	na	na	na	13	2	12	12	11.00	2.62	0.3332
Quantity Surveyors	15	7%	0	0%	na	na	na	na	na	na	12	2	11	12	10.00	2.80	0.3489
With ISO9000	88	43%	12	14%	na	na	na	na	na	na	13	1	12	12	10.07	3.19	0.3663
Without ISO9000	60	29%	10	17%	na	na	na	na	na	na	13	1	11	12	9.90	3.47	0.0764

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Part	Part 1 Use of IT to assist project communication																	
Topic	Electronic communication																	
Subject	Part time Director is the highest level of IT management in the company																	
Q.1.7.4 b	Response											Distribution Statistics						
Sample Sector	Nos	% o/a	No	%	na	na	na	na	na	na	H	L	Median	Mode	Mean	SD	Corr	
All	148	71%	52	35%	na	na	na	na	na	na	13	1	11.5	12	10.00	3.30	0.2641	
Architecture	29	14%	8	28%	na	na	na	na	na	na	13	1	11	12	9.31	3.35	0.4475	
Building Services	12	6%	8	67%	na	na	na	na	na	na	13	11	12	12	11.83	0.58	-0.26	
Civil	100	48%	36	36%	na	na	na	na	na	na	13	1	12	12	10.19	3.38	0.2505	
Landscaping	8	4%	3	38%	na	na	na	na	na	na	13	1	11.5	12	9.63	4.10	0.287	
Structural	26	13%	11	42%	na	na	na	na	na	na	13	2	12	12	11.00	2.62	0.3332	
Quantity Surveyors	15	7%	7	47%	na	na	na	na	na	na	12	2	11	12	10.00	2.80	0.3489	
With ISO9000	88	43%	33	38%	na	na	na	na	na	na	13	1	12	12	10.07	3.19	0.3663	
Without ISO9000	60	29%	19	32%	na	na	na	na	na	na	13	1	11	12	9.90	3.47	0.0764	

Part	Part 1 Use of IT to assist project communication																	
Topic	Electronic communication																	
Subject	Full time Manager reporting to a Director is the highest level of IT management in the company																	
Q.1.7.4 .c	Response											Distribution Statistics						
Sample Sector	Nos	% o/a	No	%	na	na	na	na	na	na	H	L	Median	Mode	Mean	SD	Corr	
All	148	71%	21	14%	na	na	na	na	na	na	13	1	11.5	12	10.00	3.30	0.2641	
Architecture	29	14%	3	10%	na	na	na	na	na	na	13	1	11	12	9.31	3.35	0.4475	
Building Services	12	6%	3	25%	na	na	na	na	na	na	13	11	12	12	11.83	0.58	-0.26	
Civil	100	48%	17	17%	na	na	na	na	na	na	13	1	12	12	10.19	3.38	0.2505	
Landscaping	8	4%	1	13%	na	na	na	na	na	na	13	1	11.5	12	9.63	4.10	0.287	
Structural	26	13%	5	19%	na	na	na	na	na	na	13	2	12	12	11.00	2.62	0.3332	
Quantity Surveyors	15	7%	2	13%	na	na	na	na	na	na	12	2	11	12	10.00	2.80	0.3489	
With ISO9000	88	43%	13	15%	na	na	na	na	na	na	13	1	12	12	10.07	3.19	0.3663	
Without ISO9000	60	29%	8	13%	na	na	na	na	na	na	13	1	11	12	9.90	3.47	0.0764	

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Part	Part 1 Use of IT to assist project communication																	
Topic	Electronic communication																	
Subject	Part time Manager reporting to a Director is the highest level of IT management in the company																	
Q.1.7.4 d	Response										Distribution Statistics							
Sample Sector	Nos	% o/a	No	%	na	na	na	na	na	na	H	L	Median	Mode	Mean	SD	Corr	
All	148	71%	11	7%	na	na	na	na	na	na	13	1	11.5	12	10.00	3.30	0.2641	
Architecture	29	14%	1	3%	na	na	na	na	na	na	13	1	11	12	9.31	3.35	0.4475	
Building Services	12	6%	0	0%	na	na	na	na	na	na	13	11	12	12	11.83	0.58	-0.26	
Civil	100	48%	6	6%	na	na	na	na	na	na	13	1	12	12	10.19	3.38	0.2505	
Landscaping	8	4%	1	13%	na	na	na	na	na	na	13	1	11.5	12	9.63	4.10	0.287	
Structural	26	13%	2	8%	na	na	na	na	na	na	13	2	12	12	11.00	2.62	0.3332	
Quantity Surveyors	15	7%	1	7%	na	na	na	na	na	na	12	2	11	12	10.00	2.80	0.3489	
With ISO9000	88	43%	5	6%	na	na	na	na	na	na	13	1	12	12	10.07	3.19	0.3663	
Without ISO9000	60	29%	6	10%	na	na	na	na	na	na	13	1	11	12	9.90	3.47	0.0764	

Part	Part 1 Use of IT to assist project communication																	
Topic	Electronic communication																	
Subject	Full time Senior professional is the highest level of IT management in the company																	
Q.1.7.4 e	Response										Distribution Statistics							
Sample Sector	Nos	% o/a	No	%	na	na	na	na	na	na	H	L	Median	Mode	Mean	SD	Corr	
All	148	71%	2	1%	na	na	na	na	na	na	13	1	11.5	12	10.00	3.30	0.2641	
Architecture	29	14%	1	3%	na	na	na	na	na	na	13	1	11	12	9.31	3.35	0.4475	
Building Services	12	6%	0	0%	na	na	na	na	na	na	13	11	12	12	11.83	0.58	-0.26	
Civil	100	48%	2	2%	na	na	na	na	na	na	13	1	12	12	10.19	3.38	0.2505	
Landscaping	8	4%	0	0%	na	na	na	na	na	na	13	1	11.5	12	9.63	4.10	0.287	
Structural	26	13%	0	0%	na	na	na	na	na	na	13	2	12	12	11.00	2.62	0.3332	
Quantity Surveyors	15	7%	0	0%	na	na	na	na	na	na	12	2	11	12	10.00	2.80	0.3489	
With ISO9000	88	43%	1	1%	na	na	na	na	na	na	13	1	12	12	10.07	3.19	0.3663	
Without ISO9000	60	29%	1	2%	na	na	na	na	na	na	13	1	11	12	9.90	3.47	0.0764	

Part	Part 1 Use of IT to assist project communication																	
Topic	Electronic communication																	
Subject	Part time Senior professional is the highest level of IT management in the company																	
Q.1.7.4 f	Response										Distribution Statistics							
Sample Sector	Nos	% o/a	No	%	na	na	na	na	na	na	H	L	Median	Mode	Mean	SD	Corr	
All	148	71%	9	6%	na	na	na	na	na	na	13	1	11.5	12	10.00	3.30	0.2641	
Architecture	29	14%	2	7%	na	na	na	na	na	na	13	1	11	12	9.31	3.35	0.4475	
Building Services	12	6%	0	0%	na	na	na	na	na	na	13	11	12	12	11.83	0.58	-0.26	
Civil	100	48%	3	3%	na	na	na	na	na	na	13	1	12	12	10.19	3.38	0.2505	
Landscaping	8	4%	0	0%	na	na	na	na	na	na	13	1	11.5	12	9.63	4.10	0.287	
Structural	26	13%	1	4%	na	na	na	na	na	na	13	2	12	12	11.00	2.62	0.3332	
Quantity Surveyors	15	7%	4	27%	na	na	na	na	na	na	12	2	11	12	10.00	2.80	0.3489	
With ISO9000	88	43%	6	7%	na	na	na	na	na	na	13	1	12	12	10.07	3.19	0.3663	
Without ISO9000	60	29%	3	5%	na	na	na	na	na	na	13	1	11	12	9.90	3.47	0.0764	

Part	Part 1 Use of IT to assist project communication																	
Topic	Electronic communication																	
Subject	Full time IT professional is the highest level of IT management in the company																	
Q.1.7.4 g	Response										Distribution Statistics							
Sample Sector	Nos	% o/a	No	%	na	na	na	na	na	na	H	L	Median	Mode	Mean	SD	Corr	
All	148	71%	11	7%	na	na	na	na	na	na	13	1	11.5	12	10.00	3.30	0.2641	
Architecture	29	14%	5	17%	na	na	na	na	na	na	13	1	11	12	9.31	3.35	0.4475	
Building Services	12	6%	0	0%	na	na	na	na	na	na	13	11	12	12	11.83	0.58	-0.26	
Civil	100	48%	6	6%	na	na	na	na	na	na	13	1	12	12	10.19	3.38	0.2505	
Landscaping	8	4%	0	0%	na	na	na	na	na	na	13	1	11.5	12	9.63	4.10	0.287	
Structural	26	13%	0	0%	na	na	na	na	na	na	13	2	12	12	11.00	2.62	0.3332	
Quantity Surveyors	15	7%	0	0%	na	na	na	na	na	na	12	2	11	12	10.00	2.80	0.3489	
With ISO9000	88	43%	7	8%	na	na	na	na	na	na	13	1	12	12	10.07	3.19	0.3663	
Without ISO9000	60	29%	4	7%	na	na	na	na	na	na	13	1	11	12	9.90	3.47	0.0764	

Part	Part 1 Use of IT to assist project communication																	
Topic	Electronic communication																	
Subject	Part time IT professional is the highest level of IT management in the company																	
Q.1.7.4 h	Response										Distribution Statistics							
Sample Sector	Nos	% o/a	No	%	na	na	na	na	na	na	H	L	Median	Mode	Mean	SD	Corr	
All	148	71%	4	3%	na	na	na	na	na	na	13	1	11.5	12	10.00	3.30	0.2641	
Architecture	29	14%	0	0%	na	na	na	na	na	na	13	1	11	12	9.31	3.35	0.4475	
Building Services	12	6%	0	0%	na	na	na	na	na	na	13	11	12	12	11.83	0.58	-0.26	
Civil	100	48%	3	3%	na	na	na	na	na	na	13	1	12	12	10.19	3.38	0.2505	
Landscaping	8	4%	1	13%	na	na	na	na	na	na	13	1	11.5	12	9.63	4.10	0.287	
Structural	26	13%	0	0%	na	na	na	na	na	na	13	2	12	12	11.00	2.62	0.3332	
Quantity Surveyors	15	7%	0	0%	na	na	na	na	na	na	12	2	11	12	10.00	2.80	0.3489	
With ISO9000	88	43%	1	1%	na	na	na	na	na	na	13	1	12	12	10.07	3.19	0.3663	
Without ISO9000	60	29%	3	5%	na	na	na	na	na	na	13	1	11	12	9.90	3.47	0.0764	

Part	Part 1 Use of IT to assist project communication																	
Topic	Electronic communication																	
Subject	Full time Operative is the highest level of management in the company																	
Q.1.7.4 I	Response											Distribution Statistics						
Sample Sector	Nos	% o/a	No	%	na	na	na	na	na	na	H	L	Median	Mode	Mean	SD	Corr	
All	148	71%	2	1%	na	na	na	na	na	na	13	1	11.5	12	10.00	3.30	0.2641	
Architecture	29	14%	2	7%	na	na	na	na	na	na	13	1	11	12	9.31	3.35	0.4475	
Building Services	12	6%	0	0%	na	na	na	na	na	na	13	11	12	12	11.83	0.58	-0.26	
Civil	100	48%	0	0%	na	na	na	na	na	na	13	1	12	12	10.19	3.38	0.2505	
Landscaping	8	4%	0	0%	na	na	na	na	na	na	13	1	11.5	12	9.63	4.10	0.287	
Structural	26	13%	0	0%	na	na	na	na	na	na	13	2	12	12	11.00	2.62	0.3332	
Quantity Surveyors	15	7%	0	0%	na	na	na	na	na	na	12	2	11	12	10.00	2.80	0.3489	
With ISO9000	88	43%	2	2%	na	na	na	na	na	na	13	1	12	12	10.07	3.19	0.3663	
Without ISO9000	60	29%	0	0%	na	na	na	na	na	na	13	1	11	12	9.90	3.47	0.0764	

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Part	Part 1 Use of IT to assist project communication																
Topic	Electronic communication																
Subject	<i>Part time Operative is the highest level of IT management in the company</i>																
Q.1.7.4 j	Response										Distribution Statistics						
Sample Sector	Nos	% o/a	No	%	na	na	na	na	na	na	H	L	Median	Mode	Mean	SD	Corr
All	148	71%	4	3%	na	na	na	na	na	na	13	1	11.5	12	10.00	3.30	0.2641
Architecture	29	14%	2	7%	na	na	na	na	na	na	13	1	11	12	9.31	3.35	0.4475
Building Services	12	6%	0	0%	na	na	na	na	na	na	13	11	12	12	11.83	0.58	-0.26
Civil	100	48%	2	2%	na	na	na	na	na	na	13	1	12	12	10.19	3.38	0.2505
Landscaping	8	4%	0	0%	na	na	na	na	na	na	13	1	11.5	12	9.63	4.10	0.287
Structural	26	13%	1	4%	na	na	na	na	na	na	13	2	12	12	11.00	2.62	0.3332
Quantity Surveyors	15	7%	0	0%	na	na	na	na	na	na	12	2	11	12	10.00	2.80	0.3489
With ISO9000	88	43%	3	3%	na	na	na	na	na	na	13	1	12	12	10.07	3.19	0.3663
Without ISO9000	60	29%	1	2%	na	na	na	na	na	na	13	1	11	12	9.90	3.47	0.0764

Results of the 1998 postal survey of Hong Kong Public Works Consultants

Part	Part 1 Use of IT to assist project communication																	
Topic	Electronic communication																	
Subject	Full time sub-contractor is the highest level of IT management in the company																	
Q.1.7.4 k	Response											Distribution Statistics						
Sample Sector	Nos	% o/a	No	%	na	na	na	na	na	na	H	L	Median	Mode	Mean	SD	Corr	
All	148	71%	0	0%	na	na	na	na	na	na	13	1	11.5	12	10.00	3.30	0.2641	
Architecture	29	14%	0	0%	na	na	na	na	na	na	13	1	11	12	9.31	3.35	0.4475	
Building Services	12	6%	0	0%	na	na	na	na	na	na	13	11	12	12	11.83	0.58	-0.26	
Civil	100	48%	0	0%	na	na	na	na	na	na	13	1	12	12	10.19	3.38	0.2505	
Landscaping	8	4%	0	0%	na	na	na	na	na	na	13	1	11.5	12	9.63	4.10	0.287	
Structural	26	13%	0	0%	na	na	na	na	na	na	13	2	12	12	11.00	2.62	0.3332	
Quantity Surveyors	15	7%	0	0%	na	na	na	na	na	na	12	2	11	12	10.00	2.80	0.3489	
With ISO9000	88	43%	0	0%	na	na	na	na	na	na	13	1	12	12	10.07	3.19	0.3663	
Without ISO9000	60	29%	0	0%	na	na	na	na	na	na	13	1	11	12	9.90	3.47	0.0764	

Part	Part 1 Use of IT to assist project communication																	
Topic	Electronic communication																	
Subject	Part time sub-contractor is the highest level of IT management in the company																	
Q.1.7.4 l	Response											Distribution Statistics						
Sample Sector	Nos	% o/a	No	%	na	na	na	na	na	na	H	L	Median	Mode	Mean	SD	Corr	
All	148	71%	2	1%	na	na	na	na	na	na	13	1	11.5	12	10.00	3.30	0.2641	
Architecture	29	14%	0	0%	na	na	na	na	na	na	13	1	11	12	9.31	3.35	0.4475	
Building Services	12	6%	0	0%	na	na	na	na	na	na	13	11	12	12	11.83	0.58	-0.26	
Civil	100	48%	1	1%	na	na	na	na	na	na	13	1	12	12	10.19	3.38	0.2505	
Landscaping	8	4%	0	0%	na	na	na	na	na	na	13	1	11.5	12	9.63	4.10	0.287	
Structural	26	13%	1	4%	na	na	na	na	na	na	13	2	12	12	11.00	2.62	0.3332	
Quantity Surveyors	15	7%	1	7%	na	na	na	na	na	na	12	2	11	12	10.00	2.80	0.3489	
With ISO9000	88	43%	2	2%	na	na	na	na	na	na	13	1	12	12	10.07	3.19	0.3663	
Without ISO9000	60	29%	0	0%	na	na	na	na	na	na	13	1	11	12	9.90	3.47	0.0764	

Results of the 1998 postal survey of Hong Kong Public Works Consultants

Part	Part 1 Use of IT to assist project communication																	
Topic	Electronic communication																	
Subject	No IT management in the company																	
Q.1.7.4 m	Response										Distribution Statistics							
Sample Sector	Nos	% o/a	No	%	na	na	na	na	na	na	H	L	Median	Mode	Mean	SD	Corr	
All	148	71%	8	5%	na	na	na	na	na	na	13	1	11.5	12	10.00	3.30	0.2641	
Architecture	29	14%	1	3%	na	na	na	na	na	na	13	1	11	12	9.31	3.35	0.4475	
Building Services	12	6%	0	0%	na	na	na	na	na	na	13	11	12	12	11.83	0.58	-0.26	
Civil	100	48%	7	7%	na	na	na	na	na	na	13	1	12	12	10.19	3.38	0.2505	
Landscaping	8	4%	1	13%	na	na	na	na	na	na	13	1	11.5	12	9.63	4.10	0.287	
Structural	26	13%	0	0%	na	na	na	na	na	na	13	2	12	12	11.00	2.62	0.3332	
Quantity Surveyors	15	7%	0	0%	na	na	na	na	na	na	12	2	11	12	10.00	2.80	0.3489	
With ISO9000	88	43%	3	3%	na	na	na	na	na	na	13	1	12	12	10.07	3.19	0.3663	
Without ISO9000	60	29%	5	8%	na	na	na	na	na	na	13	1	11	12	9.90	3.47	0.0764	

Part	Part 1 Use of IT to assist project communication																
Topic	Electronic communication																
Subject	Use of e-mail in company offices for sending written messages																
Q.1.7.5.a	Response										Distribution Statistics						
Sample Sector	Nos	% o/a	No '4'	% '4'	No '3'	% '3'	No '2'	% '2'	No '1'	% '1'	H	L	Median	Mode	Mean	SD	Corr
All	149	72%	73	49%	34	23%	13	9%	29	19%	4	1	3	4	3.01	1.17	0.1201
Architecture	29	14%	9	31%	4	14%	8	28%	8	28%	4	1	2	4	2.48	1.21	-0.183
Building Services	12	6%	2	17%	7	58%	2	17%	1	8%	4	1	3	3	2.83	0.83	0.418
Civil	101	49%	57	56%	26	26%	5	5%	13	13%	4	1	4	4	3.26	1.04	0.1381
Landscaping	8	4%	5	63%	3	38%	0	0%	0	0%	4	3	4	4	3.63	0.52	0.5581
Structural	26	13%	9	35%	9	35%	1	4%	7	27%	4	1	3	3	2.77	1.21	0.3647
Quantity Surveyors	15	7%	6	40%	2	13%	1	7%	6	40%	4	1	3	1	2.53	1.41	0.2876
With ISO9000	88	43%	36	41%	22	25%	12	14%	18	20%	4	1	3	4	2.86	1.17	0.2337
Without ISO9000	61	29%	37	61%	12	20%	1	2%	11	18%	4	1	4	4	3.23	1.15	0.1299

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Part	Part 1 Use of IT to assist project communication																
Topic	Electronic communication																
Subject	Use of e-mail in company offices for agreeing drafting text of written messages																
Q.1.7.5.b	Response										Distribution Statistics						
Sample Sector	Nos	% o/a	No '4'	% '4'	No '3'	% '3'	No '2'	% '2'	No '1'	% '1'	H	L	Median	Mode	Mean	SD	Corr
All	149	72%	42	28%	37	25%	21	14%	49	33%	4	1	3	1	2.48	1.22	0.0595
Architecture	29	14%	6	21%	1	3%	6	21%	16	55%	4	1	1	1	1.90	1.21	-0.333
Building Services	12	6%	0	0%	5	42%	3	25%	4	33%	3	1	2	3	2.08	0.90	0.4263
Civil	101	49%	34	34%	33	33%	12	12%	22	22%	4	1	3	4	2.78	1.14	0.0646
Landscaping	8	4%	5	63%	2	25%	0	0%	1	13%	4	1	4	4	3.38	1.06	0.3487
Structural	26	13%	4	15%	9	35%	3	12%	10	38%	4	1	2.5	1	2.27	1.15	0.2541
Quantity Surveyors	15	7%	3	20%	2	13%	2	13%	8	53%	4	1	1	1	2.00	1.25	0.3901
With ISO9000	88	43%	17	19%	26	30%	13	15%	32	36%	4	1	2	1	2.32	1.16	0.1578
Without ISO9000	61	29%	25	41%	11	18%	8	13%	17	28%	4	1	3	4	2.72	1.27	0.1091

Part	Part 1 Use of IT to assist project communication																
Topic	Electronic communication																
Subject	Use of e-mail in company offices for marking up amending written messages of others																
Q.1.7.5.c	Response										Distribution Statistics						
Sample Sector	Nos	% o/a	No '4'	% '4'	No '3'	% '3'	No '2'	% '2'	No '1'	% '1'	H	L	Median	Mode	Mean	SD	Corr
All	149	72%	32	21%	34	23%	29	19%	54	36%	4	1	2	1	2.30	1.17	0.0503
Architecture	29	14%	5	17%	2	7%	5	17%	17	59%	4	1	1	1	1.83	1.17	-0.304
Building Services	12	6%	0	0%	4	33%	3	25%	5	42%	3	1	2	1	1.92	0.90	0.2251
Civil	101	49%	24	24%	30	30%	21	21%	26	26%	4	1	3	3	2.51	1.12	0.058
Landscaping	8	4%	2	25%	3	38%	2	25%	1	13%	4	1	3	3	2.75	1.04	-0.255
Structural	26	13%	2	8%	7	27%	5	19%	12	46%	4	1	2	1	1.96	1.04	0.2919
Quantity Surveyors	15	7%	3	20%	1	7%	3	20%	8	53%	4	1	1	1	1.93	1.22	0.2206
With ISO9000	88	43%	11	13%	25	28%	17	19%	35	40%	4	1	2	1	2.14	1.08	0.1416
Without ISO9000	61	29%	21	34%	9	15%	12	20%	19	31%	4	1	2	4	2.52	1.26	0.1283

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Part	Part 1 Use of IT to assist project communication																
Topic	Electronic communication																
Subject	Use of e-mail in company offices for attaching other written messages to written messages																
Q.1.7.5.d	Response										Distribution Statistics						
Sample Sector	Nos	% o/a	No '4'	% '4'	No '3'	% '3'	No '2'	% '2'	No '1'	% '1'	H	L	Median	Mode	Mean	SD	Corr
All	149	72%	51	34%	38	26%	18	12%	42	28%	4	1	3	4	2.66	1.22	0.1504
Architecture	29	14%	7	24%	2	7%	6	21%	14	48%	4	1	2	1	2.07	1.25	-0.104
Building Services	12	6%	2	17%	7	58%	1	8%	2	17%	4	1	3	3	2.75	0.97	0.445
Civil	101	49%	41	41%	31	31%	10	10%	19	19%	4	1	3	4	2.93	1.12	0.1922
Landscaping	8	4%	4	50%	4	50%	0	0%	0	0%	4	3	3.5	4	3.50	0.53	0.2641
Structural	26	13%	4	15%	10	38%	2	8%	10	38%	4	1	3	1	2.31	1.16	0.6003
Quantity Surveyors	15	7%	3	20%	3	20%	2	13%	7	47%	4	1	2	1	2.13	1.25	0.2217
With ISO9000	88	43%	22	25%	26	30%	13	15%	27	31%	4	1	3	1	2.49	1.17	0.3007
Without ISO9000	61	29%	29	48%	12	20%	5	8%	15	25%	4	1	3	4	2.90	1.25	0.079

Part	Part 1 Use of IT to assist project communication																
Topic	Electronic communication																
Subject	Use of e-mail in company offices for attaching drawing files to written messages																
Q.1.7.5.e	Response										Distribution Statistics						
Sample Sector	Nos	% o/a	No '4'	% '4'	No '3'	% '3'	No '2'	% '2'	No '1'	% '1'	H	L	Median	Mode	Mean	SD	Corr
All	149	72%	40	27%	36	24%	26	17%	47	32%	4	1	3	1	2.46	1.19	0.1756
Architecture	29	14%	8	28%	4	14%	8	28%	9	31%	4	1	2	1	2.38	1.21	-0.171
Building Services	12	6%	3	25%	6	50%	2	17%	1	8%	4	1	3	3	2.92	0.90	0.4433
Civil	101	49%	32	32%	30	30%	14	14%	25	25%	4	1	3	4	2.68	1.17	0.1979
Landscaping	8	4%	3	38%	3	38%	2	25%	0	0%	4	2	3	4	3.13	0.83	-0.262
Structural	26	13%	6	23%	9	35%	1	4%	10	38%	4	1	3	1	2.42	1.24	0.5255
Quantity Surveyors	15	7%	0	0%	2	13%	3	20%	10	67%	3	1	1	1	1.47	0.74	0.779
With ISO9000	88	43%	20	23%	22	25%	18	20%	28	32%	4	1	2	1	2.39	1.16	0.2604
Without ISO9000	61	29%	20	33%	14	23%	8	13%	19	31%	4	1	3	4	2.57	1.24	0.1927

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Part	Part 1 Use of IT to assist project communication																
Topic	Electronic communication																
Subject	Use of e-mail in company offices for attaching digital photographs to written messages																
Q.1.7.5.f	Response										Distribution Statistics						
Sample Sector	Nos	% o/a	No '4'	% '4'	No '3'	% '3'	No '2'	% '2'	No '1'	% '1'	H	L	Median	Mode	Mean	SD	Corr
All	148	71%	21	14%	16	11%	40	27%	71	48%	4	1	2	1	1.91	1.07	0.1355
Architecture	29	14%	6	21%	1	3%	5	17%	17	59%	4	1	1	1	1.86	1.22	-0.143
Building Services	12	6%	2	17%	2	17%	2	17%	6	50%	4	1	1.5	1	2.00	1.21	0.4738
Civil	101	49%	16	16%	13	13%	31	31%	41	41%	4	1	2	1	2.04	1.09	0.1325
Landscaping	7	3%	2	29%	1	14%	2	29%	2	29%	4	1	2	4	2.43	1.27	-0.165
Structural	26	13%	2	8%	5	19%	6	23%	13	50%	4	1	1.5	1	1.85	1.01	0.1676
Quantity Surveyors	15	7%	1	7%	1	7%	4	27%	9	60%	4	1	1	1	1.60	0.91	0.3703
With ISO9000	87	42%	13	15%	9	10%	23	26%	42	48%	4	1	2	1	1.92	1.09	0.1659
Without ISO9000	61	29%	8	13%	7	11%	17	28%	29	48%	4	1	2	1	1.90	1.06	0.0811

Part	Part 1 Use of IT to assist project communication																
Topic	Electronic communication																
Subject	Use of e-mail in company offices for attaching digital video images to written messages																
Q.1.7.5.g	Response										Distribution Statistics						
Sample Sector	Nos	% o/a	No '4'	% '4'	No '3'	% '3'	No '2'	% '2'	No '1'	% '1'	H	L	Median	Mode	Mean	SD	Corr
All	148	71%	5	3%	7	5%	30	20%	106	72%	4	1	1	1	1.40	0.74	0.0787
Architecture	29	14%	1	3%	1	3%	1	3%	26	90%	4	1	1	1	1.21	0.68	-0.075
Building Services	12	6%	0	0%	1	8%	1	8%	10	83%	3	1	1	1	1.25	0.62	0.4432
Civil	101	49%	4	4%	7	7%	26	26%	64	63%	4	1	1	1	1.51	0.80	0.0462
Landscaping	7	3%	0	0%	1	14%	1	14%	5	71%	3	1	1	1	1.43	0.79	-0.545
Structural	26	13%	0	0%	2	8%	3	12%	21	81%	3	1	1	1	1.27	0.60	0.0724
Quantity Surveyors	15	7%	0	0%	0	0%	3	20%	12	80%	2	1	1	1	1.20	0.41	0.2485
With ISO9000	87	42%	3	3%	4	5%	18	21%	62	71%	4	1	1	1	1.40	0.74	0.0827
Without ISO9000	61	29%	2	3%	3	5%	12	20%	44	72%	4	1	1	1	1.39	0.74	0.1302

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Part	Part 1 Use of IT to assist project communication																
Topic	Electronic communication																
Subject	Use of e-mail in company offices for attaching digital sound files to written messages																
Q.1.7.5.h	Response										Distribution Statistics						
Sample Sector	Nos	% o/a	No '4'	% '4'	No '3'	% '3'	No '2'	% '2'	No '1'	% '1'	H	L	Median	Mode	Mean	SD	Corr
All	148	71%	4	3%	3	2%	25	17%	116	78%	4	1	1	1	1.29	0.64	0.0214
Architecture	29	14%	0	0%	0	0%	3	10%	26	90%	2	1	1	1	1.10	0.31	-0.152
Building Services	12	6%	0	0%	0	0%	0	0%	12	100%	1	1	1	1	1.00	0.00	na
Civil	101	49%	4	4%	3	3%	21	21%	73	72%	4	1	1	1	1.39	0.73	-0.002
Landscaping	7	3%	0	0%	0	0%	2	29%	5	71%	2	1	1	1	1.29	0.49	-0.687
Structural	26	13%	0	0%	1	4%	4	15%	21	81%	3	1	1	1	1.23	0.51	0.1283
Quantity Surveyors	15	7%	0	0%	0	0%	2	13%	13	87%	2	1	1	1	1.13	0.35	0.1087
With ISO9000	87	42%	2	2%	1	1%	16	18%	68	78%	4	1	1	1	1.28	0.60	0.06
Without ISO9000	61	29%	2	3%	2	3%	9	15%	48	79%	4	1	1	1	1.31	0.70	-0.062

Part	Part 1 Use of IT to assist project communication																
Topic	Electronic communication																
Subject	Use of e-mail in company offices for assigning/delegating an action																
Q.1.7.5.I	Response										Distribution Statistics						
Sample Sector	Nos	% o/a	No '4'	% '4'	No '3'	% '3'	No '2'	% '2'	No '1'	% '1'	H	L	Median	Mode	Mean	SD	Corr
All	148	71%	27	18%	27	18%	22	15%	72	49%	4	1	2	1	2.06	1.19	0.1688
Architecture	29	14%	4	14%	2	7%	3	10%	20	69%	4	1	1	1	1.66	1.11	0.0422
Building Services	12	6%	1	8%	3	25%	2	17%	6	50%	4	1	1.5	1	1.92	1.08	0.7808
Civil	101	49%	21	21%	26	26%	14	14%	40	40%	4	1	2	1	2.28	1.19	0.1534
Landscaping	7	3%	0	0%	3	43%	2	29%	2	29%	3	1	2	3	2.14	0.90	0.0853
Structural	26	13%	3	12%	6	23%	5	19%	12	46%	4	1	2	1	2.00	1.10	0.2461
Quantity Surveyors	15	7%	3	20%	1	7%	3	20%	8	53%	4	1	1	1	1.93	1.22	0.4262
With ISO9000	87	42%	14	16%	12	14%	17	20%	44	51%	4	1	1	1	1.95	1.14	0.2639
Without ISO9000	61	29%	13	21%	15	25%	5	8%	28	46%	4	1	2	1	2.21	1.24	0.2342

Results of the 1998 postal survey of Hong Kong Public Works Consultants

Part	Part 1 Use of IT to assist project communication																
Topic	Electronic communication																
Subject	Use of e-mail in assignment locations for sending written messages																
Q.1.7.6.a	Response										Distribution Statistics						
Sample Sector	Nos	% o/a	No '4'	% '4'	No '3'	% '3'	No '2'	% '2'	No '1'	% '1'	H	L	Median	Mode	Mean	SD	Corr
All	143	69%	41	29%	20	14%	25	17%	57	40%	4	1	2	1	2.31	1.26	0.2759
Architecture	29	14%	1	3%	4	14%	6	21%	18	62%	4	1	1	1	1.59	0.87	0.1743
Building Services	12	6%	1	8%	6	50%	2	17%	3	25%	4	1	3	3	2.42	1.00	0.3861
Civil	96	46%	37	39%	15	16%	17	18%	27	28%	4	1	3	4	2.65	1.26	0.2858
Landscaping	8	4%	2	25%	3	38%	0	0%	3	38%	4	1	3	3	2.50	1.31	-0.467
Structural	26	13%	7	27%	6	23%	5	19%	8	31%	4	1	2.5	1	2.46	1.21	0.4885
Quantity Surveyors	14	7%	2	14%	2	14%	2	14%	8	57%	4	1	1	1	1.86	1.17	0.5392
With ISO9000	86	42%	21	24%	14	16%	18	21%	33	38%	4	1	2	1	2.27	1.21	0.3861
Without ISO9000	57	28%	20	35%	6	11%	7	12%	24	42%	4	1	2	1	2.39	1.35	0.1989

Part	Part 1 Use of IT to assist project communication																
Topic	Electronic communication																
Subject	Use of e-mail in assignment locations for agreeing drafting text of written messages																
Q.1.7.6.b	Response										Distribution Statistics						
Sample Sector	Nos	% o/a	No '4'	% '4'	No '3'	% '3'	No '2'	% '2'	No '1'	% '1'	H	L	Median	Mode	Mean	SD	Corr
All	142	69%	33	23%	17	12%	24	17%	68	48%	4	1	2	1	2.11	1.24	0.1477
Architecture	29	14%	2	7%	1	3%	3	10%	23	79%	4	1	1	1	1.38	0.86	-0.173
Building Services	12	6%	0	0%	2	17%	4	33%	6	50%	3	1	1.5	1	1.67	0.78	0.4326
Civil	96	46%	32	33%	13	14%	20	21%	31	32%	4	1	2	4	2.48	1.26	0.1433
Landscaping	7	3%	2	29%	2	29%	0	0%	3	43%	4	1	3	1	2.43	1.40	-0.386
Structural	26	13%	4	15%	3	12%	8	31%	11	42%	4	1	2	1	2.00	1.10	0.2818
Quantity Surveyors	14	7%	1	7%	2	14%	2	14%	9	64%	4	1	1	1	1.64	1.01	0.3302
With ISO9000	85	41%	14	16%	13	15%	18	21%	40	47%	4	1	2	1	2.01	1.14	0.2463
Without ISO9000	57	28%	19	33%	4	7%	6	11%	28	49%	4	1	2	1	2.25	1.37	0.128

Results of the 1998 postal survey of Hong Kong Public Works Consultants

Part	Part 1 Use of IT to assist project communication																
Topic	Electronic communication																
Subject	Use of e-mail in assignment locations for marking up amending written messages of others																
Q.1.7.6.c	Response										Distribution Statistics						
Sample Sector	Nos	% o/a	No '4'	% '4'	No '3'	% '3'	No '2'	% '2'	No '1'	% '1'	H	L	Median	Mode	Mean	SD	Corr
All	142	69%	23	16%	21	15%	22	15%	76	54%	4	1	1	1	1.94	1.16	0.1214
Architecture	29	14%	2	7%	1	3%	2	7%	24	83%	4	1	1	1	1.34	0.86	-0.175
Building Services	12	6%	0	0%	1	8%	4	33%	7	58%	3	1	1	1	1.50	0.67	0.3536
Civil	96	46%	22	23%	17	18%	19	20%	38	40%	4	1	2	1	2.24	1.20	0.1108
Landscaping	7	3%	2	29%	2	29%	0	0%	3	43%	4	1	3	1	2.43	1.40	-0.386
Structural	26	13%	2	8%	4	15%	7	27%	13	50%	4	1	1.5	1	1.81	0.98	0.3601
Quantity Surveyors	14	7%	1	7%	2	14%	2	14%	9	64%	4	1	1	1	1.64	1.01	0.3302
With ISO9000	85	41%	6	7%	17	20%	17	20%	45	53%	4	1	1	1	1.81	0.99	0.2292
Without ISO9000	57	28%	17	30%	4	7%	5	9%	31	54%	4	1	1	1	2.12	1.35	0.1701

Part	Part 1 Use of IT to assist project communication																
Topic	Electronic communication																
Subject	Use of e-mail in assignment locations for attaching other written messages to written messages																
Q.1.7.6.d	Response										Distribution Statistics						
Sample Sector	Nos	% o/a	No '4'	% '4'	No '3'	% '3'	No '2'	% '2'	No '1'	% '1'	H	L	Median	Mode	Mean	SD	Corr
All	143	69%	35	24%	22	15%	21	15%	65	45%	4	1	2	1	2.19	1.25	0.2593
Architecture	29	14%	2	7%	1	3%	5	17%	21	72%	4	1	1	1	1.45	0.87	0.0763
Building Services	12	6%	1	8%	6	50%	1	8%	4	33%	4	1	3	3	2.33	1.07	0.4336
Civil	96	46%	32	33%	19	20%	14	15%	31	32%	4	1	3	4	2.54	1.26	0.2866
Landscaping	8	4%	3	38%	2	25%	0	0%	3	38%	4	1	3	4	2.63	1.41	-0.478
Structural	26	13%	4	15%	7	27%	4	15%	11	42%	4	1	2	1	2.15	1.16	0.645
Quantity Surveyors	14	7%	1	7%	2	14%	2	14%	9	64%	4	1	1	1	1.64	1.01	0.4796
With ISO9000	86	42%	16	19%	16	19%	16	19%	38	44%	4	1	2	1	2.12	1.17	0.3921
Without ISO9000	57	28%	19	33%	6	11%	5	9%	27	47%	4	1	2	1	2.30	1.36	0.1528

Results of the 1998 postal survey of Hong Kong Public Works Consultants

Part	Part 1 Use of IT to assist project communication																
Topic	Electronic communication																
Subject	Use of e-mail in assignment locations for attaching drawing files to written messages																
Q.1.7.6.e	Response										Distribution Statistics						
Sample Sector	Nos	% o/a	No '4'	% '4'	No '3'	% '3'	No '2'	% '2'	No '1'	% '1'	H	L	Median	Mode	Mean	SD	Corr
All	143	69%	26	18%	23	16%	26	18%	68	48%	4	1	2	1	2.05	1.17	0.2982
Architecture	29	14%	2	7%	3	10%	5	17%	19	66%	4	1	1	1	1.59	0.95	0.022
Building Services	12	6%	1	8%	6	50%	2	17%	3	25%	4	1	3	3	2.42	1.00	0.3861
Civil	96	46%	24	25%	19	20%	19	20%	34	35%	4	1	2	1	2.34	1.20	0.3234
Landscaping	8	4%	3	38%	1	13%	1	13%	3	38%	4	1	2.5	4	2.50	1.41	-0.432
Structural	26	13%	5	19%	6	23%	4	15%	11	42%	4	1	2	1	2.19	1.20	0.5753
Quantity Surveyors	14	7%	0	0%	2	14%	2	14%	10	71%	3	1	1	1	1.43	0.76	0.8183
With ISO9000	86	42%	14	16%	13	15%	20	23%	39	45%	4	1	2	1	2.02	1.13	0.394
Without ISO9000	57	28%	12	21%	10	18%	6	11%	29	51%	4	1	1	1	2.09	1.24	0.2462

Part	Part 1 Use of IT to assist project communication																
Topic	Electronic communication																
Subject	Use of e-mail in assignment locations for attaching digital photographs to written messages																
Q.1.7.6.f	Response										Distribution Statistics						
Sample Sector	Nos	% o/a	No '4'	% '4'	No '3'	% '3'	No '2'	% '2'	No '1'	% '1'	H	L	Median	Mode	Mean	SD	Corr
All	142	69%	11	8%	9	6%	34	24%	88	62%	4	1	1	1	1.60	0.92	0.1385
Architecture	29	14%	2	7%	0	0%	4	14%	23	79%	4	1	1	1	1.34	0.81	-0.145
Building Services	12	6%	0	0%	2	17%	1	8%	9	75%	3	1	1	1	1.42	0.79	0.4735
Civil	96	46%	11	11%	8	8%	28	29%	49	51%	4	1	1	1	1.80	1.01	0.1127
Landscaping	7	3%	1	14%	0	0%	3	43%	3	43%	4	1	2	2	1.86	1.07	-0.449
Structural	26	13%	1	4%	3	12%	6	23%	16	62%	4	1	1	1	1.58	0.86	0.1732
Quantity Surveyors	14	7%	0	0%	1	7%	3	21%	10	71%	3	1	1	1	1.36	0.63	0.6174
With ISO9000	85	41%	5	6%	7	8%	22	26%	51	60%	4	1	1	1	1.60	0.88	0.1744
Without ISO9000	57	28%	6	11%	2	4%	12	21%	37	65%	4	1	1	1	1.60	0.98	0.0797

Results of the 1998 postal survey of Hong Kong Public Works Consultants

Part	Part 1 Use of IT to assist project communication																
Topic	Electronic communication																
Subject	Use of e-mail in assignment locations for attaching digital video images to written messages																
Q.1.7.6.g	Response										Distribution Statistics						
Sample Sector	Nos	% o/a	No '4'	% '4'	No '3'	% '3'	No '2'	% '2'	No '1'	% '1'	H	L	Median	Mode	Mean	SD	Corr
All	142	69%	4	3%	3	2%	27	19%	108	76%	4	1	1	1	1.32	0.66	-0.023
Architecture	29	14%	0	0%	1	3%	3	10%	25	86%	3	1	1	1	1.17	0.47	-0.231
Building Services	12	6%	0	0%	0	0%	0	0%	12	100%	1	1	1	1	1.00	0.00	na
Civil	96	46%	4	4%	3	3%	21	22%	68	71%	4	1	1	1	1.41	0.75	-0.06
Landscaping	7	3%	0	0%	1	14%	1	14%	5	71%	3	1	1	1	1.43	0.79	-0.359
Structural	26	13%	0	0%	1	4%	4	15%	21	81%	3	1	1	1	1.23	0.51	0.0029
Quantity Surveyors	14	7%	0	0%	0	0%	3	21%	11	79%	2	1	1	1	1.21	0.43	0.2318
With ISO9000	85	41%	2	2%	1	1%	20	24%	62	73%	4	1	1	1	1.33	0.62	-0.082
Without ISO9000	57	28%	2	4%	2	4%	7	12%	46	81%	4	1	1	1	1.30	0.71	0.1669

Part	Part 1 Use of IT to assist project communication																
Topic	Electronic communication																
Subject	Use of e-mail in assignment locations for attaching digital sound files to written messages																
Q.1.7.6.h	Response										Distribution Statistics						
Sample Sector	Nos	% o/a	No '4'	% '4'	No '3'	% '3'	No '2'	% '2'	No '1'	% '1'	H	L	Median	Mode	Mean	SD	Corr
All	142	69%	4	3%	2	1%	23	16%	113	80%	4	1	1	1	1.27	0.63	-0.04
Architecture	29	14%	0	0%	0	0%	4	14%	25	86%	2	1	1	1	1.14	0.35	-0.208
Building Services	12	6%	0	0%	0	0%	0	0%	12	100%	1	1	1	1	1.00	0.00	na
Civil	96	46%	4	4%	2	2%	18	19%	72	75%	4	1	1	1	1.35	0.73	-0.064
Landscaping	7	3%	0	0%	0	0%	2	29%	5	71%	2	1	1	1	1.29	0.49	-0.386
Structural	26	13%	0	0%	1	4%	4	15%	21	81%	3	1	1	1	1.23	0.51	0.0029
Quantity Surveyors	14	7%	0	0%	0	0%	2	14%	12	86%	2	1	1	1	1.14	0.36	0.0934
With ISO9000	85	41%	2	2%	1	1%	17	20%	65	76%	4	1	1	1	1.29	0.61	-0.079
Without ISO9000	57	28%	2	4%	1	2%	6	11%	48	84%	4	1	1	1	1.25	0.66	0.0136

Results of the 1998 postal survey of Hong Kong Public Works Consultants

Part	Part 1 Use of IT to assist project communication																
Topic	Electronic communication																
Subject	Use of e-mail in assignment locations for assigning/delegating an action																
Q.1.7.6.I	Response										Distribution Statistics						
Sample Sector	Nos	% o/a	No '4'	% '4'	No '3'	% '3'	No '2'	% '2'	No '1'	% '1'	H	L	Median	Mode	Mean	SD	Corr
All	142	69%	18	13%	21	15%	23	16%	80	56%	4	1	1	1	1.84	1.10	0.0998
Architecture	29	14%	1	3%	2	7%	3	10%	23	79%	4	1	1	1	1.34	0.77	0.1623
Building Services	12	6%	0	0%	3	25%	2	17%	7	58%	3	1	1	1	1.67	0.89	0.7482
Civil	96	46%	18	19%	19	20%	16	17%	43	45%	4	1	2	1	2.13	1.18	0.0493
Landscaping	7	3%	1	14%	2	29%	1	14%	3	43%	4	1	2	1	2.14	1.21	-0.289
Structural	26	13%	3	12%	3	12%	7	27%	13	50%	4	1	1.5	1	1.85	1.05	0.1039
Quantity Surveyors	14	7%	0	0%	2	14%	2	14%	10	71%	3	1	1	1	1.43	0.76	0.8343
With ISO9000	85	41%	8	9%	10	12%	18	21%	49	58%	4	1	1	1	1.73	1.00	0.1715
Without ISO9000	57	28%	10	18%	11	19%	5	9%	31	54%	4	1	1	1	2.00	1.21	0.2126

Part	Part 1 Use of IT to assist project communication																
Topic	Electronic communication																
Subject	Company home page on the Internet																
Q.1.7.7	Response										Distribution Statistics						
Sample Sector	Nos	% o/a	No '4'	% '4'	No '3'	% '3'	No '2'	% '2'	No '1'	% '1'	H	L	Median	Mode	Mean	SD	Corr
All	149	72%	57	38%	0	0%	0	0%	92	62%	4	1	1	1	2.15	1.46	0.1905
Architecture	29	14%	10	34%	0	0%	0	0%	19	66%	4	1	1	1	2.03	1.45	-0.394
Building Services	12	6%	2	17%	0	0%	0	0%	10	83%	4	1	1	1	1.50	1.17	0.7054
Civil	101	49%	46	46%	0	0%	0	0%	55	54%	4	1	1	1	2.37	1.50	0.2315
Landscaping	8	4%	4	50%	0	0%	0	0%	4	50%	4	1	2.5	4	2.50	1.60	0.0685
Structural	26	13%	7	27%	0	0%	0	0%	19	73%	4	1	1	1	1.81	1.36	0.6769
Quantity Surveyors	15	7%	4	27%	0	0%	0	0%	11	73%	4	1	1	1	1.80	1.37	0.5093
With ISO9000	88	43%	35	40%	0	0%	0	0%	53	60%	4	1	1	1	2.19	1.48	0.2764
Without ISO9000	61	29%	22	36%	0	0%	0	0%	39	64%	4	1	1	1	2.08	1.45	-0.145

Results of the 1998 postal survey of Hong Kong Public Works Consultants

Part	Part 1 Use of IT to assist project communication																
Topic	Electronic communication																
Subject	Company Internet server																
Q.1.7.8	Response										Distribution Statistics						
Sample Sector	Nos	% o/a	No '4'	% '4'	No '3'	% '3'	No '2'	% '2'	No '1'	% '1'	H	L	Median	Mode	Mean	SD	Corr
All	149	72%	51	34%	0	0%	0	0%	98	66%	4	1	1	1	2.03	1.43	0.1524
Architecture	29	14%	7	24%	0	0%	0	0%	22	76%	4	1	1	1	1.72	1.31	-0.156
Building Services	12	6%	4	33%	0	0%	0	0%	8	67%	4	1	1	1	2.00	1.48	-0.103
Civil	101	49%	38	38%	0	0%	0	0%	63	62%	4	1	1	1	2.13	1.46	0.1662
Landscaping	8	4%	4	50%	0	0%	0	0%	4	50%	4	1	2.5	4	2.50	1.60	0.0685
Structural	26	13%	10	38%	0	0%	0	0%	16	62%	4	1	1	1	2.15	1.49	0.1747
Quantity Surveyors	15	7%	5	33%	0	0%	0	0%	10	67%	4	1	1	1	2.00	1.46	0.0784
With ISO9000	88	43%	33	38%	0	0%	0	0%	55	63%	4	1	1	1	2.13	1.46	0.1558
Without ISO9000	61	29%	18	30%	0	0%	0	0%	43	70%	4	1	1	1	1.89	1.38	0.1125

Part	Part 1 Use of IT to assist project communication																
Topic	Electronic communication																
Subject	Provision of an Internet service to managerial staff																
Q.1.7.9.a	Response										Distribution Statistics						
Sample Sector	Nos	% o/a	No '4'	% '4'	No '3'	% '3'	No '2'	% '2'	No '1'	% '1'	H	L	Median	Mode	Mean	SD	Corr
All	149	72%	84	56%	27	18%	8	5%	30	20%	4	1	4	4	3.11	1.19	-0.044
Architecture	29	14%	11	38%	4	14%	4	14%	10	34%	4	1	3	4	2.55	1.33	-0.124
Building Services	12	6%	6	50%	4	33%	1	8%	1	8%	4	1	3.5	4	3.25	0.97	-0.086
Civil	101	49%	61	60%	20	20%	3	3%	17	17%	4	1	4	4	3.24	1.12	-0.041
Landscaping	8	4%	4	50%	2	25%	0	0%	2	25%	4	1	3.5	4	3.00	1.31	-0.607
Structural	26	13%	12	46%	7	27%	1	4%	6	23%	4	1	3	4	2.96	1.22	0.02
Quantity Surveyors	15	7%	7	47%	3	20%	2	13%	3	20%	4	1	3	4	2.93	1.22	-0.108
With ISO9000	88	43%	44	50%	18	20%	7	8%	19	22%	4	1	3.5	4	2.99	1.21	0.0112
Without ISO9000	61	29%	40	66%	9	15%	1	2%	11	18%	4	1	4	4	3.28	1.16	-0.027

Results of the 1998 postal survey of Hong Kong Public Works Consultants

Part	Part 1 Use of IT to assist project communication																
Topic	Electronic communication																
Subject	Provision of an Internet service to professional staff																
Q.1.7.9.b	Response										Distribution Statistics						
Sample Sector	Nos	% o/a	No '4'	% '4'	No '3'	% '3'	No '2'	% '2'	No '1'	% '1'	H	L	Median	Mode	Mean	SD	Corr
All	149	72%	65	44%	31	21%	23	15%	30	20%	4	1	3	4	2.88	1.18	-0.058
Architecture	29	14%	6	21%	5	17%	8	28%	10	34%	4	1	2	1	2.24	1.15	-0.264
Building Services	12	6%	4	33%	2	17%	5	42%	1	8%	4	1	2.5	2	2.75	1.06	-0.39
Civil	101	49%	48	48%	24	24%	11	11%	18	18%	4	1	3	4	3.01	1.14	-0.04
Landscaping	8	4%	4	50%	2	25%	0	0%	2	25%	4	1	3.5	4	3.00	1.31	-0.607
Structural	26	13%	6	23%	9	35%	5	19%	6	23%	4	1	3	3	2.58	1.10	-0.011
Quantity Surveyors	15	7%	6	40%	1	7%	5	33%	3	20%	4	1	2	4	2.67	1.23	-0.075
With ISO9000	88	43%	32	36%	20	23%	19	22%	17	19%	4	1	3	4	2.76	1.14	-0.035
Without ISO9000	61	29%	33	54%	11	18%	4	7%	13	21%	4	1	4	4	3.05	1.22	0.0905

Part	Part 1 Use of IT to assist project communication																
Topic	Electronic communication																
Subject	Provision of an Internet service to technical staff																
Q.1.7.9.c	Response										Distribution Statistics						
Sample Sector	Nos	% o/a	No '4'	% '4'	No '3'	% '3'	No '2'	% '2'	No '1'	% '1'	H	L	Median	Mode	Mean	SD	Corr
All	149	72%	41	28%	27	18%	31	21%	50	34%	4	1	2	1	2.40	1.21	-0.12
Architecture	29	14%	5	17%	1	3%	8	28%	15	52%	4	1	1	1	1.86	1.13	-0.371
Building Services	12	6%	4	33%	0	0%	5	42%	3	25%	4	1	2	2	2.42	1.24	-0.349
Civil	101	49%	30	30%	24	24%	18	18%	29	29%	4	1	3	4	2.54	1.20	-0.139
Landscaping	8	4%	1	13%	3	38%	2	25%	2	25%	4	1	2.5	3	2.38	1.06	-0.006
Structural	26	13%	2	8%	5	19%	7	27%	12	46%	4	1	2	1	1.88	0.99	-0.04
Quantity Surveyors	15	7%	3	20%	2	13%	4	27%	6	40%	4	1	2	1	2.13	1.19	0.1412
With ISO9000	88	43%	20	23%	13	15%	25	28%	30	34%	4	1	2	1	2.26	1.16	-0.12
Without ISO9000	61	29%	21	34%	14	23%	6	10%	20	33%	4	1	3	4	2.59	1.27	0.0732

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Part	Part 1 Use of IT to assist project communication																
Topic	Electronic communication																
Subject	Provision of an Internet service to administrative , clerical and other staff																
Q.1.7.9.d	Response										Distribution Statistics						
Sample Sector	Nos	% o/a	No '4'	% '4'	No '3'	% '3'	No '2'	% '2'	No '1'	% '1'	H	L	Median	Mode	Mean	SD	Corr
All	149	72%	26	17%	25	17%	32	21%	66	44%	4	1	2	1	2.07	1.15	-0.044
Architecture	29	14%	3	10%	0	0%	10	34%	16	55%	4	1	1	1	1.66	0.94	-0.372
Building Services	12	6%	2	17%	2	17%	2	17%	6	50%	4	1	1.5	1	2.00	1.21	0.1065
Civil	101	49%	20	20%	20	20%	19	19%	42	42%	4	1	2	1	2.18	1.18	-0.038
Landscaping	8	4%	2	25%	2	25%	2	25%	2	25%	4	1	2.5	2	2.50	1.20	-0.494
Structural	26	13%	0	0%	5	19%	8	31%	13	50%	3	1	1.5	1	1.69	0.79	0.2624
Quantity Surveyors	15	7%	1	7%	4	27%	4	27%	6	40%	4	1	2	1	2.00	1.00	0.1301
With ISO9000	88	43%	13	15%	15	17%	24	27%	36	41%	4	1	2	1	2.06	1.09	-0.039
Without ISO9000	61	29%	13	21%	10	16%	8	13%	30	49%	4	1	2	1	2.10	1.23	-0.075

Part	Part 2 Purpose of the IT																
Topic	.																
Subject	Transmission of lists of 'activities' ('work-content data) using IT																
Q.2.1.a	Response										Distribution Statistics						
Sample Sector	Nos	% o/a	No '4'	% '4'	No '3'	% '3'	No '2'	% '2'	No '1'	% '1'	H	L	Median	Mode	Mean	SD	Corr
All	144	70%	34	24%	44	31%	43	30%	23	16%	4	1	3	3	2.62	1.02	0.1437
Architecture	29	14%	5	17%	6	21%	12	41%	6	21%	4	1	2	2	2.34	1.01	-0.007
Building Services	12	6%	3	25%	3	25%	5	42%	1	8%	4	1	2.5	2	2.67	0.98	-0.215
Civil	96	46%	25	26%	32	33%	26	27%	13	14%	4	1	3	3	2.72	1.00	0.1723
Landscaping	8	4%	1	13%	3	38%	2	25%	2	25%	4	1	2.5	3	2.38	1.06	0.1318
Structural	26	13%	6	23%	8	31%	6	23%	6	23%	4	1	3	3	2.54	1.10	0.2889
Quantity Surveyors	15	7%	4	27%	3	20%	6	40%	2	13%	4	1	2	2	2.60	1.06	-0.098
With ISO9000	88	43%	20	23%	27	31%	30	34%	11	13%	4	1	3	2	2.64	0.97	0.1734
Without ISO9000	56	27%	14	25%	17	30%	13	23%	12	21%	4	1	3	3	2.59	1.09	0.09

Results of the 1998 postal survey of Hong Kong Public Works Consultants

Part	Part 2 Purpose of the IT																
Topic	.																
Subject	Transmission of lists of 'deliverables ' ('work-content data) using IT																
Q.2.1.b	Response										Distribution Statistics						
Sample Sector	Nos	% o/a	No '4'	% '4'	No '3'	% '3'	No '2'	% '2'	No '1'	% '1'	H	L	Median	Mode	Mean	SD	Corr
All	144	70%	31	22%	43	30%	44	31%	26	18%	4	1	3	2	2.55	1.02	0.1831
Architecture	29	14%	4	14%	8	28%	11	38%	6	21%	4	1	2	2	2.34	0.97	0.0826
Building Services	12	6%	4	33%	3	25%	4	33%	1	8%	4	1	3	2	2.83	1.03	-0.228
Civil	96	46%	22	23%	32	33%	26	27%	16	17%	4	1	3	3	2.63	1.02	0.2074
Landscaping	8	4%	1	13%	2	25%	2	25%	3	38%	4	1	2	1	2.13	1.13	0.0012
Structural	26	13%	6	23%	8	31%	6	23%	6	23%	4	1	3	3	2.54	1.10	0.3371
Quantity Surveyors	15	7%	4	27%	2	13%	7	47%	2	13%	4	1	2	2	2.53	1.06	-0.057
With ISO9000	88	43%	20	23%	27	31%	30	34%	11	13%	4	1	3	2	2.64	0.97	0.1815
Without ISO9000	56	27%	11	20%	16	29%	14	25%	15	27%	4	1	2	3	2.41	1.09	0.1142

Part	Part 2 Purpose of the IT																
Topic	.																
Subject	Transmission of lists of 'changes in scope/standards' ('work-content data) using IT																
Q.2.1.c	Response										Distribution Statistics						
Sample Sector	Nos	% o/a	No '4'	% '4'	No '3'	% '3'	No '2'	% '2'	No '1'	% '1'	H	L	Median	Mode	Mean	SD	Corr
All	144	70%	27	19%	43	30%	44	31%	30	21%	4	1	2	2	2.47	1.02	0.1438
Architecture	29	14%	4	14%	8	28%	8	28%	9	31%	4	1	2	1	2.24	1.06	0.0428
Building Services	12	6%	3	25%	3	25%	5	42%	1	8%	4	1	2.5	2	2.67	0.98	-0.074
Civil	96	46%	19	20%	30	31%	30	31%	17	18%	4	1	3	3	2.53	1.00	0.1705
Landscaping	8	4%	1	13%	2	25%	1	13%	4	50%	4	1	1.5	1	2.00	1.20	0.0525
Structural	26	13%	3	12%	9	35%	7	27%	7	27%	4	1	2	3	2.31	1.01	0.2758
Quantity Surveyors	15	7%	4	27%	3	20%	6	40%	2	13%	4	1	2	2	2.60	1.06	-0.097
With ISO9000	88	43%	17	19%	24	27%	33	38%	14	16%	4	1	2	2	2.50	0.98	0.1643
Without ISO9000	56	27%	10	18%	19	34%	11	20%	16	29%	4	1	3	3	2.41	1.09	0.1038

Results of the 1998 postal survey of Hong Kong Public Works Consultants

Part	Part 2 Purpose of the IT																
Topic	.																
Subject	Transmission of lists of 'disputes and their status' ('work-content data) using IT																
Q.2.1.d	Response										Distribution Statistics						
Sample Sector	Nos	% o/a	No '4'	% '4'	No '3'	% '3'	No '2'	% '2'	No '1'	% '1'	H	L	Median	Mode	Mean	SD	Corr
All	144	70%	23	16%	37	26%	43	30%	41	28%	4	1	2	2	2.29	1.05	0.1255
Architecture	29	14%	5	17%	6	21%	8	28%	10	34%	4	1	2	1	2.21	1.11	0.0876
Building Services	12	6%	2	17%	5	42%	3	25%	2	17%	4	1	3	3	2.58	1.00	-0.301
Civil	96	46%	15	16%	26	27%	30	31%	25	26%	4	1	2	2	2.32	1.03	0.137
Landscaping	8	4%	1	13%	2	25%	1	13%	4	50%	4	1	1.5	1	2.00	1.20	0.0525
Structural	26	13%	2	8%	8	31%	8	31%	8	31%	4	1	2	1	2.15	0.97	0.3479
Quantity Surveyors	15	7%	3	20%	3	20%	6	40%	3	20%	4	1	2	2	2.40	1.06	-0.014
With ISO9000	88	43%	13	15%	22	25%	35	40%	18	20%	4	1	2	2	2.34	0.97	0.1466
Without ISO9000	56	27%	10	18%	15	27%	8	14%	23	41%	4	1	2	1	2.21	1.17	0.0406

Part	Part 2 Purpose of the IT																
Topic	.																
Subject	Use of the telephone to communicate transmit work-content related data/information																
Q.2.2.a	Response										Distribution Statistics						
Sample Sector	Nos	% o/a	No '4'	% '4'	No '3'	% '3'	No '2'	% '2'	No '1'	% '1'	H	L	Median	Mode	Mean	SD	Corr
All	145	70%	79	54%	46	32%	14	10%	6	4%	4	1	4	4	3.37	0.82	0.1815
Architecture	29	14%	20	69%	6	21%	1	3%	2	7%	4	1	4	4	3.52	0.87	0.1983
Building Services	12	6%	6	50%	4	33%	1	8%	1	8%	4	1	3.5	4	3.25	0.97	0.0374
Civil	97	47%	52	54%	30	31%	11	11%	4	4%	4	1	4	4	3.34	0.84	0.1893
Landscaping	8	4%	5	63%	3	38%	0	0%	0	0%	4	3	4	4	3.63	0.52	0.5581
Structural	26	13%	14	54%	9	35%	1	4%	2	8%	4	1	4	4	3.35	0.89	0.2064
Quantity Surveyors	15	7%	8	53%	6	40%	1	7%	0	0%	4	2	4	4	3.47	0.64	-0.082
With ISO9000	88	43%	54	61%	26	30%	5	6%	3	3%	4	1	4	4	3.49	0.76	0.1254
Without ISO9000	57	28%	25	44%	20	35%	9	16%	3	5%	4	1	3	4	3.18	0.89	0.2035

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Part	Part 2 Purpose of the IT																
Topic	.																
Subject	Use of the fax to communicate transmit work-content related data/information																
Q.2.2.b	Response										Distribution Statistics						
Sample Sector	Nos	% o/a	No '4'	% '4'	No '3'	% '3'	No '2'	% '2'	No '1'	% '1'	H	L	Median	Mode	Mean	SD	Corr
All	145	70%	86	59%	47	32%	8	6%	4	3%	4	1	4	4	3.48	0.73	0.1001
Architecture	29	14%	22	76%	5	17%	1	3%	1	3%	4	1	4	4	3.66	0.72	-0.039
Building Services	12	6%	6	50%	6	50%	0	0%	0	0%	4	3	3.5	3	3.50	0.52	-0.084
Civil	97	47%	57	59%	30	31%	7	7%	3	3%	4	1	4	4	3.45	0.76	0.1171
Landscaping	8	4%	6	75%	2	25%	0	0%	0	0%	4	3	4	4	3.75	0.46	0.4912
Structural	26	13%	15	58%	10	38%	0	0%	1	4%	4	1	4	4	3.50	0.71	0.1928
Quantity Surveyors	15	7%	9	60%	6	40%	0	0%	0	0%	4	3	4	4	3.60	0.51	-0.259
With ISO9000	88	43%	57	65%	26	30%	4	5%	1	1%	4	1	4	4	3.58	0.64	0.0181
Without ISO9000	57	28%	29	51%	21	37%	4	7%	3	5%	4	1	4	4	3.33	0.83	0.2221

Part	Part 2 Purpose of the IT																
Topic	.																
Subject	Use of e-mail to communicate transmit work-content related data/information																
Q.2.2.c	Response										Distribution Statistics						
Sample Sector	Nos	% o/a	No '4'	% '4'	No '3'	% '3'	No '2'	% '2'	No '1'	% '1'	H	L	Median	Mode	Mean	SD	Corr
All	144	70%	31	22%	62	43%	38	26%	13	9%	4	1	3	3	2.77	0.89	0.1593
Architecture	29	14%	4	14%	6	21%	15	52%	4	14%	4	1	2	2	2.34	0.90	-0.335
Building Services	12	6%	1	8%	8	67%	2	17%	1	8%	4	1	3	3	2.75	0.75	-0.032
Civil	97	47%	26	27%	46	47%	20	21%	5	5%	4	1	3	3	2.96	0.83	0.2101
Landscaping	8	4%	4	50%	3	38%	1	13%	0	0%	4	2	3.5	4	3.38	0.74	0.2442
Structural	26	13%	4	15%	13	50%	4	15%	5	19%	4	1	3	3	2.62	0.98	0.4884
Quantity Surveyors	14	7%	0	0%	7	50%	4	29%	3	21%	3	1	2.5	3	2.29	0.83	0.4436
With ISO9000	87	42%	16	18%	39	45%	25	29%	7	8%	4	1	3	3	2.74	0.86	0.263
Without ISO9000	57	28%	15	26%	23	40%	13	23%	6	11%	4	1	3	3	2.82	0.95	-0.039

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Part	Part 2 Purpose of the IT																
Topic	.																
Subject	Use of hardcopy to communicate transmit work-content related data/information																
Q.2.2.d	Response										Distribution Statistics						
Sample Sector	Nos	% o/a	No '4'	% '4'	No '3'	% '3'	No '2'	% '2'	No '1'	% '1'	H	L	Median	Mode	Mean	SD	Corr
All	145	70%	96	66%	37	26%	8	6%	4	3%	4	1	4	4	3.55	0.73	0.2034
Architecture	29	14%	25	86%	3	10%	0	0%	1	3%	4	1	4	4	3.79	0.62	0.1488
Building Services	12	6%	9	75%	3	25%	0	0%	0	0%	4	3	4	4	3.75	0.45	0.5155
Civil	97	47%	60	62%	26	27%	8	8%	3	3%	4	1	4	4	3.47	0.78	0.2394
Landscaping	8	4%	5	63%	3	38%	0	0%	0	0%	4	3	4	4	3.63	0.52	-0.048
Structural	26	13%	18	69%	6	23%	1	4%	1	4%	4	1	4	4	3.58	0.76	0.2513
Quantity Surveyors	15	7%	11	73%	4	27%	0	0%	0	0%	4	3	4	4	3.73	0.46	0.1054
With ISO9000	88	43%	65	74%	19	22%	3	3%	1	1%	4	1	4	4	3.68	0.60	0.1747
Without ISO9000	57	28%	31	54%	18	32%	5	9%	3	5%	4	1	4	4	3.35	0.86	0.1169

Part	Part 2 Purpose of the IT																
Topic	.																
Subject	Transmission of 'work schedule of activities' ('time-content data) using IT																
Q.2.3.a	Response										Distribution Statistics						
Sample Sector	Nos	% o/a	No '4'	% '4'	No '3'	% '3'	No '2'	% '2'	No '1'	% '1'	H	L	Median	Mode	Mean	SD	Corr
All	141	68%	38	27%	46	33%	32	23%	25	18%	4	1	3	3	2.69	1.06	0.1267
Architecture	29	14%	8	28%	9	31%	5	17%	7	24%	4	1	3	3	2.62	1.15	-0.234
Building Services	12	6%	2	17%	6	50%	4	33%	0	0%	4	2	3	3	2.83	0.72	-0.396
Civil	93	45%	27	29%	28	30%	24	26%	14	15%	4	1	3	3	2.73	1.04	0.188
Landscaping	8	4%	2	25%	2	25%	1	13%	3	38%	4	1	2.5	1	2.38	1.30	-0.158
Structural	26	13%	4	15%	10	38%	5	19%	7	27%	4	1	3	3	2.42	1.06	0.3543
Quantity Surveyors	15	7%	4	27%	4	27%	4	27%	3	20%	4	1	3	3	2.60	1.12	-0.08
With ISO9000	88	43%	24	27%	31	35%	20	23%	13	15%	4	1	3	3	2.75	1.02	0.1308
Without ISO9000	53	26%	14	26%	15	28%	12	23%	12	23%	4	1	3	3	2.58	1.12	0.0335

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Part	Part 2 Purpose of the IT																
Topic	.																
Subject	Transmission of '%work done' ('time-content data) using IT																
Q.2.3.b	Response										Distribution Statistics						
Sample Sector	Nos	% o/a	No '4'	% '4'	No '3'	% '3'	No '2'	% '2'	No '1'	% '1'	H	L	Median	Mode	Mean	SD	Corr
All	141	68%	28	20%	49	35%	35	25%	29	21%	4	1	3	3	2.54	1.03	0.181
Architecture	29	14%	6	21%	10	34%	6	21%	7	24%	4	1	3	3	2.52	1.09	-0.163
Building Services	12	6%	2	17%	6	50%	3	25%	1	8%	4	1	3	3	2.75	0.87	-0.439
Civil	93	45%	19	20%	32	34%	24	26%	18	19%	4	1	3	3	2.56	1.03	0.2471
Landscaping	8	4%	1	13%	3	38%	1	13%	3	38%	4	1	2.5	1	2.25	1.16	-0.016
Structural	26	13%	4	15%	10	38%	5	19%	7	27%	4	1	3	3	2.42	1.06	0.3543
Quantity Surveyors	15	7%	4	27%	2	13%	6	40%	3	20%	4	1	2	2	2.47	1.13	-0.018
With ISO9000	88	43%	20	23%	31	35%	23	26%	14	16%	4	1	3	3	2.65	1.01	0.1581
Without ISO9000	53	26%	8	15%	18	34%	12	23%	15	28%	4	1	2	3	2.36	1.06	0.1238

Part	Part 2 Purpose of the IT																
Topic	.																
Subject	Transmission of '%work to be done' ('time-content data) using IT																
Q.2.3.c	Response										Distribution Statistics						
Sample Sector	Nos	% o/a	No '4'	% '4'	No '3'	% '3'	No '2'	% '2'	No '1'	% '1'	H	L	Median	Mode	Mean	SD	Corr
All	140	68%	26	19%	47	34%	39	28%	28	20%	4	1	3	3	2.51	1.01	0.1524
Architecture	29	14%	6	21%	8	28%	8	28%	7	24%	4	1	2	3	2.45	1.09	-0.168
Building Services	12	6%	2	17%	5	42%	4	33%	1	8%	4	1	3	3	2.67	0.89	-0.431
Civil	92	44%	17	18%	32	35%	26	28%	17	18%	4	1	3	3	2.53	1.00	0.2146
Landscaping	8	4%	1	13%	3	38%	1	13%	3	38%	4	1	2.5	1	2.25	1.16	-0.016
Structural	26	13%	3	12%	10	38%	6	23%	7	27%	4	1	2.5	3	2.35	1.02	0.3501
Quantity Surveyors	15	7%	4	27%	2	13%	6	40%	3	20%	4	1	2	2	2.47	1.13	-0.018
With ISO9000	87	42%	18	21%	30	34%	25	29%	14	16%	4	1	3	3	2.60	0.99	0.1311
Without ISO9000	53	26%	8	15%	17	32%	14	26%	14	26%	4	1	2	3	2.36	1.04	0.1073

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Part	Part 2 Purpose of the IT																
Topic	.																
Subject	Transmission of 're-planned work' ('time-content data) using IT																
Q.2.3.d	Response										Distribution Statistics						
Sample Sector	Nos	% o/a	No '4'	% '4'	No '3'	% '3'	No '2'	% '2'	No '1'	% '1'	H	L	Median	Mode	Mean	SD	Corr
All	141	68%	27	19%	53	38%	34	24%	27	19%	4	1	3	3	2.57	1.01	0.1738
Architecture	29	14%	5	17%	10	34%	7	24%	7	24%	4	1	3	3	2.45	1.06	-0.184
Building Services	12	6%	2	17%	6	50%	3	25%	1	8%	4	1	3	3	2.75	0.87	-0.235
Civil	93	45%	18	19%	36	39%	23	25%	16	17%	4	1	3	3	2.60	0.99	0.2536
Landscaping	8	4%	1	13%	3	38%	1	13%	3	38%	4	1	2.5	1	2.25	1.16	-0.016
Structural	26	13%	3	12%	11	42%	5	19%	7	27%	4	1	3	3	2.38	1.02	0.3459
Quantity Surveyors	15	7%	5	33%	3	20%	4	27%	3	20%	4	1	3	4	2.67	1.18	-0.112
With ISO9000	88	43%	19	22%	34	39%	21	24%	14	16%	4	1	3	3	2.66	0.99	0.1575
Without ISO9000	53	26%	8	15%	19	36%	13	25%	13	25%	4	1	3	3	2.42	1.03	0.116

Part	Part 2 Purpose of the IT																
Topic	.																
Subject	Use of the telephone to communicate transmit time-content related data/information																
Q.2.4.a	Response										Distribution Statistics						
Sample Sector	Nos	% o/a	No '4'	% '4'	No '3'	% '3'	No '2'	% '2'	No '1'	% '1'	H	L	Median	Mode	Mean	SD	Corr
All	142	69%	68	48%	38	27%	27	19%	9	6%	4	1	3	4	3.16	0.95	0.1149
Architecture	29	14%	19	66%	6	21%	3	10%	1	3%	4	1	4	4	3.48	0.83	0.0512
Building Services	12	6%	5	42%	4	33%	2	17%	1	8%	4	1	3	4	3.08	1.00	0.0336
Civil	94	45%	44	47%	25	27%	19	20%	6	6%	4	1	3	4	3.14	0.96	0.127
Landscaping	8	4%	4	50%	2	25%	2	25%	0	0%	4	2	3.5	4	3.25	0.89	-0.528
Structural	26	13%	11	42%	10	38%	2	8%	3	12%	4	1	3	4	3.12	0.99	0.1134
Quantity Surveyors	15	7%	6	40%	4	27%	3	20%	2	13%	4	1	3	4	2.93	1.10	-0.008
With ISO9000	88	43%	49	56%	22	25%	13	15%	4	5%	4	1	4	4	3.32	0.89	0.0337
Without ISO9000	54	26%	19	35%	16	30%	14	26%	5	9%	4	1	3	4	2.91	1.00	0.1509

Results of the 1998 postal survey of Hong Kong Public Works Consultants

Part	Part 2 Purpose of the IT																	
Topic	.																	
Subject	Use of the fax to communicate transmit time-content related data/information																	
Q.2.4.b	Response										Distribution Statistics							
Sample Sector	Nos	% o/a	No '4'	% '4'	No '3'	% '3'	No '2'	% '2'	No '1'	% '1'	H	L	Median	Mode	Mean	SD	Corr	
All	142	69%	71	50%	52	37%	13	9%	6	4%	4	1	3.5	4	3.32	0.81	0.0956	
Architecture	29	14%	17	59%	10	34%	1	3%	1	3%	4	1	4	4	3.48	0.74	-0.002	
Building Services	12	6%	5	42%	6	50%	1	8%	0	0%	4	2	3	3	3.33	0.65	-0.071	
Civil	94	45%	45	48%	35	37%	11	12%	3	3%	4	1	3	4	3.30	0.80	0.1266	
Landscaping	8	4%	3	38%	4	50%	1	13%	0	0%	4	2	3	3	3.25	0.71	-0.366	
Structural	26	13%	12	46%	12	46%	1	4%	1	4%	4	1	3	4	3.35	0.75	0.0675	
Quantity Surveyors	15	7%	9	60%	4	27%	0	0%	2	13%	4	1	4	4	3.33	1.05	-0.105	
With ISO9000	88	43%	52	59%	28	32%	5	6%	3	3%	4	1	4	4	3.47	0.76	-0.025	
Without ISO9000	54	26%	19	35%	24	44%	8	15%	3	6%	4	1	3	3	3.09	0.85	0.2703	

Part	Part 2 Purpose of the IT																
Topic	.																
Subject	Use of the e-mail to communicate transmit time-content related data/information																
Q.2.4.c	Response										Distribution Statistics						
Sample Sector	Nos	% o/a	No '4'	% '4'	No '3'	% '3'	No '2'	% '2'	No '1'	% '1'	H	L	Median	Mode	Mean	SD	Corr
All	140	68%	29	21%	50	36%	43	31%	18	13%	4	1	3	3	2.64	0.95	0.2053
Architecture	29	14%	2	7%	6	21%	17	59%	4	14%	4	1	2	2	2.21	0.77	0.1075
Building Services	12	6%	0	0%	8	67%	4	33%	0	0%	3	2	3	3	2.67	0.49	0.3061
Civil	94	45%	24	26%	36	38%	25	27%	9	10%	4	1	3	3	2.80	0.93	0.2236
Landscaping	8	4%	2	25%	3	38%	3	38%	0	0%	4	2	3	3	2.88	0.83	-0.365
Structural	25	12%	3	12%	13	52%	2	8%	7	28%	4	1	3	3	2.48	1.05	0.5039
Quantity Surveyors	14	7%	2	14%	7	50%	1	7%	4	29%	4	1	3	3	2.50	1.09	0.1987
With ISO9000	86	42%	19	22%	32	37%	26	30%	9	10%	4	1	3	3	2.71	0.93	0.2505
Without ISO9000	54	26%	10	19%	18	33%	17	31%	9	17%	4	1	3	3	2.54	0.99	-0.049

Results of the 1998 postal survey of Hong Kong Public Works Consultants

Part	Part 2 Purpose of the IT																	
Topic	.																	
Subject	Use of hardcopy to communicate transmit time-content related data/information																	
Q.2.4.d	Response										Distribution Statistics							
Sample Sector	Nos	% o/a	No '4'	% '4'	No '3'	% '3'	No '2'	% '2'	No '1'	% '1'	H	L	Median	Mode	Mean	SD	Corr	
All	143	69%	88	62%	31	22%	17	12%	7	5%	4	1	4	4	3.40	0.88	0.1769	
Architecture	29	14%	23	79%	5	17%	0	0%	1	3%	4	1	4	4	3.72	0.65	0.0453	
Building Services	12	6%	10	83%	2	17%	0	0%	0	0%	4	3	4	4	3.83	0.39	0.3908	
Civil	95	46%	53	56%	21	22%	17	18%	4	4%	4	1	4	4	3.29	0.91	0.2401	
Landscaping	8	4%	7	88%	1	13%	0	0%	0	0%	4	3	4	4	3.88	0.35	0.1737	
Structural	26	13%	19	73%	4	15%	2	8%	1	4%	4	1	4	4	3.58	0.81	0.1005	
Quantity Surveyors	15	7%	10	67%	3	20%	0	0%	2	13%	4	1	4	4	3.40	1.06	0.1033	
With ISO9000	88	43%	63	72%	16	18%	6	7%	3	3%	4	1	4	4	3.58	0.77	0.0564	
Without ISO9000	55	27%	25	45%	15	27%	11	20%	4	7%	4	1	3	4	3.11	0.98	0.315	

Part	Part 2 Purpose of the IT																
Topic	.																
Subject	Transmission of 'value of work done' ('cost content data) using IT																
Q.2.5.a	Response										Distribution Statistics						
Sample Sector	Nos	% o/a	No '4'	% '4'	No '3'	% '3'	No '2'	% '2'	No '1'	% '1'	H	L	Median	Mode	Mean	SD	Corr
All	142	69%	38	27%	40	28%	42	30%	22	15%	4	1	3	2	2.66	1.04	0.1099
Architecture	29	14%	7	24%	4	14%	13	45%	5	17%	4	1	2	2	2.45	1.06	-0.093
Building Services	12	6%	4	33%	4	33%	2	17%	2	17%	4	1	3	3	2.83	1.11	-0.456
Civil	94	45%	25	27%	28	30%	29	31%	12	13%	4	1	3	2	2.70	1.00	0.1516
Landscaping	8	4%	1	13%	2	25%	3	38%	2	25%	4	1	2	2	2.25	1.04	-0.018
Structural	26	13%	7	27%	7	27%	6	23%	6	23%	4	1	3	4	2.58	1.14	0.1566
Quantity Surveyors	15	7%	5	33%	3	20%	3	20%	4	27%	4	1	3	4	2.60	1.24	-0.065
With ISO9000	88	43%	25	28%	27	31%	25	28%	11	13%	4	1	3	3	2.75	1.01	0.0913
Without ISO9000	54	26%	13	24%	13	24%	17	31%	11	20%	4	1	2	2	2.52	1.08	0.0238

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Part	Part 2 Purpose of the IT																
Topic	.																
Subject	Transmission of 'value of work to be done' ('cost content data) using IT																
Q.2.5.b	Response										Distribution Statistics						
Sample Sector	Nos	% o/a	No '4'	% '4'	No '3'	% '3'	No '2'	% '2'	No '1'	% '1'	H	L	Median	Mode	Mean	SD	Corr
All	142	69%	35	25%	41	29%	44	31%	22	15%	4	1	3	2	2.63	1.02	0.0799
Architecture	29	14%	7	24%	3	10%	14	48%	5	17%	4	1	2	2	2.41	1.05	-0.073
Building Services	12	6%	4	33%	3	25%	3	25%	2	17%	4	1	3	4	2.75	1.14	-0.523
Civil	94	45%	21	22%	31	33%	30	32%	12	13%	4	1	3	3	2.65	0.97	0.1168
Landscaping	8	4%	1	13%	2	25%	3	38%	2	25%	4	1	2	2	2.25	1.04	-0.018
Structural	26	13%	4	15%	8	31%	8	31%	6	23%	4	1	2	3	2.38	1.02	0.2086
Quantity Surveyors	15	7%	5	33%	3	20%	3	20%	4	27%	4	1	3	4	2.60	1.24	-0.065
With ISO9000	88	43%	22	25%	27	31%	28	32%	11	13%	4	1	3	2	2.68	0.99	0.0705
Without ISO9000	54	26%	13	24%	14	26%	16	30%	11	20%	4	1	2.5	2	2.54	1.08	0.0136

Part	Part 2 Purpose of the IT																
Topic	.																
Subject	Transmission of 'expenditure' ('cost content data) using IT																
Q.2.5.c	Response										Distribution Statistics						
Sample Sector	Nos	% o/a	No '4'	% '4'	No '3'	% '3'	No '2'	% '2'	No '1'	% '1'	H	L	Median	Mode	Mean	SD	Corr
All	142	69%	36	25%	40	28%	42	30%	24	17%	4	1	3	2	2.62	1.04	0.1292
Architecture	29	14%	5	17%	8	28%	11	38%	5	17%	4	1	2	2	2.45	0.99	-0.116
Building Services	12	6%	3	25%	4	33%	3	25%	2	17%	4	1	3	3	2.67	1.07	-0.149
Civil	94	45%	25	27%	26	28%	29	31%	14	15%	4	1	3	2	2.66	1.03	0.1695
Landscaping	8	4%	1	13%	3	38%	2	25%	2	25%	4	1	2.5	3	2.38	1.06	-0.075
Structural	26	13%	5	19%	5	19%	8	31%	8	31%	4	1	2	2	2.27	1.12	0.3236
Quantity Surveyors	15	7%	5	33%	3	20%	3	20%	4	27%	4	1	3	4	2.60	1.24	-0.065
With ISO9000	88	43%	23	26%	25	28%	28	32%	12	14%	4	1	3	2	2.67	1.01	0.1484
Without ISO9000	54	26%	13	24%	15	28%	14	26%	12	22%	4	1	3	3	2.54	1.09	-0.007

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Part	Part 2 Purpose of the IT																
Topic	.																
Subject	Transmission of 'commitment' ('cost content data) using IT																
Q.2.5.d	Response										Distribution Statistics						
Sample Sector	Nos	% o/a	No '4'	% '4'	No '3'	% '3'	No '2'	% '2'	No '1'	% '1'	H	L	Median	Mode	Mean	SD	Corr
All	142	69%	28	20%	46	32%	42	30%	26	18%	4	1	3	3	2.54	1.01	0.1031
Architecture	29	14%	4	14%	9	31%	10	34%	6	21%	4	1	2	2	2.38	0.98	-0.345
Building Services	12	6%	3	25%	4	33%	2	17%	3	25%	4	1	3	3	2.58	1.16	-0.14
Civil	94	45%	18	19%	32	34%	30	32%	14	15%	4	1	3	3	2.57	0.97	0.1687
Landscaping	8	4%	1	13%	3	38%	1	13%	3	38%	4	1	2.5	1	2.25	1.16	-0.016
Structural	26	13%	4	15%	7	27%	5	19%	10	38%	4	1	2	1	2.19	1.13	0.1949
Quantity Surveyors	15	7%	5	33%	2	13%	4	27%	4	27%	4	1	2	4	2.53	1.25	-0.042
With ISO9000	88	43%	19	22%	28	32%	25	28%	16	18%	4	1	3	3	2.57	1.03	0.1132
Without ISO9000	54	26%	9	17%	18	33%	17	31%	10	19%	4	1	2.5	3	2.48	0.99	0.0335

Part	Part 2 Purpose of the IT																
Topic	.																
Subject	Transmission of 'value of variations' ('cost content data) using IT																
Q.2.5.e	Response										Distribution Statistics						
Sample Sector	Nos	% o/a	No '4'	% '4'	No '3'	% '3'	No '2'	% '2'	No '1'	% '1'	H	L	Median	Mode	Mean	SD	Corr
All	142	69%	31	22%	42	30%	45	32%	24	17%	4	1	3	2	2.56	1.01	0.1506
Architecture	29	14%	6	21%	5	17%	13	45%	5	17%	4	1	2	2	2.41	1.02	-0.083
Building Services	12	6%	3	25%	5	42%	3	25%	1	8%	4	1	3	3	2.83	0.94	-0.305
Civil	94	45%	18	19%	31	33%	31	33%	14	15%	4	1	3	3	2.56	0.97	0.2144
Landscaping	8	4%	1	13%	2	25%	2	25%	3	38%	4	1	2	1	2.13	1.13	0.0383
Structural	26	13%	5	19%	7	27%	8	31%	6	23%	4	1	2	2	2.42	1.06	0.2365
Quantity Surveyors	15	7%	6	40%	2	13%	3	20%	4	27%	4	1	3	4	2.67	1.29	-0.095
With ISO9000	88	43%	22	25%	28	32%	27	31%	11	13%	4	1	3	3	2.69	0.99	0.1251
Without ISO9000	54	26%	9	17%	14	26%	18	33%	13	24%	4	1	2	2	2.35	1.03	0.0532

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Part	Part 2 Purpose of the IT																
Topic	.																
Subject	Transmission of 'value of disputes' ('cost content data) using IT																
Q.2.5.f	Response										Distribution Statistics						
Sample Sector	Nos	% o/a	No '4'	% '4'	No '3'	% '3'	No '2'	% '2'	No '1'	% '1'	H	L	Median	Mode	Mean	SD	Corr
All	142	69%	25	18%	41	29%	50	35%	26	18%	4	1	2	2	2.46	0.99	0.1394
Architecture	29	14%	5	17%	5	17%	14	48%	5	17%	4	1	2	2	2.34	0.97	-0.019
Building Services	12	6%	2	17%	5	42%	4	33%	1	8%	4	1	3	3	2.67	0.89	-0.25
Civil	94	45%	15	16%	30	32%	34	36%	15	16%	4	1	2	2	2.48	0.95	0.174
Landscaping	8	4%	1	13%	2	25%	2	25%	3	38%	4	1	2	1	2.13	1.13	0.0383
Structural	26	13%	2	8%	9	35%	8	31%	7	27%	4	1	2	3	2.23	0.95	0.2958
Quantity Surveyors	15	7%	4	27%	3	20%	4	27%	4	27%	4	1	2	1	2.47	1.19	-0.009
With ISO9000	88	43%	16	18%	28	32%	32	36%	12	14%	4	1	2.5	2	2.55	0.95	0.1369
Without ISO9000	54	26%	9	17%	13	24%	18	33%	14	26%	4	1	2	2	2.31	1.04	0.0474

Part	Part 2 Purpose of the IT																
Topic	.																
Subject	Transmission of 'money received' ('cost content data) using IT																
Q.2.5.g	Response										Distribution Statistics						
Sample Sector	Nos	% o/a	No '4'	% '4'	No '3'	% '3'	No '2'	% '2'	No '1'	% '1'	H	L	Median	Mode	Mean	SD	Corr
All	142	69%	40	28%	36	25%	41	29%	25	18%	4	1	3	2	2.64	1.07	0.1013
Architecture	29	14%	8	28%	4	14%	12	41%	5	17%	4	1	2	2	2.52	1.09	-0.153
Building Services	12	6%	4	33%	3	25%	3	25%	2	17%	4	1	3	4	2.75	1.14	-0.226
Civil	94	45%	23	24%	29	31%	27	29%	15	16%	4	1	3	3	2.64	1.02	0.1561
Landscaping	8	4%	1	13%	3	38%	1	13%	3	38%	4	1	2.5	1	2.25	1.16	-0.016
Structural	26	13%	6	23%	6	23%	6	23%	8	31%	4	1	2	1	2.38	1.17	0.1872
Quantity Surveyors	15	7%	6	40%	1	7%	4	27%	4	27%	4	1	2	4	2.60	1.30	-0.061
With ISO9000	88	43%	29	33%	18	20%	28	32%	13	15%	4	1	3	4	2.72	1.08	0.0967
Without ISO9000	54	26%	11	20%	18	33%	13	24%	12	22%	4	1	3	3	2.52	1.06	-0.009

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Part	Part 2 Purpose of the IT																
Topic	.																
Subject	Transmission of 'money outstanding' ('cost content data) using IT																
Q.2.5.h	Response										Distribution Statistics						
Sample Sector	Nos	% o/a	No '4'	% '4'	No '3'	% '3'	No '2'	% '2'	No '1'	% '1'	H	L	Median	Mode	Mean	SD	Corr
All	142	69%	41	29%	35	25%	41	29%	25	18%	4	1	3	2	2.65	1.08	0.107
Architecture	29	14%	8	28%	4	14%	12	41%	5	17%	4	1	2	2	2.52	1.09	-0.153
Building Services	12	6%	5	42%	2	17%	3	25%	2	17%	4	1	3	4	2.83	1.19	-0.213
Civil	94	45%	24	26%	28	30%	27	29%	15	16%	4	1	3	3	2.65	1.03	0.1627
Landscaping	8	4%	1	13%	3	38%	1	13%	3	38%	4	1	2.5	1	2.25	1.16	-0.016
Structural	26	13%	7	27%	5	19%	6	23%	8	31%	4	1	2	1	2.42	1.21	0.1795
Quantity Surveyors	15	7%	6	40%	1	7%	4	27%	4	27%	4	1	2	4	2.60	1.30	-0.061
With ISO9000	88	43%	30	34%	18	20%	27	31%	13	15%	4	1	3	4	2.74	1.09	0.0938
Without ISO9000	54	26%	11	20%	17	31%	14	26%	12	22%	4	1	3	3	2.50	1.06	0.0014

Part	Part 2 Purpose of the IT																
Topic	.																
Subject	Use of the telephone to communicate transmit cost related data/information																
Q.2.6.a	Response										Distribution Statistics						
Sample Sector	Nos	% o/a	No '4'	% '4'	No '3'	% '3'	No '2'	% '2'	No '1'	% '1'	H	L	Median	Mode	Mean	SD	Corr
All	142	69%	47	33%	43	30%	40	28%	12	8%	4	1	3	4	2.88	0.97	0.0919
Architecture	29	14%	10	34%	10	34%	6	21%	3	10%	4	1	3	4	2.93	1.00	0.1896
Building Services	12	6%	4	33%	2	17%	5	42%	1	8%	4	1	2.5	2	2.75	1.06	0.0144
Civil	94	45%	31	33%	26	28%	28	30%	9	10%	4	1	3	4	2.84	1.00	0.082
Landscaping	8	4%	4	50%	3	38%	1	13%	0	0%	4	2	3.5	4	3.38	0.74	-0.36
Structural	26	13%	9	35%	11	42%	2	8%	4	15%	4	1	3	3	2.96	1.04	0.2018
Quantity Surveyors	15	7%	6	40%	5	33%	3	20%	1	7%	4	1	3	4	3.07	0.96	0.0409
With ISO9000	88	43%	32	36%	32	36%	18	20%	6	7%	4	1	3	4	3.02	0.92	0.0084
Without ISO9000	54	26%	15	28%	11	20%	22	41%	6	11%	4	1	2	2	2.65	1.01	0.1134

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Part	Part 2 Purpose of the IT																
Topic	.																
Subject	Use of the fax to communicate transmit cost related data/information																
Q.2.6.b	Response										Distribution Statistics						
Sample Sector	Nos	% o/a	No '4'	% '4'	No '3'	% '3'	No '2'	% '2'	No '1'	% '1'	H	L	Median	Mode	Mean	SD	Corr
All	142	69%	64	45%	52	37%	19	13%	7	5%	4	1	3	4	3.22	0.86	0.0673
Architecture	29	14%	10	34%	10	34%	6	21%	3	10%	4	1	3	4	2.93	1.00	0.1896
Building Services	12	6%	4	33%	7	58%	1	8%	0	0%	4	2	3	3	3.25	0.62	0.0542
Civil	94	45%	41	44%	32	34%	16	17%	5	5%	4	1	3	4	3.16	0.90	0.0633
Landscaping	8	4%	5	63%	2	25%	1	13%	0	0%	4	2	4	4	3.50	0.76	-0.228
Structural	26	13%	9	35%	13	50%	2	8%	2	8%	4	1	3	3	3.12	0.86	0.2417
Quantity Surveyors	15	7%	9	60%	5	33%	0	0%	1	7%	4	1	4	4	3.47	0.83	-0.074
With ISO9000	88	43%	43	49%	32	36%	10	11%	3	3%	4	1	3	4	3.31	0.81	0.0281
Without ISO9000	54	26%	21	39%	20	37%	9	17%	4	7%	4	1	3	4	3.07	0.93	0.041

Part	Part 2 Purpose of the IT																
Topic	.																
Subject	Use of the e-mail to communicate transmit cost related data/information																
Q.2.6.c	Response										Distribution Statistics						
Sample Sector	Nos	% o/a	No '4'	% '4'	No '3'	% '3'	No '2'	% '2'	No '1'	% '1'	H	L	Median	Mode	Mean	SD	Corr
All	139	67%	25	18%	37	27%	44	32%	33	24%	4	1	2	2	2.39	1.04	0.1514
Architecture	29	14%	15	52%	10	34%	3	10%	1	3%	4	1	4	4	3.34	0.81	0.1058
Building Services	12	6%	1	8%	5	42%	3	25%	3	25%	4	1	2.5	3	2.33	0.98	-8E-04
Civil	94	45%	20	21%	28	30%	25	27%	21	22%	4	1	3	3	2.50	1.07	0.1834
Landscaping	8	4%	2	25%	3	38%	3	38%	0	0%	4	2	3	3	2.88	0.83	-0.365
Structural	25	12%	3	12%	8	32%	5	20%	9	36%	4	1	2	1	2.20	1.08	0.4246
Quantity Surveyors	14	7%	3	21%	4	29%	3	21%	4	29%	4	1	2.5	3	2.43	1.16	0.1451
With ISO9000	86	42%	16	19%	23	27%	29	34%	18	21%	4	1	2	2	2.43	1.02	0.1676
Without ISO9000	53	26%	9	17%	14	26%	15	28%	15	28%	4	1	2	1	2.32	1.07	0.0954

Results of the 1998 postal survey of Hong Kong Public Works Consultants

Part	Part 2 Purpose of the IT																
Topic	.																
Subject	Use of hardcopy/ letter/reportt/form to communicate transmit cost related data/information																
Q.2.6.d	Response										Distribution Statistics						
Sample Sector	Nos	% o/a	No '4'	% '4'	No '3'	% '3'	No '2'	% '2'	No '1'	% '1'	H	L	Median	Mode	Mean	SD	Corr
All	143	69%	87	61%	39	27%	10	7%	7	5%	4	1	4	4	3.44	0.83	0.1065
Architecture	28	14%	0	0%	5	18%	16	57%	7	25%	3	1	2	2	1.93	0.66	0.0372
Building Services	12	6%	9	75%	3	25%	0	0%	0	0%	4	3	4	4	3.75	0.45	0.1515
Civil	95	46%	53	56%	28	29%	9	9%	5	5%	4	1	4	4	3.36	0.86	0.1351
Landscaping	8	4%	6	75%	2	25%	0	0%	0	0%	4	3	4	4	3.75	0.46	0.2654
Structural	26	13%	19	73%	6	23%	0	0%	1	4%	4	1	4	4	3.65	0.69	-0.036
Quantity Surveyors	15	7%	11	73%	3	20%	0	0%	1	7%	4	1	4	4	3.60	0.83	0.1571
With ISO9000	88	43%	61	69%	21	24%	4	5%	2	2%	4	1	4	4	3.60	0.69	0.0429
Without ISO9000	55	27%	26	47%	18	33%	6	11%	5	9%	4	1	3	4	3.18	0.96	-0.062

Part	Part 2 Purpose of the IT																
Topic	.																
Subject	Transmission of 'personnel deployed' ('resource content data) using IT																
Q.2.7.a	Response										Distribution Statistics						
Sample Sector	Nos	% o/a	No '4'	% '4'	No '3'	% '3'	No '2'	% '2'	No '1'	% '1'	H	L	Median	Mode	Mean	SD	Corr
All	142	69%	28	20%	41	29%	49	35%	24	17%	4	1	2	2	2.51	0.99	0.0892
Architecture	29	14%	21	72%	6	21%	1	3%	1	3%	4	1	4	4	3.62	0.73	0.0983
Building Services	12	6%	3	25%	3	25%	5	42%	1	8%	4	1	2.5	2	2.67	0.98	-0.306
Civil	94	45%	18	19%	29	31%	35	37%	12	13%	4	1	2.5	2	2.56	0.95	0.0953
Landscaping	8	4%	1	13%	3	38%	2	25%	2	25%	4	1	2.5	3	2.38	1.06	0.191
Structural	26	13%	3	12%	7	27%	8	31%	8	31%	4	1	2	1	2.19	1.02	0.3537
Quantity Surveyors	15	7%	4	27%	3	20%	4	27%	4	27%	4	1	2	1	2.47	1.19	-0.024
With ISO9000	88	43%	19	22%	26	30%	29	33%	14	16%	4	1	3	2	2.57	1.00	0.0996
Without ISO9000	54	26%	9	17%	15	28%	20	37%	10	19%	4	1	2	2	2.43	0.98	-0.043

Results of the 1998 postal survey of Hong Kong Public Works Consultants

Part	Part 2 Purpose of the IT																
Topic	.																
Subject	Transmission of 'personnel required' ('resource content data) using IT																
Q.2.7.b	Response										Distribution Statistics						
Sample Sector	Nos	% o/a	No '4'	% '4'	No '3'	% '3'	No '2'	% '2'	No '1'	% '1'	H	L	Median	Mode	Mean	SD	Corr
All	142	69%	27	19%	48	34%	43	30%	24	17%	4	1	3	3	2.55	0.99	0.1222
Architecture	29	14%	6	21%	10	34%	7	24%	6	21%	4	1	3	3	2.55	1.06	-0.077
Building Services	12	6%	2	17%	5	42%	4	33%	1	8%	4	1	3	3	2.67	0.89	-0.436
Civil	94	45%	17	18%	33	35%	32	34%	12	13%	4	1	3	3	2.59	0.93	0.1473
Landscaping	8	4%	1	13%	3	38%	2	25%	2	25%	4	1	2.5	3	2.38	1.06	0.191
Structural	26	13%	4	15%	7	27%	7	27%	8	31%	4	1	2	1	2.27	1.08	0.3841
Quantity Surveyors	15	7%	3	20%	3	20%	5	33%	4	27%	4	1	2	2	2.33	1.11	0.0503
With ISO9000	88	43%	19	22%	31	35%	24	27%	14	16%	4	1	3	3	2.63	1.00	0.1199
Without ISO9000	54	26%	8	15%	17	31%	19	35%	10	19%	4	1	2	2	2.43	0.96	0.0182

Part	Part 2 Purpose of the IT																
Topic	.																
Subject	Transmission of 'facilities employed' ('resource content data) using IT																
Q.2.7.c	Response										Distribution Statistics						
Sample Sector	Nos	% o/a	No '4'	% '4'	No '3'	% '3'	No '2'	% '2'	No '1'	% '1'	H	L	Median	Mode	Mean	SD	Corr
All	142	69%	22	15%	45	32%	50	35%	25	18%	4	1	2	2	2.45	0.96	0.0839
Architecture	29	14%	3	10%	12	41%	8	28%	6	21%	4	1	3	3	2.41	0.95	-0.114
Building Services	12	6%	2	17%	5	42%	4	33%	1	8%	4	1	3	3	2.67	0.89	-0.436
Civil	94	45%	15	16%	29	31%	37	39%	13	14%	4	1	2	2	2.49	0.92	0.096
Landscaping	8	4%	1	13%	2	25%	3	38%	2	25%	4	1	2	2	2.25	1.04	0.3763
Structural	26	13%	2	8%	7	27%	9	35%	8	31%	4	1	2	2	2.12	0.95	0.3059
Quantity Surveyors	15	7%	3	20%	2	13%	6	40%	4	27%	4	1	2	2	2.27	1.10	0.0877
With ISO9000	88	43%	14	16%	31	35%	29	33%	14	16%	4	1	3	3	2.51	0.95	0.0694
Without ISO9000	54	26%	8	15%	14	26%	21	39%	11	20%	4	1	2	2	2.35	0.97	0.056

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Part	Part 2 Purpose of the IT																	
Topic	.																	
Subject	Transmission of 'facilities required' ('resource content data) using IT																	
Q.2.7.d	Response										Distribution Statistics							
Sample Sector	Nos	% o/a	No '4'	% '4'	No '3'	% '3'	No '2'	% '2'	No '1'	% '1'	H	L	Median	Mode	Mean	SD	Corr	
All	142	69%	23	16%	45	32%	48	34%	26	18%	4	1	2	2	2.46	0.97	0.0836	
Architecture	29	14%	3	10%	12	41%	8	28%	6	21%	4	1	3	3	2.41	0.95	-0.114	
Building Services	12	6%	3	25%	4	33%	4	33%	1	8%	4	1	3	2	2.75	0.97	-0.484	
Civil	94	45%	16	17%	30	32%	34	36%	14	15%	4	1	2	2	2.51	0.95	0.0884	
Landscaping	8	4%	1	13%	2	25%	3	38%	2	25%	4	1	2	2	2.25	1.04	0.3763	
Structural	26	13%	2	8%	7	27%	9	35%	8	31%	4	1	2	2	2.12	0.95	0.3059	
Quantity Surveyors	15	7%	3	20%	1	7%	7	47%	4	27%	4	1	2	2	2.20	1.08	0.128	
With ISO9000	88	43%	15	17%	31	35%	28	32%	14	16%	4	1	3	3	2.53	0.96	0.0669	
Without ISO9000	54	26%	8	15%	14	26%	20	37%	12	22%	4	1	2	2	2.33	0.99	0.0165	

Part	Part 2 Purpose of the IT																
Topic	.																
Subject	Transmission of 'sub-consultants hired' ('resource content data) using IT																
Q.2.7.e	Response										Distribution Statistics						
Sample Sector	Nos	% o/a	No '4'	% '4'	No '3'	% '3'	No '2'	% '2'	No '1'	% '1'	H	L	Median	Mode	Mean	SD	Corr
All	141	68%	22	16%	39	28%	49	35%	31	22%	4	1	2	2	2.37	1.00	0.1092
Architecture	29	14%	3	10%	12	41%	7	24%	7	24%	4	1	3	3	2.38	0.98	-0.112
Building Services	12	6%	3	25%	1	8%	5	42%	3	25%	4	1	2	2	2.33	1.15	-0.061
Civil	94	45%	16	17%	26	28%	36	38%	16	17%	4	1	2	2	2.45	0.97	0.1079
Landscaping	8	4%	0	0%	3	38%	3	38%	2	25%	3	1	2	2	2.13	0.83	-0.111
Structural	26	13%	3	12%	8	31%	8	31%	7	27%	4	1	2	3	2.27	1.00	0.2273
Quantity Surveyors	14	7%	2	14%	1	7%	6	43%	5	36%	4	1	2	2	2.00	1.04	0.2299
With ISO9000	87	42%	13	15%	26	30%	28	32%	20	23%	4	1	2	2	2.37	1.00	0.1507
Without ISO9000	54	26%	9	17%	13	24%	21	39%	11	20%	4	1	2	2	2.37	1.00	0.0209

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Part	Part 2 Purpose of the IT																
Topic	.																
Subject	Transmission of 'purchasing services required' ('resource content data) using IT																
Q.2.7.f	Response										Distribution Statistics						
Sample Sector	Nos	% o/a	No '4'	% '4'	No '3'	% '3'	No '2'	% '2'	No '1'	% '1'	H	L	Median	Mode	Mean	SD	Corr
All	141	68%	24	17%	40	28%	53	38%	24	17%	4	1	2	2	2.45	0.97	0.1524
Architecture	28	14%	5	18%	9	32%	9	32%	5	18%	4	1	2.5	2	2.50	1.00	-0.172
Building Services	12	6%	4	33%	3	25%	3	25%	2	17%	4	1	3	4	2.75	1.14	-0.2
Civil	94	45%	14	15%	29	31%	38	40%	13	14%	4	1	2	2	2.47	0.91	0.2
Landscaping	8	4%	0	0%	4	50%	2	25%	2	25%	3	1	2.5	3	2.25	0.89	0.0619
Structural	26	13%	3	12%	5	19%	9	35%	9	35%	4	1	2	1	2.08	1.02	0.4525
Quantity Surveyors	15	7%	4	27%	1	7%	7	47%	3	20%	4	1	2	2	2.40	1.12	0.012
With ISO9000	88	43%	18	20%	28	32%	28	32%	14	16%	4	1	3	3	2.57	0.99	0.1142
Without ISO9000	53	26%	6	11%	12	23%	25	47%	10	19%	4	1	2	2	2.26	0.90	0.1281

Part	Part 2 Purpose of the IT																
Topic	.																
Subject	Transmission of 'QS services required' ('resource content data) using IT																
Q.2.7.g	Response										Distribution Statistics						
Sample Sector	Nos	% o/a	No '4'	% '4'	No '3'	% '3'	No '2'	% '2'	No '1'	% '1'	H	L	Median	Mode	Mean	SD	Corr
All	141	68%	13	9%	36	26%	59	42%	33	23%	4	1	2	2	2.21	0.91	0.0923
Architecture	28	14%	2	7%	9	32%	12	43%	5	18%	4	1	2	2	2.29	0.85	-0.105
Building Services	12	6%	1	8%	2	17%	8	67%	1	8%	4	1	2	2	2.25	0.75	-0.124
Civil	94	45%	6	6%	22	23%	45	48%	21	22%	4	1	2	2	2.14	0.84	0.1397
Landscaping	8	4%	0	0%	2	25%	4	50%	2	25%	3	1	2	2	2.00	0.76	-0.041
Structural	26	13%	0	0%	6	23%	11	42%	9	35%	3	1	2	2	1.88	0.77	0.3831
Quantity Surveyors	15	7%	4	27%	3	20%	4	27%	4	27%	4	1	2	1	2.47	1.19	-0.014
With ISO9000	88	43%	8	9%	25	28%	38	43%	17	19%	4	1	2	2	2.27	0.88	0.0604
Without ISO9000	53	26%	5	9%	11	21%	21	40%	16	30%	4	1	2	2	2.09	0.95	0.1237

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Part	Part 2 Purpose of the IT																
Topic	.																
Subject	Transmission of 'Legal services required' ('resource content data) using IT																
Q.2.7.h	Response										Distribution Statistics						
Sample Sector	Nos	% o/a	No '4'	% '4'	No '3'	% '3'	No '2'	% '2'	No '1'	% '1'	H	L	Median	Mode	Mean	SD	Corr
All	141	68%	15	11%	26	18%	69	49%	31	22%	4	1	2	2	2.18	0.90	0.104
Architecture	28	14%	3	11%	5	18%	13	46%	7	25%	4	1	2	2	2.14	0.93	-0.054
Building Services	12	6%	0	0%	3	25%	6	50%	3	25%	3	1	2	2	2.00	0.74	-0.048
Civil	94	45%	8	9%	17	18%	52	55%	17	18%	4	1	2	2	2.17	0.82	0.1378
Landscaping	8	4%	0	0%	1	13%	5	63%	2	25%	3	1	2	2	1.88	0.64	0.2427
Structural	26	13%	0	0%	7	27%	11	42%	8	31%	3	1	2	2	1.96	0.77	0.3024
Quantity Surveyors	15	7%	4	27%	1	7%	7	47%	3	20%	4	1	2	2	2.40	1.12	0.012
With ISO9000	88	43%	9	10%	18	20%	44	50%	17	19%	4	1	2	2	2.22	0.88	0.1003
Without ISO9000	53	26%	6	11%	8	15%	25	47%	14	26%	4	1	2	2	2.11	0.93	0.1056

Part	Part 2 Purpose of the IT																
Topic	.																
Subject	Transmission of 'management services required' ('resource content data) using IT																
Q.2.7.I	Response										Distribution Statistics						
Sample Sector	Nos	% o/a	No '4'	% '4'	No '3'	% '3'	No '2'	% '2'	No '1'	% '1'	H	L	Median	Mode	Mean	SD	Corr
All	141	68%	13	9%	34	24%	66	47%	28	20%	4	1	2	2	2.23	0.87	0.1203
Architecture	28	14%	3	11%	6	21%	13	46%	6	21%	4	1	2	2	2.21	0.92	-0.047
Building Services	12	6%	0	0%	3	25%	8	67%	1	8%	3	1	2	2	2.17	0.58	-0.022
Civil	94	45%	7	7%	25	27%	47	50%	15	16%	4	1	2	2	2.26	0.82	0.1363
Landscaping	8	4%	0	0%	3	38%	3	38%	2	25%	3	1	2	2	2.13	0.83	-0.111
Structural	26	13%	0	0%	9	35%	9	35%	8	31%	3	1	2	3	2.04	0.82	0.2948
Quantity Surveyors	15	7%	3	20%	1	7%	7	47%	4	27%	4	1	2	2	2.20	1.08	0.094
With ISO9000	88	43%	7	8%	23	26%	42	48%	16	18%	4	1	2	2	2.24	0.84	0.1467
Without ISO9000	53	26%	6	11%	11	21%	24	45%	12	23%	4	1	2	2	2.21	0.93	0.0934

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Part	Part 2 Purpose of the IT																
Topic	.																
Subject	Transmission of 'Administrative services required' ('resource content data) using IT																
Q.2.7.j	Response										Distribution Statistics						
Sample Sector	Nos	% o/a	No '4'	% '4'	No '3'	% '3'	No '2'	% '2'	No '1'	% '1'	H	L	Median	Mode	Mean	SD	Corr
All	141	68%	13	9%	37	26%	65	46%	26	18%	4	1	2	2	2.26	0.87	0.1242
Architecture	28	14%	3	11%	7	25%	12	43%	6	21%	4	1	2	2	2.25	0.93	-0.019
Building Services	12	6%	1	8%	3	25%	7	58%	1	8%	4	1	2	2	2.33	0.78	0.1129
Civil	94	45%	8	9%	24	26%	49	52%	13	14%	4	1	2	2	2.29	0.81	0.1412
Landscaping	8	4%	0	0%	2	25%	4	50%	2	25%	3	1	2	2	2.00	0.76	-0.041
Structural	26	13%	1	4%	8	31%	9	35%	8	31%	4	1	2	2	2.08	0.89	0.2774
Quantity Surveyors	15	7%	2	13%	3	20%	6	40%	4	27%	4	1	2	2	2.20	1.01	0.0995
With ISO9000	88	43%	8	9%	25	28%	39	44%	16	18%	4	1	2	2	2.28	0.87	0.1379
Without ISO9000	53	26%	5	9%	12	23%	26	49%	10	19%	4	1	2	2	2.23	0.87	0.1081

Part	Part 2 Purpose of the IT																
Topic	.																
Subject	Transmission of 'other out-sourced services required' ('resource content data) using IT																
Q.2.7.k	Response										Distribution Statistics						
Sample Sector	Nos	% o/a	No '4'	% '4'	No '3'	% '3'	No '2'	% '2'	No '1'	% '1'	H	L	Median	Mode	Mean	SD	Corr
All	141	68%	12	9%	36	26%	63	45%	30	21%	4	1	2	2	2.21	0.88	0.1956
Architecture	28	14%	2	7%	6	21%	14	50%	6	21%	4	1	2	2	2.14	0.85	-0.057
Building Services	12	6%	0	0%	4	33%	7	58%	1	8%	3	1	2	2	2.25	0.62	0.2685
Civil	94	45%	8	9%	27	29%	42	45%	17	18%	4	1	2	2	2.28	0.86	0.2191
Landscaping	8	4%	0	0%	2	25%	4	50%	2	25%	3	1	2	2	2.00	0.76	-0.041
Structural	26	13%	1	4%	9	35%	8	31%	8	31%	4	1	2	3	2.12	0.91	0.3128
Quantity Surveyors	15	7%	2	13%	1	7%	8	53%	4	27%	4	1	2	2	2.07	0.96	0.1934
With ISO9000	88	43%	7	8%	24	27%	41	47%	16	18%	4	1	2	2	2.25	0.85	0.2366
Without ISO9000	53	26%	5	9%	12	23%	22	42%	14	26%	4	1	2	2	2.15	0.93	0.0909

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Part	Part 2 Purpose of the IT																
Topic	.																
Subject	Use of the telephone to communicate transmit resource related data/information																
Q.2.8.a	Response										Distribution Statistics						
Sample Sector	Nos	% o/a	No '4'	% '4'	No '3'	% '3'	No '2'	% '2'	No '1'	% '1'	H	L	Median	Mode	Mean	SD	Corr
All	142	69%	58	41%	52	37%	26	18%	6	4%	4	1	3	4	3.14	0.86	0.1001
Architecture	29	14%	12	41%	11	38%	5	17%	1	3%	4	1	3	4	3.17	0.85	0.2111
Building Services	12	6%	6	50%	3	25%	3	25%	0	0%	4	2	3.5	4	3.25	0.87	-0.339
Civil	94	45%	39	41%	33	35%	18	19%	4	4%	4	1	3	4	3.14	0.87	0.0766
Landscaping	8	4%	4	50%	3	38%	1	13%	0	0%	4	2	3.5	4	3.38	0.74	-0.262
Structural	26	13%	11	42%	10	38%	3	12%	2	8%	4	1	3	4	3.15	0.92	0.0891
Quantity Surveyors	15	7%	7	47%	5	33%	2	13%	1	7%	4	1	3	4	3.20	0.94	0.0632
With ISO9000	88	43%	40	45%	31	35%	15	17%	2	2%	4	1	3	4	3.24	0.82	0.0642
Without ISO9000	54	26%	18	33%	21	39%	11	20%	4	7%	4	1	3	3	2.98	0.92	0.0409

Part	Part 2 Purpose of the IT																
Topic	.																
Subject	Use of the fax to communicate transmit resource related data/information																
Q.2.8.b	Response										Distribution Statistics						
Sample Sector	Nos	% o/a	No '4'	% '4'	No '3'	% '3'	No '2'	% '2'	No '1'	% '1'	H	L	Median	Mode	Mean	SD	Corr
All	142	69%	62	44%	62	44%	14	10%	4	3%	4	1	3	3	3.28	0.76	0.0479
Architecture	29	14%	13	45%	12	41%	3	10%	1	3%	4	1	3	4	3.28	0.80	0.1204
Building Services	12	6%	5	42%	5	42%	2	17%	0	0%	4	2	3	4	3.25	0.75	-0.172
Civil	94	45%	40	43%	43	46%	9	10%	2	2%	4	1	3	3	3.29	0.73	0.0506
Landscaping	8	4%	3	38%	5	63%	0	0%	0	0%	4	3	3	3	3.38	0.52	-0.497
Structural	26	13%	11	42%	13	50%	1	4%	1	4%	4	1	3	3	3.31	0.74	0.0993
Quantity Surveyors	15	7%	9	60%	4	27%	1	7%	1	7%	4	1	4	4	3.40	0.91	-0.168
With ISO9000	88	43%	43	49%	34	39%	9	10%	2	2%	4	1	3	4	3.34	0.76	0.0152
Without ISO9000	54	26%	19	35%	28	52%	5	9%	2	4%	4	1	3	3	3.19	0.75	0.0496

Results of the 1998 postal survey of Hong Kong Public Works Consultants

Part	Part 2 Purpose of the IT																
Topic	.																
Subject	Use of the e-mail to communicate transmit resource related data/information																
Q.2.8.c	Response										Distribution Statistics						
Sample Sector	Nos	% o/a	No '4'	% '4'	No '3'	% '3'	No '2'	% '2'	No '1'	% '1'	H	L	Median	Mode	Mean	SD	Corr
All	141	68%	27	19%	35	25%	56	40%	23	16%	4	1	2	2	2.47	0.98	0.1128
Architecture	28	14%	0	0%	6	21%	15	54%	7	25%	3	1	2	2	1.96	0.69	0.0734
Building Services	12	6%	2	17%	3	25%	6	50%	1	8%	4	1	2	2	2.50	0.90	-0.032
Civil	94	45%	22	23%	26	28%	36	38%	10	11%	4	1	3	2	2.64	0.96	0.1188
Landscaping	8	4%	1	13%	3	38%	4	50%	0	0%	4	2	2.5	2	2.63	0.74	-0.778
Structural	26	13%	5	19%	5	19%	9	35%	7	27%	4	1	2	2	2.31	1.09	0.3134
Quantity Surveyors	15	7%	3	20%	4	27%	4	27%	4	27%	4	1	2	1	2.40	1.12	0.1421
With ISO9000	87	42%	19	22%	20	23%	35	40%	13	15%	4	1	2	2	2.52	1.00	0.1296
Without ISO9000	54	26%	8	15%	15	28%	21	39%	10	19%	4	1	2	2	2.39	0.96	-0.018

Part	Part 2 Purpose of the IT																
Topic	.																
Subject	Use of hardcopy/ letter/reportt/form to communicate transmit resource related data/information																
Q.2.8.d	Response										Distribution Statistics						
Sample Sector	Nos	% o/a	No '4'	% '4'	No '3'	% '3'	No '2'	% '2'	No '1'	% '1'	H	L	Median	Mode	Mean	SD	Corr
All	143	69%	75	52%	51	36%	11	8%	6	4%	4	1	4	4	3.36	0.80	0.1933
Architecture	29	14%	21	72%	6	21%	1	3%	1	3%	4	1	4	4	3.62	0.73	0.1467
Building Services	12	6%	8	67%	3	25%	1	8%	0	0%	4	2	4	4	3.58	0.67	0.3645
Civil	95	46%	46	48%	35	37%	10	11%	4	4%	4	1	3	4	3.29	0.82	0.2219
Landscaping	8	4%	3	38%	5	63%	0	0%	0	0%	4	3	3	3	3.38	0.52	-0.235
Structural	26	13%	14	54%	9	35%	1	4%	2	8%	4	1	4	4	3.35	0.89	0.1433
Quantity Surveyors	15	7%	9	60%	5	33%	0	0%	1	7%	4	1	4	4	3.47	0.83	0.2082
With ISO9000	88	43%	53	60%	27	31%	6	7%	2	2%	4	1	4	4	3.49	0.73	0.1513
Without ISO9000	55	27%	22	40%	24	44%	5	9%	4	7%	4	1	3	3	3.16	0.88	0.1966

Q.2.9

open question

Part	Part 2 Purpose of the IT																
Topic	.																
Subject	se of the telephone to communicate transmit five most important items of data/information stated in Q.2.10																
Q.2.10.a	Response										Distribution Statistics						
Sample Sector	Nos	% o/a	No '4'	% '4'	No '3'	% '3'	No '2'	% '2'	No '1'	% '1'	H	L	Median	Mode	Mean	SD	Corr
All	122	59%	52	43%	33	27%	28	23%	9	7%	4	1	3	4	3.05	0.98	0.0719
Architecture	24	12%	12	50%	6	25%	5	21%	1	4%	4	1	3.5	4	3.21	0.93	0.2159
Building Services	10	5%	5	50%	2	20%	2	20%	1	10%	4	1	3.5	4	3.10	1.10	-0.274
Civil	82	40%	35	43%	19	23%	21	26%	7	9%	4	1	3	4	3.00	1.02	0.0772
Landscaping	8	4%	3	38%	4	50%	1	13%	0	0%	4	2	3	3	3.25	0.71	-0.203
Structural	23	11%	11	48%	8	35%	3	13%	1	4%	4	1	3	4	3.26	0.86	0.0905
Quantity Surveyors	11	5%	3	27%	5	45%	2	18%	1	9%	4	1	3	3	2.91	0.94	-0.045
With ISO9000	74	36%	31	42%	20	27%	18	24%	5	7%	4	1	3	4	3.04	0.97	0.0683
Without ISO9000	48	23%	21	44%	13	27%	10	21%	4	8%	4	1	3	4	3.06	1.00	0.198

Part	Part 2 Purpose of the IT																
Topic	.																
Subject	Use of fax to communicate transmit five most important items of data/information stated in Q.2.10																
Q.2.10.b	Response										Distribution Statistics						
Sample Sector	Nos	% o/a	No '4'	% '4'	No '3'	% '3'	No '2'	% '2'	No '1'	% '1'	H	L	Median	Mode	Mean	SD	Corr
All	124	60%	56	45%	43	35%	20	16%	5	4%	4	1	3	4	3.21	0.86	0.0099
Architecture	25	12%	14	56%	8	32%	3	12%	0	0%	4	2	4	4	3.44	0.71	0.0615
Building Services	10	5%	5	50%	3	30%	2	20%	0	0%	4	2	3.5	4	3.30	0.82	-0.406
Civil	82	40%	35	43%	27	33%	16	20%	4	5%	4	1	3	4	3.13	0.90	0.0561
Landscaping	8	4%	4	50%	3	38%	1	13%	0	0%	4	2	3.5	4	3.38	0.74	-0.009
Structural	23	11%	9	39%	11	48%	3	13%	0	0%	4	2	3	3	3.26	0.69	0.2434
Quantity Surveyors	12	6%	5	42%	5	42%	1	8%	1	8%	4	1	3	4	3.17	0.94	-0.329
With ISO9000	75	36%	35	47%	26	35%	12	16%	2	3%	4	1	3	4	3.25	0.82	-0.032
Without ISO9000	49	24%	21	43%	17	35%	8	16%	3	6%	4	1	3	4	3.14	0.91	0.0635

Part	Part 2 Purpose of the IT																
Topic	.																
Subject	Use of e-mail to communicate transmit five most important items of data/information stated in Q.2.10																
Q.2.10.c	Response										Distribution Statistics						
Sample Sector	Nos	% o/a	No '4'	% '4'	No '3'	% '3'	No '2'	% '2'	No '1'	% '1'	H	L	Median	Mode	Mean	SD	Corr
All	123	59%	24	20%	41	33%	41	33%	17	14%	4	1	3	3	2.59	0.96	0.2033
Architecture	25	12%	2	8%	7	28%	10	40%	6	24%	4	1	2	2	2.20	0.91	-0.164
Building Services	10	5%	3	30%	3	30%	4	40%	0	0%	4	2	3	2	2.90	0.88	-0.105
Civil	82	40%	20	24%	31	38%	24	29%	7	9%	4	1	3	3	2.78	0.92	0.2687
Landscaping	8	4%	2	25%	3	38%	3	38%	0	0%	4	2	3	2	2.88	0.83	-0.215
Structural	23	11%	4	17%	5	22%	10	43%	4	17%	4	1	2	2	2.39	0.99	0.6797
Quantity Surveyors	11	5%	0	0%	4	36%	4	36%	3	27%	3	1	2	2	2.09	0.83	0.4662
With ISO9000	74	36%	13	18%	24	32%	29	39%	8	11%	4	1	2.5	2	2.57	0.91	0.3268
Without ISO9000	49	24%	11	22%	17	35%	12	24%	9	18%	4	1	3	3	2.61	1.04	0.0125

Part	Part 2 Purpose of the IT																
Topic	.																
Subject	Use of hardcopy to communicate transmit five most important items of data/information stated in Q.2.10																
Q.2.10.d	Response										Distribution Statistics						
Sample Sector	Nos	% o/a	No '4'	% '4'	No '3'	% '3'	No '2'	% '2'	No '1'	% '1'	H	L	Median	Mode	Mean	SD	Corr
All	125	60%	80	64%	30	24%	12	10%	3	2%	4	1	4	4	3.50	0.77	0.2434
Architecture	25	12%	20	80%	4	16%	1	4%	0	0%	4	2	4	4	3.76	0.52	0.0897
Building Services	10	5%	9	90%	1	10%	0	0%	0	0%	4	3	4	4	3.90	0.32	0.3888
Civil	83	40%	48	58%	22	27%	10	12%	3	4%	4	1	4	4	3.39	0.84	0.2913
Landscaping	8	4%	7	88%	1	13%	0	0%	0	0%	4	3	4	4	3.88	0.35	0.1737
Structural	23	11%	20	87%	1	4%	2	9%	0	0%	4	2	4	4	3.78	0.60	0.1824
Quantity Surveyors	12	6%	9	75%	3	25%	0	0%	0	0%	4	3	4	4	3.75	0.45	0.0816
With ISO9000	76	37%	57	75%	15	20%	4	5%	0	0%	4	2	4	4	3.70	0.57	0.1337
Without ISO9000	49	24%	23	47%	15	31%	8	16%	3	6%	4	1	3	4	3.18	0.93	0.2296

Results of the 1998 postal survey of Hong Kong Public Works Consultants

Part	Part 2 Purpose of the IT																
Topic	.																
Subject	Transmission of 'requests for information' ('issue-related data) using IT																
Q.2.11.a	Response										Distribution Statistics						
Sample Sector	Nos	% o/a	No '4'	% '4'	No '3'	% '3'	No '2'	% '2'	No '1'	% '1'	H	L	Median	Mode	Mean	SD	Corr
All	144	70%	54	38%	58	40%	20	14%	12	8%	4	1	3	3	3.07	0.92	-0.043
Architecture	29	14%	10	34%	11	38%	4	14%	4	14%	4	1	3	3	2.93	1.03	-0.094
Building Services	12	6%	4	33%	7	58%	1	8%	0	0%	4	2	3	3	3.25	0.62	-0.797
Civil	96	46%	32	33%	42	44%	16	17%	6	6%	4	1	3	3	3.04	0.87	-0.015
Landscaping	8	4%	3	38%	3	38%	1	13%	1	13%	4	1	3	4	3.00	1.07	0.5868
Structural	26	13%	5	19%	12	46%	3	12%	6	23%	4	1	3	3	2.62	1.06	0.0101
Quantity Surveyors	15	7%	8	53%	3	20%	3	20%	1	7%	4	1	4	4	3.20	1.01	-0.411
With ISO9000	88	43%	35	40%	35	40%	12	14%	6	7%	4	1	3	4	3.13	0.89	-0.098
Without ISO9000	56	27%	19	34%	23	41%	8	14%	6	11%	4	1	3	3	2.98	0.96	-0.02

Part	Part 2 Purpose of the IT																
Topic	.																
Subject	Transmission of 'variation quotations' ('issue-related data) using IT																
Q.2.11.b	Response										Distribution Statistics						
Sample Sector	Nos	% o/a	No '4'	% '4'	No '3'	% '3'	No '2'	% '2'	No '1'	% '1'	H	L	Median	Mode	Mean	SD	Corr
All	141	68%	45	32%	47	33%	31	22%	18	13%	4	1	3	3	2.84	1.02	0.0241
Architecture	28	14%	8	29%	8	29%	7	25%	5	18%	4	1	3	3	2.68	1.09	-0.032
Building Services	12	6%	4	33%	5	42%	2	17%	1	8%	4	1	3	3	3.00	0.95	-0.244
Civil	94	45%	27	29%	32	34%	25	27%	10	11%	4	1	3	3	2.81	0.98	0.0673
Landscaping	8	4%	4	50%	1	13%	2	25%	1	13%	4	1	3.5	4	3.00	1.20	0.4199
Structural	26	13%	5	19%	9	35%	6	23%	6	23%	4	1	3	3	2.50	1.07	0.1151
Quantity Surveyors	15	7%	8	53%	3	20%	3	20%	1	7%	4	1	4	4	3.20	1.01	-0.411
With ISO9000	87	42%	28	32%	33	38%	18	21%	8	9%	4	1	3	3	2.93	0.95	-0.038
Without ISO9000	54	26%	17	31%	14	26%	13	24%	10	19%	4	1	3	4	2.70	1.11	0.0664

Results of the 1998 postal survey of Hong Kong Public Works Consultants

Part	Part 2 Purpose of the IT																
Topic	.																
Subject	Transmission of 'change order proposals' ('issue-related data) using IT																
Q.2.11.c	Response										Distribution Statistics						
Sample Sector	Nos	% o/a	No '4'	% '4'	No '3'	% '3'	No '2'	% '2'	No '1'	% '1'	H	L	Median	Mode	Mean	SD	Corr
All	142	69%	44	31%	47	33%	32	23%	19	13%	4	1	3	3	2.82	1.02	0.0132
Architecture	28	14%	8	29%	9	32%	6	21%	5	18%	4	1	3	3	2.71	1.08	-0.021
Building Services	12	6%	4	33%	5	42%	2	17%	1	8%	4	1	3	3	3.00	0.95	-0.244
Civil	95	46%	27	28%	31	33%	27	28%	10	11%	4	1	3	3	2.79	0.98	0.0415
Landscaping	8	4%	4	50%	0	0%	2	25%	2	25%	4	1	3	4	2.75	1.39	0.1487
Structural	26	13%	4	15%	10	38%	7	27%	5	19%	4	1	3	3	2.50	0.99	0.078
Quantity Surveyors	15	7%	7	47%	2	13%	4	27%	2	13%	4	1	3	4	2.93	1.16	-0.264
With ISO9000	87	42%	26	30%	33	38%	19	22%	9	10%	4	1	3	3	2.87	0.96	-0.017
Without ISO9000	55	27%	18	33%	14	25%	13	24%	10	18%	4	1	3	4	2.73	1.11	0.0128

Part	Part 2 Purpose of the IT																
Topic	.																
Subject	Transmission of lists of 'requests for approvals' ('issue-related data) using IT																
Q.2.11.d	Response										Distribution Statistics						
Sample Sector	Nos	% o/a	No '4'	% '4'	No '3'	% '3'	No '2'	% '2'	No '1'	% '1'	H	L	Median	Mode	Mean	SD	Corr
All	141	68%	48	34%	44	31%	33	23%	16	11%	4	1	3	4	2.88	1.01	-0.044
Architecture	28	14%	10	36%	9	32%	4	14%	5	18%	4	1	3	4	2.86	1.11	-0.092
Building Services	12	6%	5	42%	4	33%	3	25%	0	0%	4	2	3	4	3.17	0.83	-0.145
Civil	94	45%	27	29%	31	33%	28	30%	8	9%	4	1	3	3	2.82	0.95	-0.023
Landscaping	8	4%	4	50%	2	25%	0	0%	2	25%	4	1	3.5	4	3.00	1.31	0.3833
Structural	26	13%	5	19%	9	35%	6	23%	6	23%	4	1	3	3	2.50	1.07	-0.04
Quantity Surveyors	15	7%	7	47%	2	13%	4	27%	2	13%	4	1	3	4	2.93	1.16	-0.264
With ISO9000	87	42%	33	38%	25	29%	20	23%	9	10%	4	1	3	4	2.94	1.02	-0.106
Without ISO9000	54	26%	15	28%	19	35%	13	24%	7	13%	4	1	3	3	2.78	1.00	0.0458

Results of the 1998 postal survey of Hong Kong Public Works Consultants

Part	Part 2 Purpose of the IT																
Topic	.																
Subject	Transmission of lists of 'quality conformance' ('issue-related data) using IT																
Q.2.11.e	Response										Distribution Statistics						
Sample Sector	Nos	% o/a	No '4'	% '4'	No '3'	% '3'	No '2'	% '2'	No '1'	% '1'	H	L	Median	Mode	Mean	SD	Corr
All	142	69%	42	30%	45	32%	35	25%	20	14%	4	1	3	3	2.77	1.03	0.0242
Architecture	28	14%	10	36%	8	29%	4	14%	6	21%	4	1	3	4	2.79	1.17	-0.217
Building Services	12	6%	4	33%	3	25%	5	42%	0	0%	4	2	3	2	2.92	0.90	-0.308
Civil	95	46%	24	25%	32	34%	27	28%	12	13%	4	1	3	3	2.72	0.99	0.0702
Landscaping	8	4%	3	38%	3	38%	0	0%	2	25%	4	1	3	4	2.88	1.25	0.5526
Structural	26	13%	5	19%	7	27%	8	31%	6	23%	4	1	2	2	2.42	1.06	0.0853
Quantity Surveyors	15	7%	5	33%	3	20%	5	33%	2	13%	4	1	3	2	2.73	1.10	-0.154
With ISO9000	87	42%	28	32%	27	31%	22	25%	10	11%	4	1	3	4	2.84	1.01	-0.028
Without ISO9000	55	27%	14	25%	18	33%	13	24%	10	18%	4	1	3	3	2.65	1.06	0.0835

Part	Part 2 Purpose of the IT																
Topic	.																
Subject	Transmission of lists of 'approvals' ('issue-related data) using IT																
Q.2.11.f	Response										Distribution Statistics						
Sample Sector	Nos	% o/a	No '4'	% '4'	No '3'	% '3'	No '2'	% '2'	No '1'	% '1'	H	L	Median	Mode	Mean	SD	Corr
All	142	69%	46	32%	46	32%	32	23%	18	13%	4	1	3	3	2.85	1.02	-0.018
Architecture	28	14%	11	39%	8	29%	4	14%	5	18%	4	1	3	4	2.89	1.13	-0.12
Building Services	12	6%	5	42%	5	42%	1	8%	1	8%	4	1	3	3	3.17	0.94	-0.115
Civil	95	46%	25	26%	34	36%	27	28%	9	9%	4	1	3	3	2.79	0.94	0.0027
Landscaping	8	4%	3	38%	3	38%	0	0%	2	25%	4	1	3	3	2.88	1.25	0.2925
Structural	26	13%	5	19%	9	35%	6	23%	6	23%	4	1	3	3	2.50	1.07	-0.015
Quantity Surveyors	15	7%	6	40%	2	13%	4	27%	3	20%	4	1	3	4	2.73	1.22	-0.179
With ISO9000	87	42%	33	38%	26	30%	17	20%	11	13%	4	1	3	4	2.93	1.04	-0.088
Without ISO9000	55	27%	13	24%	20	36%	15	27%	7	13%	4	1	3	3	2.71	0.98	0.0742

Results of the 1998 postal survey of Hong Kong Public Works Consultants

Part	Part 2 Purpose of the IT																
Topic	.																
Subject	Use of the telephone to communicate transmit issue-related items of data/information																
Q.2.12.a	Response										Distribution Statistics						
Sample Sector	Nos	% o/a	No '4'	% '4'	No '3'	% '3'	No '2'	% '2'	No '1'	% '1'	H	L	Median	Mode	Mean	SD	Corr
All	143	69%	62	43%	48	34%	24	17%	9	6%	4	1	3	4	3.14	0.92	0.037
Architecture	29	14%	15	52%	9	31%	3	10%	2	7%	4	1	4	4	3.28	0.92	0.0565
Building Services	12	6%	6	50%	3	25%	2	17%	1	8%	4	1	3.5	4	3.17	1.03	-0.062
Civil	95	46%	40	42%	30	32%	18	19%	7	7%	4	1	3	4	3.08	0.95	0.0253
Landscaping	8	4%	6	75%	2	25%	0	0%	0	0%	4	3	4	4	3.75	0.46	-0.232
Structural	26	13%	11	42%	9	35%	3	12%	3	12%	4	1	3	4	3.08	1.02	0.197
Quantity Surveyors	15	7%	8	53%	5	33%	2	13%	0	0%	4	2	4	4	3.40	0.74	-0.011
With ISO9000	88	43%	41	47%	28	32%	14	16%	5	6%	4	1	3	4	3.19	0.91	0.0267
Without ISO9000	55	27%	21	38%	20	36%	10	18%	4	7%	4	1	3	4	3.05	0.93	-0.057

Part	Part 2 Purpose of the IT																
Topic	.																
Subject	Use of the fax to communicate transmit issue-related items of data/information																
Q.2.12.b	Response										Distribution Statistics						
Sample Sector	Nos	% o/a	No '4'	% '4'	No '3'	% '3'	No '2'	% '2'	No '1'	% '1'	H	L	Median	Mode	Mean	SD	Corr
All	144	70%	71	49%	59	41%	10	7%	4	3%	4	1	3	4	3.37	0.74	0.0502
Architecture	29	14%	18	62%	8	28%	2	7%	1	3%	4	1	4	4	3.48	0.78	-0.056
Building Services	12	6%	6	50%	5	42%	1	8%	0	0%	4	2	3.5	4	3.42	0.67	0.0555
Civil	96	46%	43	45%	44	46%	6	6%	3	3%	4	1	3	3	3.32	0.73	0.0912
Landscaping	8	4%	5	63%	3	38%	0	0%	0	0%	4	3	4	4	3.63	0.52	-0.088
Structural	26	13%	11	42%	12	46%	1	4%	2	8%	4	1	3	3	3.23	0.86	0.1942
Quantity Surveyors	15	7%	10	67%	4	27%	1	7%	0	0%	4	2	4	4	3.60	0.63	-0.374
With ISO9000	88	43%	50	57%	30	34%	6	7%	2	2%	4	1	4	4	3.45	0.73	-0.011
Without ISO9000	56	27%	21	38%	29	52%	4	7%	2	4%	4	1	3	3	3.23	0.74	0.0757

Results of the 1998 postal survey of Hong Kong Public Works Consultants

Part	Part 2 Purpose of the IT																
Topic	.																
Subject	Use of e-mail to communicate transmit issue-related items of data/information																
Q.2.12.c	Response										Distribution Statistics						
Sample Sector	Nos	% o/a	No '4'	% '4'	No '3'	% '3'	No '2'	% '2'	No '1'	% '1'	H	L	Median	Mode	Mean	SD	Corr
All	142	69%	25	18%	43	30%	52	37%	22	15%	4	1	2	2	2.50	0.96	0.0935
Architecture	29	14%	3	10%	5	17%	14	48%	7	24%	4	1	2	2	2.14	0.92	-0.105
Building Services	12	6%	1	8%	4	33%	6	50%	1	8%	4	1	2	2	2.42	0.79	0.3662
Civil	95	46%	19	20%	33	35%	33	35%	10	11%	4	1	3	3	2.64	0.92	0.1068
Landscaping	8	4%	1	13%	4	50%	3	38%	0	0%	4	2	3	3	2.75	0.71	-0.536
Structural	26	13%	3	12%	8	31%	10	38%	5	19%	4	1	2	2	2.35	0.94	0.4441
Quantity Surveyors	14	7%	2	14%	4	29%	4	29%	4	29%	4	1	2	2	2.29	1.07	0.2578
With ISO9000	87	42%	15	17%	24	28%	37	43%	11	13%	4	1	2	2	2.49	0.93	0.161
Without ISO9000	55	27%	10	18%	19	35%	15	27%	11	20%	4	1	3	3	2.51	1.02	-0.111

Part	Part 2 Purpose of the IT																
Topic	.																
Subject	Use of hardcopy to communicate transmit issue-related items of data/information																
Q.2.12.d	Response										Distribution Statistics						
Sample Sector	Nos	% o/a	No '4'	% '4'	No '3'	% '3'	No '2'	% '2'	No '1'	% '1'	H	L	Median	Mode	Mean	SD	Corr
All	144	70%	95	66%	35	24%	10	7%	4	3%	4	1	4	4	3.53	0.75	0.1554
Architecture	29	14%	25	86%	3	10%	0	0%	1	3%	4	1	4	4	3.79	0.62	-0.025
Building Services	12	6%	9	75%	3	25%	0	0%	0	0%	4	3	4	4	3.75	0.45	0.5146
Civil	96	46%	56	58%	27	28%	10	10%	3	3%	4	1	4	4	3.42	0.80	0.2178
Landscaping	8	4%	6	75%	2	25%	0	0%	0	0%	4	3	4	4	3.75	0.46	-0.186
Structural	26	13%	21	81%	4	15%	0	0%	1	4%	4	1	4	4	3.73	0.67	-0.028
Quantity Surveyors	15	7%	12	80%	3	20%	0	0%	0	0%	4	3	4	4	3.80	0.41	0.0176
With ISO9000	88	43%	62	70%	21	24%	4	5%	1	1%	4	1	4	4	3.64	0.63	0.0931
Without ISO9000	56	27%	33	59%	14	25%	6	11%	3	5%	4	1	4	4	3.38	0.89	0.2526

Results of the 1998 postal survey of Hong Kong Public Works Consultants

Part	Part 2 Purpose of the IT																
Topic	.																
Subject	Transmission of 'names and addresses' ('company-related data) using IT																
Q.2.13.a	Response										Distribution Statistics						
Sample Sector	Nos	% o/a	No '4'	% '4'	No '3'	% '3'	No '2'	% '2'	No '1'	% '1'	H	L	Median	Mode	Mean	SD	Corr
All	141	68%	57	40%	45	32%	26	18%	13	9%	4	1	3	4	3.04	0.98	0.0678
Architecture	29	14%	9	31%	11	38%	5	17%	4	14%	4	1	3	3	2.86	1.03	-0.249
Building Services	12	6%	6	50%	3	25%	3	25%	0	0%	4	2	3.5	4	3.25	0.87	-0.531
Civil	94	45%	40	43%	27	29%	21	22%	6	6%	4	1	3	4	3.07	0.95	0.1218
Landscaping	7	3%	2	29%	3	43%	2	29%	0	0%	4	2	3	3	3.00	0.82	-0.269
Structural	26	13%	7	27%	9	35%	4	15%	6	23%	4	1	3	3	2.65	1.13	0.2625
Quantity Surveyors	15	7%	6	40%	3	20%	3	20%	3	20%	4	1	3	4	2.80	1.21	-0.099
With ISO9000	87	42%	37	43%	27	31%	15	17%	8	9%	4	1	3	4	3.07	0.99	0.085
Without ISO9000	54	26%	20	37%	18	33%	11	20%	5	9%	4	1	3	4	2.98	0.98	-0.064

Part	Part 2 Purpose of the IT																
Topic	.																
Subject	Transmission of file references' ('company-related data) using IT																
Q.2.13.b	Response										Distribution Statistics						
Sample Sector	Nos	% o/a	No '4'	% '4'	No '3'	% '3'	No '2'	% '2'	No '1'	% '1'	H	L	Median	Mode	Mean	SD	Corr
All	140	68%	46	33%	37	26%	37	26%	20	14%	4	1	3	4	2.78	1.06	-0.036
Architecture	28	14%	10	36%	7	25%	7	25%	4	14%	4	1	3	4	2.82	1.09	-0.246
Building Services	12	6%	4	33%	2	17%	6	50%	0	0%	4	2	2.5	2	2.83	0.94	-0.074
Civil	94	45%	30	32%	25	27%	26	28%	13	14%	4	1	3	4	2.77	1.05	-0.025
Landscaping	7	3%	2	29%	2	29%	3	43%	0	0%	4	2	3	2	2.86	0.90	-0.14
Structural	26	13%	4	15%	9	35%	5	19%	8	31%	4	1	2.5	3	2.35	1.09	0.0777
Quantity Surveyors	15	7%	6	40%	2	13%	4	27%	3	20%	4	1	3	4	2.73	1.22	-0.068
With ISO9000	86	42%	28	33%	27	31%	20	23%	11	13%	4	1	3	4	2.84	1.03	-0.091
Without ISO9000	54	26%	18	33%	10	19%	17	31%	9	17%	4	1	3	4	2.69	1.11	0.0238

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Part	Part 2 Purpose of the IT																
Topic	.																
Subject	Transmission of telephone directories ('company-related data) using IT																
Q.2.13.c	Response										Distribution Statistics						
Sample Sector	Nos	% o/a	No '4'	% '4'	No '3'	% '3'	No '2'	% '2'	No '1'	% '1'	H	L	Median	Mode	Mean	SD	Corr
All	140	68%	34	24%	36	26%	52	37%	18	13%	4	1	2.5	2	2.61	0.99	0.1642
Architecture	28	14%	7	25%	6	21%	10	36%	5	18%	4	1	2	2	2.54	1.07	-0.177
Building Services	12	6%	3	25%	4	33%	5	42%	0	0%	4	2	3	2	2.83	0.83	-0.003
Civil	94	45%	23	24%	24	26%	37	39%	10	11%	4	1	2.5	2	2.64	0.97	0.2142
Landscaping	7	3%	2	29%	0	0%	5	71%	0	0%	4	2	2	2	2.57	0.98	-0.211
Structural	26	13%	5	19%	6	23%	8	31%	7	27%	4	1	2	2	2.35	1.09	0.5448
Quantity Surveyors	15	7%	4	27%	4	27%	4	27%	3	20%	4	1	3	3	2.60	1.12	0.0017
With ISO9000	86	42%	21	24%	27	31%	29	34%	9	10%	4	1	3	2	2.70	0.96	0.1697
Without ISO9000	54	26%	13	24%	9	17%	23	43%	9	17%	4	1	2	2	2.48	1.04	0.0805

Part	Part 2 Purpose of the IT																
Topic	.																
Subject	Transmission of shared facilities ('company-related data) using IT																
Q.2.13.d	Response										Distribution Statistics						
Sample Sector	Nos	% o/a	No '4'	% '4'	No '3'	% '3'	No '2'	% '2'	No '1'	% '1'	H	L	Median	Mode	Mean	SD	Corr
All	138	67%	21	15%	23	17%	54	39%	40	29%	4	1	2	2	2.18	1.02	0.18
Architecture	28	14%	5	18%	3	11%	10	36%	10	36%	4	1	2	1	2.11	1.10	-0.055
Building Services	12	6%	3	25%	4	33%	3	25%	2	17%	4	1	3	3	2.67	1.07	0.0159
Civil	92	44%	13	14%	15	16%	37	40%	27	29%	4	1	2	2	2.15	1.00	0.2219
Landscaping	7	3%	0	0%	1	14%	4	57%	2	29%	3	1	2	2	1.86	0.69	-0.076
Structural	26	13%	4	15%	3	12%	10	38%	9	35%	4	1	2	2	2.08	1.06	0.1159
Quantity Surveyors	15	7%	3	20%	3	20%	5	33%	4	27%	4	1	2	2	2.33	1.11	0.1448
With ISO9000	85	41%	16	19%	15	18%	35	41%	19	22%	4	1	2	2	2.33	1.03	0.1057
Without ISO9000	53	26%	5	9%	8	15%	19	36%	21	40%	4	1	2	1	1.94	0.97	0.3045

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Part	Part 2 Purpose of the IT																
Topic	.																
Subject	Transmission of information registers ('company-related data) using IT																
Q.2.13.e	Response										Distribution Statistics						
Sample Sector	Nos	% o/a	No '4'	% '4'	No '3'	% '3'	No '2'	% '2'	No '1'	% '1'	H	L	Median	Mode	Mean	SD	Corr
All	140	68%	29	21%	30	21%	57	41%	24	17%	4	1	2	2	2.46	1.01	0.1047
Architecture	28	14%	7	25%	4	14%	12	43%	5	18%	4	1	2	2	2.46	1.07	-0.249
Building Services	12	6%	5	42%	2	17%	5	42%	0	0%	4	2	3	2	3.00	0.95	-0.204
Civil	94	45%	16	17%	20	21%	43	46%	15	16%	4	1	2	2	2.39	0.95	0.1725
Landscaping	7	3%	0	0%	1	14%	5	71%	1	14%	3	1	2	2	2.00	0.58	-0.254
Structural	26	13%	4	15%	6	23%	9	35%	7	27%	4	1	2	2	2.27	1.04	0.0959
Quantity Surveyors	15	7%	4	27%	4	27%	4	27%	3	20%	4	1	3	3	2.60	1.12	-3E-04
With ISO9000	86	42%	22	26%	18	21%	35	41%	11	13%	4	1	2	2	2.59	1.01	0.0258
Without ISO9000	54	26%	7	13%	12	22%	22	41%	13	24%	4	1	2	2	2.24	0.97	0.1977

Part	Part 2 Purpose of the IT																
Topic	.																
Subject	Use of the telephone to communicate company-related data/information																
Q.2.14.a	Response										Distribution Statistics						
Sample Sector	Nos	% o/a	No '4'	% '4'	No '3'	% '3'	No '2'	% '2'	No '1'	% '1'	H	L	Median	Mode	Mean	SD	Corr
All	143	69%	67	47%	51	36%	17	12%	8	6%	4	1	3	4	3.24	0.87	0.168
Architecture	29	14%	16	55%	8	28%	3	10%	2	7%	4	1	4	4	3.31	0.93	0.0217
Building Services	12	6%	6	50%	6	50%	0	0%	0	0%	4	3	3.5	3	3.50	0.52	-0.084
Civil	95	46%	43	45%	31	33%	15	16%	6	6%	4	1	3	4	3.17	0.92	0.2081
Landscaping	8	4%	5	63%	3	38%	0	0%	0	0%	4	3	4	4	3.63	0.52	-0.573
Structural	26	13%	12	46%	12	46%	0	0%	2	8%	4	1	3	4	3.31	0.84	0.2877
Quantity Surveyors	15	7%	9	60%	6	40%	0	0%	0	0%	4	3	4	4	3.60	0.51	-0.257
With ISO9000	88	43%	47	53%	32	36%	6	7%	3	3%	4	1	4	4	3.40	0.77	0.1212
Without ISO9000	55	27%	20	36%	19	35%	11	20%	5	9%	4	1	3	4	2.98	0.97	0.0843

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Part	Part 2 Purpose of the IT																	
Topic	.																	
Subject	Use of the fax to communicate company-related data/information																	
Q.2.14.b	Response										Distribution Statistics							
Sample Sector	Nos	% o/a	No '4'	% '4'	No '3'	% '3'	No '2'	% '2'	No '1'	% '1'	H	L	Median	Mode	Mean	SD	Corr	
All	143	69%	70	49%	54	38%	12	8%	7	5%	4	1	3	4	3.31	0.82	0.1572	
Architecture	29	14%	18	62%	8	28%	1	3%	2	7%	4	1	4	4	3.45	0.87	0.0288	
Building Services	12	6%	6	50%	6	50%	0	0%	0	0%	4	3	3.5	3	3.50	0.52	-0.084	
Civil	95	46%	43	45%	36	38%	11	12%	5	5%	4	1	3	4	3.23	0.86	0.2023	
Landscaping	8	4%	4	50%	3	38%	1	13%	0	0%	4	2	3.5	4	3.38	0.74	-0.529	
Structural	26	13%	12	46%	12	46%	0	0%	2	8%	4	1	3	4	3.31	0.84	0.2971	
Quantity Surveyors	15	7%	9	60%	6	40%	0	0%	0	0%	4	3	4	4	3.60	0.51	-0.286	
With ISO9000	88	43%	51	58%	31	35%	5	6%	1	1%	4	1	4	4	3.50	0.66	0.1047	
Without ISO9000	55	27%	19	35%	23	42%	7	13%	6	11%	4	1	3	3	3.00	0.96	-0.029	

Part	Part 2 Purpose of the IT																	
Topic	.																	
Subject	Use of e-mail to communicate company-related data/information																	
Q.2.14.c	Response										Distribution Statistics							
Sample Sector	Nos	% o/a	No '4'	% '4'	No '3'	% '3'	No '2'	% '2'	No '1'	% '1'	H	L	Median	Mode	Mean	SD	Corr	
All	143	69%	23	16%	43	30%	50	35%	27	19%	4	1	2	2	2.43	0.98	0.2292	
Architecture	29	14%	0	0%	5	17%	16	55%	8	28%	3	1	2	2	1.90	0.67	-0.097	
Building Services	12	6%	1	8%	4	33%	5	42%	2	17%	4	1	2	2	2.33	0.89	0.3669	
Civil	95	46%	20	21%	34	36%	29	31%	12	13%	4	1	3	3	2.65	0.95	0.271	
Landscaping	8	4%	1	13%	4	50%	3	38%	0	0%	4	2	3	3	2.75	0.71	-0.625	
Structural	26	13%	6	23%	5	19%	6	23%	9	35%	4	1	2	1	2.31	1.19	0.5388	
Quantity Surveyors	15	7%	2	13%	4	27%	4	27%	5	33%	4	1	2	1	2.20	1.08	0.2667	
With ISO9000	88	43%	17	19%	23	26%	34	39%	14	16%	4	1	2	2	2.49	0.98	0.2972	
Without ISO9000	55	27%	6	11%	20	36%	16	29%	13	24%	4	1	2	3	2.35	0.97	-0.088	

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Part	Part 2 Purpose of the IT																
Topic	.																
Subject	Use of an Intranet to communicate company-related data/information																
Q.2.14.d	Response										Distribution Statistics						
Sample Sector	Nos	% o/a	No '4'	% '4'	No '3'	% '3'	No '2'	% '2'	No '1'	% '1'	H	L	Median	Mode	Mean	SD	Corr
All	142	69%	14	10%	14	10%	35	25%	79	56%	4	1	1	1	1.74	0.99	0.1108
Architecture	29	14%	0	0%	1	3%	8	28%	20	69%	3	1	1	1	1.34	0.55	-0.013
Building Services	11	5%	2	18%	0	0%	4	36%	5	45%	4	1	2	1	1.91	1.14	0.5978
Civil	95	46%	12	13%	12	13%	25	26%	46	48%	4	1	2	1	1.89	1.06	0.0984
Landscaping	8	4%	1	13%	1	13%	2	25%	4	50%	4	1	1.5	1	1.88	1.13	-0.391
Structural	26	13%	3	12%	0	0%	7	27%	16	62%	4	1	1	1	1.62	0.98	0.201
Quantity Surveyors	15	7%	1	7%	1	7%	3	20%	10	67%	4	1	1	1	1.53	0.92	0.329
With ISO9000	87	42%	11	13%	4	5%	27	31%	45	52%	4	1	1	1	1.78	1.02	0.1005
Without ISO9000	55	27%	3	5%	10	18%	8	15%	34	62%	4	1	1	1	1.67	0.96	0.1606

Part	Part 2 Purpose of the IT																
Topic	.																
Subject	Use of hard-copy to communicate company-related data/information																
Q.2.14.e	Response										Distribution Statistics						
Sample Sector	Nos	% o/a	No '4'	% '4'	No '3'	% '3'	No '2'	% '2'	No '1'	% '1'	H	L	Median	Mode	Mean	SD	Corr
All	143	69%	82	57%	45	31%	8	6%	8	6%	4	1	4	4	3.41	0.83	0.1778
Architecture	29	14%	22	76%	5	17%	1	3%	1	3%	4	1	4	4	3.66	0.72	-0.171
Building Services	12	6%	8	67%	3	25%	0	0%	1	8%	4	1	4	4	3.50	0.90	0.249
Civil	95	46%	51	54%	30	32%	7	7%	7	7%	4	1	4	4	3.32	0.90	0.2398
Landscaping	8	4%	6	75%	1	13%	1	13%	0	0%	4	2	4	4	3.63	0.74	-0.314
Structural	26	13%	15	58%	8	31%	1	4%	2	8%	4	1	4	4	3.38	0.90	0.2671
Quantity Surveyors	15	7%	10	67%	5	33%	0	0%	0	0%	4	3	4	4	3.67	0.49	0.1741
With ISO9000	88	43%	57	65%	22	25%	7	8%	2	2%	4	1	4	4	3.52	0.74	0.1572
Without ISO9000	55	27%	25	45%	23	42%	1	2%	6	11%	4	1	3	4	3.22	0.94	0.1049

Results of the 1998 postal survey of Hong Kong Public Works Consultants

Part	Part 2 Purpose of the IT																
Topic	.																
Subject	Transmission of 'specifications' (project-related data) using IT																
Q.2.15.a	Response										Distribution Statistics						
Sample Sector	Nos	% o/a	No '4'	% '4'	No '3'	% '3'	No '2'	% '2'	No '1'	% '1'	H	L	Median	Mode	Mean	SD	Corr
All	143	69%	60	42%	36	25%	37	26%	10	7%	4	1	3	4	3.02	0.98	0.0196
Architecture	29	14%	13	45%	3	10%	10	34%	3	10%	4	1	3	4	2.90	1.11	-0.259
Building Services	12	6%	6	50%	4	33%	2	17%	0	0%	4	2	3.5	4	3.33	0.78	-0.433
Civil	95	46%	35	37%	29	31%	24	25%	7	7%	4	1	3	4	2.97	0.96	0.0734
Landscaping	8	4%	4	50%	1	13%	3	38%	0	0%	4	2	3.5	4	3.13	0.99	0.1596
Structural	26	13%	10	38%	8	31%	6	23%	2	8%	4	1	3	4	3.00	0.98	-0.14
Quantity Surveyors	15	7%	8	53%	1	7%	5	33%	1	7%	4	1	4	4	3.07	1.10	-0.179
With ISO9000	88	43%	40	45%	21	24%	22	25%	5	6%	4	1	3	4	3.09	0.97	-0.025
Without ISO9000	55	27%	20	36%	15	27%	15	27%	5	9%	4	1	3	4	2.91	1.01	0.0822

Part	Part 2 Purpose of the IT																
Topic	.																
Subject	Transmission of 'Bills of Quantities' (project-related data) using IT																
Q.2.15.b	Response										Distribution Statistics						
Sample Sector	Nos	% o/a	No '4'	% '4'	No '3'	% '3'	No '2'	% '2'	No '1'	% '1'	H	L	Median	Mode	Mean	SD	Corr
All	142	69%	44	31%	25	18%	45	32%	28	20%	4	1	2	2	2.60	1.12	0.0857
Architecture	29	14%	8	28%	2	7%	13	45%	6	21%	4	1	2	2	2.41	1.12	-0.233
Building Services	12	6%	5	42%	2	17%	4	33%	1	8%	4	1	3	4	2.92	1.08	0.037
Civil	94	45%	25	27%	19	20%	28	30%	22	23%	4	1	2	2	2.50	1.12	0.1659
Landscaping	8	4%	3	38%	1	13%	2	25%	2	25%	4	1	2.5	4	2.63	1.30	0.0692
Structural	26	13%	6	23%	10	38%	6	23%	4	15%	4	1	3	3	2.69	1.01	0.1484
Quantity Surveyors	15	7%	9	60%	1	7%	5	33%	0	0%	4	2	4	4	3.27	0.96	-0.323
With ISO9000	88	43%	29	33%	17	19%	29	33%	13	15%	4	1	3	4	2.70	1.08	0.056
Without ISO9000	54	26%	15	28%	8	15%	16	30%	15	28%	4	1	2	2	2.43	1.18	0.0602

Results of the 1998 postal survey of Hong Kong Public Works Consultants

Part	Part 2 Purpose of the IT																
Topic	.																
Subject	Transmission of Tender Drawings (project-related data) using IT																
Q.2.15.c	Response										Distribution Statistics						
Sample Sector	Nos	% o/a	No '4'	% '4'	No '3'	% '3'	No '2'	% '2'	No '1'	% '1'	H	L	Median	Mode	Mean	SD	Corr
All	140	68%	51	36%	25	18%	39	28%	25	18%	4	1	3	4	2.73	1.14	0.043
Architecture	29	14%	12	41%	3	10%	10	34%	4	14%	4	1	3	4	2.79	1.15	-0.289
Building Services	12	6%	7	58%	3	25%	2	17%	0	0%	4	2	4	4	3.42	0.79	-0.304
Civil	94	45%	31	33%	18	19%	26	28%	19	20%	4	1	3	4	2.65	1.14	0.092
Landscaping	8	4%	3	38%	1	13%	3	38%	1	13%	4	1	2.5	2	2.75	1.16	-0.218
Structural	26	13%	10	38%	7	27%	7	27%	2	8%	4	1	3	4	2.96	1.00	-0.229
Quantity Surveyors	13	6%	4	31%	1	8%	5	38%	3	23%	4	1	2	2	2.46	1.20	0.0253
With ISO9000	86	42%	36	42%	15	17%	23	27%	12	14%	4	1	3	4	2.87	1.11	-0.032
Without ISO9000	54	26%	15	28%	10	19%	16	30%	13	24%	4	1	2	2	2.50	1.15	0.1008

Part	Part 2 Purpose of the IT																
Topic	.																
Subject	Transmission of Construction Drawings (project-related data) using IT																
Q.2.15.d	Response										Distribution Statistics						
Sample Sector	Nos	% o/a	No '4'	% '4'	No '3'	% '3'	No '2'	% '2'	No '1'	% '1'	H	L	Median	Mode	Mean	SD	Corr
All	138	67%	47	34%	24	17%	40	29%	27	20%	4	1	3	4	2.66	1.14	0.0364
Architecture	29	14%	12	41%	3	10%	11	38%	3	10%	4	1	3	4	2.83	1.10	-0.225
Building Services	12	6%	6	50%	3	25%	3	25%	0	0%	4	2	3.5	4	3.25	0.87	-0.296
Civil	92	44%	28	30%	16	17%	27	29%	21	23%	4	1	2	4	2.55	1.15	0.083
Landscaping	8	4%	3	38%	1	13%	3	38%	1	13%	4	1	2.5	2	2.75	1.16	-0.218
Structural	26	13%	10	38%	7	27%	8	31%	1	4%	4	1	3	4	3.00	0.94	-0.236
Quantity Surveyors	13	6%	3	23%	2	15%	4	31%	4	31%	4	1	2	1	2.31	1.18	-0.011
With ISO9000	85	41%	33	39%	15	18%	24	28%	13	15%	4	1	3	4	2.80	1.12	-0.04
Without ISO9000	53	26%	14	26%	9	17%	16	30%	14	26%	4	1	2	2	2.43	1.15	0.1095

Results of the 1998 postal survey of Hong Kong Public Works Consultants

Part	Part 2 Purpose of the IT																
Topic	.																
Subject	Transmission of As Built Drawings (project-related data) using IT																
Q.2.15.e	Response										Distribution Statistics						
Sample Sector	Nos	% o/a	No '4'	% '4'	No '3'	% '3'	No '2'	% '2'	No '1'	% '1'	H	L	Median	Mode	Mean	SD	Corr
All	136	66%	38	28%	29	21%	35	26%	34	25%	4	1	2	4	2.52	1.15	0.0643
Architecture	29	14%	10	34%	7	24%	7	24%	5	17%	4	1	3	4	2.76	1.12	-0.193
Building Services	12	6%	5	42%	2	17%	3	25%	2	17%	4	1	3	4	2.83	1.19	0.0928
Civil	90	43%	22	24%	18	20%	24	27%	26	29%	4	1	2	1	2.40	1.15	0.1154
Landscaping	8	4%	3	38%	1	13%	1	13%	3	38%	4	1	2.5	1	2.50	1.41	-0.24
Structural	26	13%	9	35%	10	38%	6	23%	1	4%	4	1	3	3	3.04	0.87	-0.203
Quantity Surveyors	13	6%	3	23%	2	15%	4	31%	4	31%	4	1	2	1	2.31	1.18	-0.011
With ISO9000	85	41%	28	33%	19	22%	19	22%	19	22%	4	1	3	4	2.66	1.16	0.0294
Without ISO9000	51	25%	10	20%	10	20%	16	31%	15	29%	4	1	2	2	2.29	1.10	-0.044

Part	Part 2 Purpose of the IT																
Topic	.																
Subject	Transmission of Contract Correspondence (project-related data) using IT																
Q.2.15.f	Response										Distribution Statistics						
Sample Sector	Nos	% o/a	No '4'	% '4'	No '3'	% '3'	No '2'	% '2'	No '1'	% '1'	H	L	Median	Mode	Mean	SD	Corr
All	144	70%	61	42%	41	28%	29	20%	13	9%	4	1	3	4	3.04	1.00	-0.111
Architecture	29	14%	15	52%	3	10%	7	24%	4	14%	4	1	4	4	3.00	1.16	-0.214
Building Services	12	6%	6	50%	3	25%	3	25%	0	0%	4	2	3.5	4	3.25	0.87	-0.5
Civil	96	46%	33	34%	32	33%	21	22%	10	10%	4	1	3	4	2.92	0.99	-0.082
Landscaping	8	4%	4	50%	2	25%	1	13%	1	13%	4	1	3.5	4	3.13	1.13	0.3261
Structural	26	13%	8	31%	9	35%	6	23%	3	12%	4	1	3	3	2.85	1.01	-0.223
Quantity Surveyors	15	7%	9	60%	3	20%	3	20%	0	0%	4	2	4	4	3.40	0.83	-0.461
With ISO9000	88	43%	40	45%	25	28%	16	18%	7	8%	4	1	3	4	3.11	0.98	-0.203
Without ISO9000	56	27%	21	38%	16	29%	13	23%	6	11%	4	1	3	4	2.93	1.02	-0.024

Results of the 1998 postal survey of Hong Kong Public Works Consultants

Part	Part 2 Purpose of the IT																
Topic	.																
Subject	Transmission of Routine Correspondence (project-related data) using IT																
Q.2.15.g	Response										Distribution Statistics						
Sample Sector	Nos	% o/a	No '4'	% '4'	No '3'	% '3'	No '2'	% '2'	No '1'	% '1'	H	L	Median	Mode	Mean	SD	Corr
All	143	69%	63	44%	48	34%	20	14%	12	8%	4	1	3	4	3.13	0.95	-0.087
Architecture	29	14%	16	55%	2	7%	7	24%	4	14%	4	1	4	4	3.03	1.18	-0.237
Building Services	12	6%	8	67%	2	17%	2	17%	0	0%	4	2	4	4	3.50	0.80	-0.403
Civil	95	46%	34	36%	39	41%	13	14%	9	9%	4	1	3	3	3.03	0.94	-0.042
Landscaping	8	4%	4	50%	3	38%	0	0%	1	13%	4	1	3.5	4	3.25	1.04	0.2247
Structural	26	13%	8	31%	9	35%	6	23%	3	12%	4	1	3	3	2.85	1.01	-0.207
Quantity Surveyors	15	7%	9	60%	3	20%	3	20%	0	0%	4	2	4	4	3.40	0.83	-0.461
With ISO9000	88	43%	42	48%	28	32%	13	15%	5	6%	4	1	3	4	3.22	0.90	-0.178
Without ISO9000	55	27%	21	38%	20	36%	7	13%	7	13%	4	1	3	4	3.00	1.02	-0.041

Part	Part 2 Purpose of the IT																
Topic	.																
Subject	Transmission of Instructions (project-related data) using IT																
Q.2.15.h	Response										Distribution Statistics						
Sample Sector	Nos	% o/a	No '4'	% '4'	No '3'	% '3'	No '2'	% '2'	No '1'	% '1'	H	L	Median	Mode	Mean	SD	Corr
All	143	69%	58	41%	45	31%	27	19%	13	9%	4	1	3	4	3.03	0.98	-0.069
Architecture	29	14%	16	55%	2	7%	7	24%	4	14%	4	1	4	4	3.03	1.18	-0.25
Building Services	12	6%	6	50%	4	33%	2	17%	0	0%	4	2	3.5	4	3.33	0.78	-0.433
Civil	96	46%	33	34%	39	41%	16	17%	8	8%	4	1	3	3	3.01	0.92	-0.069
Landscaping	8	4%	4	50%	2	25%	1	13%	1	13%	4	1	3.5	4	3.13	1.13	0.3261
Structural	26	13%	10	38%	7	27%	5	19%	4	15%	4	1	3	4	2.88	1.11	-0.23
Quantity Surveyors	14	7%	5	36%	1	7%	6	43%	2	14%	4	1	2	2	2.64	1.15	-0.002
With ISO9000	87	42%	37	43%	25	29%	19	22%	6	7%	4	1	3	4	3.07	0.96	-0.121
Without ISO9000	56	27%	21	38%	20	36%	8	14%	7	13%	4	1	3	4	2.98	1.02	-0.011

Results of the 1998 postal survey of Hong Kong Public Works Consultants

Part	Part 2 Purpose of the IT																
Topic	.																
Subject	Transmission of Monthly and other reports (project-related data) using IT																
Q.2.15.i	Response										Distribution Statistics						
Sample Sector	Nos	% o/a	No '4'	% '4'	No '3'	% '3'	No '2'	% '2'	No '1'	% '1'	H	L	Median	Mode	Mean	SD	Corr
All	144	70%	64	44%	42	29%	28	19%	10	7%	4	1	3	4	3.11	0.95	-0.122
Architecture	29	14%	15	52%	3	10%	6	21%	5	17%	4	1	4	4	2.97	1.21	-0.324
Building Services	12	6%	6	50%	2	17%	4	33%	0	0%	4	2	3.5	4	3.17	0.94	-0.376
Civil	96	46%	37	39%	32	33%	21	22%	6	6%	4	1	3	4	3.04	0.93	-0.081
Landscaping	8	4%	4	50%	3	38%	1	13%	0	0%	4	2	3.5	4	3.38	0.74	0.2301
Structural	26	13%	10	38%	8	31%	4	15%	4	15%	4	1	3	4	2.92	1.09	-0.187
Quantity Surveyors	15	7%	8	53%	3	20%	4	27%	0	0%	4	2	4	4	3.27	0.88	-0.371
With ISO9000	88	43%	42	48%	23	26%	19	22%	4	5%	4	1	3	4	3.17	0.93	-0.209
Without ISO9000	56	27%	22	39%	19	34%	9	16%	6	11%	4	1	3	4	3.02	1.00	-0.046

Part	Part 2 Purpose of the IT																
Topic	.																
Subject	Transmission of Method Statements (project-related data) using IT																
Q.2.15.j	Response										Distribution Statistics						
Sample Sector	Nos	% o/a	No '4'	% '4'	No '3'	% '3'	No '2'	% '2'	No '1'	% '1'	H	L	Median	Mode	Mean	SD	Corr
All	144	70%	41	28%	49	34%	39	27%	15	10%	4	1	3	3	2.81	0.97	-0.039
Architecture	29	14%	9	31%	7	24%	9	31%	4	14%	4	1	3	2	2.72	1.07	-0.18
Building Services	12	6%	5	42%	2	17%	5	42%	0	0%	4	2	3	2	3.00	0.95	-0.222
Civil	96	46%	26	27%	35	36%	25	26%	10	10%	4	1	3	3	2.80	0.96	-0.035
Landscaping	8	4%	2	25%	3	38%	1	13%	2	25%	4	1	3	3	2.63	1.19	0.6217
Structural	26	13%	9	35%	7	27%	6	23%	4	15%	4	1	3	4	2.81	1.10	-0.191
Quantity Surveyors	15	7%	3	20%	4	27%	7	47%	1	7%	4	1	2	2	2.60	0.91	-0.056
With ISO9000	88	43%	26	30%	29	33%	26	30%	7	8%	4	1	3	3	2.84	0.95	-0.054
Without ISO9000	56	27%	15	27%	20	36%	13	23%	8	14%	4	1	3	3	2.75	1.01	-0.112

Results of the 1998 postal survey of Hong Kong Public Works Consultants

Part	Part 2 Purpose of the IT																
Topic	.																
Subject	Transmission of Quality Conformance Statements (project-related data) using IT																
Q.2.15.k	Response										Distribution Statistics						
Sample Sector	Nos	% o/a	No '4'	% '4'	No '3'	% '3'	No '2'	% '2'	No '1'	% '1'	H	L	Median	Mode	Mean	SD	Corr
All	144	70%	42	29%	43	30%	38	26%	21	15%	4	1	3	3	2.74	1.04	0.0295
Architecture	29	14%	10	34%	7	24%	7	24%	5	17%	4	1	3	4	2.76	1.12	-0.196
Building Services	12	6%	5	42%	4	33%	3	25%	0	0%	4	2	3	4	3.17	0.83	-0.219
Civil	96	46%	26	27%	30	31%	26	27%	14	15%	4	1	3	3	2.71	1.03	0.0404
Landscaping	8	4%	2	25%	2	25%	3	38%	1	13%	4	1	2.5	2	2.63	1.06	0.6962
Structural	26	13%	8	31%	6	23%	8	31%	4	15%	4	1	3	4	2.69	1.09	-0.116
Quantity Surveyors	15	7%	4	27%	2	13%	6	40%	3	20%	4	1	2	2	2.47	1.13	0.084
With ISO9000	88	43%	27	31%	27	31%	25	28%	9	10%	4	1	3	3	2.82	0.99	-0.003
Without ISO9000	56	27%	15	27%	16	29%	13	23%	12	21%	4	1	3	3	2.61	1.11	-0.014

Part	Part 2 Purpose of the IT																
Topic	.																
Subject	Transmission of Manuals and Procedures (project-related data) using IT																
Q.2.15.1	Response										Distribution Statistics						
Sample Sector	Nos	% o/a	No '4'	% '4'	No '3'	% '3'	No '2'	% '2'	No '1'	% '1'	H	L	Median	Mode	Mean	SD	Corr
All	144	70%	39	27%	36	25%	49	34%	20	14%	4	1	3	2	2.65	1.03	0.0052
Architecture	29	14%	8	28%	6	21%	10	34%	5	17%	4	1	2	2	2.59	1.09	-0.182
Building Services	12	6%	3	25%	4	33%	4	33%	1	8%	4	1	3	3	2.75	0.97	-0.055
Civil	96	46%	24	25%	24	25%	34	35%	14	15%	4	1	2.5	2	2.60	1.02	0.0236
Landscaping	8	4%	2	25%	0	0%	5	63%	1	13%	4	1	2	2	2.38	1.06	0.3586
Structural	26	13%	5	19%	11	42%	6	23%	4	15%	4	1	3	3	2.65	0.98	-0.06
Quantity Surveyors	15	7%	5	33%	2	13%	6	40%	2	13%	4	1	2	2	2.67	1.11	0.0032
With ISO9000	88	43%	24	27%	28	32%	26	30%	10	11%	4	1	3	3	2.75	0.99	-0.04
Without ISO9000	56	27%	15	27%	8	14%	23	41%	10	18%	4	1	2	2	2.50	1.08	-0.061

Results of the 1998 postal survey of Hong Kong Public Works Consultants

Part	Part 2 Purpose of the IT																
Topic	.																
Subject	Transmission of Cost Reports (project-related data) using IT																
Q.2.15.m	Response										Distribution Statistics						
Sample Sector	Nos	% o/a	No '4'	% '4'	No '3'	% '3'	No '2'	% '2'	No '1'	% '1'	H	L	Median	Mode	Mean	SD	Corr
All	144	70%	40	28%	40	28%	46	32%	18	13%	4	1	3	2	2.71	1.01	0.0282
Architecture	29	14%	10	34%	5	17%	8	28%	6	21%	4	1	3	4	2.66	1.17	-0.243
Building Services	12	6%	6	50%	2	17%	4	33%	0	0%	4	2	3.5	4	3.17	0.94	-0.376
Civil	96	46%	18	19%	31	32%	33	34%	14	15%	4	1	3	2	2.55	0.96	0.11
Landscaping	8	4%	3	38%	2	25%	2	25%	1	13%	4	1	3	4	2.88	1.13	0.6581
Structural	26	13%	5	19%	8	31%	8	31%	5	19%	4	1	2.5	3	2.50	1.03	0.1085
Quantity Surveyors	15	7%	9	60%	3	20%	3	20%	0	0%	4	2	4	4	3.40	0.83	-0.462
With ISO9000	88	43%	29	33%	28	32%	23	26%	8	9%	4	1	3	4	2.89	0.98	-0.068
Without ISO9000	56	27%	11	20%	12	21%	23	41%	10	18%	4	1	2	2	2.43	1.01	-0.022

Part	Part 2 Purpose of the IT																
Topic	.																
Subject	Transmission of Programmes and Bar Charts (project-related data) using IT																
Q.2.15.n	Response										Distribution Statistics						
Sample Sector	Nos	% o/a	No '4'	% '4'	No '3'	% '3'	No '2'	% '2'	No '1'	% '1'	H	L	Median	Mode	Mean	SD	Corr
All	144	70%	48	33%	48	33%	38	26%	10	7%	4	1	3	4	2.93	0.94	-0.025
Architecture	29	14%	13	45%	4	14%	8	28%	4	14%	4	1	3	4	2.90	1.14	-0.275
Building Services	12	6%	5	42%	4	33%	3	25%	0	0%	4	2	3	4	3.17	0.83	-0.21
Civil	96	46%	26	27%	39	41%	26	27%	5	5%	4	1	3	3	2.90	0.86	0.0022
Landscaping	8	4%	3	38%	2	25%	2	25%	1	13%	4	1	3	4	2.88	1.13	0.6581
Structural	26	13%	7	27%	9	35%	7	27%	3	12%	4	1	3	3	2.77	0.99	-0.006
Quantity Surveyors	15	7%	7	47%	2	13%	4	27%	2	13%	4	1	3	4	2.93	1.16	-0.116
With ISO9000	88	43%	34	39%	26	30%	22	25%	6	7%	4	1	3	4	3.00	0.96	-0.064
Without ISO9000	56	27%	14	25%	22	39%	16	29%	4	7%	4	1	3	3	2.82	0.90	-0.093

Results of the 1998 postal survey of Hong Kong Public Works Consultants

Part	Part 2 Purpose of the IT																
Topic	.																
Subject	Use of the telephone to communicate project-related data/information																
Q.2.16.a	Response										Distribution Statistics						
Sample Sector	Nos	% o/a	No '4'	% '4'	No '3'	% '3'	No '2'	% '2'	No '1'	% '1'	H	L	Median	Mode	Mean	SD	Corr
All	146	71%	58	40%	47	32%	31	21%	10	7%	4	1	3	4	3.05	0.94	0.0702
Architecture	29	14%	14	48%	6	21%	7	24%	2	7%	4	1	3	4	3.10	1.01	-0.067
Building Services	12	6%	3	25%	5	42%	3	25%	1	8%	4	1	3	3	2.83	0.94	-0.035
Civil	98	47%	36	37%	33	34%	20	20%	9	9%	4	1	3	4	2.98	0.97	0.1018
Landscaping	8	4%	4	50%	2	25%	2	25%	0	0%	4	2	3.5	4	3.25	0.89	-0.528
Structural	26	13%	9	35%	11	42%	4	15%	2	8%	4	1	3	3	3.04	0.92	0.104
Quantity Surveyors	15	7%	7	47%	5	33%	3	20%	0	0%	4	2	3	4	3.27	0.80	-0.072
With ISO9000	88	43%	37	42%	29	33%	17	19%	5	6%	4	1	3	4	3.11	0.92	0.047
Without ISO9000	58	28%	21	36%	18	31%	14	24%	5	9%	4	1	3	4	2.95	0.98	0.0486

Part	Part 2 Purpose of the IT																
Topic	.																
Subject	Use of the fax to communicate project-related data/information																
Q.2.16.b	Response										Distribution Statistics						
Sample Sector	Nos	% o/a	No '4'	% '4'	No '3'	% '3'	No '2'	% '2'	No '1'	% '1'	H	L	Median	Mode	Mean	SD	Corr
All	146	71%	80	55%	57	39%	7	5%	2	1%	4	1	4	4	3.47	0.66	0.0109
Architecture	29	14%	19	66%	9	31%	1	3%	0	0%	4	2	4	4	3.62	0.56	-0.012
Building Services	12	6%	6	50%	5	42%	1	8%	0	0%	4	2	3.5	4	3.42	0.67	-0.067
Civil	98	47%	51	52%	39	40%	6	6%	2	2%	4	1	4	4	3.42	0.70	0.0168
Landscaping	8	4%	4	50%	4	50%	0	0%	0	0%	4	3	3.5	3	3.50	0.53	-0.342
Structural	26	13%	11	42%	15	58%	0	0%	0	0%	4	3	3	3	3.42	0.50	-0.037
Quantity Surveyors	15	7%	9	60%	6	40%	0	0%	0	0%	4	3	4	4	3.60	0.51	-0.286
With ISO9000	88	43%	53	60%	31	35%	4	5%	0	0%	4	2	4	4	3.56	0.58	-0.077
Without ISO9000	58	28%	27	47%	26	45%	3	5%	2	3%	4	1	3	4	3.34	0.74	0.0552

Results of the 1998 postal survey of Hong Kong Public Works Consultants

Part	Part 2 Purpose of the IT																
Topic	.																
Subject	Use of e-mail to communicate project-related data/information																
Q.2.16.c	Response										Distribution Statistics						
Sample Sector	Nos	% o/a	No '4'	% '4'	No '3'	% '3'	No '2'	% '2'	No '1'	% '1'	H	L	Median	Mode	Mean	SD	Corr
All	145	70%	22	15%	42	29%	60	41%	21	14%	4	1	2	2	2.45	0.92	0.095
Architecture	29	14%	1	3%	5	17%	18	62%	5	17%	4	1	2	2	2.07	0.70	-0.093
Building Services	12	6%	2	17%	2	17%	7	58%	1	8%	4	1	2	2	2.42	0.90	0.2037
Civil	98	47%	19	19%	34	35%	34	35%	11	11%	4	1	3	3	2.62	0.93	0.0862
Landscaping	8	4%	2	25%	3	38%	3	38%	0	0%	4	2	3	2	2.88	0.83	-0.215
Structural	26	13%	4	15%	6	23%	12	46%	4	15%	4	1	2	2	2.38	0.94	0.3091
Quantity Surveyors	14	7%	1	7%	4	29%	5	36%	4	29%	4	1	2	2	2.14	0.95	0.3876
With ISO9000	87	42%	15	17%	21	24%	41	47%	10	11%	4	1	2	2	2.47	0.91	0.1075
Without ISO9000	58	28%	7	12%	21	36%	19	33%	11	19%	4	1	2	3	2.41	0.94	0.0511

Part	Part 2 Purpose of the IT																
Topic	.																
Subject	Use of hard-copy to communicate project-related data/information																
Q.2.16.d	Response										Distribution Statistics						
Sample Sector	Nos	% o/a	No '4'	% '4'	No '3'	% '3'	No '2'	% '2'	No '1'	% '1'	H	L	Median	Mode	Mean	SD	Corr
All	146	71%	108	74%	35	24%	1	1%	2	1%	4	1	4	4	3.71	0.55	0.078
Architecture	29	14%	26	90%	3	10%	0	0%	0	0%	4	3	4	4	3.90	0.31	-0.088
Building Services	12	6%	9	75%	3	25%	0	0%	0	0%	4	3	4	4	3.75	0.45	0.1515
Civil	98	47%	68	69%	27	28%	1	1%	2	2%	4	1	4	4	3.64	0.61	0.1151
Landscaping	8	4%	5	63%	3	38%	0	0%	0	0%	4	3	4	4	3.63	0.52	-0.432
Structural	26	13%	23	88%	3	12%	0	0%	0	0%	4	3	4	4	3.88	0.33	-0.488
Quantity Surveyors	15	7%	12	80%	3	20%	0	0%	0	0%	4	3	4	4	3.80	0.41	0.0176
With ISO9000	88	43%	70	80%	18	20%	0	0%	0	0%	4	3	4	4	3.80	0.41	-0.042
Without ISO9000	58	28%	38	66%	17	29%	1	2%	2	3%	4	1	4	4	3.57	0.70	0.1727

Results of the 1998 postal survey of Hong Kong Public Works Consultants

Part	Part 3 Use of the IT																
Topic	.																
Subject	Use of individual review of work-content data to combine together a portfolio view of projects																
Q.3.1.a	Response										Distribution Statistics						
Sample Sector	Nos	% o/a	No '4'	% '4'	No '3'	% '3'	No '2'	% '2'	No '1'	% '1'	H	L	Median	Mode	Mean	SD	Corr
All	139	67%	35	25%	67	48%	29	21%	8	6%	4	1	3	3	2.93	0.83	0.1322
Architecture	29	14%	7	24%	14	48%	6	21%	2	7%	4	1	3	3	2.90	0.86	-0.096
Building Services	12	6%	5	42%	4	33%	3	25%	0	0%	4	2	3	4	3.17	0.83	-0.361
Civil	92	44%	23	25%	45	49%	20	22%	4	4%	4	1	3	3	2.95	0.80	0.1587
Landscaping	8	4%	2	25%	3	38%	2	25%	1	13%	4	1	3	3	2.75	1.04	-0.063
Structural	26	13%	23	88%	3	12%	0	0%	0	0%	4	3	4	4	3.88	0.33	-0.488
Quantity Surveyors	14	7%	5	36%	5	36%	3	21%	1	7%	4	1	3	4	3.00	0.96	-0.145
With ISO9000	87	42%	23	26%	45	52%	16	18%	3	3%	4	1	3	3	3.01	0.77	0.1434
Without ISO9000	52	25%	12	23%	22	42%	13	25%	5	10%	4	1	3	3	2.78846	0.9147	-0.043

Part	Part 3 Use of the IT																
Topic	.																
Subject	spreadsheets of numeric and date data of work-content data to combine together a portfolio view of proj																
Q.3.1.b	Response										Distribution Statistics						
Sample Sector	Nos	% o/a	No '4'	% '4'	No '3'	% '3'	No '2'	% '2'	No '1'	% '1'	H	L	Median	Mode	Mean	SD	Corr
All	140	68%	36	26%	61	44%	31	22%	12	9%	4	1	3	3	2.86	0.90	0.1356
Architecture	29	14%	9	31%	10	34%	9	31%	1	3%	4	1	3	3	2.93	0.88	-0.194
Building Services	12	6%	1	8%	6	50%	4	33%	1	8%	4	1	3	3	2.58	0.79	0.0114
Civil	93	45%	20	22%	44	47%	19	20%	10	11%	4	1	3	3	2.80	0.90	0.1917
Landscaping	8	4%	1	13%	6	75%	1	13%	0	0%	4	2	3	3	3	0.5345	0.6259
Structural	26	13%	8	31%	12	46%	4	15%	2	8%	4	1	3	3	3.00	0.89	0.2606
Quantity Surveyors	14	7%	7	50%	5	36%	1	7%	1	7%	4	1	3.5	4	3.29	0.91	-0.287
With ISO9000	87	42%	24	28%	41	47%	17	20%	5	6%	4	1	3	3	2.97	0.84	0.1182
Without ISO9000	53	26%	12	23%	20	38%	14	26%	7	13%	4	1	3	3	2.70	0.97	0.0545

Results of the 1998 postal survey of Hong Kong Public Works Consultants

Part	Part 3 Use of the IT																
Topic	.																
Subject	e of database of alpha-numeric data of work-content data to combine together a portfolio view of projects																
Q.3.1.c	Response										Distribution Statistics						
Sample Sector	Nos	% o/a	No '4'	% '4'	No '3'	% '3'	No '2'	% '2'	No '1'	% '1'	H	L	Median	Mode	Mean	SD	Corr
All	140	68%	21	15%	48	34%	50	36%	21	15%	4	1	2	2	2.49	0.93	0.1698
Architecture	29	14%	4	14%	10	34%	11	38%	4	14%	4	1	2	2	2.48	0.91	-0.112
Building Services	12	6%	0	0%	6	50%	4	33%	2	17%	3	1	2.5	3	2.33	0.78	-0.113
Civil	93	45%	13	14%	31	33%	37	40%	12	13%	4	1	2	2	2.48	0.89	0.2293
Landscaping	8	4%	0	0%	3	38%	4	50%	1	13%	3	1	2	2	2.25	0.71	-0.085
Structural	26	13%	6	23%	9	35%	8	31%	3	12%	4	1	3	3	2.69	0.97	0.4368
Quantity Surveyors	14	7%	3	21%	5	36%	3	21%	3	21%	4	1	3	3	2.57	1.09	-0.082
With ISO9000	87	42%	13	15%	36	41%	28	32%	10	11%	4	1	3	3	2.60	0.88	0.1472
Without ISO9000	53	26%	8	15%	12	23%	22	42%	11	21%	4	1	2	2	2.32	0.98	0.14

Q.3.2

open question

Part	Part 3 Use of the IT																
Topic	.																
Subject	Use of individual review of time aspects data to combine together a portfolio view of projects																
Q.3.3.a	Response										Distribution Statistics						
Sample Sector	Nos	% o/a	No '4'	% '4'	No '3'	% '3'	No '2'	% '2'	No '1'	% '1'	H	L	Median	Mode	Mean	SD	Corr
All	139	67%	37	27%	56	40%	36	26%	10	7%	4	1	3	3	2.86	0.89	0.1132
Architecture	29	14%	9	31%	10	34%	7	24%	3	10%	4	1	3	3	2.86	0.99	-0.078
Building Services	12	6%	5	42%	4	33%	3	25%	0	0%	4	2	3	4	3.17	0.83	-0.361
Civil	93	45%	24	26%	37	40%	28	30%	4	4%	4	1	3	3	2.87	0.85	0.132
Landscaping	7	3%	2	29%	0	0%	4	57%	1	14%	4	1	2	2	2.43	1.13	0.2677
Structural	26	13%	3	12%	7	27%	10	38%	6	23%	4	1	2	2	2.27	0.96	0.5561
Quantity Surveyors	14	7%	5	36%	5	36%	2	14%	2	14%	4	1	3	3	2.93	1.07	-0.097
With ISO9000	86	42%	24	28%	39	45%	18	21%	5	6%	4	1	3	3	2.95	0.85	0.0884
Without ISO9000	53	26%	13	25%	17	32%	18	34%	5	9%	4	1	3	2	2.72	0.95	0.0689

Part	Part 3 Use of the IT																
Topic	.																
Subject	f spreadsheets of numeric and date data of time aspects data to combine together a portfolio view of proj																
Q.3.3.b	Response										Distribution Statistics						
Sample Sector	Nos	% o/a	No '4'	% '4'	No '3'	% '3'	No '2'	% '2'	No '1'	% '1'	H	L	Median	Mode	Mean	SD	Corr
All	140	68%	32	23%	60	43%	33	24%	15	11%	4	1	3	3	2.78	0.92	0.1372
Architecture	29	14%	8	28%	11	38%	9	31%	1	3%	4	1	3	3	2.90	0.86	-0.108
Building Services	12	6%	1	8%	6	50%	4	33%	1	8%	4	1	3	3	2.58	0.79	0.1182
Civil	93	45%	18	19%	43	46%	20	22%	12	13%	4	1	3	3	2.72	0.93	0.1654
Landscaping	8	4%	1	13%	6	75%	1	13%	0	0%	4	2	3	3	3.00	0.53	0.0978
Structural	26	13%	7	27%	13	50%	5	19%	1	4%	4	1	3	3	3.00	0.80	0.0852
Quantity Surveyors	14	7%	6	43%	3	21%	3	21%	2	14%	4	1	3	4	2.93	1.14	-0.032
With ISO9000	87	42%	22	25%	39	45%	19	22%	7	8%	4	1	3	3	2.87	0.89	0.0948
Without ISO9000	53	26%	10	19%	21	40%	14	26%	8	15%	4	1	3	3	2.62	0.97	0.1734

Part	Part 3 Use of the IT																
Topic	.																
Subject	e of database of alpha-numeric data of time aspects data to combine together a portfolio view of projects																
Q.3.3.c	Response										Distribution Statistics						
Sample Sector	Nos	% o/a	No '4'	% '4'	No '3'	% '3'	No '2'	% '2'	No '1'	% '1'	H	L	Median	Mode	Mean	SD	Corr
All	140	68%	17	12%	46	33%	50	36%	27	19%	4	1	2	2	2.38	0.93	0.1712
Architecture	29	14%	3	10%	11	38%	10	34%	5	17%	4	1	2	3	2.41	0.91	-0.044
Building Services	12	6%	0	0%	5	42%	6	50%	1	8%	3	1	2	2	2.33	0.65	-0.008
Civil	93	45%	11	12%	28	30%	38	41%	16	17%	4	1	2	2	2.37	0.91	0.2099
Landscaping	8	4%	1	13%	2	25%	4	50%	1	13%	4	1	2	2	2.38	0.92	0.1298
Structural	26	13%	5	19%	11	42%	8	31%	2	8%	4	1	3	3	2.73	0.87	0.2925
Quantity Surveyors	14	7%	3	21%	4	29%	2	14%	5	36%	4	1	2.5	1	2.36	1.22	0.0324
With ISO9000	87	42%	10	11%	33	38%	31	36%	13	15%	4	1	2	3	2.46	0.89	0.1508
Without ISO9000	53	26%	7	13%	13	25%	19	36%	14	26%	4	1	2	2	2.25	1.00	0.187

Q.3.4

open question

Part	Part 3 Use of the IT																
Topic	.																
Subject	Use of individual review of cost aspects data to combine together a portfolio view of projects																
Q.3.5.a	Response										Distribution Statistics						
Sample Sector	Nos	% o/a	No '4'	% '4'	No '3'	% '3'	No '2'	% '2'	No '1'	% '1'	H	L	Median	Mode	Mean	SD	Corr
All	137	66%	39	28%	58	42%	26	19%	14	10%	4	1	3	3	2.89	0.94	0.132
Architecture	29	14%	11	38%	10	34%	4	14%	4	14%	4	1	3	4	2.97	1.05	-0.017
Building Services	12	6%	5	42%	5	42%	2	17%	0	0%	4	2	3	3	3.25	0.75	-0.163
Civil	91	44%	22	24%	42	46%	19	21%	8	9%	4	1	3	3	2.86	0.89	0.1654
Landscaping	7	3%	1	14%	2	29%	3	43%	1	14%	4	1	2	2	2.43	0.98	0.5488
Structural	26	13%	2	8%	8	31%	11	42%	5	19%	4	1	2	2	2.27	0.87	0.4726
Quantity Surveyors	14	7%	5	36%	6	43%	2	14%	1	7%	4	1	3	3	3.0714	0.9169	0.0386
With ISO9000	85	41%	28	33%	37	44%	14	16%	6	7%	4	1	3	3	3.02	0.89	0.1
Without ISO9000	52	25%	11	21%	21	40%	12	23%	8	15%	4	1	3	3	2.67	0.98	0.07

Part	Part 3 Use of the IT																
Topic	.																
Subject	spreadsheets of numeric and date data of cost aspects data to combine together a portfolio view of proj																
Q.3.5.b	Response										Distribution Statistics						
Sample Sector	Nos	% o/a	No '4'	% '4'	No '3'	% '3'	No '2'	% '2'	No '1'	% '1'	H	L	Median	Mode	Mean	SD	Corr
All	137	66%	39	28%	58	42%	25	18%	15	11%	4	1	3	3	2.88	0.95	0.1247
Architecture	29	14%	11	38%	10	34%	5	17%	3	10%	4	1	3	4	3.00	1.00	-0.091
Building Services	12	6%	2	17%	6	50%	3	25%	1	8%	4	1	3	3	2.75	0.87	0.4138
Civil	91	44%	23	25%	40	44%	16	18%	12	13%	4	1	3	3	2.81	0.97	0.1609
Landscaping	7	3%	1	14%	3	43%	2	29%	1	14%	4	1	3	3	2.57	0.98	0.3522
Structural	26	13%	8	31%	11	42%	5	19%	2	8%	4	1	3	3	2.96	0.92	0.0528
Quantity Surveyors	14	7%	6	43%	7	50%	0	0%	1	7%	4	1	3	3	3.29	0.83	0.0151
With ISO9000	85	41%	26	31%	38	45%	14	16%	7	8%	4	1	3	3	2.98	0.90	0.1084
Without ISO9000	53	26%	10	19%	21	40%	14	26%	8	15%	4	1	3	3	2.62	0.97	0.1734

Results of the 1998 postal survey of Hong Kong Public Works Consultants

Part	Part 3 Use of the IT																
Topic	.																
Subject	e of database of alpha-numeric data of cost aspects data to combine together a portfolio view of projects																
Q.3.5.c	Response										Distribution Statistics						
Sample Sector	Nos	% o/a	No '4'	% '4'	No '3'	% '3'	No '2'	% '2'	No '1'	% '1'	H	L	Median	Mode	Mean	SD	Corr
All	137	66%	25	18%	42	31%	46	34%	24	18%	4	1	2	2	2.50	0.99	0.2126
Architecture	29	14%	7	24%	10	34%	7	24%	5	17%	4	1	3	3	2.66	1.04	-0.142
Building Services	12	6%	1	8%	5	42%	5	42%	1	8%	4	1	2.5	3	2.50	0.80	0.3253
Civil	91	44%	14	15%	29	32%	33	36%	15	16%	4	1	2	2	2.46	0.95	0.2646
Landscaping	7	3%	1	14%	1	14%	4	57%	1	14%	4	1	2	2	2.29	0.95	0.2641
Structural	26	13%	4	15%	10	38%	9	35%	3	12%	4	1	3	3	2.58	0.90	0.3914
Quantity Surveyors	14	7%	4	29%	3	21%	4	29%	3	21%	4	1	2.5	2	2.57	1.16	0.2637
With ISO9000	85	41%	15	18%	32	38%	26	31%	12	14%	4	1	3	3	2.59	0.94	0.1896
Without ISO9000	53	26%	7	13%	13	25%	19	36%	14	26%	4	1	2	2	2.25	1.00	0.187

Q.3.6

open question

Part	Part 3 Use of the IT																
Topic	.																
Subject	Use of individual review of resource aspects data to combine together a portfolio view of projects																
Q.3.7.a	Response										Distribution Statistics						
Sample Sector	Nos	% o/a	No '4'	% '4'	No '3'	% '3'	No '2'	% '2'	No '1'	% '1'	H	L	Median	Mode	Mean	SD	Corr
All	135	65%	35	26%	58	43%	28	21%	14	10%	4	1	3	3	2.84	0.93	0.1404
Architecture	29	14%	9	31%	11	38%	5	17%	4	14%	4	1	3	3	2.86	1.03	0.0075
Building Services	12	6%	6	50%	4	33%	2	17%	0	0%	4	2	3.5	4	3.33	0.78	0.0715
Civil	89	43%	19	21%	39	44%	22	25%	9	10%	4	1	3	3	2.76	0.90	0.1821
Landscaping	7	3%	1	14%	4	57%	2	29%	0	0%	4	2	3	3	2.86	0.69	0.4374
Structural	26	13%	3	12%	10	38%	8	31%	5	19%	4	1	2.5	3	2.42	0.95	0.4823
Quantity Surveyors	14	7%	7	50%	5	36%	1	7%	1	7%	4	1	3.5	4	3.29	0.91	0.2971
With ISO9000	84	41%	26	31%	36	43%	16	19%	6	7%	4	1	3	3	2.98	0.89	0.1055
Without ISO9000	52	25%	11	21%	21	40%	12	23%	8	15%	4	1	3	3	2.67	0.98	0.022

Part	Part 3 Use of the IT																
Topic	.																
Subject	spreadsheets of numeric and date data of resource aspects data to combine together a portfolio view of pr																
Q.3.7.b	Response										Distribution Statistics						
Sample Sector	Nos	% o/a	No '4'	% '4'	No '3'	% '3'	No '2'	% '2'	No '1'	% '1'	H	L	Median	Mode	Mean	SD	Corr
All	135	65%	31	23%	53	39%	36	27%	15	11%	4	1	3	3	2.74	0.94	0.2212
Architecture	29	14%	8	28%	10	34%	9	31%	2	7%	4	1	3	3	2.83	0.93	-0.087
Building Services	12	6%	3	25%	6	50%	2	17%	1	8%	4	1	3	3	2.92	0.90	0.5065
Civil	89	43%	19	21%	35	39%	23	26%	12	13%	4	1	3	3	2.69	0.96	0.284
Landscaping	7	3%	1	14%	3	43%	3	43%	0	0%	4	2	3	3	2.71	0.76	0.33
Structural	25	12%	7	28%	11	44%	5	20%	2	8%	4	1	3	3	2.92	0.91	0.0683
Quantity Surveyors	14	7%	6	43%	5	36%	2	14%	1	7%	4	1	3	4	3.14	0.95	0.2935
With ISO9000	84	41%	22	26%	35	42%	20	24%	7	8%	4	1	3	3	2.86	0.91	0.2179
Without ISO9000	52	25%	13	25%	20	38%	11	21%	8	15%	4	1	3	3	2.73	1.01	0.0439

Part	Part 3 Use of the IT																
Topic	.																
Subject	of database of alpha-numeric data of resource aspects data to combine together a portfolio view of projec																
Q.3.7.c	Response										Distribution Statistics						
Sample Sector	Nos	% o/a	No '4'	% '4'	No '3'	% '3'	No '2'	% '2'	No '1'	% '1'	H	L	Median	Mode	Mean	SD	Corr
All	135	65%	19	14%	40	30%	51	38%	25	19%	4	1	2	2	2.39	0.95	0.1857
Architecture	29	14%	4	14%	10	34%	11	38%	4	14%	4	1	2	2	2.48	0.91	-0.026
Building Services	12	6%	2	17%	5	42%	4	33%	1	8%	4	1	3	3	2.67	0.89	0.4023
Civil	89	43%	12	13%	25	28%	37	42%	15	17%	4	1	2	2	2.38	0.92	0.2143
Landscaping	7	3%	1	14%	1	14%	4	57%	1	14%	4	1	2	2	2.29	0.95	0.2641
Structural	25	12%	4	16%	9	36%	9	36%	3	12%	4	1	3	3	2.56	0.92	0.5719
Quantity Surveyors	14	7%	4	29%	3	21%	2	14%	5	36%	4	1	2.5	1	2.43	1.28	0.4224
With ISO9000	84	41%	12	14%	27	32%	33	39%	12	14%	4	1	2	2	2.46	0.91	0.1742
Without ISO9000	52	25%	10	19%	10	19%	20	38%	12	23%	4	1	2	2	2.35	1.05	0.2929

Q.3.8

open question

Part	Part 4 Self-assessment of Strategic Use of Information Technology																
Topic	Competition and business strategy																
Subject	Does IT support your core capabilities																
Q.4.1.1	Response										Distribution Statistics						
Sample Sector	Nos	% o/a	No '4'	% '4'	No '3'	% '3'	No '2'	% '2'	No '1'	% '1'	H	L	Median	Mode	Mean	SD	Corr
All	126	61%	5	4%	80	63%	38	30%	3	2%	4	1	3	3	2.69	0.59	0.2129
Architecture	25	12%	0	0%	15	60%	9	36%	1	4%	3	1	3	3	2.56	0.58	0.1146
Building Services	11	5%	0	0%	7	64%	4	36%	0	0%	3	2	3	3	2.64	0.50	0.4383
Civil	83	40%	4	5%	55	66%	22	27%	2	2%	4	1	3	3	2.73	0.59	0.2311
Landscaping	7	3%	1	14%	4	57%	2	29%	0	0%	4	2	3	3	2.86	0.69	-0.339
Structural	24	12%	1	4%	14	58%	8	33%	1	4%	4	1	3	3	2.63	0.65	0.4923
Quantity Surveyors	15	7%	0	0%	10	67%	5	33%	0	0%	3	2	3	3	2.67	0.49	0.3739
With ISO9000	81	39%	3	4%	51	63%	25	31%	2	2%	4	1	3	3	2.68	0.59	0.3149
Without ISO9000	45	22%	2	4%	29	64%	13	29%	1	2%	4	1	3	3	2.71	0.59	-0.091

Part	Part 4 Self-assessment of Strategic Use of Information Technology																
Topic	Competition and business strategy																
Subject	How do you think IT could help you to compete																
Q.4.1.2	Response										Distribution Statistics						
Sample Sector	Nos	% o/a	No '4'	% '4'	No '3'	% '3'	No '2'	% '2'	No '1'	% '1'	H	L	Median	Mode	Mean	SD	Corr
All	126	61%	20	16%	75	60%	30	24%	1	1%	4	1	3	3	2.90	0.65	0.2552
Architecture	25	12%	3	12%	15	60%	7	28%	0	0%	4	2	3	3	2.84	0.62	0.0597
Building Services	11	5%	1	9%	8	73%	2	18%	0	0%	4	2	3	3	2.91	0.54	0.3214
Civil	83	40%	16	19%	50	60%	17	20%	0	0%	4	2	3	3	2.99	0.63	0.2643
Landscaping	7	3%	0	0%	6	86%	1	14%	0	0%	3	2	3	3	2.86	0.38	-0.378
Structural	24	12%	6	25%	14	58%	4	17%	0	0%	4	2	3	3	3.08333	0.6539	0.4888
Quantity Surveyors	15	7%	1	7%	9	60%	4	27%	1	7%	4	1	3	3	2.67	0.72	0.363
With ISO9000	81	39%	16	20%	46	57%	18	22%	1	1%	4	1	3	3	2.95	0.69	0.2914
Without ISO9000	45	22%	4	9%	29	64%	12	27%	0	0%	4	2	3	3	2.82	0.58	-0.037

Results of the 1998 postal survey of Hong Kong Public Works Consultants

Part	Part 4 Self-assessment of Strategic Use of Information Technology																
Topic	Competition and business strategy																
Subject	What is the impact of IT on your corporate goals and objectives																
Q.4.1.3	Response										Distribution Statistics						
Sample Sector	Nos	% o/a	No '4'	% '4'	No '3'	% '3'	No '2'	% '2'	No '1'	% '1'	H	L	Median	Mode	Mean	SD	Corr
All	126	61%	36	29%	73	58%	17	13%	0	0%	4	2	3	3	3.15	0.63	0.1459
Architecture	25	12%	4	16%	15	60%	6	24%	0	0%	4	2	3	3	2.92	0.64	0.0659
Building Services	11	5%	3	27%	7	64%	1	9%	0	0%	4	2	3	3	3.18	0.60	-0.412
Civil	83	40%	29	35%	46	55%	8	10%	0	0%	4	2	3	3	3.25	0.62	0.1587
Landscaping	7	3%	1	14%	4	57%	2	29%	0	0%	4	2	3	3	2.86	0.69	0.0894
Structural	24	12%	8	33%	13	54%	3	13%	0	0%	4	2	3	3	3.21	0.66	0.3112
Quantity Surveyors	15	7%	1	7%	11	73%	3	20%	0	0%	4	2	3	3	2.87	0.52	0.1511
With ISO9000	81	39%	23	28%	47	58%	11	14%	0	0%	4	2	3	3	3.15	0.63	0.1837
Without ISO9000	45	22%	13	29%	26	58%	6	13%	0	0%	4	2	3	3	3.16	0.64	0.1137

Part	Part 4 Self-assessment of Strategic Use of Information Technology																
Topic	Competition and business strategy																
Subject	With regard to IT, what is your position compared to your competitors																
Q.4.1.4	Response										Distribution Statistics						
Sample Sector	Nos	% o/a	No '4'	% '4'	No '3'	% '3'	No '2'	% '2'	No '1'	% '1'	H	L	Median	Mode	Mean	SD	Corr
All	126	61%	26	21%	79	63%	17	13%	4	3%	4	1	3	3	3.01	0.69	0.1332
Architecture	25	12%	3	12%	16	64%	3	12%	3	12%	4	1	3	3	2.76	0.83	0.0268
Building Services	11	5%	2	18%	8	73%	1	9%	0	0%	4	2	3	3	3.09	0.54	0.0144
Civil	83	40%	20	24%	50	60%	12	14%	1	1%	4	1	3	3	3.07	0.66	0.1812
Landscaping	7	3%	2	29%	5	71%	0	0%	0	0%	4	3	3	3	3.29	0.49	0.0033
Structural	24	12%	7	29%	12	50%	3	13%	2	8%	4	1	3	3	3.00	0.88	0.1911
Quantity Surveyors	15	7%	1	7%	12	80%	2	13%	0	0%	4	2	3	3	2.93	0.46	0.0693
With ISO9000	81	39%	16	20%	56	69%	7	9%	2	2%	4	1	3	3	3.06	0.62	0.1432
Without ISO9000	45	22%	10	22%	23	51%	10	22%	2	4%	4	1	3	3	2.91	0.79	-0.035

Results of the 1998 postal survey of Hong Kong Public Works Consultants

Part	Part 4 Self-assessment of Strategic Use of Information Technology																	
Topic	Competition and business strategy																	
Subject	What is the impact of your use of IT on your clients																	
Q.4.1.5	Response										Distribution Statistics							
Sample Sector	Nos	% o/a	No '4'	% '4'	No '3'	% '3'	No '2'	% '2'	No '1'	% '1'	H	L	Median	Mode	Mean	SD	Corr	
All	126	61%	50	40%	50	40%	25	20%	1	1%	4	1	3	4	3.18	0.77	0.1825	
Architecture	25	12%	7	28%	8	32%	9	36%	1	4%	4	1	3	2	2.84	0.90	0.2926	
Building Services	11	5%	5	45%	5	45%	1	9%	0	0%	4	2	3	4	3.36	0.67	0.1245	
Civil	83	40%	36	43%	34	41%	13	16%	0	0%	4	2	3	4	3.28	0.72	0.2056	
Landscaping	7	3%	3	43%	1	14%	3	43%	0	0%	4	2	3	2	3.00	1.00	0.557	
Structural	24	12%	9	38%	11	46%	4	17%	0	0%	4	2	3	3	3.21	0.72	0.446	
Quantity Surveyors	15	7%	6	40%	6	40%	3	20%	0	0%	4	2	3	3	3.20	0.77	-0.019	
With ISO9000	81	39%	32	40%	32	40%	17	21%	0	0%	4	2	3	4	3.19	0.76	0.2354	
Without ISO9000	45	22%	18	40%	18	40%	8	18%	1	2%	4	1	3	3	3.18	0.81	0.0545	

Part	Part 4 Self-assessment of Strategic Use of Information Technology																
Topic	Competition and business strategy																
Subject	Do you think your company IT expertise will help it to win work																
Q.4.1.6	Response										Distribution Statistics						
Sample Sector	Nos	% o/a	No '4'	% '4'	No '3'	% '3'	No '2'	% '2'	No '1'	% '1'	H	L	Median	Mode	Mean	SD	Corr
All	126	61%	20	16%	67	53%	31	25%	8	6%	4	1	3	3	2.79	0.79	0.1169
Architecture	25	12%	4	16%	11	44%	9	36%	1	4%	4	1	3	3	2.72	0.79	0.2445
Building Services	11	5%	1	9%	8	73%	2	18%	0	0%	4	2	3	3	2.91	0.54	0.0147
Civil	83	40%	17	20%	47	57%	14	17%	5	6%	4	1	3	3	2.92	0.78	0.0584
Landscaping	7	3%	1	14%	6	86%	0	0%	0	0%	4	3	3	3	3.14	0.38	0.3781
Structural	24	12%	4	17%	15	63%	3	13%	2	8%	4	1	3	3	2.88	0.80	0.2
Quantity Surveyors	15	7%	0	0%	6	40%	8	53%	1	7%	3	1	2	2	2.33	0.62	0.5185
With ISO9000	81	39%	11	14%	44	54%	23	28%	3	4%	4	1	3	3	2.78	0.72	0.1887
Without ISO9000	45	22%	9	20%	23	51%	8	18%	5	11%	4	1	3	3	2.80	0.89	-0.048

Results of the 1998 postal survey of Hong Kong Public Works Consultants

Part	Part 4 Self-assessment of Strategic Use of Information Technology																
Topic	Competition and business strategy																
Subject	How is IT used as a part of strategi/business alliances																
Q.4.1.7	Response										Distribution Statistics						
Sample Sector	Nos	% o/a	No '4'	% '4'	No '3'	% '3'	No '2'	% '2'	No '1'	% '1'	H	L	Median	Mode	Mean	SD	Corr
All	126	61%	15	12%	52	41%	57	45%	2	2%	4	1	3	2	2.63	0.71	0.1196
Architecture	25	12%	3	12%	11	44%	11	44%	0	0%	4	2	3	3	2.68	0.69	0.1608
Building Services	11	5%	1	9%	4	36%	6	55%	0	0%	4	2	2	2	2.55	0.69	0.3332
Civil	83	40%	13	16%	35	42%	35	42%	0	0%	4	2	3	3	2.73	0.72	0.0891
Landscaping	7	3%	0	0%	4	57%	3	43%	0	0%	3	2	3	3	2.57	0.53	-0.547
Structural	24	12%	2	8%	13	54%	9	38%	0	0%	4	2	3	3	2.71	0.62	0.165
Quantity Surveyors	15	7%	0	0%	4	27%	9	60%	2	13%	3	1	2	2	2.13	0.64	0.0652
With ISO9000	81	39%	10	12%	32	40%	37	46%	2	2%	4	1	3	2	2.62	0.73	0.1817
Without ISO9000	45	22%	5	11%	20	44%	20	44%	0	0%	4	2	3	3	2.67	0.67	-0.026

Part	Part 4 Self-assessment of Strategic Use of Information Technology																
Topic	The role of IT																
Subject	How do you currently use IT in your company																
Q.4.2.1	Response										Distribution Statistics						
Sample Sector	Nos	% o/a	No '4'	% '4'	No '3'	% '3'	No '2'	% '2'	No '1'	% '1'	H	L	Median	Mode	Mean	SD	Corr
All	126	61%	41	33%	47	37%	32	25%	6	5%	4	1	3	3	2.98	0.88	0.1077
Architecture	25	12%	8	32%	8	32%	7	28%	2	8%	4	1	3	4	2.88	0.97	-0.066
Building Services	11	5%	2	18%	5	45%	3	27%	1	9%	4	1	3	3	2.73	0.90	-0.127
Civil	83	40%	31	37%	32	39%	19	23%	1	1%	4	1	3	3	3.12	0.80	0.1138
Landscaping	7	3%	3	43%	2	29%	2	29%	0	0%	4	2	3	4	3.14	0.90	-0.258
Structural	24	12%	9	38%	8	33%	5	21%	2	8%	4	1	3	4	3.00	0.98	0.139
Quantity Surveyors	15	7%	1	7%	6	40%	5	33%	3	20%	4	1	2	3	2.33	0.90	0.066
With ISO9000	81	39%	22	27%	33	41%	21	26%	5	6%	4	1	3	3	2.89	0.88	0.2205
Without ISO9000	45	22%	19	42%	14	31%	11	24%	1	2%	4	1	3	4	3.13	0.87	-0.057

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Part	Part 4 Self-assessment of Strategic Use of Information Technology																
Topic	The role of IT																
Subject	How would you describe the relationship between IT and your business strategy																
Q.4.2.2	Response										Distribution Statistics						
Sample Sector	Nos	% o/a	No '4'	% '4'	No '3'	% '3'	No '2'	% '2'	No '1'	% '1'	H	L	Median	Mode	Mean	SD	Corr
All	126	61%	21	17%	50	40%	50	40%	5	4%	4	1	3	3	2.69	0.79	0.042
Architecture	25	12%	4	16%	7	28%	12	48%	2	8%	4	1	2	2	2.52	0.87	0.0413
Building Services	11	5%	1	9%	4	36%	5	45%	1	9%	4	1	2	2	2.45	0.82	-0.412
Civil	83	40%	16	19%	36	43%	30	36%	1	1%	4	1	3	3	2.81	0.76	0.0327
Landscaping	7	3%	0	0%	5	71%	2	29%	0	0%	3	2	3	3	2.71	0.49	-0.166
Structural	24	12%	3	13%	8	33%	10	42%	3	13%	4	1	2	2	2.46	0.88	0.1797
Quantity Surveyors	15	7%	0	0%	6	40%	7	47%	2	13%	3	1	2	2	2.27	0.70	-0.046
With ISO9000	81	39%	16	20%	24	30%	36	44%	5	6%	4	1	2	2	2.63	0.87	0.1018
Without ISO9000	45	22%	5	11%	26	58%	14	31%	0	0%	4	2	3	3	2.80	0.63	-0.053

Part	Part 4 Self-assessment of Strategic Use of Information Technology																
Topic	The role of IT																
Subject	What is the level of participation of your IT people in the development of your overall business strategy																
Q.4.2.3	Response										Distribution Statistics						
Sample Sector	Nos	% o/a	No '4'	% '4'	No '3'	% '3'	No '2'	% '2'	No '1'	% '1'	H	L	Median	Mode	Mean	SD	Corr
All	126	61%	15	12%	32	25%	60	48%	19	15%	4	1	2	2	2.34	0.88	0.1106
Architecture	25	12%	4	16%	4	16%	12	48%	5	20%	4	1	2	2	2.28	0.98	-0.035
Building Services	11	5%	0	0%	1	9%	7	64%	3	27%	3	1	2	2	1.82	0.60	-0.4
Civil	83	40%	11	13%	23	28%	39	47%	10	12%	4	1	2	2	2.42	0.87	0.1171
Landscaping	7	3%	1	14%	2	29%	3	43%	1	14%	4	1	2	2	2.43	0.98	-0.097
Structural	24	12%	3	13%	6	25%	11	46%	4	17%	4	1	2	2	2.33	0.92	0.3436
Quantity Surveyors	15	7%	0	0%	4	27%	7	47%	4	27%	3	1	2	2	2.00	0.76	0.1254
With ISO9000	81	39%	10	12%	17	21%	39	48%	15	19%	4	1	2	2	2.27	0.91	0.181
Without ISO9000	45	22%	5	11%	15	33%	21	47%	4	9%	4	1	2	2	2.47	0.81	0.0697

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Part	Part 4 Self-assessment of Strategic Use of Information Technology																
Topic	The role of IT																
Subject	Does IT have an impact on your operational strategy																
Q.4.2.4	Response										Distribution Statistics						
Sample Sector	Nos	% o/a	No '4'	% '4'	No '3'	% '3'	No '2'	% '2'	No '1'	% '1'	H	L	Median	Mode	Mean	SD	Corr
All	126	61%	21	17%	54	43%	40	32%	11	9%	4	1	3	3	2.67	0.86	0.055
Architecture	25	12%	4	16%	11	44%	7	28%	3	12%	4	1	3	3	2.64	0.91	-0.253
Building Services	11	5%	2	18%	4	36%	3	27%	2	18%	4	1	3	3	2.55	1.04	-0.172
Civil	83	40%	16	19%	35	42%	28	34%	4	5%	4	1	3	3	2.76	0.82	0.0828
Landscaping	7	3%	0	0%	4	57%	3	43%	0	0%	3	2	3	3	2.57	0.53	0.24
Structural	24	12%	3	13%	11	46%	5	21%	5	21%	4	1	3	3	2.50	0.98	0.158
Quantity Surveyors	15	7%	1	7%	5	33%	6	40%	3	20%	4	1	2	2	2.27	0.88	0.0332
With ISO9000	81	39%	14	17%	36	44%	22	27%	9	11%	4	1	3	3	2.68	0.89	0.0643
Without ISO9000	45	22%	7	16%	18	40%	18	40%	2	4%	4	1	3	2	2.67	0.80	-0.026

Part	Part 4 Self-assessment of Strategic Use of Information Technology																	
Topic	The role of IT																	
Subject	Does IT have any influence on the delivery of your marketing																	
Q.4.2.5	Response										Distribution Statistics							
Sample Sector	Nos	% o/a	No '4'	% '4'	No '3'	% '3'	No '2'	% '2'	No '1'	% '1'	H	L	Median	Mode	Mean	SD	Corr	
All	126	61%	11	9%	50	40%	56	44%	9	7%	4	1	2	2	2.50	0.76	0.1295	
Architecture	25	12%	4	16%	6	24%	14	56%	1	4%	4	1	2	2	2.52	0.82	0.187	
Building Services	11	5%	1	9%	3	27%	6	55%	1	9%	4	1	2	2	2.36	0.81	0.3497	
Civil	83	40%	7	8%	39	47%	32	39%	5	6%	4	1	3	3	2.58	0.73	0.0801	
Landscaping	7	3%	1	14%	4	57%	2	29%	0	0%	4	2	3	3	2.86	0.69	0.0894	
Structural	24	12%	2	8%	8	33%	12	50%	2	8%	4	1	2	2	2.42	0.78	0.2114	
Quantity Surveyors	15	7%	1	7%	5	33%	6	40%	3	20%	4	1	2	2	2.27	0.88	0.4337	
With ISO9000	81	39%	8	10%	31	38%	35	43%	7	9%	4	1	2	2	2.49	0.79	0.1545	
Without ISO9000	45	22%	3	7%	19	42%	21	47%	2	4%	4	1	2	2	2.51	0.69	0.1083	

Results of the 1998 postal survey of Hong Kong Public Works Consultants

Part	Part 4 Self-assessment of Strategic Use of Information Technology																
Topic	IT strategy																
Subject	How would you describe the use of IT systems in your company																
Q.4.3.1	Response										Distribution Statistics						
Sample Sector	Nos	% o/a	No '4'	% '4'	No '3'	% '3'	No '2'	% '2'	No '1'	% '1'	H	L	Median	Mode	Mean	SD	Corr
All	126	61%	22	17%	29	23%	55	44%	20	16%	4	1	2	2	2.42	0.96	0.0949
Architecture	25	12%	1	4%	2	8%	16	64%	6	24%	4	1	2	2	1.92	0.70	-0.259
Building Services	11	5%	0	0%	4	36%	5	45%	2	18%	3	1	2	2	2.18	0.75	-0.069
Civil	83	40%	19	23%	20	24%	34	41%	10	12%	4	1	2	2	2.58	0.98	0.1215
Landscaping	7	3%	0	0%	4	57%	3	43%	0	0%	3	2	3	3	2.57	0.53	-0.547
Structural	24	12%	3	13%	5	21%	11	46%	5	21%	4	1	2	2	2.25	0.94	0.2443
Quantity Surveyors	15	7%	2	13%	3	20%	6	40%	4	27%	4	1	2	2	2.20	1.01	0.0855
With ISO9000	81	39%	14	17%	17	21%	38	47%	12	15%	4	1	2	2	2.41	0.95	0.1083
Without ISO9000	45	22%	8	18%	12	27%	17	38%	8	18%	4	1	2	2	2.44	0.99	0.1637

Part	Part 4 Self-assessment of Strategic Use of Information Technology																
Topic	IT strategy																
Subject	What are the objectives of your IT strategy																
Q.4.3.2	Response										Distribution Statistics						
Sample Sector	Nos	% o/a	No '4'	% '4'	No '3'	% '3'	No '2'	% '2'	No '1'	% '1'	H	L	Median	Mode	Mean	SD	Corr
All	126	61%	7	6%	50	40%	56	44%	13	10%	4	1	2	2	2.40	0.75	0.0788
Architecture	25	12%	0	0%	7	28%	16	64%	2	8%	3	1	2	2	2.20	0.58	-0.071
Building Services	11	5%	0	0%	5	45%	5	45%	1	9%	3	1	2	3	2.36	0.67	0.0131
Civil	83	40%	5	6%	40	48%	32	39%	6	7%	4	1	3	3	2.53	0.72	0.0763
Landscaping	7	3%	0	0%	3	43%	4	57%	0	0%	3	2	2	2	2.43	0.53	-0.559
Structural	24	12%	1	4%	12	50%	8	33%	3	13%	4	1	3	3	2.46	0.78	0.11
Quantity Surveyors	15	7%	2	13%	1	7%	7	47%	5	33%	4	1	2	2	2.00	1.00	0.0998
With ISO9000	81	39%	6	7%	30	37%	37	46%	8	10%	4	1	2	2	2.42	0.77	0.1096
Without ISO9000	45	22%	1	2%	20	44%	19	42%	5	11%	4	1	2	3	2.38	0.72	-0.141

Results of the 1998 postal survey of Hong Kong Public Works Consultants

Part	Part 4 Self-assessment of Strategic Use of Information Technology																
Topic	IT strategy																
Subject	What is the thrust of your IT strategy																
Q.4.3.3	Response										Distribution Statistics						
Sample Sector	Nos	% o/a	No '4'	% '4'	No '3'	% '3'	No '2'	% '2'	No '1'	% '1'	H	L	Median	Mode	Mean	SD	Corr
All	126	61%	24	19%	42	33%	42	33%	18	14%	4	1	3	3	2.57	0.96	0.0234
Architecture	25	12%	3	12%	7	28%	10	40%	5	20%	4	1	2	2	2.32	0.95	-0.261
Building Services	11	5%	1	9%	2	18%	6	55%	2	18%	4	1	2	2	2.18	0.87	0.1496
Civil	83	40%	20	24%	33	40%	23	28%	7	8%	4	1	3	3	2.80	0.91	0.0227
Landscaping	7	3%	2	29%	2	29%	3	43%	0	0%	4	2	3	2	2.86	0.90	-0.551
Structural	24	12%	5	21%	8	33%	6	25%	5	21%	4	1	3	3	2.54	1.06	0.142
Quantity Surveyors	15	7%	1	7%	3	20%	5	33%	6	40%	4	1	2	1	1.93	0.96	0.2663
With ISO9000	81	39%	11	14%	28	35%	30	37%	12	15%	4	1	2	2	2.47	0.91	0.0958
Without ISO9000	45	22%	13	29%	14	31%	12	27%	6	13%	4	1	3	3	2.76	1.03	0.0102

Part	Part 4 Self-assessment of Strategic Use of Information Technology																	
Topic	IT strategy																	
Subject	How do you intend to manage IT in the future																	
Q.4.3.4	Response										Distribution Statistics							
Sample Sector	Nos	% o/a	No '4'	% '4'	No '3'	% '3'	No '2'	% '2'	No '1'	% '1'	H	L	Median	Mode	Mean	SD	Corr	
All	126	61%	20	16%	40	32%	60	48%	6	5%	4	1	2	2	2.59	0.81	0.0347	
Architecture	25	12%	2	8%	9	36%	12	48%	2	8%	4	1	2	2	2.44	0.77	0.2574	
Building Services	11	5%	0	0%	7	64%	4	36%	0	0%	3	2	3	3	2.64	0.50	0.0975	
Civil	83	40%	16	19%	29	35%	36	43%	2	2%	4	1	3	2	2.71	0.80	-0.019	
Landscaping	7	3%	1	14%	2	29%	4	57%	0	0%	4	2	2	2	2.57	0.79	0.4665	
Structural	24	12%	5	21%	7	29%	11	46%	1	4%	4	1	2.5	2	2.67	0.87	-0.137	
Quantity Surveyors	15	7%	1	7%	3	20%	9	60%	2	13%	4	1	2	2	2.20	0.77	0.3028	
With ISO9000	81	39%	11	14%	27	33%	38	47%	5	6%	4	1	2	2	2.54	0.81	0.0904	
Without ISO9000	45	22%	9	20%	13	29%	22	49%	1	2%	4	1	2	2	2.67	0.83	-0.058	

Results of the 1998 postal survey of Hong Kong Public Works Consultants

Part	Part 4 Self-assessment of Strategic Use of Information Technology																
Topic	IT strategy																
Subject	What are the critical success factors for sustainable competitive advantage achieved through IT in your company?																
Q.4.3.5	Response										Distribution Statistics						
Sample Sector	Nos	% o/a	No '4'	% '4'	No '3'	% '3'	No '2'	% '2'	No '1'	% '1'	H	L	Median	Mode	Mean	SD	Corr
All	126	61%	13	10%	38	30%	64	51%	11	9%	4	1	2	2	2.42	0.79	0.1243
Architecture	25	12%	2	8%	7	28%	14	56%	2	8%	4	1	2	2	2.36	0.76	0.2166
Building Services	11	5%	0	0%	3	27%	8	73%	0	0%	3	2	2	2	2.27	0.47	0.5965
Civil	83	40%	10	12%	30	36%	39	47%	4	5%	4	1	2	2	2.55	0.77	0.0536
Landscaping	7	3%	0	0%	5	71%	2	29%	0	0%	3	2	3	3	2.71	0.49	-0.12
Structural	24	12%	5	21%	5	21%	13	54%	1	4%	4	1	2	2	2.58	0.88	-0.025
Quantity Surveyors	15	7%	0	0%	4	27%	6	40%	5	33%	3	1	2	2	1.93	0.80	0.6385
With ISO9000	81	39%	10	12%	19	23%	41	51%	11	14%	4	1	2	2	2.35	0.87	0.2222
Without ISO9000	45	22%	3	7%	19	42%	23	51%	0	0%	4	2	2	2	2.56	0.62	-0.126

Part	Part 4 Self-assessment of Strategic Use of Information Technology																
Topic	IT strategy																
Subject	How do you intend to manage IT projects and innovations?																
Q.4.3.6	Response										Distribution Statistics						
Sample Sector	Nos	% o/a	No '4'	% '4'	No '3'	% '3'	No '2'	% '2'	No '1'	% '1'	H	L	Median	Mode	Mean	SD	Corr
All	126	61%	27	21%	50	40%	31	25%	18	14%	4	1	3	3	2.68	0.97	0.2946
Architecture	25	12%	5	20%	8	32%	7	28%	5	20%	4	1	3	3	2.52	1.05	0.1439
Building Services	11	5%	1	9%	6	55%	3	27%	1	9%	4	1	3	3	2.64	0.81	0.2895
Civil	83	40%	21	25%	35	42%	19	23%	8	10%	4	1	3	3	2.83	0.92	0.3167
Landscaping	7	3%	1	14%	3	43%	3	43%	0	0%	4	2	3	2	2.71	0.76	-0.092
Structural	24	12%	6	25%	10	42%	5	21%	3	13%	4	1	3	3	2.79	0.98	0.2756
Quantity Surveyors	15	7%	1	7%	7	47%	2	13%	5	33%	4	1	3	3	2.27	1.03	0.4101
With ISO9000	81	39%	21	26%	31	38%	17	21%	12	15%	4	1	3	3	2.75	1.01	0.3338
Without ISO9000	45	22%	6	13%	19	42%	14	31%	6	13%	4	1	3	3	2.56	0.89	0.0457

Results of the 1998 postal survey of Hong Kong Public Works Consultants

Part	Part 4 Self-assessment of Strategic Use of Information Technology																	
Topic	IT strategy																	
Subject	What is the level of R&D regarding IT in your company																	
Q.4.3.7	Response										Distribution Statistics							
Sample Sector	Nos	% o/a	No '4'	% '4'	No '3'	% '3'	No '2'	% '2'	No '1'	% '1'	H	L	Median	Mode	Mean	SD	Corr	
All	126	61%	16	13%	22	17%	46	37%	42	33%	4	1	2	2	2.10	1.01	0.1306	
Architecture	25	12%	2	8%	4	16%	8	32%	11	44%	4	1	2	1	1.88	0.97	0.1483	
Building Services	11	5%	0	0%	2	18%	4	36%	5	45%	3	1	2	1	1.73	0.79	-0.31	
Civil	83	40%	13	16%	15	18%	31	37%	24	29%	4	1	2	2	2.20	1.03	0.1162	
Landscaping	7	3%	0	0%	2	29%	3	43%	2	29%	3	1	2	2	2.00	0.82	-0.515	
Structural	24	12%	4	17%	2	8%	9	38%	9	38%	4	1	2	2	2.04	1.08	0.08	
Quantity Surveyors	15	7%	0	0%	3	20%	7	47%	5	33%	3	1	2	2	1.87	0.74	0.2083	
With ISO9000	81	39%	13	16%	14	17%	29	36%	25	31%	4	1	2	2	2.19	1.05	0.1139	
Without ISO9000	45	22%	3	7%	8	18%	17	38%	17	38%	4	1	2	2	1.93	0.91	-0.02	

Part	Part 4 Self-assessment of Strategic Use of Information Technology																
Topic	IT strategy																
Subject	What is the nature of your IT department																
Q.4.3.8	Response										Distribution Statistics						
Sample Sector	Nos	% o/a	No '4'	% '4'	No '3'	% '3'	No '2'	% '2'	No '1'	% '1'	H	L	Median	Mode	Mean	SD	Corr
All	126	61%	8	6%	32	25%	6	5%	80	63%	4	1	1	1	1.75	1.04	0.174
Architecture	25	12%	2	8%	4	16%	0	0%	19	76%	4	1	1	1	1.56	1.04	0.1712
Building Services	11	5%	0	0%	2	18%	2	18%	7	64%	3	1	1	1	1.55	0.82	0.1601
Civil	83	40%	6	7%	24	29%	4	5%	49	59%	4	1	1	1	1.84	1.08	0.1435
Landscaping	7	3%	1	14%	2	29%	1	14%	3	43%	4	1	2	1	2.14	1.21	0.4077
Structural	24	12%	2	8%	7	29%	1	4%	14	58%	4	1	1	1	1.88	1.12	0.0577
Quantity Surveyors	15	7%	0	0%	4	27%	1	7%	10	67%	3	1	1	1	1.60	0.91	0.1252
With ISO9000	81	39%	6	7%	20	25%	3	4%	52	64%	4	1	1	1	1.75	1.07	0.177
Without ISO9000	45	22%	2	4%	12	27%	3	7%	28	62%	4	1	1	1	1.73	1.01	0.2805

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Part	Part 4 Self-assessment of Strategic Use of Information Technology																	
Topic	IT strategy																	
Subject	How much importance do you attach to IT skills within your company																	
Q.4.3.9	Response											Distribution Statistics						
Sample Sector	Nos	% o/a	No '4'	% '4'	No '3'	% '3'	No '2'	% '2'	No '1'	% '1'	H	L	Median	Mode	Mean	SD	Corr	
All	126	61%	9	7%	45	36%	53	42%	19	15%	4	1	2	2	2.35	0.82	0.1285	
Architecture	25	12%	2	8%	8	32%	11	44%	4	16%	4	1	2	2	2.32	0.85	-0.004	
Building Services	11	5%	0	0%	3	27%	6	55%	2	18%	3	1	2	2	2.09	0.70	0.3742	
Civil	83	40%	8	10%	33	40%	32	39%	10	12%	4	1	2	3	2.47	0.83	0.0981	
Landscaping	7	3%	0	0%	5	71%	1	14%	1	14%	3	1	3	3	2.57	0.79	0.3798	
Structural	24	12%	1	4%	9	38%	10	42%	4	17%	4	1	2	2	2.29	0.81	0.2553	
Quantity Surveyors	15	7%	0	0%	5	33%	7	47%	3	20%	3	1	2	2	2.13	0.74	0.5437	
With ISO9000	81	39%	8	10%	25	31%	37	46%	11	14%	4	1	2	2	2.37	0.84	0.1706	
Without ISO9000	45	22%	1	2%	20	44%	16	36%	8	18%	4	1	2	3	2.31	0.79	-0.126	

Part	Part 4 Self-assessment of Strategic Use of Information Technology																
Topic	IT strategy																
Subject	Who is aware of your IT strategy																
Q.4.3.10	Response										Distribution Statistics						
Sample Sector	Nos	% o/a	No '4'	% '4'	No '3'	% '3'	No '2'	% '2'	No '1'	% '1'	H	L	Median	Mode	Mean	SD	Corr
All	126	61%	35	28%	35	28%	40	32%	16	13%	4	1	3	2	2.71	1.01	0.0793
Architecture	25	12%	4	16%	5	20%	11	44%	5	20%	4	1	2	2	2.32	0.99	-0.1
Building Services	11	5%	1	9%	4	36%	5	45%	1	9%	4	1	2	2	2.45	0.82	0.4635
Civil	83	40%	29	35%	25	30%	20	24%	9	11%	4	1	3	4	2.89	1.01	0.064
Landscaping	7	3%	1	14%	3	43%	3	43%	0	0%	4	2	3	2	2.71	0.76	0.1783
Structural	24	12%	7	29%	7	29%	8	33%	2	8%	4	1	3	2	2.79	0.98	-0.016
Quantity Surveyors	15	7%	3	20%	6	40%	4	27%	2	13%	4	1	3	3	2.67	0.98	0.2216
With ISO9000	81	39%	20	25%	23	28%	28	35%	10	12%	4	1	3	2	2.65	0.99	0.1114
Without ISO9000	45	22%	15	33%	12	27%	12	27%	6	13%	4	1	3	4	2.80	1.06	0.1467

Results of the 1998 postal survey of Hong Kong Public Works Consultants

Part	Part 4 Self-assessment of Strategic Use of Information Technology																
Topic	IT strategy																
Subject	is the extent and nature of involvement of IT users in the development and implementation of your IT strategy																
Q.4.3.11	Response										Distribution Statistics						
Sample Sector	Nos	% o/a	No '4'	% '4'	No '3'	% '3'	No '2'	% '2'	No '1'	% '1'	H	L	Median	Mode	Mean	SD	Corr
All	126	61%	34	27%	21	17%	66	52%	5	4%	4	1	2	2	2.67	0.92	0.0644
Architecture	25	12%	5	20%	3	12%	15	60%	2	8%	4	1	2	2	2.44	0.92	0.1833
Building Services	11	5%	0	0%	5	45%	6	55%	0	0%	3	2	2	2	2.45	0.52	0.2775
Civil	83	40%	27	33%	12	14%	42	51%	2	2%	4	1	2	2	2.77	0.94	0.0092
Landscaping	7	3%	4	57%	0	0%	3	43%	0	0%	4	2	4	4	3.14	1.07	0.2826
Structural	24	12%	7	29%	6	25%	10	42%	1	4%	4	1	3	2	2.79	0.93	0.0897
Quantity Surveyors	15	7%	3	20%	3	20%	8	53%	1	7%	4	1	2	2	2.53	0.92	0.3219
With ISO9000	81	39%	23	28%	14	17%	42	52%	2	2%	4	1	2	2	2.72	0.91	0.0671
Without ISO9000	45	22%	11	24%	7	16%	24	53%	3	7%	4	1	2	2	2.58	0.94	-0.087

Part	Part 4 Self-assessment of Strategic Use of Information Technology																
Topic	IT strategy																
Subject	What do you consider to be the risks associated with the implementation of your IT strategy																
Q.4.3.12	Response										Distribution Statistics						
Sample Sector	Nos	% o/a	No '4'	% '4'	No '3'	% '3'	No '2'	% '2'	No '1'	% '1'	H	L	Median	Mode	Mean	SD	Corr
All	126	61%	13	10%	28	22%	47	37%	38	30%	4	1	2	2	2.13	0.96	0.0781
Architecture	25	12%	0	0%	4	16%	11	44%	10	40%	3	1	2	2	1.76	0.72	-0.378
Building Services	11	5%	0	0%	3	27%	4	36%	4	36%	3	1	2	1	1.91	0.83	-0.334
Civil	83	40%	12	14%	19	23%	27	33%	25	30%	4	1	2	2	2.22	1.04	0.1051
Landscaping	7	3%	0	0%	1	14%	2	29%	4	57%	3	1	1	1	1.57	0.79	-0.458
Structural	24	12%	3	13%	7	29%	7	29%	7	29%	4	1	2	3	2.25	1.03	0.0012
Quantity Surveyors	15	7%	1	7%	3	20%	6	40%	5	33%	4	1	2	2	2.00	0.93	0.1998
With ISO9000	81	39%	9	11%	20	25%	31	38%	21	26%	4	1	2	2	2.21	0.96	0.0046
Without ISO9000	45	22%	4	9%	8	18%	16	36%	17	38%	4	1	2	1	1.98	0.97	0.2812

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Part	Part 4 Self-assessment of Strategic Use of Information Technology																	
Topic	IT strategy																	
Subject	How often do you review your IT strategy																	
Q.4.3.13	Response										Distribution Statistics							
Sample Sector	Nos	% o/a	No '4'	% '4'	No '3'	% '3'	No '2'	% '2'	No '1'	% '1'	H	L	Median	Mode	Mean	SD	Corr	
All	126	61%	55	44%	49	39%	17	13%	5	4%	4	1	3	4	3.22	0.83	0.0533	
Architecture	25	12%	10	40%	6	24%	6	24%	3	12%	4	1	3	4	2.92	1.08	0.097	
Building Services	11	5%	4	36%	6	55%	1	9%	0	0%	4	2	3	3	3.27	0.65	-0.379	
Civil	83	40%	37	45%	36	43%	9	11%	1	1%	4	1	3	4	3.31	0.71	0.032	
Landscaping	7	3%	3	43%	3	43%	1	14%	0	0%	4	2	3	3	3.29	0.76	0.0021	
Structural	24	12%	8	33%	11	46%	4	17%	1	4%	4	1	3	3	3.08	0.83	0.0068	
Quantity Surveyors	15	7%	8	53%	4	27%	2	13%	1	7%	4	1	4	4	3.27	0.96	-0.214	
With ISO9000	81	39%	38	47%	28	35%	11	14%	4	5%	4	1	3	4	3.23	0.87	0.0508	
Without ISO9000	45	22%	17	38%	21	47%	6	13%	1	2%	4	1	3	3	3.20	0.76	0.0733	

Part	Part 4 Self-assessment of Strategic Use of Information Technology																
Topic	IT strategy																
Subject	How do you measure the IT performance of your company																
Q.4.3.14	Response										Distribution Statistics						
Sample Sector	Nos	% o/a	No '4'	% '4'	No '3'	% '3'	No '2'	% '2'	No '1'	% '1'	H	L	Median	Mode	Mean	SD	Corr
All	126	61%	20	16%	60	48%	42	33%	4	3%	4	1	3	3	2.76	0.75	0.0227
Architecture	25	12%	3	12%	11	44%	8	32%	3	12%	4	1	3	3	2.56	0.87	0.1655
Building Services	11	5%	2	18%	5	45%	4	36%	0	0%	4	2	3	3	2.82	0.75	0.0682
Civil	83	40%	14	17%	43	52%	25	30%	1	1%	4	1	3	3	2.84	0.71	-0.02
Landscaping	7	3%	0	0%	3	43%	4	57%	0	0%	3	2	2	2	2.43	0.53	0.5256
Structural	24	12%	3	13%	11	46%	9	38%	1	4%	4	1	3	3	2.67	0.76	0.1162
Quantity Surveyors	15	7%	2	13%	7	47%	6	40%	0	0%	4	2	3	3	2.73	0.70	0.1618
With ISO9000	81	39%	11	14%	41	51%	26	32%	3	4%	4	1	3	3	2.74	0.74	0.0178
Without ISO9000	45	22%	9	20%	19	42%	16	36%	1	2%	4	1	3	3	2.80	0.79	0.1715

Results of the 1998 postal survey of Hong Kong Public Works Consultants

Part	Part 4 Self-assessment of Strategic Use of Information Technology																
Topic	IT strategy																
Subject	What are the characteristics of your IT strategy																
Q.4.3.15	Response										Distribution Statistics						
Sample Sector	Nos	% o/a	No '4'	% '4'	No '3'	% '3'	No '2'	% '2'	No '1'	% '1'	H	L	Median	Mode	Mean	SD	Corr
All	126	61%	58	46%	37	29%	12	10%	19	15%	4	1	3	4	3.06	1.08	0.1873
Architecture	25	12%	8	32%	10	40%	3	12%	4	16%	4	1	3	3	2.88	1.05	0.1037
Building Services	11	5%	6	55%	3	27%	0	0%	2	18%	4	1	4	4	3.18	1.17	0.3893
Civil	83	40%	43	52%	21	25%	8	10%	11	13%	4	1	4	4	3.16	1.06	0.2019
Landscaping	7	3%	4	57%	1	14%	1	14%	1	14%	4	1	4	4	3.14	1.21	-0.135
Structural	24	12%	15	63%	6	25%	2	8%	1	4%	4	1	4	4	3.46	0.83	0.214
Quantity Surveyors	15	7%	8	53%	3	20%	1	7%	3	20%	4	1	4	4	3.07	1.22	0.3106
With ISO9000	81	39%	39	48%	26	32%	6	7%	10	12%	4	1	3	4	3.16	1.02	0.2429
Without ISO9000	45	22%	19	42%	11	24%	6	13%	9	20%	4	1	3	4	2.89	1.17	-0.201

Part	Part 4 Self-assessment of Strategic Use of Information Technology																
Topic	IT strategy																
	Who is the champion for IT projects in your company																
Q.4.3.16	Response										Distribution Statistics						
Sample Sector	Nos	% o/a	No '4'	% '4'	No '3'	% '3'	No '2'	% '2'	No '1'	% '1'	H	L	Median	Mode	Mean	SD	Corr
All	126	61%	50	40%	18	14%	33	26%	25	20%	4	1	3	4	2.74	1.18	0.0648
Architecture	25	12%	3	12%	3	12%	10	40%	9	36%	4	1	2	2	2.00	1.00	0.2713
Building Services	11	5%	4	36%	2	18%	4	36%	1	9%	4	1	3	2	2.82	1.08	-0.141
Civil	83	40%	39	47%	12	14%	21	25%	11	13%	4	1	3	4	2.95	1.13	0.0231
Landscaping	7	3%	5	71%	0	0%	1	14%	1	14%	4	1	4	4	3.29	1.25	0.4819
Structural	24	12%	9	38%	6	25%	6	25%	3	13%	4	1	3	4	2.88	1.08	0.0809
Quantity Surveyors	15	7%	8	53%	1	7%	3	20%	3	20%	4	1	4	4	2.93	1.28	0.2788
With ISO9000	81	39%	27	33%	14	17%	23	28%	17	21%	4	1	3	4	2.63	1.16	0.119
Without ISO9000	45	22%	23	51%	4	9%	10	22%	8	18%	4	1	4	4	2.93	1.21	0.1482

Results of the 1998 postal survey of Hong Kong Public Works Consultants

6.6 Summary of the results from the analysis of the open question response from the postal survey of a population sample of Hong Kong consultants – taken from ‘Appendices-datafile.xls’.

Please refer to the following pages.

Summary of the results from the analysis
of the open-question response in the
postal survey of a population sample of Hong Kong consultants

Items of data/information most important to HK Consultants for assessing the performance of projects								
All Consultants			Architectural Consultants			Building Services Consultants		
Keywords	Freq	Wt-Freq	Keywords	Freq	Wt-Freq	Keywords	Freq	Wt-Freq
Work controls	86	60	Work controls	13	9	Work controls	8	5.2
Costs	67	43.4	Costs	11	6.8	Fees	6	3.6
Value	62	44.4	Value	9	5	Costs	5	2.8
Fees	37	19.6	Quality	7	4.8	Quality	4	2.6
Quality	29	19.2	Fees	5	2	Correspondence	4	2.2
Resources	25	16	Drawings	4	3.4	Value	3	2.2
Time	24	15.4	Resources	4	2.8	Profit	3	1.8
Client feedback	21	11.4	Time	3	2.8	Staffing	2	1.6
Man power	17	10.4	Client feedback	3	2	Resources	2	1.4
Staffing	13	5.2	Staffing	3	1.8	Time	2	1.2
Project attributes	11	6.8	Man power	3	1.6	Performance reports	1	0.8
Profit	10	6.2	Performance reports	3	1.6	Client feedback	1	0.4
Performance reports	10	5.6	Company interests	2	1.4	Drawings	1	0.4
Correspondence	10	5.2	Project attributes	2	1.2	Variations	1	0.4
Company interests	8	4.6	Information	2	1.2	Compliance	1	0.2
Compliance	7	3	Correspondence	2	1	Man power	0	0
Drawings	6	4.4	Deliverables	1	1	Project attributes	0	0
Variations	6	2.4	Profit	1	1	Company interests	0	0
Information	5	4	Variations	1	0.8	Information	0	0
Deliverables	3	2.4	Compliance	1	0.6	Deliverables	0	0
Approvals	2	1.8	Materials	1	0.4	Approvals	0	0
Materials	2	1	Meetings	1	0.4	Materials	0	0
Meetings	2	0.8	Approvals	0	0	Meetings	0	0
Instructions	0	0	Instructions	0	0	Instructions	0	0
Total response	463		Total response	82		Total response	44	
% resp in top ten	82%		% resp in top ten	76%		% resp in top ten	89%	
Civil Consultants			Landscape Consultants			Structural Consultants		
Keywords	Freq	Wt-Freq	Keywords	Freq	Wt-Freq	Keywords	Freq	Wt-Freq
Work controls	68	47.2	Work controls	5	3.4	Work controls	24	17
Value	46	33.6	Value	4	2.6	Costs	16	10.6
Costs	46	29.6	Deliverables	2	1.8	Value	14	8.2
Fees	24	13	Costs	2	1	Resources	8	4.6
Quality	20	13.4	Project attributes	2	1	Fees	6	2.6
Resources	17	11	Time	1	1	Profit	4	2.2
Time	17	10.2	Resources	1	0.6	Quality	4	2.2
Client feedback	17	8.4	Man power	1	0.6	Project attributes	3	2
Man power	11	6.8	Performance reports	1	0.6	Staffing	3	2
Staffing	10	3.4	Staffing	1	0.2	Time	3	1.4
Project attributes	8	5.6	Compliance	1	0.2	Information	2	1.8
Profit	7	3.8	Fees	0	0	Drawings	2	1.6
Compliance	5	2.2	Quality	0	0	Client feedback	2	1.4
Variations	5	1.6	Client feedback	0	0	Performance reports	2	1.4
Company interests	4	2.6	Correspondence	0	0	Correspondence	2	1
Deliverables	3	2.4	Profit	0	0	Approvals	1	0.8
Correspondence	3	1.8	Company interests	0	0	Man power	1	0.8
Performance reports	3	1.6	Drawings	0	0	Variations	1	0.8
Approvals	1	1	Variations	0	0	Compliance	1	0.6
Information	1	1	Information	0	0	Materials	1	0.6
Meetings	1	0.4	Approvals	0	0	Meetings	1	0.4
Drawings	0	0	Materials	0	0	Company interests	1	0.2
Instructions	0	0	Meetings	0	0	Deliverables	0	0
Materials	0	0	Instructions	0	0	Instructions	0	0
Total response	317		Total response	21		Total response	102	
% resp in top ten	87%		% resp in top ten	95%		% resp in top ten	83%	
Quantity Surveyors			with ISO9000 Consultants			w/o ISO9000 Consultants		
Keywords	Freq	Wt-Freq	Keywords	Freq	Wt-Freq	Keywords	Freq	Wt-Freq
Costs	9	6.4	Work controls	45	31.4	Work controls	41	28.6
Fees	7	4	Costs	44	28.8	Value	26	20.6
Value	5	3.8	Value	36	23.8	Costs	23	14.6
Work controls	3	2.2	Fees	27	14	Client feedback	15	7.8
Man power	3	2	Quality	19	12.8	Quality	10	6.4
Quality	3	1.8	Resources	17	11	Fees	10	5.6
Time	3	1.8	Time	16	10.8	Resources	8	5
Profit	3	1.6	Man power	11	7.2	Time	8	4.6
Resources	2	1.6	Staffing	9	4.4	Project attributes	7	4
Client feedback	2	1.4	Correspondence	8	4	Man power	6	3.2
Company interests	2	0.6	Profit	7	4.6	Staffing	4	0.8
Staffing	1	0.6	Performance reports	7	3.6	Company interests	3	2.4
Performance reports	1	0.2	Drawings	6	4.4	Deliverables	3	2.4
Project attributes	1	0.2	Client feedback	6	3.6	Performance reports	3	2
Approvals	0	0	Company interests	5	2.2	Compliance	3	1.8
Compliance	0	0	Project attributes	4	2.8	Profit	3	1.6
Correspondence	0	0	Compliance	4	1.2	Variations	3	1.2
Deliverables	0	0	Information	3	2.4	Approvals	2	1.8
Drawings	0	0	Variations	3	1.2	Information	2	1.6
Information	0	0	Meetings	2	0.8	Correspondence	2	1.2
Instructions	0	0	Approvals	0	0	Materials	2	1
Materials	0	0	Deliverables	0	0	Drawings	0	0
Meetings	0	0	Instructions	0	0	Instructions	0	0
Variations	0	0	Materials	0	0	Meetings	0	0
Total response	45		Total response	279		Total response	184	
% resp in top ten	89%		% resp in top ten	83%		% resp in top ten	84%	

Items of work content data/information most important to HK Consultants for assessing the performance of a portfolio of projects									
All Consultants			Architectural Consultants			Building Services Consultants			
Keywords	Freq	Wt-Freq	Keywords	Freq	Wt-Freq	Keywords	Freq	Wt-Freq	
Quality	42	29.8	Work progress	7	5.8	Scope	6	3.6	
Project attributes	27	16.2	Quality	7	5.2	Activities	5	4.2	
Work progress	24	17.6	Time	6	3.4	Quality	5	3.6	
Scope	21	14.2	Costs	5	3.4	Claims/disputes	5	1.6	
Costs	17	12.2	Client issues	4	1.6	Deliverables	4	3.4	
Client issues	15	7.6	Project attributes	2	1.6	Client issues	2	1.2	
Management	14	9	Quantities	2	1.6	Design	1	1	
Deliverables	13	11.4	Scope	2	1.6	Progress	1	1	
Time	13	7.8	Documentation	2	1.2	Value	1	1	
Documentation	13	7.4	Man power	2	1.2	Approvals	1	0.8	
Claims/disputes	13	4.2	Claims/disputes	2	0.8	Documentation	1	0.6	
Communication	10	5.8	Communication	1	1	Quantities	1	0.6	
Activities	9	7.6	Activities	1	0.8	Drawings	1	0.4	
Variations	9	5.4	Deliverables	1	0.8	Materials	1	0.4	
Progress	8	6.4	Resources	1	0.8	Variations	1	0.4	
Design	8	5.8	Staff	1	0.8	Information	1	0.2	
Information	8	3.6	Compliance	1	0.4	Project attributes	1	0.2	
Drawings	7	3.6	Drawings	1	0.4	Communication	0	0	
Resources	6	4.4	Value	1	0.4	Compliance	0	0	
Staff	5	3.8	Variations	1	0.4	Correspondence	0	0	
Quantities	5	3.4	Approvals	1	0.2	Costs	0	0	
Value	5	3.2	Design	1	0.2	Man power	0	0	
Nature of work	4	2.2	Correspondence	0	0	Management	0	0	
Man power	3	2.2	Information	0	0	Nature of work	0	0	
Approvals	3	2	Management	0	0	Resources	0	0	
Compliance	3	1.8	Materials	0	0	Staff	0	0	
Materials	3	1.4	Nature of work	0	0	Time	0	0	
Correspondence	2	1.4	Progress	0	0	Work progress	0	0	
Total response	310		Total response	52		Total response	38		
% resp in top ten	64%		% resp in top ten	75%		% resp in top ten	82%		
Civil Consultants			Landscape Consultants			Structural Consultants			
Keywords	Freq	Wt-Freq	Keywords	Freq	Wt-Freq	Keywords	Freq	Wt-Freq	
Quality	30	21.2	Project attributes	3	1.2	Quality	10	6.8	
Project attributes	22	13.4	Progress	2	1.8	Work progress	10	6.6	
Work progress	17	12	Quality	2	1.4	Project attributes	10	5.6	
Scope	15	9.6	Client issues	1	1	Scope	8	5.4	
Management	10	6.6	Work progress	1	1	Design	5	4.2	
Documentation	10	5.4	Resources	1	0.8	Activities	4	3.4	
Costs	9	6	Value	1	0.4	Drawings	4	2.4	
Client issues	9	5.4	Costs	1	0.2	Information	4	2.2	
Communication	9	4.8	Activities	0	0	Variations	4	2	
Deliverables	8	7	Approvals	0	0	Documentation	4	1.8	
Progress	8	6.4	Claims/disputes	0	0	Claims/disputes	4	1.2	
Claims/disputes	8	2.2	Communication	0	0	Deliverables	3	2.6	
Variations	7	4.4	Compliance	0	0	Client issues	3	2	
Information	7	3.2	Correspondence	0	0	Staff	3	2	
Activities	6	4.8	Deliverables	0	0	Approvals	3	2	
Design	6	4.6	Design	0	0	Management	3	1.8	
Time	6	3.8	Documentation	0	0	Communication	3	1.8	
Drawings	5	2.4	Drawings	0	0	Costs	2	2	
Staff	4	3	Information	0	0	Man power	2	1.8	
Resources	3	2	Man power	0	0	Nature of work	2	1	
Quantities	3	1.8	Management	0	0	Time	2	0.4	
Value	3	1.8	Materials	0	0	Compliance	1	0.8	
Nature of work	3	1.6	Nature of work	0	0	Materials	1	0.8	
Materials	3	1.4	Quantities	0	0	Correspondence	1	0.6	
Approvals	2	1.8	Scope	0	0	Quantities	1	0.6	
Compliance	2	1.4	Staff	0	0	Progress	1	0.4	
Man power	1	1	Time	0	0	Resources	0	0	
Correspondence	0	0	Variations	0	0	Value	0	0	
Total response	216		Total response	12		Total response	98		
% resp in top ten	64%		% resp in top ten	100%		% resp in top ten	64%		
Quantity Surveyors			with ISO9000 Consultants			w/o ISO9000 Consultants			
Keywords	Freq	Wt-Freq	Keywords	Freq	Wt-Freq	Keywords	Freq	Wt-Freq	
Costs	5	4	Quality	25	18.2	Quality	17	11.6	
Quality	5	4	Work progress	16	11	Project attributes	13	7.8	
Resources	3	2.4	Project attributes	14	8.4	Scope	8	6.6	
Management	3	2	Scope	13	7.6	Work progress	8	6.6	
Deliverables	2	1.8	Costs	12	9.4	Time	6	3.8	
Claims/disputes	2	0.8	Management	12	7.2	Costs	5	2.8	
Client issues	2	0.6	Deliverables	11	9.8	Documentation	4	2.4	
Activities	1	1	Client issues	11	6	Communication	4	2	
Design	1	1	Claims/disputes	10	3.4	Variations	4	2	
Correspondence	1	0.8	Documentation	9	5	Client issues	4	1.6	
Documentation	1	0.8	Information	8	3.6	Resources	3	2	
Work progress	1	0.8	Activities	7	6	Claims/disputes	3	0.8	
Quantities	1	0.6	Time	7	4	Management	2	1.8	
Scope	1	0.6	Progress	6	4.6	Progress	2	1.8	
Time	1	0.6	Design	6	4.4	Activities	2	1.6	
Information	1	0.4	Communication	6	3.8	Deliverables	2	1.6	
Project attributes	1	0.4	Drawings	6	3.2	Compliance	2	1.4	
Value	1	0.4	Variations	5	3.4	Design	2	1.4	
Approvals	0	0	Staff	4	2.8	Nature of work	2	1.2	
Communication	0	0	Quantities	4	2.6	Value	2	1	
Compliance	0	0	Resources	3	2.4	Staff	1	1	
Drawings	0	0	Man power	3	2.2	Quantities	1	0.8	
Man power	0	0	Value	3	2.2	Drawings	1	0.4	
Materials	0	0	Approvals	2	1.8	Approvals	1	0.2	
Nature of work	0	0	Correspondence	2	1.4	Materials	1	0.2	
Progress	0	0	Materials	2	1.2	Correspondence	0	0	
Staff	0	0	Nature of work	2	1	Information	0	0	
Variations	0	0	Compliance	1	0.4	Man power	0	0	
Total response	33		Total response	210		Total response	100		
% resp in top ten	76%		% resp in top ten	63%		% resp in top ten	73%		

Items of time content data/information most important to HK Consultants for assessing the performance of a portfolio of projects								
All Consultants			Architectural Consultants			Building Services Consultants		
Keywords	Freq	Wt-Freq	Keywords	Freq	Wt-Freq	Keywords	Freq	Wt-Freq
Work schedule	38	32.4	Work schedule	8	7	Work schedule	8	6.8
Work progress	21	13.8	Time	5	4	Work progress	6	4.6
Completion factors	16	13.6	Re-planning	4	2.4	Re-planning	3	1.6
Time	16	11	Duration	2	1.8	Milestone	2	1.8
Information	15	10.4	Costs	2	1.6	Critical actions	1	1
Re-planning	15	7.2	Delay	2	1.4	Participant performance	1	1
Costs	9	6	Drawing time	2	1.4	Delay	1	0.8
Project factors	9	4.6	Work progress	2	1	Quality	1	0.8
Milestone	8	7.6	Staff	2	0.6	Scope	1	0.6
Manhours	8	7.2	Production	1	1	Completion factors	1	0.4
Critical actions	8	6.4	Completion factors	1	0.8	Drawing time	1	0.4
Duration	8	5.4	Scope	1	0.6	Duration	1	0.2
Delay	8	4.8	Manpower	1	0.4	Administration overhead	0	0
Production	7	3.6	Participant performance	1	0.2	Client actions	0	0
Staff	7	3.6	Administration overhead	0	0	Communication	0	0
Participant performance	7	3.4	Client actions	0	0	Costs	0	0
Communication	6	2.6	Communication	0	0	Deliverables	0	0
Design time	5	4.4	Critical actions	0	0	Design time	0	0
Timesheets	5	3.8	Deliverables	0	0	Downtime	0	0
Progress	4	2.6	Design time	0	0	Information	0	0
Resources	4	1.8	Downtime	0	0	Manhours	0	0
Variations	4	1.8	Information	0	0	Manpower	0	0
Drawing time	3	2.4	Manhours	0	0	Production	0	0
Submissions	3	2	Milestone	0	0	Progress	0	0
Quality	3	1.8	Progress	0	0	Project factors	0	0
Client actions	3	1.8	Project factors	0	0	Resources	0	0
Downtime	3	1.4	Quality	0	0	Staff	0	0
Scope	3	1.2	Resources	0	0	Submissions	0	0
Deliverables	2	1.8	Submissions	0	0	Time	0	0
Manpower	2	1.4	Timesheets	0	0	Timesheets	0	0
Administration overhead	2	1	Variations	0	0	Variations	0	0
Total response	252		Total response	34		Total response	27	
% resp in top ten	62%		% resp in top ten	88%		% resp in top ten	93%	
Civil Consultants			Landscape Consultants			Structural Consultants		
Keywords	Freq	Wt-Freq	Keywords	Freq	Wt-Freq	Keywords	Freq	Wt-Freq
Work schedule	24	19.8	Information	2	1.8	Work schedule	12	10.4
Work progress	14	9.2	Timesheets	1	1	Work progress	7	3.4
Information	13	9.8	Deliverables	1	0.8	Re-planning	6	3.4
Completion factors	12	10.4	Administration overhead	0	0	Milestone	5	4.8
Time	9	5.6	Client actions	0	0	Completion factors	4	3.4
Project factors	8	4.2	Communication	0	0	Time	4	3
Re-planning	8	3.8	Completion factors	0	0	Staff	4	2.2
Milestone	7	6.6	Costs	0	0	Information	4	1.8
Manhours	7	6.2	Critical actions	0	0	Design time	3	2.8
Costs	6	4.2	Delay	0	0	Duration	3	2.2
Delay	6	3.4	Design time	0	0	Submissions	3	2
Communication	6	2.6	Downtime	0	0	Progress	3	1.8
Timesheets	5	3.8	Drawing time	0	0	Critical actions	2	1.8
Staff	5	3	Duration	0	0	Project factors	2	1.6
Duration	5	2.6	Manhours	0	0	Drawing time	2	1.4
Production	5	2	Manpower	0	0	Manhours	2	1.4
Critical actions	4	2.8	Milestone	0	0	Delay	2	1.2
Participant performance	4	2	Participant performance	0	0	Resources	2	1.2
Variations	4	1.8	Production	0	0	Timesheets	2	1.2
Design time	3	2.6	Progress	0	0	Production	2	1
Progress	3	2.2	Project factors	0	0	Quality	1	0.8
Submissions	3	2	Quality	0	0	Client actions	1	0.6
Quality	3	1.8	Re-planning	0	0	Scope	1	0.6
Downtime	3	1.4	Resources	0	0	Communication	1	0.4
Deliverables	2	1.8	Scope	0	0	Participant performance	1	0.4
Resources	2	1.2	Staff	0	0	Costs	1	0.2
Administration overhead	2	1	Submissions	0	0	Variations	1	0.2
Scope	2	0.6	Time	0	0	Administration overhead	0	0
Drawing time	1	1	Variations	0	0	Deliverables	0	0
Manpower	1	1	Work progress	0	0	Downtime	0	0
Client actions	1	0.6	Work schedule	0	0	Manpower	0	0
Total response	178		Total response	4		Total response	81	
% resp in top ten	61%		% resp in top ten	100%		% resp in top ten	64%	
Quantity Surveyors			with ISO9000 Consultants			w/o ISO9000 Consultants		
Keywords	Freq	Wt-Freq	Keywords	Freq	Wt-Freq	Keywords	Freq	Wt-Freq
Work schedule	6	5.6	Work schedule	31	26.6	Time	10	6.6
Critical actions	4	3.6	Work progress	17	10.4	Completion factors	7	6.8
Work progress	3	2.2	Information	11	7	Work schedule	7	5.8
Milestone	2	1.8	Completion factors	9	6.8	Re-planning	7	3.4
Completion factors	2	1.4	Re-planning	8	3.8	Costs	6	3.6
Resources	2	0.6	Critical actions	7	6.2	Work progress	4	3.4
Duration	1	1	Milestone	6	5.8	Information	4	3.4
Manhours	1	1	Time	6	4.4	Staff	4	1.8
Client actions	1	0.6	Delay	6	3.8	Production	4	1.6
Time	1	0.6	Duration	6	3.6	Design time	3	2.6
Information	1	0.4	Project factors	6	3.4	Manhours	3	2.6
Project factors	1	0.4	Manhours	5	4.6	Project factors	3	1.2
Participant performance	1	0.2	Participant performance	5	2.2	Communication	3	1.2
Re-planning	1	0.2	Progress	4	2.6	Duration	2	1.8
Administration overhead	0	0	Resources	4	1.8	Milestone	2	1.8
Communication	0	0	Costs	3	2.4	Timesheets	2	1.6
Costs	0	0	Drawing time	3	2.4	Participant performance	2	1.2
Delay	0	0	Timesheets	3	2.2	Client actions	2	1.2
Deliverables	0	0	Production	3	2	Administration overhead	2	1
Design time	0	0	Staff	3	1.8	Delay	2	1
Downtime	0	0	Communication	3	1.4	Scope	2	0.6
Drawing time	0	0	Variations	3	1.4	Deliverables	1	1
Manpower	0	0	Design time	2	1.8	Quality	1	0.8
Production	0	0	Manpower	2	1.4	Submissions	1	0.8
Progress	0	0	Downtime	2	1.2	Variations	1	0.4
Quality	0	0	Submissions	2	1.2	Critical actions	1	0.2
Scope	0	0	Quality	2	1	Downtime	1	0.2
Staff	0	0	Deliverables	1	0.8	Drawing time	0	0
Submissions	0	0	Client actions	1	0.6	Manpower	0	0
Timesheets	0	0	Scope	1	0.6	Progress	0	0
Variations	0	0	Administration overhead	0	0	Resources	0	0
Total response	27		Total response	165		Total response	87	
% resp in top ten	85%		% resp in top ten	65%		% resp in top ten	64%	

Items of cost content data/information most important to HK Consultants for assessing the performance of a portfolio of projects								
All Consultants			Architectural Consultants			Building Services Consultants		
Keywords	Freq	Wt-Freq	Keywords	Freq	Wt-Freq	Keywords	Freq	Wt-Freq
Valuation	31	21.6	Cost uncertainties	6	2.4	Valuation	7	5
Management factors	25	16.8	Cost of work	5	4	Payments	7	3.2
Cost of work	21	17.2	Valuation	5	2	Budget	5	4.2
Fees	20	14.2	Payments	4	3.6	Fees	3	2.4
Payments	20	9.2	Management factors	4	2.6	Profit	3	1.6
Cost uncertainties	20	8.4	Cost of resources	3	2.6	Cost management	2	1.8
Budget	18	14.8	Fees	3	2.4	Expenditure	2	1.2
Profit	18	11.8	Budget	3	1.8	Cost of resources	1	0.8
Expenditure	16	10.2	Cost of overheads	3	1.4	Quality	1	0.8
Cost of resources	14	10.6	Expenditure	3	1.4	Cost uncertainties	1	0.4
Work progress	12	6.6	IT	3	1.2	Cashflow	0	0
Cost of overheads	11	5.2	Work progress	2	2	Cost effectiveness	0	0
Resources	10	8	Resources	2	1.8	Cost of overheads	0	0
Man hours	7	5.2	Production factors	2	1.4	Cost of work	0	0
Cost effectiveness	6	3.6	Man hours	2	1.2	Costs	0	0
Staffing	5	3.6	Cost effectiveness	2	1.2	Delay	0	0
Production factors	5	3.6	Profit	1	1	Expenses	0	0
IT	5	2	Staffing	1	0.8	IT	0	0
Expenses	4	2.4	Costs	1	0.6	Man hours	0	0
Quality	4	1.8	Delay	1	0.6	Management	0	0
Cost management	3	2.8	Cashflow	0	0	Production cost	0	0
Delay	3	2.4	Cost management	0	0	Resources	0	0
Cashflow	3	2.2	Expenses	0	0	Staffing	0	0
Costs	3	1.6	Quality	0	0	Work progress	0	0
Total response	284		Total response	56		Total response	32	
% resp in top ten	71%		% resp in top ten	70%		% resp in top ten	100%	
Civil Consultants			Landscape Consultants			Structural Consultants		
Keywords	Freq	Wt-Freq	Keywords	Freq	Wt-Freq	Keywords	Freq	Wt-Freq
Valuation	19	14	Management factors	2	1.8	Fees	12	8.4
Management factors	16	11	Profit	2	1.4	Management factors	9	6
Cost of work	15	12.6	Production factors	1	1	Budget	7	5.8
Cost uncertainties	13	5.6	Valuation	1	1	Cost of work	6	4.6
Budget	12	11.2	Budget	0	0	Profit	6	4
Profit	12	7.6	Cashflow	0	0	Valuation	6	3.8
Expenditure	11	7.8	Cost of resources	0	0	Payments	6	3.2
Fees	11	6.2	Cost effectiveness	0	0	Work progress	6	3.2
Payments	11	4	Cost management	0	0	Expenditure	5	2.6
Cost of resources	10	7	Cost of overheads	0	0	Cost of overheads	4	1.4
Work progress	9	4.4	Cost of work	0	0	Resources	3	2.6
Resources	6	4.6	Cost uncertainties	0	0	Staffing	3	2.6
Cost of overheads	5	2.4	Costs	0	0	Cost of resources	3	2
Man hours	4	3.2	Delay	0	0	Quality	3	1.2
Expenses	4	2.4	Expenditure	0	0	Man hours	2	1.4
Cost effectiveness	4	2.4	Expenses	0	0	Cost management	1	1
Cost management	3	2.8	Fees	0	0	Delay	1	1
Production factors	3	2.2	IT	0	0	Expenses	1	0.6
Staffing	3	2	Man hours	0	0	Production factors	1	0.6
Quality	3	1.6	Payments	0	0	Cost uncertainties	1	0.2
Delay	2	1.8	Quality	0	0	Cashflow	0	0
Costs	2	1	Resources	0	0	Cost effectiveness	0	0
Cashflow	1	0.8	Staffing	0	0	Costs	0	0
IT	1	0.6	Work progress	0	0	IT	0	0
Total response	180		Total response	6		Total response	86	
% resp in top ten	72%		% resp in top ten	100%		% resp in top ten	78%	
Quantity Surveys			with ISO9000 Consultants			w/o ISO9000 Consultants		
Keywords	Freq	Wt-Freq	Keywords	Freq	Wt-Freq	Keywords	Freq	Wt-Freq
Profit	6	4	Valuation	22	15.8	Budget	9	8.2
Valuation	5	4.2	Management factors	19	12.8	Valuation	9	5.8
Payments	4	1.4	Payments	17	8.4	Cost of work	8	6.8
Fees	3	2.8	Profit	15	10.6	Fees	7	5.4
Budget	3	2.2	Cost uncertainties	14	5.2	Management factors	6	4
Cost of overheads	3	1.4	Cost of work	13	10.4	Expenditure	6	3.4
Resources	2	1.6	Fees	13	8.8	Cost uncertainties	6	3.2
Cashflow	2	1.4	Cost of resources	11	8.4	Work progress	5	1.8
Management factors	2	1	Cost of overheads	11	5.2	Cost of resources	3	2.2
Cost of resources	1	1	Expenditure	10	6.8	Expenses	3	1.8
Man hours	1	0.8	Resources	9	7.6	Profit	3	1.2
Staffing	1	0.8	Budget	9	6.6	Payments	3	0.8
Expenditure	1	0.6	Work progress	7	4.8	Cost effectiveness	2	2
IT	1	0.2	Staffing	5	3.6	Man hours	2	1.8
Cost effectiveness	0	0	Man hours	5	3.4	Costs	2	1
Cost management	0	0	IT	5	2	Cashflow	1	0.8
Cost of work	0	0	Production factors	4	3	Delay	1	0.8
Cost uncertainties	0	0	Quality	4	1.8	Production factors	1	0.6
Costs	0	0	Cost effectiveness	4	1.6	Resources	1	0.4
Delay	0	0	Cost management	3	2.8	Cost management	0	0
Expenses	0	0	Delay	2	1.6	Cost of overheads	0	0
Production factors	0	0	Cashflow	2	1.4	IT	0	0
Quality	0	0	Costs	1	0.6	Quality	0	0
Work progress	0	0	Expenses	1	0.6	Staffing	0	0
Total response	35		Total response	206		Total response	78	
% resp in top ten	89%		% resp in top ten	70%		% resp in top ten	79%	

Items of resource content data/information most important to HK Consultants for assessing the performance of a portfolio of projects									
All Consultants			Architectural Consultants			Building Services Consultants			
Keywords	Freq	Wt-Freq	Keywords	Freq	Wt-Freq	Keywords	Freq	Wt-Freq	
Staffing	57	49.8	Staffing	6	5.4	Staffing	9	8.2	
Facilities	21	10.4	Management factors	6	3.2	Cost	5	3.2	
IT	18	10.2	Cost	4	3.4	Management factors	5	2.8	
Resources	16	12.8	Resources	4	3.4	Competance	4	2.4	
Management factors	16	8.2	Manhours	4	2.6	Facilities	2	1	
Cost	15	10.4	Facilities	4	2.2	Sub-contractor	2	0.8	
Productivity	14	9.6	Specialist services	4	2	Communication	1	1	
Specialist services	12	6.8	IT	3	1.6	Resources	1	1	
Competance	12	6	Productivity	2	1.8	Abortive work	1	0.6	
Manpower	8	6.8	Time	2	1.6	Quality	1	0.6	
Manhours	8	5.6	Abortive work	2	1.4	Specialist services	1	0.2	
Sub-consultant	8	4.4	Manpower	2	1.4	Information	0	0	
Information	7	4.6	Competance	2	0.8	IT	0	0	
Skills	6	4.4	Scope	1	1	Location	0	0	
Plant/Equipment	6	4.2	Sub-consultant	1	1	Manhours	0	0	
Communication	6	3.2	Skills	1	0.8	Manpower	0	0	
Sub-contractor	6	2.2	Communication	1	0.2	Materials	0	0	
Time	5	4	Location	1	0.2	Plant/Equipment	0	0	
Quality	4	2.6	Information	0	0	Productivity	0	0	
Abortive work	4	2.2	Materials	0	0	Resource controls	0	0	
Location	4	1	Plant/Equipment	0	0	Scope	0	0	
Resource controls	3	2.4	Quality	0	0	Skills	0	0	
Materials	2	1.8	Resource controls	0	0	Sub-consultant	0	0	
Scope	2	1.8	Sub-contractor	0	0	Time	0	0	
Total response	284		Total response	50		Total response	32		
% resp in top ten	67%		% resp in top ten	78%		% resp in top ten	97%		
Civil Consultants			Landscape Consultants			Structural Consultants			
Keywords	Freq	Wt-Freq	Keywords	Freq	Wt-Freq	Keywords	Freq	Wt-Freq	
Staffing	39	34.8	IT	2	1.8	Staffing	22	18.8	
IT	13	7.8	Resources	2	1.8	Resources	7	5.2	
Resources	11	8.8	Abortive work	0	0	Productivity	7	4.2	
Facilities	11	5.2	Communication	0	0	Manpower	5	4.4	
Competance	10	5.2	Cost	0	0	Cost	5	3.2	
Cost	9	6	Cost	0	0	Information	5	3	
Information	7	4.6	Facilities	0	0	Facilities	5	2.6	
Management factors	7	3	Information	0	0	Management factors	4	2	
Productivity	6	3.6	Location	0	0	IT	4	2	
Specialist services	6	3.2	Management factors	0	0	Plant/Equipment	3	2.2	
Sub-consultant	6	3.2	Manhours	0	0	Communication	3	1.6	
Plant/Equipment	5	3.6	Manpower	0	0	Sub-contractor	3	1.2	
Skills	5	3.6	Materials	0	0	Materials	2	1.8	
Communication	5	3	Plant/Equipment	0	0	Competance	2	1.4	
Manpower	4	3.6	Productivity	0	0	Time	2	1.2	
Manhours	4	3	Quality	0	0	Sub-consultant	2	1	
Quality	4	2.6	Resource controls	0	0	Specialist services	2	0.4	
Resource controls	3	2.4	Scope	0	0	Resource controls	1	1	
Sub-contractor	3	1.4	Skills	0	0	Abortive work	1	0.6	
Location	3	0.8	Specialist services	0	0	Manhours	1	0.4	
Materials	1	0.8	Staffing	0	0	Location	1	0.2	
Abortive work	1	0.6	Sub-consultant	0	0	Quality	0	0	
Time	1	0.4	Sub-contractor	0	0	Scope	0	0	
Scope	0	0	Time	0	0	Skills	0	0	
Total response	164		Total response	4		Total response	87		
% resp in top ten	73%		% resp in top ten	100%		% resp in top ten	77%		
Quantity Surveyors			with ISO9000 Consultants			w/o ISO9000 Consultants			
Keywords	Freq	Wt-Freq	Keywords	Freq	Wt-Freq	Keywords	Freq	Wt-Freq	
Staffing	8	7	Staffing	37	32	Staffing	20	17.8	
Productivity	4	2.8	Management factors	13	7.2	Facilities	8	4	
Facilities	4	2	Facilities	13	6.4	Competance	7	3.4	
Resources	2	2	Cost	12	8	Resources	6	4.4	
Time	2	2	IT	12	6.2	IT	6	4	
Specialist services	2	1.6	Resources	10	8.4	Productivity	4	2.8	
Cost	2	1	Productivity	10	6.8	Sub-consultant	4	2.4	
Management factors	2	1	Specialist services	9	5.6	Sub-contractor	4	1.4	
Scope	1	0.8	Manpower	8	6.8	Cost	3	2.4	
IT	1	0.4	Manhours	8	5.6	Plant/Equipment	3	2	
Abortive work	1	0.2	Information	7	4.6	Specialist services	3	1.2	
Sub-consultant	1	0.2	Time	5	4	Management factors	3	1	
Communication	0	0	Competance	5	2.6	Skills	2	1.6	
Competance	0	0	Communication	5	2.4	Location	2	0.6	
Information	0	0	Skills	4	2.8	Materials	1	1	
Location	0	0	Abortive work	4	2.2	Resource controls	1	1	
Manhours	0	0	Sub-consultant	4	2	Communication	1	0.8	
Manpower	0	0	Plant/Equipment	3	2.2	Quality	1	0.4	
Materials	0	0	Quality	3	2.2	Abortive work	0	0	
Plant/Equipment	0	0	Scope	2	1.8	Information	0	0	
Quality	0	0	Resource controls	2	1.4	Manhours	0	0	
Resource controls	0	0	Sub-contractor	2	0.8	Manpower	0	0	
Skills	0	0	Location	2	0.4	Scope	0	0	
Sub-contractor	0	0	Materials	1	0.8	Time	0	0	
Total response	30		Total response	181		Total response	79		
% resp in top ten	93%		% resp in top ten	73%		% resp in top ten	82%		

6.7 Dendrogram of project performance keywords from the analysis of the open-question response in the postal survey of a population sample of Hong Kong consultants

Please refer to the following pages.

**Dendrogram of project performance keywords
from the analysis of the open-question response in the
postal survey of a population sample of Hong Kong consultants**

<u>Keyword</u>	<u>Meaning</u>
Approvals	Approvals Statutory approvals
Client feedback	Client acceptance Client complaint Client feedback Client satisfaction
Company interests	Company - related Marketing opportunity Presentation Project experience gained Project numbers Sales
Compliance	Comformance with design Design review Disputes Reliability
Correspondence	Client correspondence documents Communication with statutory authorities Correspondence Correspondence - consultants Correspondence - contract Correspondence - email Facsimile Feedback of others

Costs	Budget Cash flow Cost Cost control Cost efficiency Cost estimated Cost of construction handled Cost of internal staff Cost of money Cost of project Cost of staff Cost outturn Cost overheads Cost reports Cost staff Cost to date Cost to go Cost vs budget Costs Costs - turnover Costs -accounts Costs direct Costs to date Estimates Invoice approval Invoices Invoices outstanding Labour cost Expenditure Expenditure- actual vs planned Expenditure to date
Deliverables	Deliverables Delivery on schedule
Drawings	Drawings Drawings production Drawings to client
Fees	Fee agreement Fee earned Fee received Fee to go Fees Fees claimed Fees owed Fees paid Fees received Fees timely payment Fees to claim

Information	Information from client Information from statutory authorities Information quality Instruction to site offices Instructions
Man power	Man hour used Manpower efficiency Manpower management Manpower overtime Manpower required Manpower used
Materials	Material delivered on site Materials ordered
Meetings	Meeting deadlines Meetings
Performance reports	Inspection records Record of supervision Report drafts Report of site inspection Report -performance Reports Reports from sites Reports of project status Technical reports
Profit	Profit Profit outturn Profit-gross
Project attributes	Contract status Organisation Project liability/risk Project proposals Scope Sourcing Specifications Technical problems Technical project data

Quality	Quality Quality - accuracy Quality - HKQAA external audit Quality assessment Quality assurance plan Quality conformance Quality environment Quality feedback Quality independent checks Quality of deliverables Quality of resources Quality of work Quality standard Quality vs specification
Resources	Commitment Construction labourer on site Equipment allocation Plant Resource commitment Resource redundancy Resource used Resources Resources assignment schedule Resources available Resources required Resources to go Resources used
Staffing	Staff - nos professionals used Staff development Staff experience Staff required Staff utilisation
Time	Completion date Time Time - ontime Time gone Time of response Time related Time sheets Time spent against cost Time to complete Time to go Timeliness Timing

Value	Value of assignment Value of invoices to date Value of resources used Value of tender bid Value of variations Value of work Value of work done Value of work done vs schedule Value of work done vs staff time Value of work in progress Value of work to go Value to go
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Variations	Client variations Variations
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Work controls	Action Activities Activities - abortive work Activities - critical done Activities - non-critical done Activity lists Forecast Measurements Milestones achieved Percent completed Performance Performance achieved Performance reviews Progress Progress of work Progress report Project controls Project status Purchasing Quantity done Target dates achieved Work content Work done Work done vs schedule Work load Work progress Work reworked Work schedule Work schedule re-planned Work to go
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6.8 Dendrogram of work-related project performance keywords from the analysis of the open-question response in the postal survey of a population sample of Hong Kong consultants

Please refer to the following pages.

**Dendrogram of work-related project performance keywords
from the analysis of the open-question response in the
postal survey of a population sample of Hong Kong consultants**

<u>Keyword</u>	<u>Meaning</u>
Activities	Activities Activities - progress Activities done Activities required/performed
Approvals	Approval - Statutory Approval of design calculations Approvals
Claims/disputes	Claims Claims by Contractor's Dispute nature Dispute status Disputes
Client issues	Architect implementation plan Client / team interface Client complaints Client feedback Client prestige Client queries Client track record
Communication	Communiation adequacy Communication - effective Communication skill Communication to project team Communication with Govt Delivery risks Instructions IT support Meetings Transmital equipment
Compliance	Compliance of office procedures Compliance with regulation Data validation
Correspondence	Correspondence

Costs	<ul style="list-style-type: none"> Budget Cash flow Cost Cost data availability Cost efficiency Cost outturn Cost reports Cost tendered vs award Cost within budget Expenditure Fee received Performance bond Profit
Deliverables	<ul style="list-style-type: none"> Deliverable produced Deliverable schedule Deliverables Deliverables - key items Deliverables - major equipment Deliverables - standards
Design	<ul style="list-style-type: none"> Design Design - production Design calculation Design changes Design drawings E&M Design economy Design extent
Documentation	<ul style="list-style-type: none"> Document management system Documentation experience Documentation standards Records As built and maintenance manuals Report on tenders Reports Reports - technical review Reports from In-house service departments Reports produced
Drawings	<ul style="list-style-type: none"> Drawing production Drawings Drawings for contractor Drawings for tender Drawings produced
Information	<ul style="list-style-type: none"> Information / data clarity Information capture Information distribution Information from Govt Information required on time Information submittal to Contractor Information transmittal

Man power	Man power Man power required
Management	Construction supervision Controls Efficiency Organising Performance on previous work Performance service Problem solving Project administration Project management Relevance and usefulness Risk assessment Site supervision Site visit extent Standardisation
Materials	Material properties Materials - rate used Materials and equipment changes
Nature of work	Method statements Nature of foundation and risks Nature of project Nature of work
Progress	Progress Progress data Progress reports Project progress data
Project attributes	Buildability Concise Measurements Project aesthetics Project clarity Project complexity Project constraints Project effectiveness Project format Project innovations Project interfaces Project location Project nature Project objectives Project participants Project presentation Project prestige Project size Project type Site constraints Status of contract Status of project Tender documents Work location Work to follow

Quality	Production - non-conformance Quality Quality - accuracy Quality - achieved Quality - degree of non-conformance Quality - deliverables Quality - standards Quality changes Quality check Quality complaints received Quality conformance Quality consistency Quality control Quality independent checks Quality ISO 9000 records Quality of calculations / drawings Quality of deliverables Quality of design Quality of drawings Quality of product Quality of project documents Quality of report Quality of work Quality performance Quality procedures Quality -specified in brief Quality test results Reliability Specification
Quantities	Production efficiency Quantities - standards Quantity of abortive work Quantity of work Quantity to be re-worked
Resources	Resource adequacy Resource allocation Resource skills Resources Resources assignment
Scope	Scope Scope - specification Scope change Scope change frequency Scope change scale Scope change/standard Scope lack of clarity Scope of activities Scope of work Scope outturn Scope presentation Scope specification Scope well defined

Staff	Staff - office Staff - site Staff capability Staff location and deployment Staff totals
Time	Completion on time Delays - Number and size Site delays Time Time & cost potential Time gone Time of response Time required Time spent Time spent per drawing
Value	Value of claims settled Value of work Value of work done
Variations	Variation - additional work Variation orders review Variations Work addition Work addition not reimbursable Work extras
Work progress	Work backlog Work done Work done - percent Work done distribution Work done vs schedule Work milestones achieved Work phase Work planning Work schedule Work submissions to Govt Work task completion Work to go

6.9 Dendrogram of time-related project performance keywords from the analysis of the open-question response in the postal survey of a population sample of Hong Kong consultants

Please refer to the following pages.

**Dendrogram of time-related project performance keywords
from the analysis of the open-question response in the
postal survey of a population sample of Hong Kong consultants**

<u>Keyword</u>	<u>Meaning</u>
Administration overhead	Administration as % of total hours Administration overhead
Client actions	Client approval to proceed Client information Client requirement
Communication	Communication Communication at all levels Communication efficiency Communication requirement Transmittal speed
Completion factors	Completion / start date Completion data vs planned Completion date Completion of building Completion of major tasks -percent Completion of tasks Completion of work as scheduled Completion on time Completion phases Completion target Completion time
Costs	Cost balance sheet Cost estimates Cost of money Costs Costs vs forecast Payment response Payments against schedule
Critical actions	Critical activities achieved Critical dates for deliverables Dates Deadline satisfied Final measurement deadline Start date Tender date

Delay	Delay - vs schedule percent Delay contributory factors Delays - days Delays - vs schedule Delays minimised Deviation from work schedule
Deliverables	Deliverables on schedule Delivery date schedule
Design time	Design changes within schedule Design concept preliminary to client Design on schedule Design submission to government
Downtime	Downtime - holidays Downtime between projects Downtime periods Downtime vs total time
Drawing time	Drawing delivery Drawing time spent
Duration	Duration of project Duration of work Duration of work forecast EOT
Information	Data Data access Data accuracy Data base Data spreadsheets Document adequate Document transmittal Information exchange Information for Occupation Permit Information from consultants Information loading Printing services Reports
Manhours	Budget hours Budgeted hours vs work done Man hour records Man hour required Man hour to complete Man hour used Man-hour budget Overtime working
Manpower	Manpower Manpower required

Milestone	Milestone dates Milestones / delivery performance Milestones -achieved
Participant performance	Contractor performance Feedback Participation from others Service Sub-consultants Subcontractor performance Subcontracts to complete work
Production	Efficiency Procedure control Production of tender Production on schedule Standardisation Timeliness of design, activities
Progress	Progress Progress monitoring Progress of work Site progress
Project factors	Accuracy Complexity Environmental factors Equipment Forecast work Goodwill Interfaces Precontract period Weather
Quality	Quality conformance Quality procedures Reliability
Re-planning	Re-planned activities Re-planned schedule Re-planned work Re-planned work vs planned time Re-planned work within schedule Revised work
Resources	Material used Resource pool shared Resources adequate Resources allocated adequate
Scope	Extension of work Scope Scope change

Staff	Staff deployment Staff idling time Staff productivity Staff resources Staff scheduling
Submissions	Submission on time Submission schedule Submissions
Time	Time Time allocated Time allowed for deliverable Time for each stage of work Time gone Time gone vs contract period Time holidays Time of information received Time of outstanding work Time of response Time spent Time to go Time vs prestige of client
Timesheets	Timesheet Timesheets checked
Variations	Variations Variations external programme factors Variations re-planning / re-design
Work progress	Acceleration of works Non-critical / activities achieved Work advanced Work completed Work done - percent Work efficiency Work priorities Work to be done Work to be done percent
Work schedule	Bar chart review Updating work schedule Work breakdown Work schedule Work schedule adequate Work schedule analysis Work schedule dates Work schedule milestones Work schedule on track Work schedule updates Work schedule vs progress Work scheduled within contract period Work stage

6.10 Dendrogram of cost-related project performance keywords from the analysis of the open-question response in the postal survey of a population sample of Hong Kong consultants

Please refer to the following pages.

**Dendrogram of cost-related project performance keywords
from the analysis of the open-question response in the
postal survey of a population sample of Hong Kong consultants**

<u>Keyword</u>	<u>Meaning</u>
Budget	Budget Budget satisfied Budgeted yearly performance achieved Commitment Commitment forecast Complete within budget
Cashflow	Cash flow Cash lock-up Cashflow to date
Cost of resources	Cost of man power Cost of money Cost of personnel Cost of salaries and expense Cost of staff & overhead Cost of staff for each project Cost of subconsultants Cost per staff Equipment charges Salary cost vs fee income Salary records Salary review Staff cost vs fee bid
Cost effectiveness	Cost saving Cost vs time of work stages Cost-effectiveness
Cost management	Project cost accounting Project cost review Project financial report
Cost of overheads	Cost of overhead Cost of rent Costs of information Location overhead Overhead cost to date Overhead cost total Overhead costs Overhead recovery Tax Traveling

Cost of production	Value of earning/staff time
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Cost of resources	Staff expenditure for supervision vs budget
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Cost of work	Actual to planned use Actuals vs planned cashflow Cost of production Cost of work done Cost of work to be done Cost to complete Cost to complete vs budget Costs - Building & Construction Design work within the budget Out-turn cost estimated Overtime cost Overtime work Total cost Total value
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Cost uncertainties	Claims and complaints Cost of changes Cost of dispute resolution Cost of expenses & disbursement Cost of rework Cost of variations Cost overrun Costs of abortive work Costs unbudgeted Creditor bills / unpaid subcontractor bills Exchange rate Inflation rate Unpaid bills Value earned vs dispute Value of dispute Value of variations Variations
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Costs	Cost Cost - basic Cost committed
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Delay	Delay costs Delay mitigation Delay to construction
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Expenditure	Expenditure Expenditure against budget Expenditure needed
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Expenses	Expenses Expenses - for subcontracting / testing Expenses vs budget
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Fees	<ul style="list-style-type: none"> Fee Fee agreements Fee arrears Fee billing Fee earned Fee for additional work Fee income and cashflow forecast Fee outstanding Fee received Fees Fees in dispute
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IT	<ul style="list-style-type: none"> IT maintenance IT subcontractor support IT support Software support Spreadsheets data
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Man hours	<ul style="list-style-type: none"> Man hours Man hours chargeable vs actual worked Man hours from subconsultants Man hours incurred to date Man power required Man-hour schedule maintained
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Management	<ul style="list-style-type: none"> Client instruction Client payment history Data formats Database data Delegate responsibility Delivery Documentation of addition work Efficiency Effort wasted Feedback Interfacing with client and contractor Location Production of blue prints Project organisation Recommendations Reliability Reports Service Standard of service provided Standardisation opportunity Subcontractor management Time
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Payments	<ul style="list-style-type: none"> Money outstanding Money received Money received and outstanding Money spent Payment / month Payment schedule Payments outstanding
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Production cost	Printing charges Production cost effectiveness Scope extras Time cost vs. time budget
Profit	Margin Outturn cost vs. fee Profit Profit / loss details Profit forecast Profit margin Profit to date Profit to fee income Profit vs plan Profit vs prestige Value earned vs cost
Quality	Quality Quality compliance Quality of drawings
Resources	Equipment Manpower Material Material consumption Resources Resources optimised
Staffing	Staff deployment Staff manning carefully Staff resources monitoring Staff seniors movement Staff training
Valuation	Interim certificate valuation Invoice schedule Valuation on time Valuation trends Value of the assignment Value of work completed Value of work done Value of work done to date Value of work done vs to go Value of work to be done Value to date

Work progress	Completion of tasks
	Progress
	Work accuracy
	Work addition
	Work done
	Work in progress
	Work repeated
	Work stage achieved
	Work unforeseen
	Work wasted

6.11 Dendrogram of resource-related project performance keywords from the analysis of the open-question response in the postal survey of a population sample of Hong Kong consultants

Please refer to the following pages.

**Dendrogram of resource-related project performance keywords
from the analysis of the open-question response in the
postal survey of a population sample of Hong Kong consultants**

<u>Keyword</u>	<u>Meaning</u>
Abortive work	Abortive work hours Abortive work zero Non-productive time Re-work hours
Communication	Client satisfaction Client's feedback Communication Communication by PM's on resources Feedback
Competance	Commitment of staff Competant technically Controls staff competent Experience Experience of staff to crisis management Expertise Initiative Leaderships New technologies Practicality Professionalism Project management team adeqaute
Cost	Cost Cost / benefit of provision Cost actual vs budget Cost data base Cost of personnel Cost of surveyors Expenditure - capital Fee income per technical staff Finance Labour cost report Opportunity cost Salary Salary multiplier Task budget Value added

Facilities	Facilities allocated Facilities available Facilities deployed Facilities employed Facilities percent deployed Facilities percent required Facilities required Facilities skill to be committed Facilities used Facilities used vs required Facility availability
Information	Information available Information from architect Information from Contractor Information from E&M Information from government Information from Q.S
IT	CAD CAD usage Database IT IT equipment IT procurement IT reports IT resource available IT strategy IT support IT updates Spreadsheets
Location	Accessibility Location Space Working environment
Management factors	Delegation of work Instruction clarity Management of variation/payments to contractors Management participation Management required Management services required Management skills Management time used Marketing results Meeting deadlines Office backup Out-sourcing services required Production facilities adequate Supervision by senior adequate Technical backup Vendor required

Manhours	Hour total in meeting deadlines Hours total on unbudgetted tasks Man hour total Man hour used Man hours Man hours per person Overtime Manpower adequate for company Manpower adequate/project Manpower needed Manpower required Manpower used
Materials	Formwork used Materials used
Plant/Equipment	Equipment Equipment available Equipment efficiency Equipment needed Manpower Plant used
Productivity	Adequacy Certainty of requirement Efficiency Efficiency to achieve Efficient production Efficient use of support staff Monitor project progress Output required Productivity Progress Task completion Work schedule
Quality	Quality checks by staff Quality conformance Quality of resources available Quality of staff
Resource controls	Planned to actual resource use Planning ahead Reports

Resources	Resource adequate Resource adhoc deployed Resource allocated Resource available Resource available vs output Resource efficiency Resource optimisation Resource time/cost available Resource to suit schedule Resource total Resources Resources available Resources suitable Responsibilities of key staff
Scope	Scope Scope of work
Skills	Skill man hours Skill of personnel Skills Skills available Skills needed
Specialist services	Administration services required Administrative services Administrative services used Administrative support External support Q.S services required Service Special resources Transportation

Staffing	Controls staff Distribution of staff categories Labourer numbers Personnel available Personnel deployed Personnel deployed -percent Personnel needed -percent Personnel required Personnel uncommitted Personnel used Staff available Staff available from other offices Staff deployed Staff efficiency Staff experience Staff multi-tasking Staff numbers Staff productivity Staff quality Staff re-location Staff required Staff teamwork Staff training Staff used vs time Staff vs programme Staffing Staffing adequate Staffing appropriate Staffing available Team resources Team shop Teams balanced
Sub-consultant	Sub-consultant co-operation Sub-consultant hired Sub-consultants Sub-consultants hired Sub-consultant's quality adequate
Sub-contractor	Contractor's management team Contractor's technical support Sub-contractor hired Sub-contractors Subcontractors available Subcontractors hired
Time	Time Time spent Time used by surveyors Timing

6.12 References

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- ¹ Works Branch Technical Circular. WBTC 19/93. (1993) *Filing Practice for Works-Contracts*. Works Bureau of the Government Secretariat of the Hong Kong Special Administrative Region of China.
- ² Works Branch Technical Circular. WBTC 8/95. (1995) *Computer Aided Document Management System for Works Contracts*. Works Bureau of the Government Secretariat of the Hong Kong Special Administrative Region of China.
- ³ Boughton, G., Futcher, K., and Torbet, E. 1997 Project-Information-Management-Systems Deployed in Anticipation of Disputes on Multi-Contract, Non-Traditional Infrastructure Procurement. in Drogemuller R. (ed) IT support for construction process re-engineering. Proc. CIB Publication 208. CIB/W78 conference, July 1997 Cairns, James Cook University of North Queensland, Australia.
- ⁴ Archer, G., Futcher, K., and McMahon, M. 1997 *Multi-participant Project Information Management System* in Drogemuller R. (ed) IT support for construction process re-engineering. Proc. CIB Publication 208. CIB/W78 conference, July 1997 Cairns, James Cook University of North Queensland, Australia.
- ⁵ Futcher, K., and Thorpe, T. 1998 The significance of data 'held in context' in project information management systems. Second Singapore International Conference on Construction Project Management, Singapore, February 19-20 1998.

Chapter Seven - Appendices

7 Chapter Seven - A Longitudinal-grounded study of a Project-Management-Information-System (PMIS)

7.1 Layout of Appendices

For ease of reference, the Appendices for this Chapter of the Thesis are laid out in the order referenced within the Thesis, Chapter Seven.

7.2 Statistical indicators of the diversity of the PWP at March 1998

Attribute of the PWP at 31 March, 1998 for the financial year 1998/1999	Statistics or frequency
No of attributes	7 No stated in the 'Estimates' (Government of the Hong Kong SAR, 1999) Type of infrastructure (within unique project code) Title of project (category of cost) Project overall cost (budget) Expenditure up to end of previous financial year Expenditure in current financial year Expenditure next financial year PWP status (Category B or A project)
No projects	886 No. Statistics for cashflow 99/2000; High = HKD 510 million Low = HKD <0.1 million Median = HKD 3.4 million Mode = HKD <0.1 million Mean = HKD 19.9 million SD = HKD 48 million Statistics for project budgets; High = HKD 10,990 million Low = HKD 3.3 million Median = HKD 98 million Mode = HKD 32 million Mean = HKD 360 million SD = HKD 856 million
Diversity of projects	48 out of 72 categories of infrastructure Statistics for frequency; High = 137 No Low = 1 No Median = 7 No Mode = 1 No (6 instances) Mean = 18 No SD = 29 No

	10 most frequent categories of infrastructure		
	137	No	Civil Eng - Land development
	119	No	Roads
	78	No	Environment - sewerage
	62	No	Fresh water supply
	61	No	Secondary schools
	55	No	Primary schools
	36	No	Civil Eng - drainage and erosion
	33	No	Fresh/salt water supply
	27	No	Tertiary education
	25	No	Environment - refuse disposal
Diversity of Clients (by adding data from the PW_MS database linked by PWP No.	16 Clients		
	Statistics for frequency;		
	High	= 233	No
	Low	= 3	No
	Median	= 29	No
	Mode	= 41	No (2 instances)
	Mean	= 55	No
	SD	= 69	No
	10 most frequent Clients for infrastructure projects		
	233	No	Planning, Environment, Lands Bureau
	147	No	Works Bureau
	139	No	Transport Bureau
	132	No	Education & Manpower Bureau
	42	No	Housing Bureau
	41	No	Security Bureau
	41	No	Home Affairs Bureau
	36	No	Health and Welfare Bureau
	22	No	Economic Services Bureau
	15	No	Treasury Bureau
Diversity of Controlling Officers (by adding data from the PW_MS database linked by PWP No.	10 Controlling Officers with project management responsibility for projects		
	307	No	Director Architectural Services
	199	No	Director Territory Development
	105	No	Director of Highways
	95	No	Director of Drainage Services
	92	No	Director of Water Supply
	34	No	Director of Home Affairs
	31	No	Director of Civil Engineering
	21	No	Director of Environment
	2	No	Secretary for Works
	Statistics for Controlling Officer's portfolios of projects		
	High	= 307	No
	Low	= 2	No
	Median	= 63	No
	Mode	= None	
	Mean	= 89	No
	SD	= 98	No
Diversity of PWP status (i.e., Category A or B	791	No	Category A projects
	95	No	Category B projects

Figure 7-1 Statistical indicators of the diversity of the PWP at March 1998 for the financial year 1998-1999¹.

Diversity of projects	Statistics or frequency		
At 31 March, 1998 for the financial year 1998/1999	48 out of 72 categories of infrastructure		
	Statistics for frequency;		
	High = 137	No	
	Low = 1	No	
	Median = 7	No	
	Mode = 1	No (6 instances)	
	Mean = 18	No	
	SD = 29	No	
	10 most frequent categories of infrastructure		
	137	No	Civil Eng - Land development
	119	No	Roads
	78	No	Environment - sewerage
	62	No	Fresh water supply
	61	No	Secondary schools
	55	No	Primary schools
	36	No	Civil Eng - drainage and erosion
	33	No	Fresh/salt water supply
	27	No	Tertiary education
	25	No	Environment - refuse disposal
At 31 March, 1997 for the financial year 1997/1998	56 out of 72 categories of infrastructure		
	Statistics for frequency;		
	High = 162	No	
	Low = 1	No	
	Median = 6	No	
	Mode = 1	No (9 instances)	
	Mean = 18	No	
	SD = 31	No	
	10 most frequent categories of infrastructure		
	162	No	Civil Eng - Land development
	126	No	Roads
	83	No	Environment – sewerage
	74	No	Secondary schools
	63	No	Primary schools
	63	No	Fresh water supply
	33	No	Civil Eng - drainage and erosion
	31	No	Fresh/salt water supply
	28	No	Recreation - open spaces
	26	No	Environment - refuse disposal
At 31 March, 1996 for the financial year 1996/1997	48 out of 72 categories of infrastructure		
	Statistics for frequency;		
	High = 166	No	
	Low = 1	No	
	Median = 8	No	
	Mode = 1	No (6 instances)	
	Mean = 20	No	
	SD = 31	No	
	10 most frequent categories of infrastructure		
	166	No	Civil Eng - Land development
	120	No	Roads
	67	No	Fresh water supply
	61	No	Environment - sewerage
	53	No	Primary schools
	53	No	Secondary schools

At 31 March, 1995 for the financial year 1995/1996	35	No	Recreation - open spaces
	32	No	Environment - refuse disposal
	29	No	Civil Eng - drainage and erosion
	27	No	Fresh/salt water supply
	53 out of 72 categories of infrastructure		
	Statistics for frequency;		
	High	= 174	No
	Low	= 1	No
	Median	= 8	No
	Mode	= 1	No (7 instances)
At 31 March, 1994 for the financial year 1994/1995	Mean	= 19	No
	SD	= 30.4	No
	10 most frequent categories of infrastructure		
	174	No	Civil Eng - Land development
	114	No	Roads
	68	No	Environment – sewerage
	68	No	Fresh water supply
	51	No	Primary schools
	51	No	Secondary schools
	37	No	Environment - refuse disposal
	35	No	Recreation - open spaces
	27	No	Health hospitals
	25	No	Civil Eng - drainage and erosion
	60 out of 72 categories of infrastructure		
	Statistics for frequency;		
	High	= 174	No
	Low	= 1	No
	Median	= 6	No
	Mode	= 1	No (13 instances)
	Mean	= 16	No
	SD	= 28.7	No
	10 most frequent categories of infrastructure		
	174	No	Civil Eng - Land development
	122	No	Roads
	71	No	Fresh water supply
	67	No	Environment – sewerage
	38	No	Secondary schools
	34	No	Environment - refuse disposal
	30	No	Primary schools
	25	No	Law and Order - police
	25	No	Health hospitals
	24	No	Fresh/salt water supply

Figure 7-2 Project diversity within the PWP for the financial years 1994/95 - 1998/99^{1,2,3,4,5}

7.3 The major participant-roles in PWP procurement

Figure 7-3, shows the integration of the principal roles in the PWP procurement process by the use of the PW_MS introduced in 1994.

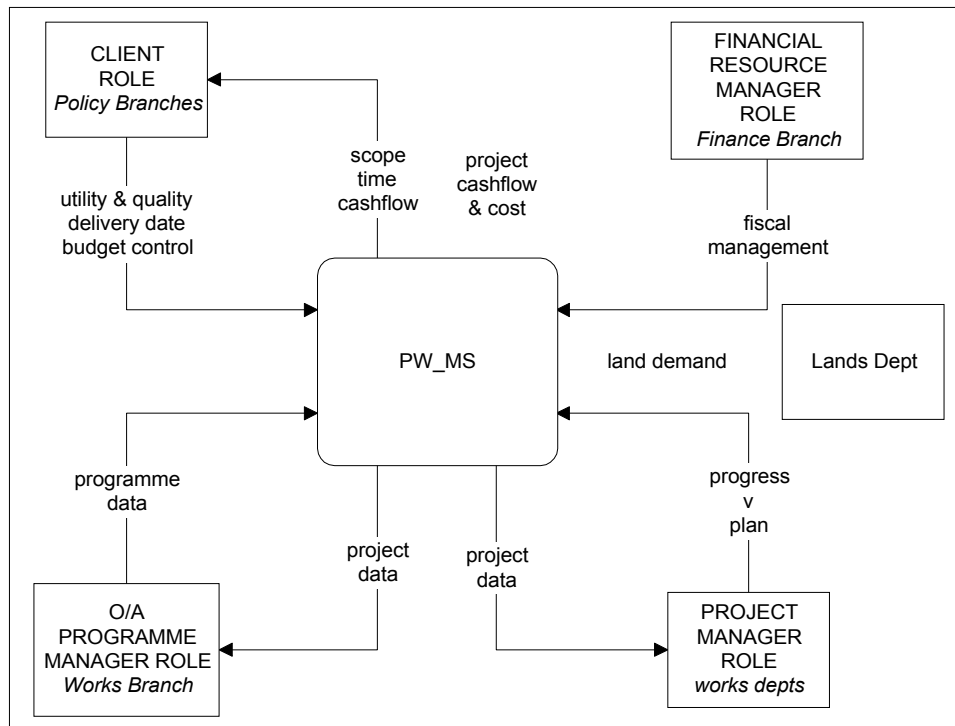


Figure 7-3 Integration of the major participants in PWP delivery via the MIS, taken from the Public Works Project Controls Procedure 001.

The responsibilities of these four ‘generic’ major-participants, the ‘Client-role’, the ‘Financial-resource Manager-role’, the ‘overall Programme Manager-role’, and the ‘Project Manager-role’ are described in this Appendix.

Clients

A ‘Policy Secretary’ heads each of the Bureaux that make up the central core of the Government and collectively called the Government Secretariat. Each Bureau has the sole responsibility for a specific aspect of community affairs⁶. It is their role to define the policies needed in the public interest and to identify the need for any consequential public works infrastructure necessary to satisfy the needs of their policy initiatives. The Policy Secretary makes the request for funding resources in the annual RAE. Bids for funding are assessed by the Finance Bureau but it is up to the Policy Secretaries to justify their requests. The final decision on the competing bids for resources rests with the Star Chamber although Policy Secretaries can appeal against a negative decision of the Star Chamber. For example, Table 7-1, shows the funding resource available for the Policy Secretaries bids in the 1992 RAE compared to their bids for funding.

	\$M in constant 1992 prices			
	<u>1993-1994</u>	<u>1994-1995</u>	<u>1995-96</u>	<u>1996-97</u>
Medium Range Forecast Expenditure guideline	86,180	90,490	95,020	99,770
Forecast expenditure on existing commitments	85,690	89,160	92,140	94,320
Resource available for allocation	490	1,330	2,880	5,450
Bids from Policy Secretaries	3,620	4,223	5,369	5,871

Table 7-1 Competition for funds in the 1992RAE⁷

Funds are allocated to the Policy Secretaries as a global amount but they can re-distribute the lump sum amount as necessary to suit their purposes.

'They [Policy Secretaries] have the authority to alter the timing or priority of their projects in their programmes, providing that the estimated overall expenditure over the five-year forecast period is not exceeded, and subject to the ability of the works departments to accommodate the design and supervision requirements⁸.'

The Policy Secretaries fulfill all the fundamental criteria for Clients of infrastructure projects, namely they:

- require the outcome of the procurement;
- provide the resources for the procurement;
- operate within constraints of scope, cost and time;
- can fund and must approve changes to the project implementation plan; and
- are responsible for achieving a satisfactory outcome from the procurement.

The Policy Secretaries assign the task of procurement to the works departments, making them accountable, as the Vote Controllers, to the Finance Committee for the prudent management of the expenditure of funds on the consultants and the contractors needed to deliver the project⁹. The works departments are obliged to manage the scope, cost and time aspects of project delivery to satisfy the Policy-Secretary-client for each project. In this manner they concurrently manage many projects. They determine priorities and manage their departmental resources to meet their obligations as Vote Controllers and to concurrently satisfy many Clients. This is a programme-management role seeking an optimum outcome of their portfolio-of-projects but the Director of each works department is not authorised to resolve procurement issues external to their department. That overall programme-management role for the PWP portfolio-of-projects is the responsibility of the Secretary for Works⁸.

Financial Resource Manager

The Finance Bureau of the HKG SAR fulfills the role of the 'Financial Resource Manager' for the PWP and its constituent projects. The Finance Bureau is that element of the government organisation chart headed by the Financial Secretary. Its authority stems from the Public Finance Ordinance and empowers the Financial Secretary to delegate some of his roles and responsibilities to the Secretary for the Treasury who is the titular head of the Bureau⁶. The Finance Bureau is thus the

executive arm of the Financial Secretary's organisation. It deals with the two phases of funding arrangement needed for public works projects: the Resource Allocation Exercise (RAE), and the approval of the Finance Committee of the Legislative Council (Legco).

The RAE is an annual process that earmarks in the annual budget the future funds needed to pay for the consultant and contractor services required for the procurement of a public works project. This is achieved when the Policy Secretary-client for that project gets support for it in the annual RAE of the Star Chamber i.e., the Chief Secretary's Committee. Design development of the project using in-house resources is not charged to the project. These staff costs and overheads are a separate charge that is included in the annual appropriation for the cost of the government⁹. The final phase of the funding process is to seek the approval of the Finance Committee of Legco for the expenditure of the funds earmarked for the project. The timing of public works projects does not suit the annual accounting of the Appropriations Bill nor is it convenient for the cost variations typical of construction projects to be constrained to fixed expenditure constraints typical of the Appropriations Bill. For these reasons the funds needed to pay for the services of the consultants and the contractors needed for project delivery are provided through a fund arrangement called the Capital Works Reserve Fund administered by the Finance Bureau¹⁰. Funds are drawn from this fund to pay consultants and contractors with the prior approval of the Finance Committee. This approval must be sought when the scope, cost and timing of the expenditure is well defined but before agreements or contracts are signed.

These phases of funding arrangement coincide with the development stages of a public works project shown in Figure 7-4. The Policy Secretary-client states the utility and service need for a public works project. If the project is shown to be viable in a feasibility study then it enters the PWP at Category C¹¹. The project is upgraded to Category B status when future funding is earmarked in the five year forecast of expenditure in the CWRF during the annual RAE process¹². At the pre-Agreement or the pre-Tender stage, the approval of the Finance Committee is needed for the anticipated expenditure. The project is then upgraded to Category A status and the consequent expenditure is tracked in the Government's ledger accounting system (LAFIS).

The Financial Secretary, through his executive staff in the Finance Bureau, ensures that the HGK SAR can afford the level of spending proposed for the PWP from the CWRF. 'In practice, this requires that growth in public expenditure should be linked to the real growth of Hong Kong's economy as measured by GDP'¹³.

'The Government's principal budgetary planning guideline is that public expenditure should not grow faster than the trend growth rate of the economy over the medium termBecause economic performance tends to be cyclical, the use of the trend growth rate is important. . . . growth rate in GDP and the growth rate in public expenditure should, over a period of years, remain close together. . . . to achieve this the Government operates over a five-year planning horizon and establishes [forecasts] the trend growth [in GDP] over this period'.⁷

For example, the economy and public expenditure grew in real terms by about fifty percent over the seven-year period from 1988/87 to 1993/94.

The Financial Resource Manager for the PWP, meaning the Finance Bureau of the Government Secretariat, is actively engaged in ensuring that public works projects are coordinated to meet the budgetary and the procedural requirements of the RAE and the Finance Committee of Legco. They look to the Policy Secretary-client sponsors of the public works projects to provide the arguments in support of each the project in the competition for financing in the RAE. They also look to them for the justification for the project put before the Finance Committee when requesting approval to the expenditure of the earmarked funds in the CWRP of the HKG SAR. However, as stated earlier, the responsibility for diligence in the expenditure of the approved funds is assigned by the Finance Committee to the Vote Controller for the project - usually the Director of the works department managing the procurement⁹.

Project Managers

The project manager, or otherwise the works department professional assigned responsibility for the project, is held accountable to the Director of the works department for the delivery of the project within the constraints of scope, cost and time¹³. The Director is accountable to the Secretary for Works for satisfactory progress of Category C and Category B projects, and is also accountable as the Vote Controller, to the Finance Committee for procurement of the Category A status projects. These arrangements are shown in Figure 7-4.

The description of the Project Managers role in the delivery of PWP projects is found in the Civil Engineering Manual¹⁴, the Technical Manual¹⁵, and the Project Control Procedures¹⁶ of the HKGSAR.

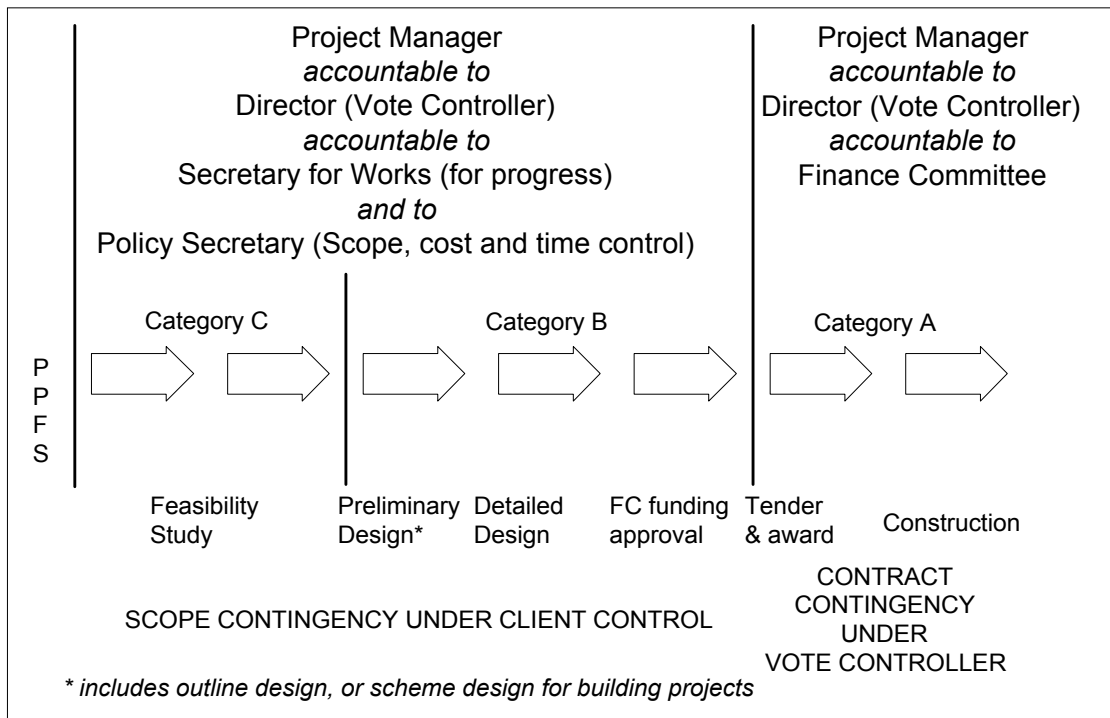


Figure 7-4 Typical lifecycle of a PWP project showing the chain of accountability¹⁶.

The works department is involved in all the activities shown in the typical project life cycle in Figure 7-4. Project implementation involves many stages with input from different sources outside of the project team and from other organisations. Co-ordination, progress monitoring and problem solving throughout the project life cycle is the responsibility of the project manager (this role could also be carried out by the project team leader (PTL) on smaller projects). At the outset of any project, on receipt of a client project brief, the works department undertakes a preliminary project feasibility studies (PPFS) to define the project in terms of scope, cost, time and risk, and prove its viability. If on completion of the PPFS, significant risks have been identified such that the project cannot be considered as well defined, then the works department will undertake a more detailed feasibility study (FS). This is to overcome risks so that the project is viable and well defined to an extent considered satisfactory by the Works Branch and by Finance Branch. The Policy Secretary can now bid for funds in the next RAE to pay for the consultant and contractor services needed to procure the project.

If the Policy Secretary is successful then the project is moved to Category B status in the PWP. On entry to Category B the implementation plan (scope, cost, time, risk) identified in the PPFS or FS are fixed baselines for the project. This original baseline plan establishes a firm budget in terms of an estimate of cost and corresponding cashflow along with a firm delivery time-plan for the defined scope of the project. The Project Manager's role is to deliver the project in accordance with the baseline implementation plan (BIP).

The BIP includes a high-level work schedule of activities and significant milestone dates. Finer activity planning can fit into this standardised framework. The estimate of cost is calculated so as to include the value of measured items known to be required and the value of items thought, in the circumstances, to have some probability (or risk) of being needed. This second part is a probability-based calculation of the contingency for

the project. Any change in the baseline scope of a Category B project requires the approval of the client Policy Secretary. The Policy Secretary must also provide the additional funds and agree to the necessary changes in the BIP. In the case of Category A projects, the Policy Secretary must also get the approval of the Finance Committee.

A Project Manager can escalate problems to his superior responsible for the management of a portfolio-of-projects within the department. The superior can, in-turn, escalate serious problems to the Works Director who has the responsibility for the entire portfolio-of-projects entrusted to that department. The Director can escalate major problems to the Secretary for Works who has the overall responsibility for management of the Public Works Programme⁸.

Programme Manager

The responsibility for managing many projects that have some common feature occurs frequently among the PWP participants. Portfolio-of-projects arise within the works departments at headquarters level and below. It also occurs within the Policy Bureaux. In these cases, the organisation has a direct responsibility for many projects and must manage them concurrently. In terms of the works departments portfolio-of-projects these are stated in the Technical Manual¹⁸ as:

- Directing overall policy and strategy [for the portfolio];
- Monitoring performance [overall];
- Planning and allocating resources [from a pooled-resource];
- Reporting [overall];
- Intervening to resolve critical issues . . . affecting more than one project;
- Maintaining relationships [where the issues transcend one project].

The situation is different in the case of the PWP as a whole. Policy Secretaries and the works departments have an interest in component portfolio-of-projects within the PWP, not the whole. The Finance Bureau has an interest in the financial aspects of the PWP but does not have a jurisdiction that includes the performance of the works departments in procurement of the portfolio. To fill the gap, the Secretary for the Treasury assigned the responsibility for the implementation of the PWP to the Secretary of Works⁸. This responsibility includes:

- Ensuring that the staff and resources of the works departments (including consultants employed by them) are deployed effectively to deliver the PWP according to the programme of works set by the Star Chamber and as approved by the Finance Committee;
- Ensuring that the works departments (including those whose Directors report to other Bureaux) are effectively deployed so that the Category B projects are made ready to start expeditiously;
- To coordinate the resolution of all project-related problems that cannot be quickly resolved at departmental level;
- To monitor forecast spending against the allocations shown against project subheads in the CWRF Estimates, and to take remedial measures.

The concerns of the Secretary for Works are thus focused on the timely expenditure of allocated funds so as to meet the preset targets. The overall PWP cashflow is the sum of the cashflows of the component public works projects allocated by the Star

Chamber and approved by the Finance Committee. To achieve the timely expenditure it is essential that Category B status projects are ready to start as soon as possible because this triggers the commencement of the expenditure cashflow. If a delay occurs then an underspending will be incurred for the duration of the delay. Matching actual expenditures with the Estimates of Annual Expenditure published in the annual Budget is a fundamental aspect of PWP programme-management. In 1992-1993 this objective was not met.

7.4 Per cent PWP underspending for 1991-92 to 1987-88

Financial Year 1991-92		Underspending (+ve)	
PWP sub-heads ▼		Cf Estimate	Cf Revised Estimate
702 Port and Airport Development		48%	50%
703 Buildings		25%	36%
704 Drainage		25%	30%
705 Civil Engineering		38%	48%
706 Highways		13%	22%
707 New Towns and Public Housing not Housing Authority*		34%	41%
709 Waterworks		42%	48%
Total for 1991-92		33%	40%
Financial Year 1990-91		Underspending (+ve)	
PWP sub-heads ▼		Cf Estimate	Cf Revised Estimate
702 Port and Airport Development		-15%	21%
703 Buildings		3%	27%
704 Drainage		4%	32%
705 Civil Engineering		21%	41%
706 Highways		2%	14%
707 *New Towns and Public Housing.		17%	32%
709 Waterworks		28%	36%
Total for 1990-91		10%	29%
Financial Year 1989-90		Underspending (+ve)	
PWP sub-heads ▼		Cf Estimate	Cf Revised Estimate
703 Buildings		-33%	23%
705 Civil Engineering		-7%	22%
706 Highways		-18%	12%
707 *New Towns and Public Housing.		-7%	21%
709 Waterworks		2%	32%
Total for 1989-90		-15%	21%
Financial Year 1988-89		Underspending (+ve)	
PWP sub-heads ▼		Cf Estimate	Cf Revised Estimate
703 Buildings		-23%	18%
705 Civil Engineering		-18%	18%
706 Highways		-39%	7%
707 *New Towns and Public Housing.		-21%	21%
709 Waterworks		15%	27%
Total for 1988-89		-22%	18%
Financial Year 1987-88		Underspending (+ve)	
PWP sub-heads ▼		Cf Estimate	Cf Revised Estimate
703 Buildings		-33%	21%
705 Civil Engineering		-28%	10%
706 Highways		-49%	10%
707 *New Towns and Public Housing.		-5%	21%
709 Waterworks		10%	20%
Total for 1987-88		-18%	18%

Table 7-2 PWP underspending in percent for 1991-92 to 1987-88

7.5 Chronological background to the implementation of the PW_MS

Source of information

The Secretary for Works of the Government Secretariat gave permission for this discovery-process within the files of the Works Bureau on the topic of the implementation of the PW_MS. Different sources have been examined where possible to triangulate opinion found within the registry of files. The extent that the requirements for the MIS are satisfied is measured from an audit by the researcher against the implemented MIS. The audit findings were substantiated by informal interviews with the staff of the Public Works Systems Administration Unit who manage the MIS.

The purpose of this section of the research is twofold:

- One, to document the owner's requirements for the PW_MS and to measure the degree that they are provided in the PW_MS.
- Two, to measure the functionality of the PW_MS against the Cleland and King statement of requirements for a PIMS.

A definitive statement of the functional requirement for the PW_MS does not exist. A series of authoritative documents produced throughout the history of the PW_MS contain statements of requirement. In the absence of a final statement of requirement and because the management debate during implementation reflects attitudes toward the implemented system, a holistic approach is used to audit the requirement against the implementation. The emerging requirement is described in chronological order and then audited against the physical system. Red used within the text and Tables means that the functionality identified is not satisfied in the current version of the PW_MS. To explain why the requirements for the PW_MS evolved in this manner, the inception and early development of the PW_MS is recounted in terms of the decisions and objectives of the day.

Implementation of the PW_MS

The early objectives for the PW_MS are stated in a series of papers leading up to and including the initiative stated by the Financial Secretary in his Speech moving the Second Reading of the Appropriation Bill in March 1993¹⁷. Proposals in this direction had previously been discussed a year earlier at the Public Works Progress Committee¹⁸ on July 21, 1992. It recommended that the Works Policy Division, of the Works Branch, should look to existing PWP policies, practices, and procedures; and to the project management approach taken for the ACP, to help in deciding on an information management system for the PWP. A powerful consensus of the directors of the Works Departments favoured a project management information system. The nub of their comment is listed in Table 5-1. It indicates the degree of support and the

objectives that they had for a MIS to be used as part of a project controls approach to the management of the PWP. As a result of this consensus, the Works Bureau¹⁹ set out to engage consultants to investigate, and advise on an optimum specification for a MIS that would meet the needs of a best approach to the management of the PWP. A second stage would be the appointment of a consultant to deliver a system that satisfied the functional specification.

Works Director	Comment (Source: Works Branch, 1992) ²⁰	In WB (W) 271/38/23 (92)
Architectural Services	‘Architectural Services Departments keeps project information in various systems. INFORM holds information on the progress of work. LAFIS keeps details of actual expenditure and funds allocations. Arch S D forecasting system gives cashflow projections.’ <u>The idea of having a central database information system for all works department is acceptable.</u> However, there must be flexibility within the system to cater for the need of individual departments.’	Folio (3)
Civil Engineering Services	‘ <u>The proposal . . . is fully supported.</u> ’ ‘In view of the diversity and individual needs of department projects, there are many varieties of . . . procedures that suit each project. The financial system should take into account these requirements.’	Folio (11)
Drainage Services	[It should be] a “user-friendly” computerised information system.	Folio (10)
Electrical and Mechanical Highways	‘I confirm that we do not have any comments to make.’	Folio (7)
	‘ <u>It is clear that the Works Group of Departments are in need of a unified system of monitoring and reporting activity under the PWP programme.</u> ’ ‘For many years Highways Department has been working with a system which is cumbersome, entails duplication and is quickly out of date and therefore unreliable.’ ‘It is not user friendly and does not lend itself to interrogation at the various levels of management within the department’ ‘I agree that there is a need to streamline the presently fragmented information on the PWP and to develop an electronic database both to provide an on-line information system and to reduce paper flow	Folio (6)
Territory Development	‘ <u>the department welcomes the development of a comprehensive electronic database.</u> ’ . . . ‘it is important to consider . . . the specific objectives of the intended computerised information system’. . . ‘the new system should cater for the preparation of annual RAS programmes’ . . . ‘existing financial monitoring system (monthly forecast and actual expenditures) should be incorporated . . . as well’ . . . ‘The system should . . . include various analysis to assist management decisions’.	Folio (4)
Water Supplies	<u>The objective to develop an electronic database to replace various paper returns is supported.</u>	Folio (8)

Table 7-3 Early comments from the Works Directors on the proposal for a PWP MIS

In February 1993, expressions of interest were requested from a long-list of project management consultants taken from the EACSB directory of engineering consultants. In the covering letter on this subject it was explained that the Works Branch wanted to develop a functional specification for '... overall programme management and cost information controls systems to be used by the works group of departments. The objective was, to '... significantly enhance the means available for the Public Works Programme to be controlled, and trend deviations identified in time for corrective action to be taken'²¹. The expressions of interest were reviewed by an assessment panel chaired by the Deputy Secretary (Programme and Resources) of the Works Branch, with members from other involved Branches of the Government Secretariat. A short list of suitable consults was agreed. Work immediately started on drawing up a detailed Brief for the consultant services. Finance Branch was part of this initial work. They were aware of the statements to be made by the Financial Secretary in his forthcoming budget speech. In early March, 1993, they wrote to the Secretary for Works and, inter alia, stated,

'... The object of the study is not simply to make implemental [incremental] improvements to the present project-reporting procedures of works departments and Works Branch. Its aim should be to consider in some depth the means to provide a government-wide, public works project information and management system.'²²

Immediately after the 1993 Budget speech, the Secretary for the Treasury²³ wrote to Works Branch to state that the current initiatives were to be subsumed into a more comprehensive consultant service managed by a Steering Group under the leadership of the Financial Secretary. The Secretary of Works managed the practical work of the Steering Group using a Working Group at the day-to-day level. The Steering Group included, by invitation, participation from industry leaders, Legco, and the Secretaries for Works, Treasury, Transport, Economic Services, and for Planning, Environment and Lands.

These enhanced requirements were included in the brief for the appointment of consultants. However, the ambition for the work was now greater than envisaged when Expressions of Interest were earlier invited. On March 10, 1993 the Secretary for the Treasury²⁴ wrote to the Secretary for Works to confirm their agreement on these increased requirement for the consultants services. The short-list of engineering consultants were advised of the elevation of ambition for the work and they strengthened their teams to include world-class management-consultants plus other necessary expertise. The Government procedures for the appointment of a consultant were fast-tracked by agreement between the Secretary for the Treasury and the Secretary for Works.

From the above, the identified characteristics of the conception stage of the PW_MS are:

- ❑ The leadership and commitment to achieve an early implementation of a project/portfolio management information system called the PW_MS, was driven from the highest levels of authority within the HKG SAR. It was publicly announced as a major component of Government policy for effective management of the public works programme. It was steered in a transparent fashion by high-ranking government officials at ministerial level, respected leaders of the construction industry, and by politicians with appropriate cognate experience. Within the public works organisation a powerful consensus of the Directors of the Works Departments had confirmed their support of the initiative. McKinsey Inc., were hired to assist in this undertaking.
- ❑ The cost of the MIS was not an issue but the urgent need for an operational system was a predominant concern as the Financial Secretary had already stated that it would be in operation within nine months. Within this timeframe, the development of a customised MIS using SSADM and PRINCE methodologies was not practicable.
- ❑ The functionality of the MIS was not clearly stated, other than it would serve as an aid to the project management of the public works projects and would thus enable the Secretary for works to manage the whole of the PWP so as to match actual expenditure to budgeted funding.
- ❑ The PW_MS was conceived as a critical-success-factor in the business of project/portfolio procurement. The information technology involved was a secondary consideration. As a consequence the project was lead as a business initiative by the business leaders with most to win from its success.

A request for approval to spend money on the appointment consultants for the purposes of this initiative was presented to the Finance Committee on April 16, 1993. It proposed an expenditure of \$34 million on the proposed consultant services. This included the implementation of a yet to be defined PWP MIS as part of a larger exercise to bring about improvement in the delivery of PWP. By way of context, it said, ‘. . . A subsidiary but essential element of work will be to develop and fully test a suitable prototype computer system to ensure that it can be used effectively . . . to help manage the Public Works Programme.’²⁵ The enclosure to this paper has statements that define the high-level objectives for the PW_MS. These, along with the specifications stated in the Consultant Brief and comments made in the report addressed to the Consultants Selection Board of the HKG SAR are listed in Table 7-4.^{30,23} Up to this point the requirement for the PWP MIS is the untutored view of the client for the system. All of the items in this specification except ‘resource planning’ are satisfied in the implemented PW_MS.

Statement of requirement (objectives) for the PWP MIS.	
• ‘to link all the works departments and relevant Branches’	• Source ²⁶
• ‘[the consultants will] develop and . . . test a . . . prototype computer system . . . that it can be used . . . by works departments and Policy Branches to help manage to the Public Works Programme.’	• Source ²⁷
• In respect of this system, the consultants duties are to –	• Source ²⁸
• produce, review and agree with the Government, a functional specification and system prototype; develop a working prototype and undertake full testing; complete revisions of the prototype system required as a result of system trial and recommendations arising from further works under the Brief; verify and input all available data to the prototype system; and train key government staff in the use of the prototype system.	
• Consultants will. . . establish a prototype computer based information and management system. . . . they are also required to produce a functional specification for the computer system.	• Source ²⁹
• The objective of this consultancy is to improve substantially government’s capacity to deliver public works projects on time and within budget and spending targets.	• Source ³⁰
• In respect of this system, the consultants duties are to –	• Source ³¹
• produce, review and agree with the Government, a functional specification and system requirement;	
• develop a working prototype and undertake full testing;	
• complete revisions of the prototype system required as a result of system trial and recommendations arising from further works under the Brief; verify and input all available data to the prototype system; and train key government staff in the use of the prototype system.	
• construction-management analyses will include work-scheduling; cost-control; resource-planning ; and trend monitoring’,	• Source ³²
• ‘. . . the Consultants shall propose and acquire, subject to the approval of the Secretary for Works, computer facilities for this purpose and arrange for the PW_MS to be developed.’	• Source ³³
• ‘. . . selection of an application . . . package. . . this approach reduces the risks associated with developing an unproven system, and allows the prototyping to concentrate on testing the system functions.’	• Source ³⁴

Table 7-4 Statements of objective for the PW_MS taken from authoritative documents up to the appointment of a management consultant.

From this time onwards the functional requirement for the PWP MIS was influenced by the advice of the consultant, McKinsey Inc. They started work on May 3, 1993, reporting interim progress to the Steering Committee at the Inception stage of the Brief, and thereafter at intervals of three months. Throughout this period, the Secretary for Works held weekly meetings with the Consultants and with his staff deployed on the project. The documents produced and the decisions by the Steering Committee, and the subordinate Working Committee form a statement of functional-objective for the PW_MS. This is founded upon the broadly worded statements of objectives cited so far. A review of other documents over the nine-month period of

the consultant agreement has been carried out. Relevant extracts are cited here to piece together a statement of objective for the PW_MS.

Page 13 of the McKinsey Inception Report³⁵ provided an assessment of the computerised tools and techniques currently used within public works departments to aid in their management of their PWP projects. The summary statement from McKinsey says, ‘Initial impressions of the computer systems environment supporting the PWP indicate relatively few applications and varying levels of sophistication in project management and estimating.’

Table 7-5 reproduces McKinsey’s preliminary assessment of the failings in the ad hoc systems deployed within the works departments. These were taken as perceived ‘failings’ to be resolved by the PW_MS. Text in red font indicates ambitions that are not satisfied in the PW_MS.

Purpose of the approach	McKinsey assessment
<ul style="list-style-type: none"> Financial Control i.e., LAFIS and related departmental add-on programs to LAFIS 	<ul style="list-style-type: none"> ‘inappropriate for project monitoring’ ‘do not track internal resources’ ‘identify delay too late’
<ul style="list-style-type: none"> Project information management 	<ul style="list-style-type: none"> ‘little computerised monitoring of projects’ ‘data at Works Branch level is difficult to reconcile and aggregate’
<ul style="list-style-type: none"> Project scheduling 	<ul style="list-style-type: none"> ‘few packages used – mostly in one department’ ‘incompatible’
<ul style="list-style-type: none"> Cost estimation and resource allocation 	<ul style="list-style-type: none"> ‘no standardised estimating software used across departments’ ‘no standard RAS format’

Table 7-5 McKinsey assessment of the failings in the pre-PW_MS MIS used within the public works departments for management of their PWP projects

McKinsey made clear their intention to search the market for a ready-made software for the PW_MS³⁶. The notes of the Steering Group Meeting held on May 22, 1993, show implicit acceptance of the Consultant’s Inception Report including this rapid-prototyping approach to system implementation. The Financial Secretary is quoted as saying ‘that classic project management provided one of the answers: that is, defining decision dates, and [then] programming-in, all the necessary steps [to help resolve PWP underspending problems]’³⁷ i.e., a top-down planning approach for each PWP project.

McKinsey published their first interim report, concerning the diagnostic phase of their studies on June, 18, 1993³⁸. It focuses on existing PWP procedures, practices and systems. Pages 2-35 to 2-38 are relevant to the PW_MS. They said, ‘Ineffective management reports and weak information systems prevent proactive management of project progress, leading to project delays, poor performance, and underspending’³⁸. McKinsey’s observations were influential to the Steering Committee and were taken as statements of what the PW_MS should resolve or otherwise avoid happening in the

future. These desired attributes of the PW_MS are listed in Table 7-6. The items printed in red font are not satisfied within the PW_MS.

Problem	Time-impact	Cost-impact	Scope-impact
PERFORMANCE MEASUREMENT			
<ul style="list-style-type: none"> • ‘not tied to fixed . . . baselines’ • ‘few true measures of good performance’ • ‘resources not directly linked with output’ 	<ul style="list-style-type: none"> • ‘delays and slippage are not tracked’ • ‘projects are delayed’ 	<ul style="list-style-type: none"> • ‘true project costs are difficult to gauge’ • ‘cost variances are hidden’ 	<ul style="list-style-type: none"> • ‘changes in scope are invisible’ • ‘impact of scope changes not well understood’
MANAGEMENT REPORTING			
<ul style="list-style-type: none"> • ‘numerous and redundant reports’ • ‘inconsistent formats and incomplete data prepared manually’ 	<ul style="list-style-type: none"> • ‘significant time and resources spent creating and distributing reports’ • ‘cross-departmental comparisons are difficult’ 		<ul style="list-style-type: none"> • ‘people do not address scope changes early enough’
INFORMATION SYSTEMS			
<ul style="list-style-type: none"> • ‘limited access to the ‘few existing systems’ • ‘computer skills not valued’ 	<ul style="list-style-type: none"> • ‘slow response to information queries’ • ‘few scheduling tools used to enhance productivity’ 	<ul style="list-style-type: none"> • ‘high cost of manual data entry and re-keying data’ 	<ul style="list-style-type: none"> • ‘inability to simulate scope changes and impact’

Table 7-6 McKinsey Inc assessment of the management reports and systems existing in 1993

The Steering Group met again on June 30, 1993, (WB (CR) 166/14 (93) Pt 5) to review the Diagnostic Report with the McKinsey consultants. They said inter alia that,

‘. . . The present system which involved different branches/departments at different stages of project development and implementation made it difficult to hold any particular officer accountable for the delivery of a particular project. . . .FS [Financial Secretary] shared fully the view that there was a need to identify accountable officers . . .for projects. . . In his view, there should be two accountable officers for each project: the project delivery agent and the client.’³⁹

The Preliminary Technical Specification for the PW_MS⁴⁰ was produced by McKinsey in early August, 1993 subject to later revisions to include comments from the Client-side. The final version was issued in September, 1993⁴⁰. Page 1-11 and 1-12 of the Stage 1 Recommendations introduced the idea of baseline control to make

visible the impact of change in scope and consequent delay. Table 7-7 states the McKinsey functional recommendations for this to be effective.

Baseline attribute of project	Definition of the baseline
<ul style="list-style-type: none"> • SCOPE • TIME • COST 	<ul style="list-style-type: none"> • A concise description of the end product • Milestones necessary to complete project tasks • Cost budgets and cash flows consistent with achieving milestones.
<ul style="list-style-type: none"> • STAFFING 	<ul style="list-style-type: none"> • Staff resources required consistent with achieving milestones

Table 7-7 Recommended minimum baselines in the PWP project controls

The McKinsey Preliminary Functional Specification was reviewed at the Third Meeting of the Steering Group held August 27, 1998⁴¹. However, the required urgent pace of development for the PW_MS meant that development work, along the lines of the recommendations of the Consultant stated in the Preliminary Technical Specification for the PW_MS, had to start earlier. It was clear from the outset that McKinsey were strongly committed to acquiring existing commercial software to best-suit the PW_MS functional need – and customising it where it did not fit. In this approach, a selected proprietary software product becomes the de facto Functional Specification for the PW_MS. It offers a quick and effective form of implementation but it deviates from the ‘keep-it-simple, bespoke development’ conceived within the Works Branch for the PW_MS and outlined in their Brief to the Consultants³⁴. The debate over the Consultant’s proposed fast-track approach to the implementation of the PW_MS continued throughout August.

In their search for a proprietary software to satisfy the needs of a PWP MIS, the Consultants reported that they had reviewed the marketing brochures of over one hundred software used to assist in project management^{42,41}. After screening the functionality of these products they identified two that could satisfy the unusual combination of multi-project, multi-participant, and multi-manager approach needed to conform to the HKG SAR requirements for the management of PWP projects. Multi-manager situations arise when a Works Director ‘entrusts’ a project in part or entirety to another works department or some other quasi-government organisation. This re-arrangement of project responsibilities has been devised over a number of years in an ad hoc manner to minimise the engineering interfaces that arise on congested fast-track construction projects.

The McKinsey proposal to implement the prototype system from the best option found in their screening of a large number of software and the assessment of the resultant short-list of products carried risks. Doubts were expressed over the pre-selection process, and the risks perceived in customising a proprietary product supplied by a UK-based software company of limited resources and potentially precarious future operating in a difficult commercial market⁴³. McKinsey prevailed in this debate by counter-arguing of the overwhelming benefit of developing the software concurrently with the development of the Functional Specification: if necessary, the development could be iterative⁴⁴. The fast-track approach was attractive to the Steering Committee because they had publicly promised speedy results. Futcher^{45,46,47} has since written of the easy lure and false-promise of

concurrent development of bespoke software solutions from proprietary software products. In compromise of the rapid-prototyping approach the Secretary for Works⁴⁸ agreed to the development of the prototype PW_MS from a pre-selected proprietary software in a 'pilot' scheme intended to confirm the durability and effectiveness of the McKinsey selection before embarking on the prototype implementation. In late August 1993, a competitive selection process was used to determine the preferred solution out of two commercial software products deemed by McKinsey as suitable, plus the original bespoke- solution envisaged in the funding proposals to the Finance Bureau and to the Finance Committee. This assessment would include competitive bids on cost, technical merit, and the risks arising from each vendor. The Third Meeting of the Steering Group⁴⁹ held on August 27, 1998, agreed to this approach.

On September 10, 1993 McKinsey issued the Preliminary Functional Specification for the PW_MS⁴⁰. They stated in the first paragraph that 'the PW_MS will be developed in an iterative manner, the functionality specification may be refined and updated as its development progresses'. This document is 50 pages long with an appendix of 14 pages. The objectives stated in that document are paraphrased here Table 7-7. This provides a definitive statement of objectives for the PW_MS. Requirements not satisfied in the implemented MIS are shown in red font.

Objective	Ref ⁶⁹
1 'Project Management – to improve project planning, design, control and execution to meet PWP targets'	Page 3
2 'Programme Management' – to provide a management reporting tool to forecast on track execution and performance of the PWP.'	Page 3
3 'Programme Development – to facilitate optimal use of resources to support the PWP through effective forecasting and resource planning.'	Page 3
Key Functions	
4 'Baseline Management –	Page 5
a) setting project targets in terms of time, cost scope, and <i>resources</i> .	Page 18
b) Managing project progress against targets with client approval [of changed targets]	Page 7
c) Monitoring trends'	Page 16
d) Managing project design and construction progress against plans, including identifying deviations and trends.	Page 19
e) Lifecycle baseline	Page 20
f) For projects and contracts	
g) Actuals versus baseline	
h) Changed only with well-defined approval process	
i) Change approval thro Client endorsement, PWPC [CWC] approval	
5 'Exception Reporting and Corrective Action Planning –	Page 5
a) Defining thresholds at project-level beyond which performance should not deviate.	Page 16
b) Time threshold – to allow for minor fluctuations in project start and end dates	Page 21
c) Cost threshold – to allow for tender price fluctuations and minor scope/design changes	Page 22
d) Scope threshold – to allow for minor scope changes only as a result of detailed design	Page 23
e) Cashflow threshold – to allow for impact of time delays, re-estimated cost and changes in design with client approval. Raising warning flags automatically when thresholds are exceeded.	Page 24
	Page 27

	f) Understanding causes of deviations.	
	g) Planning and executing corrective actions.'	
	h) Printing PWP exception report	
	i) Printing Works Management Status Report	
	j) Printing Project Status Report	
	k) PTLs [project managers] record why deviations have occurred.	
	l) PTLs [project managers] re-plan a work-around solution recorded in PW_MS	
	m) PW_MS reports should note corrective actions	
6	'Performance Measurement –	Page 5
	a) Measuring key time, cost and scope performance indicators.	
	b) Analysing historical trends'	
7	'Programme progress reporting –	
	a) Aggregating and segmenting performance indicators by program, head, department and division to obtain top management view.	Page 5
	b) Distributing reports automatically.'	Page 16
	c) Performance statistics	
	d) Programme progress monitoring	
8	'Work scheduling –	Page 5
	a) Planning key activities and resources	Page 7
	b) Anticipating overall work levels'	
	c) Tracking activity completion against baseline.	Page 16
	d) Based on generic work scheduling templates customised by project team leaders to suit each project	
	e) Set firm baselines at Cat C	
9	Resource Planning –	Page 5
	a) Tracking available staffing resources	Page 16
	b) Matching workload with resources	
	c) Measuring use of consultants/contractors to handle workload peaks'	Page 7
	d) Tracking actual resource use against baseline.	Page 40
	e) Annual resource planning process to match workload to available resources	Page 41
	f) PW_MS should support tracking of resources through timesheets and the aggregation of the data	
10	'The PW_MS will support Government's process of project delivery' i.e., Cat C thro to Cat A in terms of sequential phases satisfying CPB, PPFS, RAE, PWSC/FC, construction completion	Page 6
11	'Top-down programme control, bottom-up project control –	Page 8
	a) PWPC [CWC] drives the overall programme	
	b) Project team leaders drive individual projects	
12	'Single, consistent database'	Page 8
	a) Consistent data definitions across departments	
	b) Single (centralised) logical Works database	
	c) Clear accountability for PTL's [project managers] to keep data up to date.	
13	'Proven, consistent technology architecture'	Page 8
	a) package based implementation, not reinventing the wheel	
	b) consistent hardware platforms across departments	
	c) consistent software structure	
14	'Flexible and expandable'	Page 8
	a) add extra reports without programming expertise	
	b) increase users without changing hardware architecture	
	c) add extra database fields without programming expertise	
15	'Easy to use and to support'	Page 8

	a)	Windows/mouse	
	b)	Menus/icons	
	c)	Straightforward concepts	
	d)	Vendor capable of providing local support	
16	'Audience'		Page 12
	a)	Serving 3 constituencies: policy bureaux, works departments, and enabling departments	- 13
	b)	Policy Sec access = terminal per bureau	
	c)	Works department access = terminal at every level down to engineers/architect	
	d)	Enabling departments access = terminal per key area and 1 per DLO	
	e)	Recommended number of terminals = 246 by early 1995	
17	'Performance Statistics'		Page 23
	a)	Time to construction start	
	b)	Time to completion	
	c)	Time elapsed in current phase	
	d)	Progress against baselines	
	e)	Land provision progress	
	f)	Trending against time	
	g)	Forecast cost to completion	
	h)	APE's – current and historical	
	i)	Cash flows – actuals and variances	
	j)	Consultant cost – actuals and variances	
	k)	Approved scope variations	
	l)	Pending scope variations	
	m)	Project risks identified vs. incurred	
	n)	Person hour resource usage vs baseline	
	o)	% work done vs % resource usage	
	p)	% resource usage vs % elapsed time	
	q)	% planned completions and major milestones/phases not delivered so far during year	
	r)	% projects delayed by more than 3 months	
	s)	average project delay	
	t)	average time by phase/by Cat	
	u)	phase containing most slippage	
	v)	Average % slippage by time/phase	
	w)	Time to completion	
	x)	Time elapsed	
	y)	Progress against original baseline	
	z)	Progress against current baseline	
	aa)	% actual cost vs planned by programme/head, department, and client	
	bb)	% actual spent vs planned by programme/head, department, division	
	cc)	Current cost vs original baseline costs	
	dd)	Forecast cost to completion	
	ee)	APE's current and historical	
	ff)	Cashflow variances and overruns	
	gg)	% projects with significant scope changes by department, client, project type	
	hh)	% projects cancelled by department, client, project type.	
	ii)	Approved variations to scope	
	jj)	Pending variations to scope	
	kk)	Project risks identified vs risks incurred	
	ll)	Baseline resource utilisation	
	mm)	Projects exceeding resources or short by 20%	

nn)	Total no person hours by Programme/Head, Department,	
oo)	Divisions, Project type.	
pp)	Person hour usage by Phase, skill level, consultant, in-house	
qq)	% work done	
rr)	average land resumption time by department, client, project type.	
18	'Hierarchial breakdown structures'	Page 30
a)	Work Breakdown Structure (WBS) - PWP > programme > Project > Phases > Contract	
b)	Organisational Breakdown Structure (OBS) – PWPC > Clients > Departments > Division > Team	
19	'Report Writing'	Page 31
a)	'reports should generated automatically from the system's database'	Page 32
b)	standardised terms across departments	
c)	standardised yet flexible formats of regularly produced reports	
d)	ability to create ad hoc reports without programming on demand	
e)	regular reports automatically printed with recipient name at sites convenient to users	
f)	Reports for project managers inc project status report and exception report.	
g)	Reports for 'line managers' inc human resources report, works management report, project status report by dev programme	
h)	'Enabling constituency reports' inc DLO, Environmental status report, financial summary report	
20	'PW_MS support for programme development process'	Page 35
a)	store inflation factors for next 5 years	
b)	aggregate project cashflows for PWP and summarize by: Client; Head; Year; Department.	
c)	Store new project budget by Policy Secretary	
d)	Store overall 5-year spending aspiration	
e)	Collate Cat C projects to be submitted to Star Chamber	
f)	Store project cost estimates and cashflows, seperated into key line items of: measured work, inflation contingency, project contingency.	
g)	Roll forward project cashflows annually to account for prior year's inflation	
h)	Track completion of Cat C inception and feasibility work	
i)	Track Policy Sec use of new project budget development resources	
j)	Generate project status reports in format suitable for Star Chamber upgrade bid	
21	'Measuring work done'	Page 39
a)	PW_MS should measure work done in terms of % resources consumed.	
b)	Intermediate milestone tracking	
c)	Measures of % work completed	
22	'Operating environment'	Page 42
a)	response time of <2 seconds, <5 minutes average per report.	Page 43
b)	User-friendly emphasis – customised reports without programming	Page 44
c)	Ad hoc querying without programming	Page 45
d)	Add/delete new data items without programming	Page 46
e)	Increase number of users without changing architecture.	Page 48
f)	System access via password	Page 50
g)	Backup/disaster recovery, daily incremental backup, offsite data tape storage	
h)	Fault tolerance for surge protection	
i)	Shallow menu-driven user interface with keyboard shortcuts	

-
- j) Menu-driven choice to avoid data entry via typing
 - k) **Context sensitive on-line help**
 - l) Training < one day per person
 - m) Requires well-defined, validated and timely sources of data stored efficiently
 - n) Data entry field checking
 - o) Consistency checking of data
 - p) Owner has read/write access, others have read access with permission
 - q) Same person per division/department responsible for submission of data
 - r) Named person to be interface for any issues
 - s) Interface with LAFIS, CFS and IFIS to be manual
-

Table 7-8 Desirable functional features of the proposed PW_MS by McKinsey.

From the above, the identified characteristics of the inception stage of the PW_MS implementation are:

- The leadership and commitment from the highest levels of authority evident at the conception stage to achieve an early implementation of the PW_MS was now content to subordinate their authority to McKinsey Inc who had been appointed with responsibility for recommendation and implementation.
- Definition using SSADM methods of a minimum set of Functionality for the PW_MS was not achieved due to the Client's fixation on the existing core-process of PWP procurement some of which was enshrined in Hong Kong legislation.
- Implementation of the PW_MS using a rapid-prototyping approach was determined as essential to bring the MIS into operational service within a nine-month project period.
- Selection of a best-fit proprietary software solution was expedient and in keeping with the rapid prototyping, but it resulted in conforming the problem to fit the solution and vice versa.
- Lack of consultation on the adoption of software and by default, the Functionality caused a lack of 'ownership' from the User community.
- Selection of a UK-based proprietary software as the 'best-fit' solution that none-the-less required customisation to suit the Client's needs was a courageous decision that imposed managerial challenges in coordinating communications, understanding, and the production of software deliverables in the UK for issues arising in Hong Kong.

This overall ambition for the PW_MS was not satisfied within the prototype delivered by the consultant. On September 1, 1993 the McKinsey consultants met with the HKG staff who would be responsible for the future operation of the MIS. At that

briefing it was made clear that the pilot system to be produced by the consultants was to be a sub-set of the total ambition listed in Table 7-8. The pilot would test: ‘baseline management and reduced scope change; exception generation and corrective action planning; generic templates for work-scheduling; work progress tracing using timesheets; annual resource planning process using aggregates of resource demand and availability.’⁵⁰ Table 7-9 shows the outcome of the comparative evaluation. Items in red font are not found in the implemented PW_MS.

Preliminary Functional Spec Ref	Functional Requirement Definition	Features
3.1.1. Baseline management	<ul style="list-style-type: none"> Management of baseline information including planned project scope; activity durations, start and end dates; milestones; cost and contingencies. Baseline change management Scope tracking Scope changes Time tracking Cost tracking 	<ul style="list-style-type: none"> System should store historical baselines retrievable by date for reference. Each baseline change must be secured and validated. Access/change can only be effected by approved user ID/password. System provides audit trail of change activities Scope tracking available at project and contract levels using variable and unlimited text format. Text editing capabilities for changing previously defined scope descriptions Screen flow (e.g. fast path) to facilitate update of time and cost forecast due to scope change. Tracks actual baseline, forecast to complete against actual dates. Tracks time at 2 levels contract and project Flexible reporting intervals monthly, quarterly, annual Tracks cost elements at each level of breakdown structure defined in Section 3.2.2 Tracks planned, system-generated forecast cost against actual commitment and expenditure Interface readily available for download of actual commitment and expenditures from external system.

	<ul style="list-style-type: none"> • Expenditure forecast support • Contingency management • Rate adjustment 	<ul style="list-style-type: none"> • User can select from a set of S-curves to create a project expenditure profile. • Tracks 3 categories of contingency design <ul style="list-style-type: none"> • contract (construction) • project • Aggregates contingency at project, department and programme levels • Provide security to ensure proper approval for transfer of contingency into cost element budgets • User-specific access to central rate adjustment • applies one rate (e.g. annual inflation) to all appropriate fields for change • generates audit trail report on changes
3.1.2 Exception Reporting	<ul style="list-style-type: none"> • System generated reporting on events which have exceeded user-defined limits of tolerance (thresholds) which constitutes an exception • Threshold setup • Prioritised exceptions 	<ul style="list-style-type: none"> • Exception reporting should be triggered by events in • baseline tracking (e.g. project delays, cost-over or underspending) • Baseline change management (e.g. number/value of changes) • Contingency management (e.g. low remaining balance in contingency account triggers need to apply for additional funds) • Work scheduling (e.g. mismatch between remaining duration and percent work completed measures) • Threshold (upper and lower limits) can be set in absolute value or in percent terms in multiple management levels • programme, project, contract • Sorting capabilities to prioritise by <ul style="list-style-type: none"> • severity of exception • value of project • project category and to group by project accountability

3.2.1 Performance Statistics

- Corrective actions
- Variable length, text-formatted action descriptions should be tracked and reported by
 - date
 - responsibility (e.g. PTL or department)
- Tracking of statistics which measure the effectiveness and efficiency of PWP project delivery
- Tracks project measures such as
 - frequency and extent of baseline changes
 - consumption of contingency
 - slippage this month vs. last month
 - project delays due to controllable vs. uncontrollable causes
- progress (using earned value or other work progress measure)
- Provides supporting reports for tracking project delivery accountability
- Aggregates and sorts by responsibility at 4 levels
 - programme
 - department
 - division
 - project team

3.2.2 Programme Reporting

- Key requirement is flexibility, system must accommodate
 - multiple breakdown structures that are related (e.g. WBS, OBS)
- System must be able to roll up data by
 - PWP
 - Development programme
 - Project type
 - PWPC [CWC]
 - Works branch
 - Works department
 - Division
 - Project team
- Complex project and contract splits
- Tracks unique project-contract relationships
- tracks contracts which have been split between related projects e.g. road construction contract which spans multiple development sites)
- Entrustment relationships
- Tracks projects which are funded by one department, but are executed by a different department

3.3.1 Work scheduling

- Facilitate the set-up and maintenance of project work plan information
- Facilitate the initial set-up of project work schedules by providing system generated templates

		<ul style="list-style-type: none"> • Validate linkages between related project activities (e.g. project start date cannot precede completion of land resumption activity)
	<ul style="list-style-type: none"> • Logically link scheduled activities • Track work progress 	<ul style="list-style-type: none"> • Automatically shift dates downstream by the same amount as changes entered on preceding date forecasts • Ability to track a variety of work progress measures <ul style="list-style-type: none"> • Remaining duration • Percent work completed • Achievement on intermediate milestones
	<ul style="list-style-type: none"> • Financial reporting 	<ul style="list-style-type: none"> • Aggregate budgeted project estimates and compare with actual project commitments over RAS period (currently 5 years) at head and programme levels. <ul style="list-style-type: none"> • Calculate difference and report as uncommitted funding using graphical and numeric displays
	<ul style="list-style-type: none"> • Support for programme fund allocation process 	<ul style="list-style-type: none"> • Provide a prioritised list of projects in Cat C, B which can be selected for accelerated approval to increase programme spending.
4.1 Performance	<ul style="list-style-type: none"> • Number of users will grow from initially 50 to up to 300. • System configuration must support application processing for specified number of users at a reasonable rate 	<ul style="list-style-type: none"> • Capacity is not constrained by hardware or software architecture
	<ul style="list-style-type: none"> • Capacity 	<ul style="list-style-type: none"> • Must accommodate 2,000 projects: total storage of 800 Mbyte growing at 40Mb per year for 10 years
	<ul style="list-style-type: none"> • Throughput 	<ul style="list-style-type: none"> • Can accommodate high speed transmission for remote users • Must accommodate up to 300 concurrent user's over time • LAN traffic limits of 10Mbits/sec
	<ul style="list-style-type: none"> • System robustness 	<ul style="list-style-type: none"> • Ensure that system and network exception handling has fail-safe feature to contain and localise system failure

	<ul style="list-style-type: none"> • Response time 	<ul style="list-style-type: none"> • < 2 secs for online processing with data base read only • < 5 secs for online processing with data base update • – 10 secs for online graphical report generation with data base read only
	<ul style="list-style-type: none"> • System and network administration 	<ul style="list-style-type: none"> • System and network administration are integrated with software backup and recovery functions • Provide system accounting and network management functions
4.2 Flexibility	<ul style="list-style-type: none"> • Facilitates on-going maintenance and enhancement • Modularity • Scalability 	<ul style="list-style-type: none"> • Modular development to facilitate incremental upgrades • Upward compatibility to facilitate upgrades • Portability to facilitate expansion
	<ul style="list-style-type: none"> • Tool kit 	<ul style="list-style-type: none"> • Development tools for minimising customisation effort
	<ul style="list-style-type: none"> • Interface 	<ul style="list-style-type: none"> • Flexible import/export functions to facilitate transfer of data to and from system
	<ul style="list-style-type: none"> • Standard communications protocol 	<ul style="list-style-type: none"> • Provides compatibility with existing networks (e.g. Novell, TCP/IP, Token Ring)
4.3 Security	<ul style="list-style-type: none"> • Ensure data integrity by: • Preventing unauthorised update of system data 	<ul style="list-style-type: none"> • User id/password validation for specific functions (including control of access privileges) • Audit trail reporting available for all system transactions
	<ul style="list-style-type: none"> • Synchronised record update 	<ul style="list-style-type: none"> • Prevents duplicate data processing • Provides flexible record locking and transaction logging
	<ul style="list-style-type: none"> • Providing backup/recovery function 	<ul style="list-style-type: none"> • Incremental and full backup and recovery • Flexible file locking management to minimise application downtime due to backup and recovery • Roll back/forward flexibility • Backup version control

	<ul style="list-style-type: none"> Disaster recovery 	<ul style="list-style-type: none"> Flexible architecture which easily supports relocation of data center Modular design to facilitate re-configuration.
4.4 Ease of use	<ul style="list-style-type: none"> User friendly interfaces including; Menu-driven processing Pick-list Context-sensitive help Training 	<ul style="list-style-type: none"> Window-driven processing to accommodate users not familiar with information technology User-specified pick lists to facilitate data entry and validation Help screens easily available Instructions written in easy to understand language that is not full of jargon Locally available technical and application training Well documented user manuals with tutorials User-assistance hot-line available during local business hours
3.1.1 Baseline management	<ul style="list-style-type: none"> Management of additional baseline information <ul style="list-style-type: none"> Staffing resources Timesheet processing 	<ul style="list-style-type: none"> User-defined resource profile linked to activities within the generic template at cost element level Allows input of man-hours by skills category Tracks total resource demand, supply Tracks resource skill categories and associated resource costs Track internal and external resources separately Tracks interdepartmental resources/sharing secondment Timesheet data entered by employee aggregated by cost element/skill category Tracks actual man-hours vs. baseline

	<ul style="list-style-type: none"> • Provide ‘what-if analysis’ 	<ul style="list-style-type: none"> • Ability to set up and store unlimited sets of parameters for ‘what-if analysis’ • Report on results of sensitivity analysis • Provide version control to manage the many ‘what-if’ plan which will be generated to prevent mix-up with real life plan • Archive function to automatically delete old plans from ‘what-if’ analysis
	<ul style="list-style-type: none"> • Expenditure forecast support 	<ul style="list-style-type: none"> • Commonly used S-curve profiles can be stored in library by <ul style="list-style-type: none"> • User • Department
3.1.2 Exception Reporting	<ul style="list-style-type: none"> • System generated reporting on events which have exceeded user-defined limits of tolerance (threshold) which constitutes an exception • colour coding exception elements 	<ul style="list-style-type: none"> • Facilitates differentiation between levels for exception severity, for example: <ul style="list-style-type: none"> • red for severe exception • yellow for warning on minor exception • green for no exception
3.2.1 Performance statistics	<ul style="list-style-type: none"> • Tracking of statistics which measure the effectiveness and efficiency of PWP project delivery <ul style="list-style-type: none"> • resource planning 	<ul style="list-style-type: none"> • Tracking statistics for optimising internal and external staffing measures such as <ul style="list-style-type: none"> • staff utilisation • staff productivity
3.3.1 Work scheduling	<ul style="list-style-type: none"> • Facilitate the set-up and maintenance of project work plan information 	<ul style="list-style-type: none"> • Facilitate initial set-up of project work schedules by providing system-generated templates customised by <ul style="list-style-type: none"> • department • project team
3.3.2 Resource Planning	<ul style="list-style-type: none"> • Tracking of staffing resources to provide early identification of resource requirements 	<ul style="list-style-type: none"> • Aggregate manually entered project staffing requirements and report on total resource demand by: <ul style="list-style-type: none"> • overall programme • department • skills category • Calculate difference between total resource requirements and internal resource supply • Report on resource variance using graphical and numeric displays

<ul style="list-style-type: none"> • Resource leveling 	<ul style="list-style-type: none"> • Provides complicated algorithm available for resource leveling • Also supports manual resource leveling by skill category at department level • Supports planning for optimal mix between internal and external resources • Provides a ten year planning horizon
<ul style="list-style-type: none"> • Measuring performance on staff scheduling 	<ul style="list-style-type: none"> • Facilitate planning for internal and external staffing requirements by reporting on; <ul style="list-style-type: none"> • staff utilisation • staff productivity

Table 7-9 Evaluation of functional fit of proprietary PW_MS software⁵¹

The competitive assessment of options was between two out of the three pre-selected firms: one of the three declining to compete. The HKG SAR/McKinsey review panel recommended that a uniquely-customised version of Panorama[®] software to be adopted for the PW-MS⁵⁰. However, the functional requirements mentioned in the pilot evaluation were not fully implemented within the PW_MS. All three of the competing software vendors had stated that there was insufficient time for delivery of the ‘core’ PW_MS before the deadline date of January 31, 1994. The term ‘core’, had been introduced by the consultants to define the minimum functions that must be provided with the prototype PW_MS. Other desirable functions were to be delivered in subsequent stages of development after the McKinsey consultant agreement had expired. This did not take place. The ensuing contract between McKinsey Co Inc and Panorama Software Corporation Ltd was for the core system. Omitted were the staff resource functions described in earlier functional specifications. A Novation agreement signed on April 8, 1994 transferred the contractual rights and obligations of McKinsey Co Inc to the Government of Hong Kong. Long term pricing arrangements for further software licences was contained within a Deed of Agreement between HKG and PSCL.

McKinsey completed their assignment on January 31, 1994 having managed the customisation of the core PW_MS software and the installation of a 50 terminal wide area network in a short period of time from November 1993 to the end of January 1994. Their Final Report to the Steering Committee⁵² dated February 15, 1994, describes these achievements. Further work was needed to improve the quality of data recorded in what was now called ‘the core-prototype system’. Crow Maunsell Management Consultants Co Ltd were appointed, in a short-term Consultant Agreement, to provide needed services. These included the creation of discrete staff resource models on stand-alone PC’s employing Primavera[™] work-scheduling software. The model is used to match proposed workloads to staff resources for the purposes to the annual Resource Allocation Exercise.

The prototype PW_MS became operational in May 1994. The works departments were informed that they were now responsible for the timely recording of project data

and information within the PW_MS. There were problems in this: the fifty-six terminals in the core-prototype PW_MS network were too few to provide enough access points for the regular update of project data. The system response was very slow, making it frustrating to use the software, and few people were trained in the operation of the PW_MS or the concepts of project management. To overcome some of these problems the core-prototype was rapidly expanded. On June 3, 1994, the Finance Committee⁵³ was asked to agree to thirty eight million Hong Kong dollars expenditure by the Secretary for Works so that the PW_MS could be

- equipped with a sufficient number of terminals distributed to system users so that data updates and report generation can take place quickly enough to produce timely progress reports and monitoring of projects;
- capable of operating in a robust computer environment with provision of essential disaster recovery facilities backed up by specialist support of the Information Technology Services Departments (ITSD);
- easy to use by non-computing professionals;
- **fine-tuned to remove weaknesses recognised during prototyping.**

This second stage of PW_MS implementation was funded from the 'Head 710 'Computerisation' of the Government accounts, therefore the Director of Information Technology Services (ITSD) was responsible for the technology aspects of the further implementation. This work was carried out according to their professional standards, meaning that SSADM and PRINCE methodologies would be applied to the implementation for the first time. SSADM had not been applied in the fast moving, early stages. As a result there was no systems documentation, which describes the PW_MS. ITSD appointed James Martin Ltd., information technology consultants, to make good this deficiency. They were instructed to apply SSADM techniques as far as possible and work to PRINCE methodologies to provide an unbiased professional opinion on the 'weaknesses recognised during prototyping' and the status of the prototype PW_MS overall. The overall objectives of this in-depth review of the PW_MS, is stated in Para 3.1, Part VII of the Tender Specification⁵⁴ of their contract. It states:

“The Contractor should achieve the following objectives in carrying out the analysis, design and specification of the PW_MS Phase II:

- document the current system with, inter alia, the logical data flows, logical data structure and process descriptions of the current system;
- collect and document the user requirements for an enhanced PW_MS (i.e., the required system) including all functional and non-functional requirements;
- specify the required system with, inter alia, the logical data flows, logical data structure and process specifications of the required system;
- specify and justify the selected technical system option which will support the required system;
- evaluate and propose system implementation approaches and produce implementation plan for the required system which is to run on the platform as specified in the selected technical option; and

- define the requirements for disaster recovery and produce disaster recovery requirements and proposal for the enhanced PW_MS.”

These things were done through a process of extensive user consultation, interviews and measurement according to PRINCE methodologies. It results in volumes of technical documentation. Table 2-1, on page 36 of the Final Report of ‘Selected Business System Options’⁵⁵ stated the ‘lack-of-fit’ between the things the PW_MS could do when compared to the things that needed to be done. These were the failings in the PW_MS that most threatened its viability in use. The IT contractor advised that, in the short term, these lack-of-fit’ issues must be fixed to maintain an on-going service from the PW_MS. The recommendations are given in Table 7-10. Issues not fixed in the PW_MS at the time of this research are shown in red font. In the long term, the contractor recommended an early start to a fundamental re-development of the PW_MS.

Requirement	Description	Vital Need	Overall Priority	Explanation
SCOPE	Extending scope of PW_MS to include pre-Cat C, Cat D and subvented projects	No	Low	To provide a total PWP service to suit FB and others
COST	Addresses problems in relation to MOD and constant price calculations	No	Medium	At present PW_MS cannot provide dynamic forecasts of outturn costs due to mismatches between actuals in MOD and future costs in constant prices.
TIME	Addresses problems in the comparison of baseline dates to actual performance and for planning projects which are wholly consultants agreements	Yes	High	At present only two dates are fixed as baselines – this is totally inadequate for comparing actual vs. planned performance
STAFF RESOURCE	Including within the PW_MS time sheets and staff resource models.	No	Low	Resolved by building staff resource models outside the PW_MS
USER INTEFACE	Making the PW_MS easier to use by the User	No	Medium	Technical improvements
BI-LINGUAL	Chinese capability	Yes	High	Highly desirable but does not add to the functionality of the PW_MS
SUPPORT	Need for online ‘help’ system, documentation and user training	Yes	High	Online help not technically achievable in the UNIX version of PW_MS.
REPORTS	Existing reports to be	Yes	High	More baseline milestones

	improved, new reports to be made easier to get, and better use of the data outside of the PW_MS			permit important reports which are currently impossible to produce. Using other report writing technologies permits all users to create reports
AUDIT	To provide traces on who changes data and when	No	Medium	Audit trails to help enable the repair of damaged data
SECURITY	To ensure system data is accessed by authorised personnel	Yes	High	To reduce the high risk of malicious damage to data.
CONTROL	Stops non-PWSAU from changing baseline data	Yes	High	Vital to stop users from 'moving' the goalposts
BACKUP & RECOVERY	For adequate disaster recovery of the system	Yes	High	To maintain a service and insure against loss of data in a crisis.

Table 7-10 'Lack-of-fit' issues identified during the independent assessment of the PW_MS by the specialist IT contractor.

The specialist IT contractor's assessment of the PW_MS was carried out according to the PRINCE management/control process adopted as standard practice by ITSD. Quality assurance and sign-off, by representative user groups and committees is required at each stage of the work or deliverable produced. At the top of the management tree, the work was steered by a Project Steering Committee (PSC) chaired by the Secretary for Works with a high degree of participation from ITSD at Assistant Director level. The recommendations were accepted by the Secretary for Works at the PSC held on July, 1, 1996⁵⁶. Since then the Works Bureau has worked towards removal of 'lack-of-fit' items according to the agreed priority order as follows. Things not done at the time of this research are in red font:

- Support in the form of system documentation, user-manuals and hands-on training classes;
- Data security, access control according to pre-assigned read/write rights, daily backup, roll-back and second location Disaster Recovery systems are in place;
- Modifying the cost-control element of the system to a MOD-basis with the ability to deflate the future part of the cashflow to constant prices. It would result in an easier-to-use system that would compare current expenditure forecasts against actual expenditure and calculate the subsequent impact on the latest resource-allocation-exercise cashflow, the approved project estimate cashflow, and the forecast cashflow information given to the Legislative Council in the annual Budget. In short, it would provide an instant indicator of performance for Cat A projects against the fundamental cashflow forecasts of the HKG SAR.
- Modifying the time-control element of the system to more baseline milestones in the project timeplan. These are the target dates that are fixed using baseline controls to form a benchmark to measure actual progress. At present there are three milestone dates subject to baseline control and therefore used for a comparison of actual progress to planned progress. All other date information is

automatically updated to accord with actual work done and revision of the forecast accordingly.

- PW_MS reports can be developed using a high-degree of computer programmer knowledge in SQL and Oracle™ software, or by commissioning the software owners to develop customised reports. An alternative proposed approach is to add a data-warehouse facility onto the PW_MS system to permit report writing by the user community and the integration of data from other sources.
- A more user-friendly graphic-user-interface with English/Chinese language capability could be achieved if the PW_MS is changed to the new Windows® version. Something that is considered desirable by the PWSAU but is not essential at this time.

From the above, the identified characteristics of the construction stage of the PW_MS implementation are:

- The leadership and commitment from the highest levels of authority evident at the conception stage to achieve an early implementation of the PW_MS was further reduced to the extent that decision-making on ‘technical’ issues was substantially delegated to the consultants.
- The functional specification for the PW_MS was dictated by what was possible within existing constraints rather than desirable, excepting for a ‘core’ minimum set of requirements.
- Retrospective user-consultation showed dissatisfaction with the PW_MS functionality and performance.
- Retrospective SSADM analysis showed lack-of-fit between desired and delivered functionality.

7.6 Technical overview of the Initial PW_MS

Platform

The PW_MS operates over a wide-area-network of computers that extend to all the principal public works offices in the SAR of Hong Kong. It is designed to operate in accordance with the principles of project management. The technical parts of the PW_MS are each described in the following sections under the headings:

- Wide-Area-Network;
- PW_MS software;
- Oracle© database;
- Utility software; and
- Disaster recovery.

Wide-Area-Network

In simple technical terms, the PW_MS is a wide-area-network of computer terminals that are linked together by dedicated, high capacity, telecommunication datalines. Routers control the routing of messages to and from the database server, the application servers, and the terminals in the system. The PW_MS application software is loaded on application servers, the database is on a central single database server, and the users operate from discrete terminals connected by Ethernet, or modems and datalines, to the most convenient application server. The application servers are connected to the database server. Through a calculated amount of redundancy there is also connection to a disaster-recovery-database-server that operates if the database server fails. The PW_MS wide-area network extends into 39 buildings, to 66 floors within those buildings, across the HK SAR. This interplay and the unified whole of the network system are managed by the Network-Management-System (NMS) of the PW_MS. For ease of understanding, this predominantly star-topology⁵⁷ network is shown schematically in Figure 7-5.

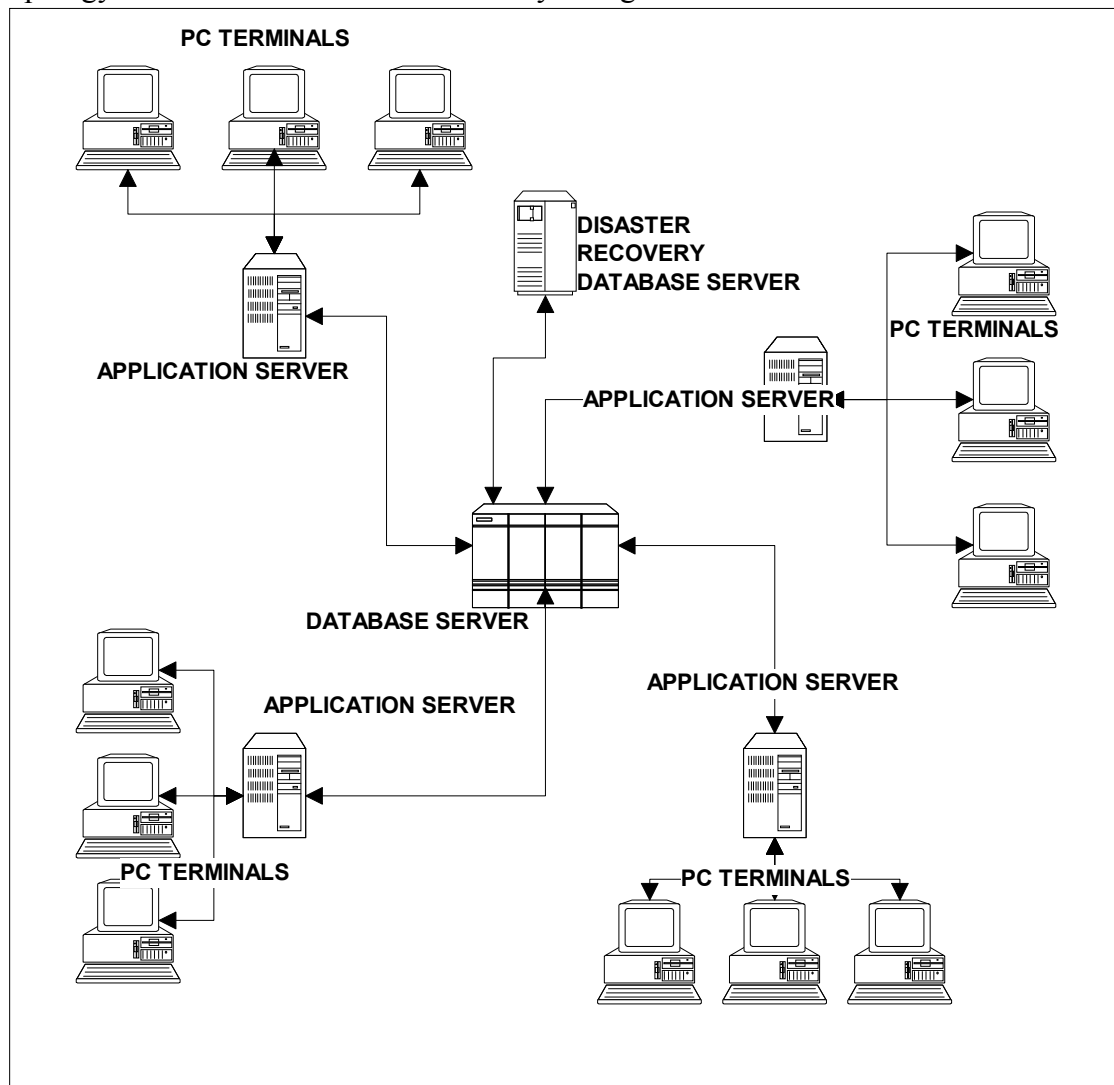


Figure 7-5 Showing the 'star' topology of the PW_MS WAN.

Terminals and application servers

Standard PC's are used as PW_MS terminals. They contain a UNIX emulation software, which allows them to operate the application server. When they are logged on to the PW_MS software they use UNIX[®] computer operating system needed for the running of the PW_MS application software. PW_MS application servers are strategically located so that they can service many terminals clustered around them. In some cases the application servers are in the building and connected to the terminals across an Ethernet LAN, but often they are not and depend on datalines for connectivity.

PW_MS software

The PW_MS application software is a commercial product for project management purposes. It was specifically modified to extend its original purpose to the management of the more than fifteen hundred projects in the PWP portfolio. The project management functions satisfied by the software comply with the requirements of the BS6079⁵⁸ and the 1992 CIOB Code of Project Management for Construction and Development⁵⁹. How this is achieved in the HKG SAR use of the PW_MS is described in Section 7.7 of the Appendices. The application software is a loose combination of two commercial products owned and marketed by an UK company called Panorama Software Corporation Ltd., (PSCL). One product is for cost management and the other is for work scheduling. For the purposes of the PW_MS the two software products run together in a fashion transparent to the User but the cost and the time-analysis elements of the software are not fully integrated. For instance, a change of a date in the time-plan does not cause a corresponding adjustment in the cashflow diagram.

Oracle[®] database

The PW_MS software is programmed to work in conjunction with Oracle[®] database software running on a database server in the UNIX[®] operating system. The database is strategically located to form a hub for the application servers connected to it by the network routers and the telecommunication datalines. The Oracle[®] database is at the centre of the PW_MS because all of the users of the data on occasion require access to all of the data.

Utility software

The PW_MS software is dependent on other software. For example, the graphic user interface displayed on the terminal screen is achieved using a software called ORIN[™]. This relationship imposes a product constraint on the evolution on the PW_MS due to changes in the interdependent software.

Disaster recovery

A degree of redundancy and provision for alternative operations is built into the PW_MS to ensure a continued albeit reduced operation if any element fails. This includes connection to another database server located in the ITSD Disaster Recovery Centre in Tsuen Wan.

Functionality

The information here is from first-hand observation of the use of the PW_MS in the offices of the Public Works Systems Administration Unit of the Works Bureau over the period of the research. Also from reference to the PW_MS User Manual 4th Edition⁶⁰ and the Public Works Project Controls Manual Edition⁹.

Project data

In simple terms, the elements of project data permanently retained within the PW_MS for each project are broadly described in Table 7-11. When projects are completed the project status within the PW_MS is 'CLOSED' but the accumulated data is retained within the database although the project is removed from screen displays and omitted from data reports. If the status is later reactivated then the data is reactivated within the database.

Data attribute	Description
Project ownership and associated attributes	<ul style="list-style-type: none">• Policy Secretary i.e., Client;• Head of expenditure;• Category of work;• Policy Area;• Works Department;• PWP Category (A, B or C);• Long and short title;• PW-MS status i.e., 'unplanned, planned, finished, closed'; and• District Land Office involved.
Up-to-date approved/ baseline plan for the delivery of each PWP project	<ul style="list-style-type: none">• a statement of the approved scope of works,• the date for the planned upgrade to Cat B status i.e., funding provided in the RAE;• the date for the planned upgrade to Cat A i.e., approval by the Finance Committee;• the date for the planned completion of the works,• the latest approved cashflow for the project,• the approved budget for the project.
Up-to-date forecast plan for the delivery of the project	<ul style="list-style-type: none">• a 'work-schedule' for all the activities in the project that calculates future dates according to duration of the activities, when they are reported as taking place, or how much work has been done.• A cashflow of forecast expenditure [probably at

	variance to the latest approved cashflow].
Actual cost and times	<ul style="list-style-type: none"> • up-to-date record of actual expenditure; and • up-to-date record of actual work done against the work schedule activities
Land	<ul style="list-style-type: none"> • up-to-date record of the land requirements
Contacts/communication	<ul style="list-style-type: none"> • up-to-date record of the names and contact details of the works department staff dealing with the project at various management levels • up-to-date record of the names and contact details of the contractor/consultant staff dealing with the project at various management levels
Diary/notebook	<ul style="list-style-type: none"> • up-to-date free format text record of what is happening on the project in the form of an electronic diary which is split into a number of topic sections. <ul style="list-style-type: none"> • Critical actions/key decisions • Cost/funding matters • Construction matters • Deflation or MOD prices • Design matters • Environmental matters • Executive summary • General • Housing Bureau site ref number • Progress relating to housing development • Land/site matters • Other matters • Policy/client matters • Project scope matters • Progress summary • Part-upgrading project • Project scope • Statutory procedure matters • Works related/technical matters
Baseline control audit trail	<ul style="list-style-type: none"> • a sequential record of all the approved changes made to the baseline approved • cashflow, • upgrade dates and • scope of works.

Table 7-11 Types of project-data recorded within the PW_MS.

Principal functions

In the 1998 Review of the PW_MS⁶¹ the six aims of the PW_MS are stated as:

- Maintaining a baseline for each project;
- Maintaining a forecast for each project;

- Maintaining a record of achievement for each project;
- Maintaining a notebook/ledger of unstructured/free-format data for each project;
- Provides performance indicators; and
- Producing reports.

These are each briefly described in the following sub-sections but greater background detail is provided in Section 7.7 of these Appendices.

Maintaining a baseline for each project

In summary, with regard to maintaining a baseline for each project:

- The baseline within the PW_MS is the officially approved plan for the project defined by scope, dates, and cost;
- It is maintained for each category B and Category A, PWP project;
- It includes the details of the project scope; the cashflow separated into a small number of cost types; and three milestone dates;
- **The control of baseline time within the PW_MS is inadequate as the work-schedule is not linked to the key-programme dates.**

Maintaining a forecast for each project

In summary, with regard to maintaining a forecast of predicted performance for each project:

- The forecast data is the project teams prediction for the project.
- It is maintained for all PWP projects.
- It includes the cashflow separated into a small number of cost types; and a detailed timeplan of the project activities leading to completion of the project.
- The timeplan is logic driven and cannot be over-written to suit spurious, but desired target dates.

Maintaining a record of achievement for each project

In summary, with regard to maintaining a record of actual progress or performance,

- The achievement data is the project team's record of the money spent and the progress of work for the project.
- Progress of work must be maintained for all PWP projects
- If progress is not reported each quarter period then by default a three-month delay is automatically imposed on all future activities.
- The recording of actual start-and-end dates and percent completed-on on-going activities produces the calculation of the outturn effect for all future activities.
- Cumulative totals of expenditure are maintained for all Category A projects.
- Expenditure can only be recorded by the Project Manager within the current quarter recording-period.
- Retrospective adjustment of expenditure can be recorded in previous quarters be changed by the PWSAU.

Maintaining a notebook/ledger of unstructured/free-format data for each project

In summary, with regard to maintaining a project ledger/notebook,

- The notebook/ledger data is an ad hoc free-format text record of events on the project.
- The project and work-package diaries are divided in 14 sections to create a comprehensive, easy to understand electronic notebook on the project read by everyone with access rights to that project.
- The project contact and work-package contacts state who is accountable for the project/work-package and how to instantly contact them.
- Land data is provided to state the need for land and who is accountable for its procurement.

Provides performance indicators

In summary, with regard to performance indicators,

- Exception reporting of deviations in the actual and the forecast cashflow compared to the baseline-cashflow are shown on the work-breakdown-structure hierarchy to visually indicate those projects deviating by an unacceptable tolerance from the plan.
- Outturn forecast completion date for the works is shown on the project screen.
- Printed reports state deviations from baselines in terms of costs and baseline dates.

For example Figure 7-7 shows the use of colour coding within the PWP work-breakdown-structure to identify performance in terms of actual expenditure compared to the baseline-forecast: green colour indicates compliance within specified tolerance, amber indicates a deviation within $<+/-10\%$, and red shows a deviation $>+/-10\%$. Of the baseline.

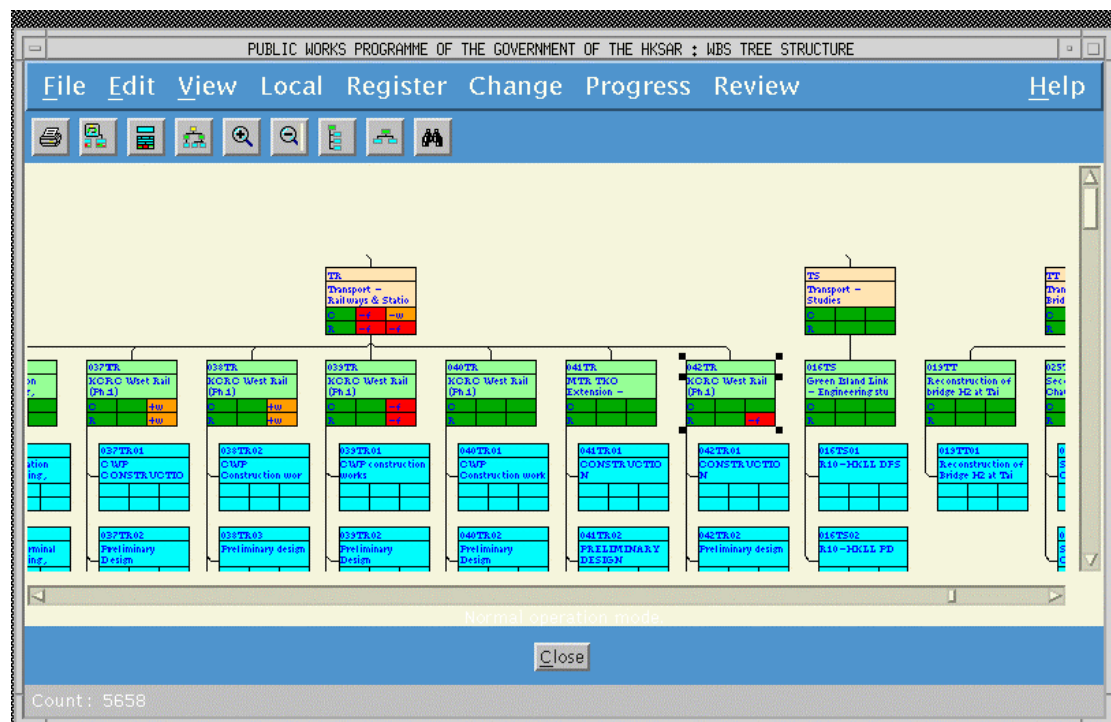


Figure 7-6 'Traffic light' colour coding to indicate baseline cashflow deviations.

Producing reports

The information in this sub-section of the thesis is taken from PW_MS Reports Manual⁶² and from usage statistics supplied by the PWSAU in June 1999. The commonly used available reports in the PW-MS in order of frequency of use are listed in Appendix 7-7, 'PW_MS Report usage measured from inception in May 1994 to June 10, 1999'. An analysis of these statistics shows:

- Thirty-four percent of the reports produced were exception/deviation reports, i.e., they report on data comparisons to show exceptions to baseline data;
- Thirty-two percent of the reports were status reports that present situational information kept within or derived from the data within the PW_MS;
- Twenty-two percent are reports containing verbatim information taken from the PW_MS; and
- Thirteen percent of the reports are for change control purposes.

In summary,

- The PW_MS contains over 60 reports that can be produced on screen or printed in hardcopy.
- A limited data down-load is provided to users to allow them to create ad hoc reports using other software but this has many disadvantages.
- Project Reports list all of the recorded scope, time, cost and other data by project.
- Summary Report are combinations of costs data which show performance for combinations of PWP projects. These combinations are user defined and allow creation of performance reports by division, department, client, programme, etc.

7.7 Project/Portfolio management functionality of the PW_MS

Principal functions

In the 1998 Review of the PW_MS⁶³ the six aims of the PW_MS are stated as:

- ❑ Maintaining a baseline for each project;
- ❑ Maintaining a forecast for each project;
- ❑ Maintaining a record of achievement for each project;
- ❑ Maintaining a notebook/ledger of unstructured/free-format data for each project;
- ❑ Provides performance indicators; and
- ❑ Producing reports.

These are each described in the following sub-sections.

Maintaining a baseline for each project

The baseline is the current official plan approved by the Client and the delivery Agents for the project. It comprises definitive items of scope, date, and cost data that are fixed so they can be used as a 'baseline' for the comparison of actual performance. The baseline data can be subsequently changed according to procedural rules that make mandatory the prior approval of the client and the portfolio managers for the proposed change. This approval process also records an audit trail of the changes. PWP projects are baselined when they are upgraded to Category B in the PWP, i.e., from the moment that they have funds ear-marked in the annual RAE. Only the PWSAU can implement the change in the baseline: thereby amending the fixed items of data to bring into effect the desired change. They require written evidence that the change is officially approved. A 'pending change order proforma' generated by the PW_MS serves this purpose, but it must first be signed by the project manager, by a higher ranking officer on behalf of the Works Director, by the Policy Bureau i.e., the Client, and by the PMU/FB on behalf of the Secretary for Works. In this way the project baseline data is maintained as 'controlled' items. Also kept within the PW_MS is the record of the approved changes to the baseline over the project lifecycle. The signed change-order proforma is retained in physical files in the PWSAU.

The 'controlled' items of fixed data in the baseline include:

- The statement of the scope of the project;
- The approved cashflow for the project by quarter-year periods of time. This should match with the RAE cashflow for the next five years and the annual 'Estimates' for the financial year. The PW_MS cashflows are separated into construction costs, construction contingency, consultant costs, consultant contingency, and 'other'. 'Other' is used to record the inflation element

corresponding to constant price cashflows. The Approved Project Estimate, the budget, is also recorded as a fixed item of controlled data.

- The planned dates for upgrade to Category B, upgrade to Category A, and completion of the works. According to the independent advice of the James Martin Co Ltd., consultants who reviewed the PW_MS for a determination of being fit-for-purpose, these dates are too few to maintain an adequate baseline of the project work schedule as a baseline. It is one of the lack-of fit issues identified by them as needing correction in the short term.

Maintaining a forecast for each project

The forecast is the project manager's current prediction of how the project will progress in the future. For each PWP project, the PW_MS holds a record of the forecast cashflow and the forecast timeplan of activities for the project. These can be changed at any time by anyone with write access to that project. Usually, this would be the project team/manager responsible for the project. The forecast data recorded in the PW_MS for each project includes:

- The forecast cashflow for the project by quarter-year periods of time. These cashflows are separated into construction costs, construction contingency, consultant costs, consultant contingency, and 'other'. 'Other' is used to record the inflation element of cost corresponding to the constant price cashflows.
- The timeplans of the work activities are in two levels. At the project level, the standard timeplan includes the standard activities in a PWP project. Below the project level are a number of optional, more detailed timeplans for specific project-level activities e.g., land acquisition, or construction. These are attached to the start and end of the project level activity and provide greater planning detail. A fixed order of sequence is applied to the activities in both levels, so that they follow each other in order of preceding, succeeding, or concurrent actions. The project manager cannot change the sequence of the activities but can amend the duration of each activity. The project manager must also state the start date of the first activity. The project manager can also record the dates that he wants activities within the sequence to start and/or end. The PW_MS software calculates the dates of the start and end of each activity from this data. If the sequence and the duration make it impossible to achieve the desired start and end dates then they are over-written. In the PW_MS, like all professional-standard work scheduling software, spurious dates are subordinate to the logically correct timeplan. This poses a problem if the dates are decided without regard for the timeplan – a frequent scenario within the public works departments.

Maintaining a record of achievement for each project

The record of achievement is primarily the comparison of actual performance against the baseline performance, and secondarily the comparison of the forecast performance against the baseline performance. For each PWP project, the PW_MS holds a record of the actual expenditure and the start-and-end of activities, or the progress of an on-going activity. These should be reported at frequent intervals, at least every quarter of the year. The achievement data recorded in the PW_MS for each project includes:

- The actual MOD expenditure on the project separated into construction costs, construction contingency, consultant costs, consultant contingency. These are recorded against the work package sub-element of the project. They include a record of the payment identifier/invoice. Actual expenditure cannot be recorded for past quarter periods unless the PWSAU invokes its 'super-user' powers to assist in this data correction. **It was proposed by James Martin Ltd., that recording expenditure in future periods should likewise be controlled but this is not implemented with the PW_MS.**
- The progress of the work, meaning the dates that an activity on the timeplan starts and ends is recorded. Also, the percent completed of an on-going activity and the remaining duration envisaged. The timeplan then re-calculates the dates of the remaining future activities to forecast the outturn effect. If the progress is not reported by the end of the quarter reporting period, then the PW_MS assumes no progress has been achieved and imposes a three-month delay on all future activities.

Maintaining a notebook/ledger of unstructured/free-format data for each project

This is a free-format text record of data on the project. These are held in the database as 'memo' field data strings. For each PWP project, the PW_MS holds text records written by the project participants as the project proceeds. These are ad hoc in nature but useful for the management of the project. Procedural instructions (Public Works Systems Administration Unit, 1996), state that they should be brought up to date at least every quarter. They are used to: improve communications between the client and the works department staff; to provide informative text statements about the project; and to state in text format other details that are hindered by fixed-format structured data. The information contained in the text records is data that is held within a readily understood format that is useful to professionals and non-professionals alike and is a more effective means of project communication than other database items⁶⁴. The information provides for an instant understanding of what is happening on the project. It is intended that it be read from the PW_MS screens by everyone with access to the project data but especially those persons who are remote from the project. The contact data names the individuals accountable for the project and for project reporting. It enables provides telephone and fax communications for rapid direct contact with them.

The notebook/ledger data recorded in the PW_MS for each project includes:

- A 'project diary' that is divided into the specific sub-sections listed on Table 7-11 of the Thesis.
- A 'work-package diary' for each work-package element of a project. This is divided the same as the project-level diary.
- 'Project contacts' that lists the personnel with responsibilities for the project. The consultant and the contractor personnel are named as appropriate. This element of data states the name; the post; the level of responsibility e.g., project manager; the address; the telephone number; and the fax number of each person named.
- Basic land data such as confirmation that land is required, the number of lots involved and the DLO dealing with the land clearance and acquisition.

Provides performance indicators

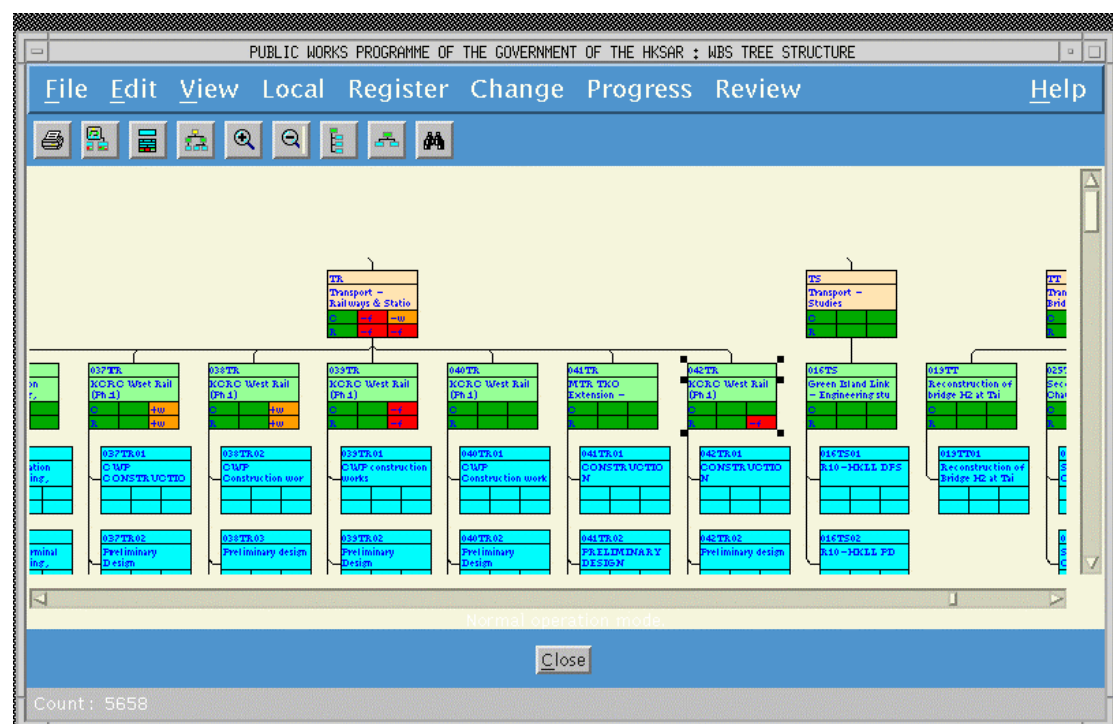
Once the baseline plan is established, then management control focuses on timely feedback of unsatisfactory progress to give enough lead time to correct the deviations from plan. Two methods are customarily used for this purpose:

- indicators of non-compliance with the baseline plan i.e., exception reporting; and
- outturn-forecasts derived by trend-analysis into the future.

Exception reports are valuable if they are pertinent and timely. When these criteria are satisfied, then they are an effective tool for project control⁶⁵. The PW_MS compares actual progress with the baseline plan and reports when it deviates from the plan by a specified amount such as $< \pm 10\%$ and $> \pm 10\%$. The baseline data for exception reporting in the PW_MS is currently limited to:

- the cashflows; and
- three key dates:
 - 'Date of upgrade to Category B' i.e., provision of funds;
 - 'Date of upgrade to Category A' i.e., submissions to the Finance Committee for their approval for the expenditure of the funds; and,
 - 'Date of the completion of the project'.

For example Figure 7-7 shows the use of colour coding within the PWP work-breakdown-structure to identify performance in terms of actual expenditure compared to the baseline-forecast: green colour indicates compliance within specified tolerance, amber indicates a deviation within $< \pm 10\%$, and red shows a deviation $> \pm 10\%$. Of the baseline.



The PW_MS automatically calculates the predicted-outturn-date for completion of the project and reports this as an item of data for each project. It also states if this deviates from the three baseline dates recorded for each project.

The exception/outturn reporting in the PW_MS for each project includes:

- The threshold for a variation in baseline cashflow is set at greater than +/- 5% for normal tolerance (amber), and greater than +/-10% (red) for exceptional non-performance.
- The outturn-date for completion of the works and any corresponding deviation in time is reported in the project screen.
- Cashflow deviations and baseline date deviations are also printed in paper reports for each projects or groups of projects.

Producing reports

The information in this sub-section of the thesis is taken from PW_MS Reports Manual⁶⁶ and from usage statistics supplied by the PWSAU in June 1999.

The PW_MS is equipped with over sixty reports. These are produced at the request of the user and can be shown on the screen of the PW_MS terminal or they can be printed on a nearby printer. It is possible for a software programmer to use some facilities supplied with the software to create additional reports. Seventeen of the thirty-nine most used reports i.e., those listed in the PW_MS Reports Manual, were developed by the staff of the PWSAU. Development of ad hoc reports in this manner is constrained by the high-degree of expertise needed for the programming and by the limitations of data and data-granularity within the PW_MS database. The commonly used available reports in the PW-MS in order of frequency of use are listed in Appendix 7-7, 'PW_MS Report usage measured from inception in May 1994 to June 10, 1999'. An analysis of these statistics shows:

- 34% of the reports produced were exception/deviation reports, i.e., they report on data comparisons to show exceptions to baseline data;
- 32% of the reports were status reports that present situational information kept within or derived from the data within the PW_MS;
- 22% are reports containing verbatim information taken from the PW_MS; and
- 13% of the reports are for change control purposes.

The PWSAU have also created a facility that enables Users to get a general data-down-load that can then be used to produce ad hoc reports within other software such as Excel® or Access®. The reports available from the PW_MS⁶⁰ include:

- Project Reports that list all of the scope, time, cost, and other performance data of the project.
- Summary Reports that use combined cost data to indicate the performance of the PWP in part or its entirety. The selection of the elements of the PWP programme is according to the Users requirements and access-rights: Programme, Head, Department, Division, Policy Bureau are some of the options.

7.8 PW_MS Report usage measured from inception in May 1994 to June 10, 1999.

Please refer to the following pages.

PW_MS Report Usage measured from inception in May 1994 to June 10, 1999

The PW_MS reports are classified as:
 EXC = Exception/deviation reports I.e., comparisons and results
 STAT = Status report I.e., rollup of data and other situational data
 CHG = Change control proforma or report
 VER = verbatim transcript of data or memo fields

Report Name	Type	No	% total
Report coapprvl Change Order Registration and Approvl Form	CHG	31868	13%
Report costatus Change Order Status	CHG	92	0%
Report changord Change Order Register	CHG	65	0%
Report okchord Change Order Details After Baseline	CHG	55	0%
Change Order reports subtotal =		32080	13%
Report progress Project Situation Report	EXC	17114	7%
Report fixmod HK- CurrBaseline:FixPrice/MOD	EXC	14274	6%
Report prjexp Project Expenditure Summary	EXC	14027	6%
Report gslip Activity Slippage	EXC	12481	5%
Report gmlvar Milestone Variance	EXC	10533	4%
Report quarter4 HK* WD Cat A Qtr Rept - Curr Qtr	EXC	4959	2%
Report hknetpro Network Dates	EXC	4533	2%
Report pstatus HK* Exceptions on Period End Data Entry	EXC	1623	1%
Report quarter3 HK* WD Cat A Qtr Rept - Prev Qtr	EXC	1443	1%
Report hibwdcq HK* WD HI Cat B report - Curr Qtr	EXC	1106	0%
Report quarter1 Quarterly Report for PWP Projects	EXC	717	0%
Report hnswdcq HK* WD HI New Start report - Curr Qtr	EXC	639	0%
Report quarter2 Quarterly Report for PWP Projects (amber)	EXC	539	0%
Report pwpc1 Quarterly PWPC Progress Report	EXC	286	0%
Report hibwdpq HK* WD HI Cat B report - Prev Qtr	EXC	242	0%
Report hkwdhacq HK* Cat-A PWP Housing Proj (Curr Q) - WD	EXC	207	0%
Report traffic HK* Exception Report on Traffic Lights	EXC	148	0%
Report hnswdpq HK* WD HI New Start report - Prev Qtr	EXC	142	0%
Report hibprjq HK* WB HI Cat B report - Curr Qtr	EXC	103	0%
Report hknhicab HK* New High Impact Cat-B Report	EXC	96	0%
Report pwpc2 Quarterly PWPC Progress	EXC	66	0%
Report hkwdhapp HK* Cat-A PWP Housing Proj (Prev Q) - WD	EXC	61	0%
Report hnsprjq HK* WB HI New Start report - Curr Qtr	EXC	45	0%
Report hibprjq HK* WB HI Cat B report - Prev Qtr	EXC	44	0%
Report reconcil HK* Graphical Quarterly Report - User Re	EXC	30	0%
Report quarter Quarterly Progress Report	EXC	24	0%
Report hnsprjq HK* WB HI New Start report - Prev Qtr	EXC	22	0%
Report hkwbhacq HK* Cat-A Housing Proj (Curr Q) - WB	EXC	20	0%
Report expinfo HK* Expense profile vs Actual Expenditur	EXC	16	0%
Report hkwbhbpq HK* WB Housing Cat-B Qtr Report - Prev Q	EXC	9	0%
Report hkwbhbpq HK* Cat-A Housing Proj (Prev Q) - WB	EXC	5	0%
Report hkwbhbcq HK* WB Housing Cat-B Qtr Report - Curr Q	EXC	5	0%
Report hkwdhbcq HK* WD Housing Cat-B Qtr Report - Curr Q	EXC	4	0%
Report amquar1 HK* Quarterly Report for PWP Projects (a	EXC	2	0%
Report hkwdhbpq HK* WD Housing Cat-B Qtr Report - Prev Q	EXC	2	0%
Report perfnw Performance Graphics	EXC	2	0%
Report comcost Comparison Cost Summary	EXC	1	0%
Report pmrep Performance Measurement Table	EXC	1	0%
Report prjst Projected Costs	EXC	1	0%
Exception/deviation reports subtotal =		85572	34%

Report Name	Type	No	% total
Report projcost Projected Costs	STAT	30385	12%
Report quick Quick View of CashFlow	STAT	19835	8%
Report actaudit Accounted Costs - Audit	STAT	18261	7%
Report hkprjst Projected Costs	STAT	7506	3%
Report wpae Work Package Estimate	STAT	1768	1%
Report stats HK* Data Entry Statistics	STAT	1489	1%
Report pend_list List of Pending Change Orders	STAT	642	0%
Report pend_co Statistics on Pending Change Orders	STAT	584	0%
Report cashflow HK* Annual Cashflow Forecast	STAT	386	0%
Report gengraph This is an example of the FRS Graphics Report	STAT	300	0%
Report gnetpro Project Dates	STAT	152	0%
Report land HK* Data Entry Status on Land Issues	STAT	147	0%
Report menrep Menu Access Report	STAT	106	0%
Report classcon Classification Codes	STAT	70	0%
Report wddwnld HK* WD Data Download	STAT	54	0%
Report landacq HK* Land Acq./Clearance Report	STAT	53	0%
Report accper Accounting Periods	STAT	33	0%
Report strtype Structure Types	STAT	21	0%
Report landtar Land Acquisition Target Dates	STAT	20	0%
Report catstat Category/Status	STAT	17	0%
Report rollres Roll Up Results	STAT	16	0%
Report progstat Cost Account Status Codes	STAT	15	0%
Report cprwbs Work Breakdown Structure	STAT	13	0%
Report startend HK* Project Start and Completion Dates	STAT	11	0%
Report elacrep Element Access Report	STAT	10	0%
Report cer Cost Engineering Report	STAT	8	0%
Report class User Classes	STAT	7	0%
Report cprfc Functional Categories	STAT	7	0%
Report projusr User Access - by Project	STAT	7	0%
Report strlink Structure Linking	STAT	7	0%
Report respass Responsibility Assignment by WBS	STAT	6	0%
Report rolludef Roll Up Request Lists	STAT	6	0%
Report calcdefin Calculation Definitions	STAT	5	0%
Report cprprob Problem Analysis	STAT	5	0%
Report gtgrlist Target Dates	STAT	5	0%
Report costype Cost Types	STAT	3	0%
Report curres Resource Units	STAT	3	0%
Report eocbl Element of Cost Baseline	STAT	3	0%
Report neocres Elements of Cost - full listing	STAT	3	0%
Report ratetype Rate Types	STAT	3	0%
Report restypes Resource Types	STAT	2	0%
Report rsummary Resource Summary	STAT	2	0%
Report userpac User Access to all Projects	STAT	2	0%
Report allrate1 Rate Values - All Sources	STAT	1	0%
Report eocres Elements of Cost	STAT	1	0%
Report glorates Global Rate Values	STAT	1	0%
Report gperiod DEFAULT screen	STAT	1	0%
Report hkstrdtl Structure Details (HK)	STAT	1	0%
Report nnetusr Network Access - by User	STAT	1	0%
Report repuser User Report	STAT	1	0%
Report responco Responsibility Codes	STAT	1	0%
Report resset1 Resource Code Sets	STAT	1	0%
Report rollusel Roll Up Selection Rules	STAT	1	0%
Report rtsets Run Time Sets	STAT	1	0%
Report source Source Documents	STAT	1	0%
Report wpfail Work Packages Not Registered	STAT	1	0%
Report wpggstat Work Package Progress Status Codes	STAT	1	0%
Status reports subtotal =		81992	32%

Report Name	Type	No	% total
Report hkcareg Project Register	VER	18936	7%
Report netdates Network Raw Data (before Time Analysis)	VER	17991	7%
Report diarys Element Diary Details	VER	10895	4%
Report meta Project Diary Report	VER	1929	1%
Report elesum Element Scope Details	VER	1913	1%
Report elecon Contact Element Details	VER	764	0%
Report hkwpae Work Package Actuals	VER	708	0%
Report careg Project Register	VER	551	0%
Report strucdtl Structure Details	VER	535	0%
Report contreg Contract Register	VER	355	0%
Report ptlplst HK* PTL & PD List	VER	135	0%
Report gactl Activity Details	VER	40	0%
Report projdetl Project Details	VER	10	0%
Report autrail Audit Trail	VER	6	0%
Report claudit Element Audit Trail	VER	2	0%
Report objects Objects used within Project	VER	2	0%
Report spread Total Spreading Curves	VER	2	0%
Report ccontact Contact Roles	VER	1	0%
Report milesreg Payment Milestone Registration	VER	1	0%
Report projuacc Project Access Details	VER	1	0%
Report reasonco Reason Codes	VER	1	0%
Verbatim reports subtotal use =		54778	22%
Total reports use =		254422	

7.9 PWP underspend in per cent by Heads of Expenditure for 1993-94 to 1998-99.

Financial Year 1993-94		Underspending (+ve)	
PWP sub-heads ↓		Cf Estimate	Cf Revised Estimate
702 Port and Airport Development		1%	13%
703 Buildings		-30%	40%
704 Drainage		9%	22%
705 Civil Engineering		26%	31%
706 Highways		-1%	16%
707 New Towns and Public Housing not Housing Authority		10%	28%
709 Waterworks		-35%	9%
Total for 1993-94 ⇒		-3%	24%
Financial Year 1994-95		Underspending (+ve)	
PWP sub-heads ↓		Cf Estimate	Cf Revised Estimate
702 Port and Airport Development		3%	16%
703 Buildings		2%	29%
704 Drainage		17%	26%
705 Civil Engineering		12%	28%
706 Highways		-11%	16%
707 New Towns and Public Housing not Housing Authority		31%	45%
709 Waterworks		6%	11%
711 Housing		-	90%
Total for 1994-95 ⇒		6%	23%
Financial Year 1995-96		Underspending (+ve)	
PWP sub-heads ↓		Cf Estimate	Cf Revised Estimate
702 Port and Airport Development		12%	24%
703 Buildings		-45%	28%
704 Drainage		24%	40%
705 Civil Engineering		4%	19%
706 Highways		14%	22%
707 New Towns and Public Housing not Housing Authority		14%	37%
709 Waterworks		-5%	18%
711 Housing		70%	77%
Total for 1995-96 ⇒		3%	27%
Financial Year 1996-97		Underspending (+ve)	
PWP sub-heads ↓		Cf Estimate	Cf Revised Estimate
702 Port and Airport Development		12%	22%
703 Buildings		17%	31%
704 Drainage		-2%	29%
705 Civil Engineering		-1%	13%
706 Highways		-4%	13%
707 New Towns and Public Housing not Housing Authority		18%	32%
709 Waterworks		15%	19%
711 Housing		53%	54%
Total for 1996-97 ⇒		12%	25%

Financial Year 1997-98		Underspending (+ve)	
PWP sub-heads ↓		Cf Estimate	Cf Revised Estimate
702 Port and Airport Development		7%	18%
703 Buildings		9%	24%
704 Drainage		4%	23%
705 Civil Engineering		-7%	9%
706 Highways		4%	19%
707 New Towns and Public Housing not Housing Authority		20%	32%
709 Waterworks		0%	12%
711 Housing		-26%	17%
Total for 1997-98 ⇒		6%	21%
Financial Year 1998-99		Underspending (+ve)	
PWP sub-heads ↓		Cf Estimate	Cf Revised Estimate
702 Port and Airport Development			
703 Buildings			
704 Drainage			
705 Civil Engineering			
706 Highways			
707 New Towns and Public Housing not Housing Authority			
709 Waterworks			
711 Housing			
Total for 1998-99 ⇒			

Table 7-12 PWP underspend in percent for 1993-94 to 1998-99

7.10 References

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- ¹ Government of the Hong Kong SAR. 1998. Estimates for the year ending 31 March 1999, Volume II – Fund Accounts. Government Printer: Hong Kong
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Chapter Eight - Appendices

8 Chapter Eight - A Qualitative Survey of User-satisfaction with the case-study PMIS

8.1 Layout of Appendices

For ease of reference, the Appendices for this Chapter of the Thesis are laid out in the order referenced within the Thesis, Chapter Eight.

8.2 Questionnaire developed for a postal survey of the Users of the PW_MS

A copy of the proforma Questionnaire is provided on the following pages.

8.3 Covering letter to the Questionnaire

WB(WM) 1/4/14 HQARCHS1

WONG HERBERT YAN HOW
PM221
ASD-PD2-PM
Architectural Services Dept

Friday, January 22, 1999

Dear Colleague,

1999 Works Bureau PW_MS Survey

I will be grateful for your cooperation. Please complete the enclosed questionnaire. It has been written and subjected to several revisions by members of the PW_MS user group to make it easy for you to complete.

The PW_MS is nearly five years old so we are conducting this survey to measure its use and to get your suggestions for improvement. It will also provide valuable information for the longer-term-development of a successor system. This survey is part of a work improvement exercise that has the dual objectives of bringing about an increase in the efficiency and the effectiveness of the PW_MS: and to achieve a reduction in user effort.

You have been selected at random from the list of registered PW_MS Users to make a population sample. The combined response from the population sample will be taken as the consensus view of all the works department users of the PW_MS. This survey will be a success if you respond **objectively** and as asked on the questionnaire. It is important that you complete this questionnaire so that we can include your experience and suggestions in the consensus view.

The information you provide will be kept confidential: it will only be used for the purpose of this survey. A final report of the overall results and summary statistical information will be produced. Your response will then be destroyed. In this manner, confidentiality will be maintained at all times.

Please complete the questionnaire and return it to the Public Works Systems Administration Unit, Works Bureau by February 16, 1999 in the envelope provided. If you have any queries about the survey then please contact Mr Terrie Hung at the PWSAU on telephone number 28482920.

Thank you

(K.G.Futcher)
Chief Assistant Secretary/Public Works Systems Administration

8.4 Response to qualitative postal survey by sub-strata of the population sample

- The population strata of HQ-users are adequately represented in terms of the 31 respondents and the consequent seventy-six percent response rate.
- The PGM respondents are deemed representative for statistical analysis as sixteen responses were received: equivalent to fifty-five percent response.
- The response is representative for the PJM strata as the response was one hundred and fourteen, being a sixty-eight percent rate of response.

User Class	Class size	Response Nos	% of Class	Response Strata (Nos)	Response Strata (%)
HQArch	1	0	0%	31	76%
HQCED	4	3	75%		
HQDSD	13	8	62%		
HQEPD	4	4	100%		
HQHAD	2	2	100%		
HQHYD	3	3	100%		
HQTDD	8	7	88%		
HQWSD	7	4	57%%		
PGMArch	2	1	50%	16	55%
PGMCED	4	1	25%		
PGMDSD	5	2	40%		
PGMEPD	5	2	40%		
PGMHYD	9	8	89%		
PGMTDD	3	1	33%		
PGMWSD	1	1	100%		
PJMArch	5	4	80%	114	68%
PJMCED	20	13	65%		
PJMDSD	31	13	42%		
PJMEPD	14	13	93%		
PJMHYD	39	25	64%		
PJMTDD	27	24	89%		
PJMWSD	32	22	69%		

Table 8-1 Response from the postal survey of PW_MS Users by User class.

8.5 Summary of response to ‘tick-the-box’ questions – taken from ‘Appendices-datafile.xls’.

Please refer to the following pages.

Appendices, Chapter 8, Section 8.5
Qualitative postal survey of a population-sample of Users of the PW_MS
Tabulated statistical attributes of the analysis in terms of strata of the population sample – tick-it questions

Part	Preliminaries																			
Topic	Participation in PWP project delivery																			
Subject	<i>The number of Cat. A PWP projects that I am currently involved with is =</i>																			
Q.I.1.a	Response														Distribution Statistics					
Sample Sector	Nos	% o/a	No '5'	% '5'	No '4'	% '4'	No '3'	% '3'	No '2'	% '2'	No '1'	% '1'	No 'n/u'	% 'n/u'	H	L	Median	Mode	Mean	SD
All	151	65%	na	na	na	na	na	na	na	na	na	na	na	na	290	0	2	1	13.53	34.45
HQ & PGM	44	70%	na	na	na	na	na	na	na	na	na	na	na	na	290	0	6	0	31.16	53.90
PJM	107	64%	na	na	na	na	na	na	na	na	na	na	na	na	116	0	1	1	6.28	17.85

Part	Preliminaries																			
Topic	Participation in PWP project delivery																			
Subject	<i>The number of Cat. B PWP projects that I am currently involved with is =</i>																			
Q.I.1.b	Response														Distribution Statistics					
Sample Sector	Nos	% o/a	No '5'	% '5'	No '4'	% '4'	No '3'	% '3'	No '2'	% '2'	No '1'	% '1'	No 'n/u'	% 'n/u'	H	L	Median	Mode	Mean	SD
All	142	61%	na	na	na	na	na	na	na	na	na	na	na	na	80	0	1	0	4.81	11.32
HQ & PGM	41	65%	na	na	na	na	na	na	na	na	na	na	na	na	80	0	3	0	12.71	18.70
PJM	101	60%	na	na	na	na	na	na	na	na	na	na	na	na	14	0	1	0	1.60	2.21

Part	Preliminaries																			
Topic	Participation in PWP project delivery																			
Subject	<i>The number of Cat. C PWP projects that I am currently involved with is =</i>																			
Q.I.1.c	Response														Distribution Statistics					
Sample Sector	Nos	% o/a	No '5'	% '5'	No '4'	% '4'	No '3'	% '3'	No '2'	% '2'	No '1'	% '1'	No 'n/u'	% 'n/u'	H	L	Median	Mode	Mean	SD
All	122	53%	na	na	na	na	na	na	na	na	na	na	na	na	14	0	0	0	0.40	1.65
HQ & PGM	37	59%	na	na	na	na	na	na	na	na	na	na	na	na	10	0	0	0	0.65	1.80
PJM	85	51%	na	na	na	na	na	na	na	na	na	na	na	na	14	0	0	0	0.29	1.59

Part	Preliminaries																			
Topic	Participation in PWP project delivery																			
Subject	<i>How frequently do you use the PW_MS logging on yourself</i>																			
Q.I.2.a	Response														Distribution Statistics					
Sample Sector	Nos	% o/a	No '5'	% '5'	No '4'	% '4'	No '3'	% '3'	No '2'	% '2'	No '1'	% '1'	No 'n/u'	% 'n/u'	H	L	Median	Mode	Mean	SD
All	156	68%	na	na	10	6%	34	22%	27	17%	85	54%	na	na	4	1	1	1	1.80	0.99
HQ & PGM	44	70%	na	na	8	18%	8	18%	7	16%	21	48%	na	na	4	1	2	1	2.07	1.19
PJM	112	67%	na	na	2	2%	26	23%	20	18%	64	57%	na	na	4	1	1	1	1.70	0.89

Part	Preliminaries																			
Topic	Participation in PWP project delivery																			
Subject	How frequently do you use the PW_MS by other staff using the PW_MS for you																			
Q.I.2.b	Response														Distribution Statistics					
Sample Sector	Nos	% o/a	No '5'	% '5'	No '4'	% '4'	No '3'	% '3'	No '2'	% '2'	No '1'	% '1'	No 'n/u'	% 'n/u'	H	L	Median	Mode	Mean	SD
All	155	67%	na	na	3	2%	68	44%	36	23%	48	31%	na	na	4	1	2	3	2.17	0.90
HQ & PGM	48	76%	na	na	2	4%	23	48%	4	8%	19	40%	na	na	4	1	3	3	2.17	1.02
PJM	107	64%	na	na	1	1%	45	42%	32	30%	29	27%	na	na	4	1	2	3	2.17	0.84

Part	Part 1 Improving the PW_MS																			
Topic	Participation in PWP project delivery																			
Subject	PW_MS satisfy the traditional aspects of project management i.e., information management and control of the scope, the cost, and the time of a																			
Q.1.1.1	Response														Distribution Statistics					
Sample Sector	Nos	% o/a	No '5'	% '5'	No '4'	% '4'	No '3'	% '3'	No '2'	% '2'	No '1'	% '1'	No 'n/u'	% 'n/u'	H	L	Median	Mode	Mean	SD
All	159	69%	na	na	4	3%	42	26%	63	40%	12	8%	38	24%	4	1	2	2	2.31	0.70
HQ & PGM	47	75%	na	na	1	2%	13	28%	15	32%	3	6%	15	32%	4	1	2	2	2.38	0.71
PJM	112	67%	na	na	3	3%	29	26%	48	43%	9	8%	23	21%	4	1	2	2	2.29	0.69

Part	Part 1 Improving the PW_MS																			
Topic	Participation in PWP project delivery																			
Subject	requirements of the scope statement features/functions/procedures of traditional project management be kept the same, reduced, or changed in																			
Q.1.1.2.a	Response														Distribution Statistics					
Sample Sector	Nos	% o/a	No '5'	% '5'	No '4'	% '4'	No '3'	% '3'	No '2'	% '2'	No '1'	% '1'	No 'n/u'	% 'n/u'	H	L	Median	Mode	Mean	SD
All	160	69%	na	na	na	na	102	64%	18	11%	4	3%	36	23%	3	1	3	3	2.79	0.48
HQ & PGM	46	73%	na	na	na	na	25	54%	2	4%	1	2%	18	39%	3	1	3	3	2.86	0.45
PJM	114	68%	na	na	na	na	77	68%	16	14%	3	3%	18	16%	3	1	3	3	2.77	0.49

Part	Part 1 Improving the PW_MS																			
Topic	Participation in PWP project delivery																			
Subject	the requirements of the cashflows features/functions/procedures of traditional project management be kept the same, reduced, or changed in the																			
Q.1.1.2.b	Response														Distribution Statistics					
Sample Sector	Nos	% o/a	No '5'	% '5'	No '4'	% '4'	No '3'	% '3'	No '2'	% '2'	No '1'	% '1'	No 'n/u'	% 'n/u'	H	L	Median	Mode	Mean	SD
All	160	69%	na	na	na	na	63	39%	34	21%	24	15%	39	24%	3	1	3	3	2.32	0.79
HQ & PGM	47	75%	na	na	na	na	15	32%	4	9%	10	21%	18	38%	3	1	3	3	2.17	0.93
PJM	113	67%	na	na	na	na	48	42%	30	27%	14	12%	21	19%	3	1	3	3	2.37	0.74

Part	Part 1 Improving the PW_MS																			
Topic	Participation in PWP project delivery																			
Subject	Should the requirements of the work-schedules and baseline dates features/functions/procedures of traditional project management be kept the same, reduced, or changed in the PW_MS?																			
Q.1.1.2.c	Response														Distribution Statistics					
Sample Sector	Nos	% o/a	No '5'	% '5'	No '4'	% '4'	No '3'	% '3'	No '2'	% '2'	No '1'	% '1'	No 'n/u'	% 'n/u'	H	L	Median	Mode	Mean	SD
All	160	69%	na	na	na	na	54	34%	45	28%	20	13%	41	26%	3	1	2	3	2.29	0.74
HQ & PGM	47	75%	na	na	na	na	12	26%	4	9%	11	23%	20	43%	3	1	2	3	2.04	0.94
PJM	113	67%	na	na	na	na	42	37%	41	36%	9	8%	21	19%	3	1	2	3	2.36	0.66

Q.1.1.3 *Is an open question, please refer to Volume 1 Section 7.6.1.1*

Part	Part 1 Improving the PW_MS																			
Topic	Resource Management																			
Subject	you want to add a staff resources element into the PW_MS to give you the data that you want on the staff resource demands/capacity/performance																			
Q.1.1.2.a	Response														Distribution Statistics					
Sample Sector	Nos	% o/a	No '5'	% '5'	No '4'	% '4'	No '3'	% '3'	No '2'	% '2'	No '1'	% '1'	No 'n/u'	% 'n/u'	H	L	Median	Mode	Mean	SD
All	161	70%	na	na	na	na	na	na	19	12%	66	41%	76	47%	2	1	1	1	1.22	0.42
HQ & PGM	47	75%	na	na	na	na	na	na	12	26%	11	23%	24	51%	2	1	2	2	1.52	0.51
PJM	114	68%	na	na	na	na	na	na	7	6%	55	48%	52	46%	2	1	1	1	1.11	0.32

Q.1.2.2 *Is an open question, please refer to Volume 1, Section 7.6.1.2*

Part	Part 1 Improving the PW_MS																			
Topic	Effort in data capture and data entry																			
Subject	Is the effort needed for data entry into the PW_MS acceptable to you?																			
Q.1.3.1	Response														Distribution Statistics					
Sample Sector	Nos	% o/a	No '5'	% '5'	No '4'	% '4'	No '3'	% '3'	No '2'	% '2'	No '1'	% '1'	No 'n/u'	% 'n/u'	H	L	Median	Mode	Mean	SD
All	158	68%	na	na	17	11%	23	15%	42	27%	36	23%	40	25%	4	1	2	2	2.18	1.03
HQ & PGM	44	70%	na	na	4	9%	2	5%	12	27%	10	23%	16	36%	4	1	2	2	2.00	1.02
PJM	114	68%	na	na	13	11%	21	18%	30	26%	26	23%	24	21%	4	1	2	2	2.23	1.03

Part	Part 1 Improving the PW_MS																			
Topic	Effort in data capture and data entry																			
Subject	In general, what should be the frequency for regular updating of the PW_MS data for the cost-forecast actions?																			
Q.1.3.2.a	Response														Distribution Statistics					
Sample Sector	Nos	% o/a	No '5'	% '5'	No '4'	% '4'	No '3'	% '3'	No '2'	% '2'	No '1'	% '1'	No 'n/u'	% 'n/u'	H	L	Median	Mode	Mean	SD
All	156	68%	na	na	70	45%	30	19%	0	0%	35	22%	21	13%	4	1	4	4	3.00	1.25
HQ & PGM	45	71%	na	na	17	38%	14	31%	0	0%	7	16%	7	16%	4	1	3	4	3.08	1.10
PJM	111	66%	na	na	53	48%	16	14%	0	0%	28	25%	14	13%	4	1	4	4	2.97	1.31

Part	Part 1 Improving the PW_MS																			
Topic	Effort in data capture and data entry																			
Subject	In general, what should be the frequency for regular updating of the PW_MS data for the record actual expenditure actions?																			
Q.1.3.2.b	Response														Distribution Statistics					
Sample Sector	Nos	% o/a	No '5'	% '5'	No '4'	% '4'	No '3'	% '3'	No '2'	% '2'	No '1'	% '1'	No 'n/u'	% 'n/u'	H	L	Median	Mode	Mean	SD
All	159	69%	na	na	67	42%	54	34%	0	0%	16	10%	21	13%	4	1	3	4	3.26	0.95
HQ & PGM	45	71%	na	na	15	33%	21	47%	0	0%	3	7%	5	11%	4	1	3	3	3.23	0.81
PJM	114	68%	na	na	52	46%	33	29%	0	0%	13	11%	16	14%	4	1	4	4	3.27	1.00

Part	Part 1 Improving the PW_MS																			
Topic	Effort in data capture and data entry																			
Subject	In general, what should be the frequency for regular updating of the PW_MS data for the progress/update of the timeplan actions?																			
Q.1.3.2.c	Response														Distribution Statistics					
Sample Sector	Nos	% o/a	No '5'	% '5'	No '4'	% '4'	No '3'	% '3'	No '2'	% '2'	No '1'	% '1'	No 'n/u'	% 'n/u'	H	L	Median	Mode	Mean	SD
All	156	68%	na	na	75	48%	37	24%	1	1%	25	16%	18	12%	4	1	4	4	3.17	1.12
HQ & PGM	45	71%	na	na	16	36%	12	27%	0	0%	11	24%	6	13%	4	1	3	4	2.85	1.25
PJM	111	66%	na	na	59	53%	25	23%	1	1%	14	13%	12	11%	4	1	4	4	3.30	1.04

Part	Part 1 Improving the PW_MS																			
Topic	Effort in data capture and data entry																			
Subject	In general, what should be the frequency for regular updating of the PW_MS data for the record progress in the project diary actions?																			
Q.1.3.2.d	Response														Distribution Statistics					
Sample Sector	Nos	% o/a	No '5'	% '5'	No '4'	% '4'	No '3'	% '3'	No '2'	% '2'	No '1'	% '1'	No 'n/u'	% 'n/u'	H	L	Median	Mode	Mean	SD
All	157	68%	na	na	72	46%	47	30%	0	0%	18	11%	20	13%	4	1	4	4	3.26	0.99
HQ & PGM	45	71%	na	na	18	40%	13	29%	0	0%	7	16%	7	16%	4	1	3	4	3.11	1.11
PJM	112	67%	na	na	54	48%	34	30%	0	0%	11	10%	13	12%	4	1	4	4	3.32	0.95

Part	Part 1 Improving the PW_MS																			
Topic	Effort in data capture and data entry																			
Subject	In general, what should be the frequency for regular updating of the PW_MS data for the record progress in the work-package diary actions?																			
Q.1.3.2.e	Response														Distribution Statistics					
Sample Sector	Nos	% o/a	No '5'	% '5'	No '4'	% '4'	No '3'	% '3'	No '2'	% '2'	No '1'	% '1'	No 'n/u'	% 'n/u'	H	L	Median	Mode	Mean	SD
All	158	68%	na	na	65	41%	38	24%	1	1%	25	16%	29	18%	4	1	4	4	3.11	1.13
HQ & PGM	45	71%	na	na	20	44%	10	22%	0	0%	7	16%	8	18%	4	1	4	4	3.16	1.14
PJM	113	67%	na	na	45	40%	28	25%	1	1%	18	16%	21	19%	4	1	3	4	3.09	1.14

Part	Part 1 Improving the PW_MS																			
Topic	Effort in data capture and data entry																			
Subject	How frequently should we use the PW_MS?																			
Q.1.3.3.a	Response														Distribution Statistics					
Sample Sector	Nos	% o/a	No '5'	% '5'	No '4'	% '4'	No '3'	% '3'	No '2'	% '2'	No '1'	% '1'	No 'n/u'	% 'n/u'	H	L	Median	Mode	Mean	SD
All	157	68%	na	na	41	26%	56	36%	49	31%	11	7%	na	na	4	1	3	3	2.81	0.91
HQ & PGM	45	71%	na	na	10	22%	12	27%	20	44%	3	7%	na	na	4	1	2	2	2.64	0.91
PJM	112	67%	na	na	31	28%	44	39%	29	26%	8	7%	na	na	4	1	3	3	2.88	0.90

Part	Part 1 Improving the PW_MS																			
Topic	Effort in data capture and data entry																			
Subject	In general, the data updating interval should be?																			
Q.1.3.3.b	Response														Distribution Statistics					
Sample Sector	Nos	% o/a	No '5'	% '5'	No '4'	% '4'	No '3'	% '3'	No '2'	% '2'	No '1'	% '1'	No 'n/u'	% 'n/u'	H	L	Median	Mode	Mean	SD
All	154	67%	na	na	56	36%	16	10%	70	45%	11	7%	na	na	4	1	2	2	2.76	1.03
HQ & PGM	45	71%	na	na	11	24%	7	16%	23	51%	3	7%	na	na	4	1	2	2	2.59	0.95
PJM	109	65%	na	na	45	41%	9	8%	47	43%	8	7%	na	na	4	1	2	2	2.83	1.06

Q.1.3.4 *Is an open question, please refer to Volume 1, Section 7.6.1.3*

Part	Part 1 Improving the PW_MS																			
Topic	Added value from the PW_MS																			
Subject	Is the PW_MS useful to you?																			
Q.1.4.1.a	Response														Distribution Statistics					
Sample Sector	Nos	% o/a	No '5'	% '5'	No '4'	% '4'	No '3'	% '3'	No '2'	% '2'	No '1'	% '1'	No 'n/u'	% 'n/u'	H	L	Median	Mode	Mean	SD
All	159	69%	na	na	7	4%	12	8%	71	45%	45	28%	24	15%	4	1	2	2	1.86	0.78
HQ & PGM	46	73%	na	na	3	7%	4	9%	22	48%	8	17%	9	20%	4	1	2	2	2.05	0.81
PJM	113	67%	na	na	4	4%	8	7%	49	43%	37	33%	15	13%	4	1	2	2	1.79	0.76

Part	Part 1 Improving the PW_MS																			
Topic	Added value from the PW_MS																			
Subject	Is the PW_MS worth the effort needed to keep the data on your projects up-to-date?																			
Q.1.4.1.b	Response														Distribution Statistics					
Sample Sector	Nos	% o/a	No '5'	% '5'	No '4'	% '4'	No '3'	% '3'	No '2'	% '2'	No '1'	% '1'	No 'n/u'	% 'n/u'	H	L	Median	Mode	Mean	SD
All	159	69%	na	na	7	4%	13	8%	65	41%	51	32%	23	14%	4	1	2	2	1.82	0.81
HQ & PGM	46	73%	na	na	1	2%	5	11%	19	41%	12	26%	9	20%	4	1	2	2	1.86	0.75
PJM	113	67%	na	na	6	5%	8	7%	46	41%	39	35%	14	12%	4	1	2	2	1.81	0.83

Part	Part 1 Improving the PW_MS																			
Topic	Added value from the PW_MS																			
Subject	Should the 'activities in the work schedule of activities' be kept, their use reduced or increased, or be deleted from the PW_MS?																			
Q.1.4.2.a	Response														Distribution Statistics					
Sample Sector	Nos	% o/a	No '5'	% '5'	No '4'	% '4'	No '3'	% '3'	No '2'	% '2'	No '1'	% '1'	No 'n/u'	% 'n/u'	H	L	Median	Mode	Mean	SD
All	157	68%	na	na	4	3%	66	42%	45	29%	9	6%	33	21%	4	1	3	3	2.52	0.68
HQ & PGM	46	73%	na	na	1	2%	20	43%	11	24%	1	2%	13	28%	4	1	3	3	2.64	0.60
PJM	111	66%	na	na	3	3%	46	41%	34	31%	8	7%	20	18%	4	1	3	3	2.48	0.70

Part	Part 1 Improving the PW_MS																			
Topic	Added value from the PW_MS																			
Subject	he 'time analysis for calculation of activity dates, milestones, and delays' be kept, their use reduced or increased, or be deleted from the																			
Q.1.4.2.b	Response														Distribution Statistics					
Sample Sector	Nos	% o/a	No '5'	% '5'	No '4'	% '4'	No '3'	% '3'	No '2'	% '2'	No '1'	% '1'	No 'n/u'	% 'n/u'	H	L	Median	Mode	Mean	SD
All	157	68%	na	na	12	8%	64	41%	34	22%	14	9%	33	21%	4	1	3	3	2.60	0.82
HQ & PGM	46	73%	na	na	3	7%	17	37%	8	17%	4	9%	14	30%	4	1	3	3	2.59	0.84
PJM	111	66%	na	na	9	8%	47	42%	26	23%	10	9%	19	17%	4	1	3	3	2.60	0.81

Part	Part 1 Improving the PW_MS																			
Topic	Added value from the PW_MS																			
Subject	Should the ' categories-of-cost ' be kept, their use reduced or increased, or be deleted from the PW_MS?																			
Q.1.4.2.c	Response														Distribution Statistics					
Sample Sector	Nos	% o/a	No '5'	% '5'	No '4'	% '4'	No '3'	% '3'	No '2'	% '2'	No '1'	% '1'	No 'n/u'	% 'n/u'	H	L	Median	Mode	Mean	SD
All	158	68%	na	na	17	11%	65	41%	36	23%	6	4%	34	22%	4	1	3	3	2.75	0.75
HQ & PGM	46	73%	na	na	5	11%	17	37%	9	20%	1	2%	14	30%	4	1	3	3	2.81	0.74
PJM	112	67%	na	na	12	11%	48	43%	27	24%	5	4%	20	18%	4	1	3	3	2.73	0.76

Part	Part 1 Improving the PW_MS																			
Topic	Added value from the PW_MS																			
Subject	Should the 'calculation of outturn project cost ' be kept, their use reduced or increased, or be deleted from the PW_MS?																			
Q.1.4.2.d	Response														Distribution Statistics					
Sample Sector	Nos	% o/a	No '5'	% '5'	No '4'	% '4'	No '3'	% '3'	No '2'	% '2'	No '1'	% '1'	No 'n/u'	% 'n/u'	H	L	Median	Mode	Mean	SD
All	155	67%	na	na	9	6%	82	53%	21	14%	4	3%	38	25%	4	1	3	3	2.83	0.61
HQ & PGM	45	71%	na	na	3	7%	25	56%	4	9%	0	0%	12	27%	4	2	3	3	2.97	0.47
PJM	110	65%	na	na	6	5%	57	52%	17	15%	4	4%	26	24%	4	1	3	3	2.77	0.65

Part	Part 1 Improving the PW_MS																			
Topic	Added value from the PW_MS																			
Subject	ld the 'screen 'traffic lights' to indicate cost deviation from baseline' be kept, their use reduced or increased, or be deleted from the PW_M																			
Q.1.4.2.e	Response														Distribution Statistics					
Sample Sector	Nos	% o/a	No '5'	% '5'	No '4'	% '4'	No '3'	% '3'	No '2'	% '2'	No '1'	% '1'	No 'n/u'	% 'n/u'	H	L	Median	Mode	Mean	SD
All	159	69%	na	na	3	2%	64	40%	22	14%	16	10%	54	34%	4	1	3	3	2.51	0.79
HQ & PGM	46	73%	na	na	1	2%	17	37%	3	7%	4	9%	21	46%	4	1	3	3	2.60	0.82
PJM	113	67%	na	na	2	2%	47	42%	19	17%	12	11%	33	29%	4	1	3	3	2.49	0.78

Part	Part 1 Improving the PW_MS																			
Topic	Added value from the PW_MS																			
Subject	Should the 'making available project data for your ready access' be kept, their use reduced or increased, or be deleted from the PW_MS?																			
Q.1.4.2.f	Response														Distribution Statistics					
Sample Sector	Nos	% o/a	No '5'	% '5'	No '4'	% '4'	No '3'	% '3'	No '2'	% '2'	No '1'	% '1'	No 'n/u'	% 'n/u'	H	L	Median	Mode	Mean	SD
All	159	69%	na	na	16	10%	72	45%	27	17%	6	4%	38	24%	4	1	3	3	2.81	0.72
HQ & PGM	46	73%	na	na	5	11%	22	48%	4	9%	2	4%	13	28%	4	1	3	3	2.91	0.72
PJM	113	67%	na	na	11	10%	50	44%	23	20%	4	4%	25	22%	4	1	3	3	2.77	0.72

Q.1.4.3 *Is an open question, please refer to Section 7.6.1.4*

Part	Part 1 Improving the PW_MS																			
Topic	Report writing and output																			
Subject	Does the PW_MS provide the reports that you need?																			
Q.1.5.1.a	Response														Distribution Statistics					
Sample Sector	Nos	% o/a	No '5'	% '5'	No '4'	% '4'	No '3'	% '3'	No '2'	% '2'	No '1'	% '1'	No 'n/u'	% 'n/u'	H	L	Median	Mode	Mean	SD
All	159	69%	na	na	6	4%	25	16%	48	30%	42	26%	38	24%	4	1	2	2	1.96	0.87
HQ & PGM	45	71%	na	na	2	4%	4	9%	19	42%	9	20%	11	24%	4	1	2	2	1.97	0.80
PJM	114	68%	na	na	4	4%	21	18%	29	25%	33	29%	27	24%	4	1	2	1	1.95	0.90

Part	Part 1 Improving the PW_MS																			
Topic	Report writing and output																			
Subject	Does the PW_MS provide the supply of data, that you need?																			
Q.1.5.1.b	Response														Distribution Statistics					
Sample Sector	Nos	% o/a	No '5'	% '5'	No '4'	% '4'	No '3'	% '3'	No '2'	% '2'	No '1'	% '1'	No 'n/u'	% 'n/u'	H	L	Median	Mode	Mean	SD
All	160	69%	na	na	5	3%	23	14%	58	36%	36	23%	38	24%	4	1	2	2	1.98	0.81
HQ & PGM	46	73%	na	na	2	4%	5	11%	20	43%	8	17%	11	24%	4	1	2	2	2.03	0.79
PJM	114	68%	na	na	3	3%	18	16%	38	33%	28	25%	27	24%	4	1	2	2	1.95	0.82

Part	Part 1 Improving the PW MS																			
Topic	Report writing and output																			
Subject	Are/would the PW_MS reports Quarterly progress reports on high impact Cat A projects be useful to you?																			
Q.1.5.2.a	Response														Distribution Statistics					
Sample Sector	Nos	% o/a	No '5'	% '5'	No '4'	% '4'	No '3'	% '3'	No '2'	% '2'	No '1'	% '1'	No 'n/u'	% 'n/u'	H	L	Median	Mode	Mean	SD
All	159	69%	na	na	13	8%	30	19%	27	17%	38	24%	51	32%	4	1	2	1	2.17	1.05
HQ & PGM	46	73%	na	na	4	9%	12	26%	9	20%	8	17%	13	28%	4	1	2	3	2.36	0.99
PJM	113	67%	na	na	9	8%	18	16%	18	16%	30	27%	38	34%	4	1	2	1	2.08	1.06

Part	Part 1 Improving the PW_MS																			
Topic	Report writing and output																			
Subject	Are/would the PW_MS reports Quarterly progress reports on Cat B projects be useful to you?																			
Q.1.5.2.b	Response														Distribution Statistics					
Sample Sector	Nos	% o/a	No '5'	% '5'	No '4'	% '4'	No '3'	% '3'	No '2'	% '2'	No '1'	% '1'	No 'n/u'	% 'n/u'	H	L	Median	Mode	Mean	SD
All	159	69%	na	na	9	6%	20	13%	27	17%	35	22%	68	43%	4	1	2	1	2.03	1.00
HQ & PGM	46	73%	na	na	3	7%	11	24%	8	17%	6	13%	18	39%	4	1	2.5	3	2.39	0.96
PJM	113	67%	na	na	6	5%	9	8%	19	17%	29	26%	50	44%	4	1	2	1	1.87	0.99

Part	Part 1 Improving the PW_MS																			
Topic	Report writing and output																			
Subject	Are/would any of the reports listed on the reports menu within the PW_MS be useful to you?																			
Q.1.5.2.c	Response														Distribution Statistics					
Sample Sector	Nos	% o/a	No '5'	% '5'	No '4'	% '4'	No '3'	% '3'	No '2'	% '2'	No '1'	% '1'	No 'n/u'	% 'n/u'	H	L	Median	Mode	Mean	SD
All	158	68%	na	na	3	2%	14	9%	54	34%	40	25%	47	30%	4	1	2	2	1.82	0.75
HQ & PGM	45	71%	na	na	2	4%	3	7%	20	44%	7	16%	13	29%	4	1	2	2	2.00	0.76
PJM	113	67%	na	na	1	1%	11	10%	34	30%	33	29%	34	30%	4	1	2	2	1.75	0.74

Part	Part 1 Improving the PW_MS																			
Topic	Report writing and output																			
Subject	Are/would the FoxPro data download from the PW_MS be useful to you?																			
Q.1.5.2.d	Response														Distribution Statistics					
Sample Sector	Nos	% o/a	No '5'	% '5'	No '4'	% '4'	No '3'	% '3'	No '2'	% '2'	No '1'	% '1'	No 'n/u'	% 'n/u'	H	L	Median	Mode	Mean	SD
All	158	68%	na	na	0	0%	6	4%	15	9%	34	22%	103	65%	3	1	1	1	1.49	0.69
HQ & PGM	46	73%	na	na	0	0%	2	4%	10	22%	7	15%	27	59%	3	1	2	2	1.74	0.65
PJM	112	67%	na	na	0	0%	4	4%	5	4%	27	24%	76	68%	3	1	1	1	1.36	0.68

Part	Part 1 Improving the PW MS																			
Topic	Report writing and output																			
Subject	Are/would the spreadsheet formant data download from the PWSAU be useful to you?																			
Q.1.5.2.e	Response														Distribution Statistics					
Sample Sector	Nos	% o/a	No '5'	% '5'	No '4'	% '4'	No '3'	% '3'	No '2'	% '2'	No '1'	% '1'	No 'n/u'	% 'n/u'	H	L	Median	Mode	Mean	SD
All	159	69%	na	na	1	1%	8	5%	17	11%	29	18%	104	65%	4	1	1	1	1.65	0.80
HQ & PGM	46	73%	na	na	0	0%	3	7%	8	17%	6	13%	29	63%	3	1	2	2	1.82	0.73
PJM	113	67%	na	na	1	1%	5	4%	9	8%	23	20%	75	66%	4	1	1	1	1.58	0.83

Part	Part 1 Improving the PW_MS																			
Topic	Report writing and output																			
Subject	Are/would the use of SQL to access the PW_MS database be useful to you?																			
Q.1.5.2.f	Response														Distribution Statistics					
Sample Sector	Nos	% o/a	No '5'	% '5'	No '4'	% '4'	No '3'	% '3'	No '2'	% '2'	No '1'	% '1'	No 'n/u'	% 'n/u'	H	L	Median	Mode	Mean	SD
All	158	68%	na	na	1	1%	10	6%	7	4%	34	22%	106	67%	4	1	1	1	1.58	0.87
HQ & PGM	46	73%	na	na	1	2%	6	13%	3	7%	9	20%	27	59%	4	1	2	1	1.95	1.03
PJM	112	67%	na	na	0	0%	4	4%	4	4%	25	22%	79	71%	3	1	1	1	1.36	0.70

Q.1.5.3 Is an open question, please refer to Section 7.6.1.5

Part	Part 1 Improving the PW_MS																			
Topic	Centralised, single source of data																			
Subject	Is the PW_MS an effective centralised, single source of accurate PWP data/information to project participants?																			
Q.1.6.1	Response														Distribution Statistics					
Sample Sector	Nos	% o/a	No '5'	% '5'	No '4'	% '4'	No '3'	% '3'	No '2'	% '2'	No '1'	% '1'	No 'n/u'	% 'n/u'	H	L	Median	Mode	Mean	SD
All	160	69%	na	na	9	6%	17	11%	58	36%	40	25%	36	23%	4	1	2	2	1.96	0.87
HQ & PGM	46	73%	na	na	1	2%	7	15%	15	33%	14	30%	9	20%	4	1	2	2	1.86	0.82
PJM	114	68%	na	na	8	7%	10	9%	43	38%	26	23%	27	24%	4	1	2	2	2.00	0.89

Q.1.6.2 Is an open question, please refer to Section 7.6.1.6

Part	Part 1 Improving the PW_MS																			
Topic	Effectiveness of the PW_MS																			
Subject	the PW_MS effective for the management of the groups of projects in the hierarchical breakdown-structures in the PW_MS, i.e. WBS OBS, FRS, CRs																			
Q.1.7.1	Response														Distribution Statistics					
Sample Sector	Nos	% o/a	No '5'	% '5'	No '4'	% '4'	No '3'	% '3'	No '2'	% '2'	No '1'	% '1'	No 'n/u'	% 'n/u'	H	L	Median	Mode	Mean	SD
All	158	68%	na	na	6	4%	7	4%	48	30%	29	18%	68	43%	4	1	2	2	1.89	0.81
HQ & PGM	45	71%	na	na	2	4%	2	4%	15	33%	6	13%	20	44%	4	1	2	2	2.00	0.82
PJM	113	67%	na	na	4	4%	5	4%	33	29%	23	20%	48	42%	4	1	2	2	1.85	0.81

Q.1.7.2 Is an open question, please refer to Section 7.6.1.7

Part	Part 1 Improving the PW_MS																			
Topic	Using the PW_MS																			
Subject	Is the performance of logging onto the PW_MS satisfactory to you?																			
Q.1.8.1.a	Response														Distribution Statistics					
Sample Sector	Nos	% o/a	No '5'	% '5'	No '4'	% '4'	No '3'	% '3'	No '2'	% '2'	No '1'	% '1'	No 'n/u'	% 'n/u'	H	L	Median	Mode	Mean	SD
All	158	68%	na	na	na	na	12	8%	49	31%	39	25%	58	37%	3	1	2	2	1.73	0.66
HQ & PGM	45	71%	na	na	na	na	3	7%	20	44%	8	18%	14	31%	3	1	2	2	1.84	0.58
PJM	113	67%	na	na	na	na	9	8%	29	26%	31	27%	44	39%	3	1	2	1	1.68	0.70

Part	Part 1 Improving the PW_MS																			
Topic	Using the PW_MS																			
Subject	Is the performance of accessing project data in the PW_MS satisfactory to you?																			
Q.1.8.1.b	Response														Distribution Statistics					
Sample Sector	Nos	% o/a	No '5'	% '5'	No '4'	% '4'	No '3'	% '3'	No '2'	% '2'	No '1'	% '1'	No 'n/u'	% 'n/u'	H	L	Median	Mode	Mean	SD
All	158	68%	na	na	na	na	15	9%	45	28%	41	26%	56	35%	3	1	2	2	1.74	0.70
HQ & PGM	45	71%	na	na	na	na	6	13%	17	38%	7	16%	14	31%	3	1	2	2	1.97	0.67
PJM	113	67%	na	na	na	na	9	8%	28	25%	34	30%	42	37%	3	1	2	1	1.65	0.70

Part	Part 1 Improving the PW_MS																			
Topic	Using the PW_MS																			
Subject	Is the performance of updating the project timeplan in the PW_MS satisfactory to you?																			
Q.1.8.1.c	Response														Distribution Statistics					
Sample Sector	Nos	% o/a	No '5'	% '5'	No '4'	% '4'	No '3'	% '3'	No '2'	% '2'	No '1'	% '1'	No 'n/u'	% 'n/u'	H	L	Median	Mode	Mean	SD
All	158	68%	na	na	na	na	12	8%	35	22%	45	28%	65	41%	3	1	2	1	1.64	0.70
HQ & PGM	45	71%	na	na	na	na	6	13%	10	22%	10	22%	18	40%	3	1	2	1	1.85	0.78
PJM	113	67%	na	na	na	na	6	5%	25	22%	35	31%	47	42%	3	1	1	1	1.56	0.66

Part	Part 1 Improving the PW_MS																			
Topic	Using the PW_MS																			
Subject	Is the performance of recording expenditure within the PW_MS satisfactory to you?																			
Q.1.8.1.d	Response														Distribution Statistics					
Sample Sector	Nos	% o/a	No '5'	% '5'	No '4'	% '4'	No '3'	% '3'	No '2'	% '2'	No '1'	% '1'	No 'n/u'	% 'n/u'	H	L	Median	Mode	Mean	SD
All	158	68%	na	na	na	na	20	13%	35	22%	36	23%	66	42%	3	1	2	1	1.82	0.77
HQ & PGM	45	71%	na	na	na	na	12	27%	8	18%	6	13%	18	40%	3	1	2	3	2.23	0.82
PJM	113	67%	na	na	na	na	8	7%	27	24%	30	27%	48	42%	3	1	2	1	1.66	0.69

Part	Part 1 Improving the PW_MS																			
Topic	Using the PW_MS																			
Subject	Is the performance of creation of a pending change order involving cashflow within the PW_MS satisfactory to you?																			
Q.1.8.1.e	Response														Distribution Statistics					
Sample Sector	Nos	% o/a	No '5'	% '5'	No '4'	% '4'	No '3'	% '3'	No '2'	% '2'	No '1'	% '1'	No 'n/u'	% 'n/u'	H	L	Median	Mode	Mean	SD
All	158	68%	na	na	na	na	19	12%	45	28%	30	19%	64	41%	3	1	2	2	1.88	0.72
HQ & PGM	45	71%	na	na	na	na	10	22%	10	22%	6	13%	19	42%	3	1	2	2	2.15	0.78
PJM	113	67%	na	na	na	na	9	8%	35	31%	24	21%	45	40%	3	1	2	2	1.78	0.67

Part	Part 1 Improving the PW_MS																			
Topic	Using the PW_MS																			
Subject	Is the performance of writing an entry in the project or work package diary within the PW_MS satisfactory to you?																			
Q.1.8.1.f	Response														Distribution Statistics					
Sample Sector	Nos	% o/a	No '5'	% '5'	No '4'	% '4'	No '3'	% '3'	No '2'	% '2'	No '1'	% '1'	No 'n/u'	% 'n/u'	H	L	Median	Mode	Mean	SD
All	158	68%	na	na	na	na	48	30%	37	23%	11	7%	61	39%	3	1	2.5	3	2.39	0.69
HQ & PGM	45	71%	na	na	na	na	16	36%	8	18%	2	4%	18	40%	3	1	3	3	2.54	0.65
PJM	113	67%	na	na	na	na	32	28%	29	26%	9	8%	43	38%	3	1	2	3	2.33	0.70

Part	Part 1 Improving the PW_MS																			
Topic	Using the PW_MS																			
Subject	Is the performance of updating the project contacts within the PW_MS satisfactory to you?																			
Q.1.8.1.g	Response														Distribution Statistics					
Sample Sector	Nos	% o/a	No '5'	% '5'	No '4'	% '4'	No '3'	% '3'	No '2'	% '2'	No '1'	% '1'	No 'n/u'	% 'n/u'	H	L	Median	Mode	Mean	SD
All	158	68%	na	na	na	na	46	29%	29	18%	11	7%	72	46%	3	1	3	3	2.41	0.71
HQ & PGM	45	71%	na	na	na	na	14	31%	7	16%	2	4%	22	49%	3	1	3	3	2.52	0.67
PJM	113	67%	na	na	na	na	32	28%	29	26%	9	8%	43	38%	3	1	2	3	2.33	0.70

Part	Part 1 Improving the PW_MS																			
Topic	Using the PW_MS																			
Subject	Is the performance of obtaining and printing ta report within the PW_MS satisfactory to you?																			
Q.1.8.1.h	Response														Distribution Statistics					
Sample Sector	Nos	% o/a	No '5'	% '5'	No '4'	% '4'	No '3'	% '3'	No '2'	% '2'	No '1'	% '1'	No 'n/u'	% 'n/u'	H	L	Median	Mode	Mean	SD
All	157	68%	na	na	na	na	18	11%	54	34%	28	18%	57	36%	3	1	2	2	1.90	0.67
HQ & PGM	45	71%	na	na	na	na	3	7%	23	51%	4	9%	15	33%	3	1	2	2	1.97	0.49
PJM	112	67%	na	na	na	na	15	13%	31	28%	24	21%	42	38%	3	1	2	2	1.87	0.74

Part	Part 1 Improving the PW_MS																			
Topic	Using the PW_MS																			
Subject	In overall terms, is the PW_MS satisfactory to use?																			
Q.1.8.2	Response														Distribution Statistics					
Sample Sector	Nos	% o/a	No '5'	% '5'	No '4'	% '4'	No '3'	% '3'	No '2'	% '2'	No '1'	% '1'	No 'n/u'	% 'n/u'	H	L	Median	Mode	Mean	SD
All	152	66%	na	na	3	2%	18	12%	46	30%	53	35%	30	20%	4	1	2	1	1.76	0.80
HQ & PGM	41	65%	na	na	0	0%	5	12%	17	41%	10	24%	9	22%	3	1	2	2	1.84	0.68
PJM	111	66%	na	na	3	3%	13	12%	29	26%	43	39%	21	19%	4	1	2	1	1.73	0.84

Q.1.8.3 Is an open question, please refer to Section 7.6.1.8

Part	Part 1 Improving the PW_MS																			
Topic	Using the PW_MS																			
Subject	How fast should the PW_MS be?																			
Q.1.8.4	Response														Distribution Statistics					
Sample Sector	Nos	% o/a	No '5'	% '5'	No '4'	% '4'	No '3'	% '3'	No '2'	% '2'	No '1'	% '1'	No 'd/k'	% 'd/k'	H	L	Median	Mode	Mean	SD
All	157	68%	na	na	80	51%	29	18%	12	8%	36	23%	na	na	4	1	4	4	2.97	1.23
HQ & PGM	44	70%	na	na	26	59%	11	25%	1	2%	6	14%	na	na	4	1	4	4	3.30	1.05
PJM	113	67%	na	na	54	48%	18	16%	11	10%	30	27%	na	na	4	1	3	4	2.85	1.28

Part	Part 1 Improving the PW_MS																			
Topic	Ease of use of the PW_MS																			
Subject	The PW_MS should be as easy to use as?																			
Q.1.9.1	Response														Distribution Statistics					
Sample Sector	Nos	% o/a	No '5'	% '5'	No '4'	% '4'	No '3'	% '3'	No '2'	% '2'	No '1'	% '1'	No 'd/k'	% 'd/k'	H	L	Median	Mode	Mean	SD
All	155	67%	na	na	75	48%	40	26%	5	3%	10	6%	25	16%	4	0	3	4	2.84	1.49
HQ & PGM	44	70%	na	na	18	41%	13	30%	3	7%	2	5%	8	18%	4	0	3	4	2.70	1.50
PJM	111	66%	na	na	57	51%	27	24%	2	2%	8	7%	17	15%	4	0	4	4	2.89	1.49

Part	Part 2 Use of the PW_MS for management of Category C, B, and A PWP projects																			
Topic	Project register, diary and contacts																			
Subject	Does the project register in the PW_MS contain all the data that you want for your projects?																			
Q.2.1.1.	Response														Distribution Statistics					
Sample Sector	Nos	% o/a	No '5'	% '5'	No '4'	% '4'	No '3'	% '3'	No '2'	% '2'	No '1'	% '1'	No 'n/u'	% 'n/u'	H	L	Median	Mode	Mean	SD
All	158	68%	na	na	na	na	22	14%	86	54%	4	3%	45	28%	4	1	2	2	2.18	0.49
HQ & PGM	45	71%	na	na	na	na	6	13%	21	47%	1	2%	17	38%	3	1	2	2	2.18	0.48
PJM	113	67%	na	na	na	na	16	14%	65	58%	3	3%	28	25%	4	1	2	2	2.18	0.49

Q.2.1.2 Is an open question, please refer to Section 7.6.2.1

Part	Part 2 Use of the PW_MS for management of Category C, B, and A PWP projects																			
Topic	Project register, diary and contacts																			
Subject	Does the project diary in the PW_MS contain all the data that you want for your projects?																			
Q.2.1.3	Response														Distribution Statistics					
Sample Sector	Nos	% o/a	No '5'	% '5'	No '4'	% '4'	No '3'	% '3'	No '2'	% '2'	No '1'	% '1'	No 'n/u'	% 'n/u'	H	L	Median	Mode	Mean	SD
All	157	68%	na	na	na	na	25	16%	74	47%	7	4%	50	32%	4	1	2	2	2.19	0.55
HQ & PGM	44	70%	na	na	na	na	9	20%	15	34%	1	2%	19	43%	3	1	2	2	2.32	0.56
PJM	113	67%	na	na	na	na	16	14%	59	52%	6	5%	31	27%	4	1	2	2	2.15	0.55

Q.2.1.4 Is an open question, please refer to Section 7.6.2.1

Part	Part 2 Use of the PW_MS for management of Category C, B, and A PWP projects																			
Topic	Project register, diary and contacts																			
Subject	Does the project contacts in the PW_MS contain all the data that you want for your projects?																			
Q.2.1.5	Response														Distribution Statistics					
Sample Sector	Nos	% o/a	No '5'	% '5'	No '4'	% '4'	No '3'	% '3'	No '2'	% '2'	No '1'	% '1'	No 'n/u'	% 'n/u'	H	L	Median	Mode	Mean	SD
All	158	68%	na	na	na	na	4	3%	84	53%	1	1%	69	44%	3	1	2	2	2.03	0.24
HQ & PGM	46	73%	na	na	na	na	0	0%	22	48%	1	2%	23	50%	2	1	2	2	1.96	0.21
PJM	112	67%	na	na	na	na	4	4%	62	55%	0	0%	46	41%	3	2	2	2	2.06	0.24

Q.2.1.6 Is an open question, please refer to Section 7.6.2.1

Part	Part 2 Use of the PW_MS for management of Category C, B, and A PWP projects																			
Topic	Project register, diary and contacts																			
Subject	Does the work-package register in the PW_MS contain all the data that you want for your projects?																			
Q.2.1.7	Response														Distribution Statistics					
Sample Sector	Nos	% o/a	No '5'	% '5'	No '4'	% '4'	No '3'	% '3'	No '2'	% '2'	No '1'	% '1'	No 'n/u'	% 'n/u'	H	L	Median	Mode	Mean	SD
All	157	68%	na	na	na	na	16	10%	74	47%	4	3%	63	40%	3	1	2	2	2.13	0.45
HQ & PGM	45	71%	na	na	na	na	2	4%	19	42%	1	2%	23	51%	3	1	2	2	2.05	0.38
PJM	112	67%	na	na	na	na	14	13%	55	49%	3	3%	40	36%	3	1	2	2	2.15	0.46

Q.2.1.8 Is an open question, please refer to Section 7.6.2.1

Part	Part 2 Use of the PW_MS for management of Category C, B, and A PWP projects																			
Topic	Project register, diary and contacts																			
Subject	Does the work-package diary in the PW_MS contain all the data that you want for your projects?																			
Q.2.1.9	Response															Distribution Statistics				
Sample Sector	Nos	% o/a	No '5'	% '5'	No '4'	% '4'	No '3'	% '3'	No '2'	% '2'	No '1'	% '1'	No 'n/u'	% 'n/u'	H	L	Median	Mode	Mean	SD
All	155	67%	na	na	na	na	22	14%	63	41%	4	3%	66	43%	3	1	2	2	2.20	0.50
HQ & PGM	44	70%	na	na	na	na	8	18%	10	23%	1	2%	25	57%	3	1	2	2	2.37	0.60
PJM	111	66%	na	na	na	na	14	13%	53	48%	3	3%	41	37%	3	1	2	2	2.16	0.47

Q.2.1.10 Is an open question, please refer to Section 7.6.2.1

Part	Part 2 Use of the PW_MS for management of Category C, B, and A PWP projects																			
Topic	Project scope																			
Subject	Does the scope element of the PW_MS have all the data that you want for your projects?																			
Q.2.2.1.a	Response														Distribution Statistics					
Sample Sector	Nos	% o/a	No '5'	% '5'	No '4'	% '4'	No '3'	% '3'	No '2'	% '2'	No '1'	% '1'	No 'n/u'	% 'n/u'	H	L	Median	Mode	Mean	SD
All	156	68%	na	na	na	na	4	3%	91	58%	6	4%	55	35%	3	1	2	2	1.98	0.32
HQ & PGM	45	71%	na	na	na	na	1	2%	25	56%	1	2%	18	40%	3	1	2	2	2.00	0.28
PJM	111	66%	na	na	na	na	3	3%	66	59%	5	5%	37	33%	3	1	2	2	1.97	0.33

Part	Part 2 Use of the PW_MS for management of Category C, B, and A PWP projects																			
Topic	Project scope																			
Subject	Does the scope element of the PW_MS have all the functions that you want for your projects?																			
Q.2.2.1.b	Response														Distribution Statistics					
Sample Sector	Nos	% o/a	No '5'	% '5'	No '4'	% '4'	No '3'	% '3'	No '2'	% '2'	No '1'	% '1'	No 'n/u'	% 'n/u'	H	L	Median	Mode	Mean	SD
All	155	67%	na	na	na	na	3	2%	81	52%	5	3%	65	42%	3	1	2	2	1.98	0.30
HQ & PGM	44	70%	na	na	na	na	1	2%	22	50%	0	0%	21	48%	3	2	2	2	2.04	0.21
PJM	111	66%	na	na	na	na	2	2%	59	53%	5	5%	44	40%	3	1	2	2	1.95	0.32

Q.2.2.2 Is an open question, please refer to Section 7.6.2.2

Part	Part 2 Use of the PW_MS for management of Category C, B, and A PWP projects																			
Topic	Cost																			
Subject	Does the cost element of the PW_MS have all the data that you want for your projects?																			
Q.2.3.1.a	Response														Distribution Statistics					
Sample Sector	Nos	% o/a	No '5'	% '5'	No '4'	% '4'	No '3'	% '3'	No '2'	% '2'	No '1'	% '1'	No 'n/u'	% 'n/u'	H	L	Median	Mode	Mean	SD
All	155	67%	na	na	na	na	20	13%	79	51%	12	8%	44	28%	3	1	2	2	2.07	0.53
HQ & PGM	44	70%	na	na	na	na	6	14%	23	52%	1	2%	14	32%	3	1	2	2	2.17	0.46
PJM	111	66%	na	na	na	na	14	13%	56	50%	11	10%	30	27%	3	1	2	2	2.04	0.56

Part	Part 2 Use of the PW_MS for management of Category C, B, and A PWP projects																			
Topic	Cost																			
Subject	Does the cost element of the PW_MS have all the functions that you want for your projects?																			
Q.2.3.1.b	Response															Distribution Statistics				
Sample Sector	Nos	% o/a	No '5'	% '5'	No '4'	% '4'	No '3'	% '3'	No '2'	% '2'	No '1'	% '1'	No 'n/u'	% 'n/u'	H	L	Median	Mode	Mean	SD
All	153	66%	na	na	na	na	6	4%	76	50%	18	12%	53	35%	3	1	2	2	1.88	0.48
HQ & PGM	43	68%	na	na	na	na	0	0%	21	49%	4	9%	18	42%	2	1	2	2	1.84	0.37
PJM	110	65%	na	na	na	na	6	5%	55	50%	14	13%	35	32%	3	1	2	2	1.89	0.51

Q.2.3.2 Is an open question, please refer to Section 7.6.2.3

Part	Part 2 Use of the PW_MS for management of Category C, B, and A PWP projects																			
Topic	Time management and work-scheduling																			
Subject	Does the time plan element of the PW_MS have all the data that you want for your projects?																			
Q.2.4.1.a	Response														Distribution Statistics					
Sample Sector	Nos	% o/a	No '5'	% '5'	No '4'	% '4'	No '3'	% '3'	No '2'	% '2'	No '1'	% '1'	No 'n/u'	% 'n/u'	H	L	Median	Mode	Mean	SD
All	155	67%	na	na	na	na	23	15%	68	44%	14	9%	50	32%	3	1	2	2	2.09	0.59
HQ & PGM	45	71%	na	na	na	na	5	11%	18	40%	5	11%	17	38%	3	1	2	2	2.00	0.61
PJM	110	65%	na	na	na	na	18	16%	50	45%	9	8%	33	30%	3	1	2	2	2.12	0.58

Part	Part 2 Use of the PW_MS for management of Category C, B, and A PWP projects																			
Topic	Time management and work-scheduling																			
Subject	Does the time plan element of the PW_MS have all the functions that you want for your projects?																			
Q.2.4.1.b	Response														Distribution Statistics					
Sample Sector	Nos	% o/a	No '5'	% '5'	No '4'	% '4'	No '3'	% '3'	No '2'	% '2'	No '1'	% '1'	No 'n/u'	% 'n/u'	H	L	Median	Mode	Mean	SD
All	153	66%	na	na	na	na	14	9%	53	35%	25	16%	61	40%	3	1	2	2	1.88	0.64
HQ & PGM	43	68%	na	na	na	na	2	5%	12	28%	9	21%	20	47%	3	1	2	2	1.70	0.63
PJM	110	65%	na	na	na	na	12	11%	41	37%	16	15%	41	37%	3	1	2	2	1.94	0.64

Q.2.4.2 Is an open question, please refer to Section 7.6.2.4

Part	Part 2 Use of the PW_MS for management of Category C, B, and A PWP projects																			
Topic	Project planning and monitoring using change orders and baseline control																			
Subject	Does the change orders and monitoring element of the PW_MS have all the data that you want for your projects?																			
Q.2.5.1.a	Response														Distribution Statistics					
Sample Sector	Nos	% o/a	No '5'	% '5'	No '4'	% '4'	No '3'	% '3'	No '2'	% '2'	No '1'	% '1'	No 'n/u'	% 'n/u'	H	L	Median	Mode	Mean	SD
All	155	67%	na	na	na	na	12	8%	90	58%	6	4%	46	30%	3	1	2	2	2.06	0.41
HQ & PGM	44	70%	na	na	na	na	2	5%	23	52%	4	9%	14	32%	3	1	2	2	1.93	0.46
PJM	111	66%	na	na	na	na	10	9%	67	60%	2	2%	32	29%	3	1	2	2	2.10	0.38

Part	Part 2 Use of the PW_MS for management of Category C, B, and A PWP projects																			
Topic	Project planning and monitoring using change orders and baseline control																			
Subject	Does the change orders and monitoring element of the PW_MS have all the functions that you want for your projects?																			
Q.2.5.1.b	Response														Distribution Statistics					
Sample Sector	Nos	% o/a	No '5'	% '5'	No '4'	% '4'	No '3'	% '3'	No '2'	% '2'	No '1'	% '1'	No 'n/u'	% 'n/u'	H	L	Median	Mode	Mean	SD
All	154	67%	na	na	na	na	7	5%	85	55%	8	5%	54	35%	3	1	2	2	1.99	0.39
HQ & PGM	43	68%	na	na	na	na	0	0%	21	49%	4	9%	18	42%	2	1	2	2	1.84	0.37
PJM	111	66%	na	na	na	na	10	9%	67	60%	2	2%	32	29%	3	1	2	2	2.10	0.38

Q.2.5.2 Is an open question, please refer to Section 7.6.2.5

Part	Part 2 Use of the PW_MS for management of Category C, B, and A PWP projects																			
Topic	Land delivery																			
Subject	Does the land delivery lement of the PW_MS have all the data that you want for your projects?																			
Q.2.6.1.a	Response														Distribution Statistics					
Sample Sector	Nos	% o/a	No '5'	% '5'	No '4'	% '4'	No '3'	% '3'	No '2'	% '2'	No '1'	% '1'	No 'n/u'	% 'n/u'	H	L	Median	Mode	Mean	SD
All	154	67%	na	na	na	na	14	9%	53	34%	2	1%	84	55%	3	1	2	2	2.17	0.45
HQ & PGM	43	68%	na	na	na	na	3	7%	13	30%	0	0%	27	63%	3	2	2	2	2.19	0.40
PJM	111	66%			na	na	11	10%	40	36%	2	2%	57	51%	3	1	2	2	2.17	0.47

Part	Part 2 Use of the PW_MS for management of Category C, B, and A PWP projects																			
Topic	Land delivery																			
Subject	Does the land delivery element of the PW_MS have all the functions that you want for your projects?																			
Q.2.6.1.b	Response														Distribution Statistics					
Sample Sector	Nos	% o/a	No '5'	% '5'	No '4'	% '4'	No '3'	% '3'	No '2'	% '2'	No '1'	% '1'	No 'n/u'	% 'n/u'	H	L	Median	Mode	Mean	SD
All	155	67%	na	na	na	na	7	5%	47	30%	10	6%	90	58%	3	1	2	2	1.95	0.52
HQ & PGM	44	70%	na	na	na	na	3	7%	11	25%	1	2%	29	66%	3	1	2	2	2.13	0.52
PJM	111	66%			na	na	4	4%	36	32%	9	8%	61	55%	3	1	2	2	1.90	0.51

Q.2.6.2 Is an open question, please refer to Section 7.6.2.6

Part	Part 2 Use of the PW_MS for management of Category C, B, and A PWP projects																			
Topic	Works Contracts																			
Subject	Does the works contracts element of the PW_MS have all the data that you want for your projects?																			
Q.2.7.1.a	Response															Distribution Statistics				
Sample Sector	Nos	% o/a	No '5'	% '5'	No '4'	% '4'	No '3'	% '3'	No '2'	% '2'	No '1'	% '1'	No 'n/u'	% 'n/u'	H	L	Median	Mode	Mean	SD
All	155	67%	na	na	na	na	7	5%	71	46%	3	2%	74	48%	3	1	2	2	2.05	0.35
HQ & PGM	44	70%	na	na	na	na	0	0%	20	45%	0	0%	24	55%	2	2	2	2	2.00	0.00
PJM	111	66%	na	na	na	na	7	6%	51	46%	3	3%	50	45%	3	1	2	2	2.07	0.40

Part	Part 2 Use of the PW_MS for management of Category C, B, and A PWP projects																			
Topic	Works Contracts																			
Subject	Does the works contracts element of the PW_MS have all the functions that you want for your projects?																			
Q.2.7.1.b	Response														Distribution Statistics					
Sample Sector	Nos	% o/a	No '5'	% '5'	No '4'	% '4'	No '3'	% '3'	No '2'	% '2'	No '1'	% '1'	No 'n/u'	% 'n/u'	H	L	Median	Mode	Mean	SD
All	155	67%	na	na	na	na	5	3%	57	37%	10	6%	82	53%	3	1	2	2	1.93	0.45
HQ & PGM	44	70%	na	na	na	na	0	0%	17	39%	1	2%	25	57%	2	1	2	2	1.94	0.24
PJM	111	66%	na	na	na	na	5	5%	40	36%	9	8%	57	51%	3	1	2	2	1.93	0.51

Q.2.7.2 Is an open question, please refer to Section 7.6.2.7

Part	Part 3 Use of the PW_MS in the management of Groups of Category C, B, and A PWP projects																			
Topic	Project Contacts																			
Subject	Does the contacts element of the PW_MS have all the data that you want for your projects?																			
Q.3.1.1.a	Response														Distribution Statistics					
Sample Sector	Nos	% o/a	No '5'	% '5'	No '4'	% '4'	No '3'	% '3'	No '2'	% '2'	No '1'	% '1'	No 'n/u'	% 'n/u'	H	L	Median	Mode	Mean	SD
All	159	69%	na	na	na	na	2	1%	48	30%	3	2%	105	66%	3	1	2	2	1.98	0.31
HQ & PGM	45	71%	na	na	na	na	0	0%	18	40%	1	2%	26	58%	2	1	2	2	1.95	0.23
PJM	114	68%	na	na	na	na	2	2%	30	26%	2	2%	79	69%	3	1	2	2	2.00	0.35

Part	Part 3 Use of the PW_MS in the management of Groups of Category C, B, and A PWP projects																			
Topic	Project Contacts																			
Subject	Does the contacts element of the PW_MS have all the functions that you want for your projects?																			
Q.3.1.1.b	Response														Distribution Statistics					
Sample Sector	Nos	% o/a	No '5'	% '5'	No '4'	% '4'	No '3'	% '3'	No '2'	% '2'	No '1'	% '1'	No 'n/u'	% 'n/u'	H	L	Median	Mode	Mean	SD
All	157	68%	na	na	na	na	2	1%	42	27%	5	3%	108	69%	3	1	2	2	1.94	0.38
HQ & PGM	44	70%	na	na	na	na	0	0%	15	34%	3	7%	26	59%	2	1	2	2	1.83	0.38
PJM	113	67%	na	na	na	na	2	2%	27	24%	2	2%	82	73%	3	1	2	2	2.00	0.37

Q.3.1.2 Is an open question, please refer to Section 7.6.3.1

Part	Part 3 Use of the PW_MS in the management of Groups of Category C, B, and A PWP projects																			
Topic	Project Contacts																			
Subject	c-lights' element of the PW_MS screen display of projects show the data that you want, to identify/warn of the projects that are not progressi																			
Q.3.1.3.a	Response														Distribution Statistics					
Sample Sector	Nos	% o/a	No '5'	% '5'	No '4'	% '4'	No '3'	% '3'	No '2'	% '2'	No '1'	% '1'	No 'n/u'	% 'n/u'	H	L	Median	Mode	Mean	SD
All	159	69%	na	na	na	na	3	2%	33	21%	5	3%	117	74%	3	1	2	2	1.95	0.44
HQ & PGM	46	73%	na	na	na	na	0	0%	9	20%	3	7%	34	74%	2	1	2	2	1.75	0.45
PJM	113	67%	na	na	na	na	3	3%	24	21%	2	2%	83	73%	3	1	2	2	2.03	0.42

Part	Part 3 Use of the PW_MS in the management of Groups of Category C, B, and A PWP projects																			
Topic	Project Contacts																			
Subject	ights' element of the PW_MS screen display of projects have the functions that you want, to identify/warn of the projects that are not progres																			
Q.3.1.3.b	Response														Distribution Statistics					
Sample Sector	Nos	% o/a	No '5'	% '5'	No '4'	% '4'	No '3'	% '3'	No '2'	% '2'	No '1'	% '1'	No 'n/u'	% 'n/u'	H	L	Median	Mode	Mean	SD
All	158	68%	na	na	na	na	3	2%	29	18%	7	4%	119	75%	3	1	2	2	1.90	0.50
HQ & PGM	45	71%	na	na	na	na	0	0%	8	18%	3	7%	34	76%	2	1	2	2	1.73	0.47
PJM	113	67%	na	na	na	na	3	3%	21	19%	4	4%	85	75%	3	1	2	2	1.96	0.51

Q.3.1.4 Is an open question, please refer to Section 7.6.3.1

Part	Part 3 Use of the PW_MS in the management of Groups of Category C, B, and A PWP projects																			
Topic	Summations of data for selected groups of projects																			
Subject	Does the PW_MS provide enough information on groups of projects that you select?																			
Q.3.2.1	Response														Distribution Statistics					
Sample Sector	Nos	% o/a	No '5'	% '5'	No '4'	% '4'	No '3'	% '3'	No '2'	% '2'	No '1'	% '1'	No 'n/u'	% 'n/u'	H	L	Median	Mode	Mean	SD
All	158	68%	na	na	na	na	4	3%	26	16%	4	3%	124	78%	3	1	2	2	2.00	0.49
HQ & PGM	45	71%	na	na	na	na	2	4%	12	27%	3	7%	28	62%	3	1	2	2	1.94	0.56
PJM	113	67%	na	na	na	na	2	2%	14	12%	1	1%	96	85%	3	1	2	2	2.06	0.43

Q.3.2.2 Is an open question, please refer to Section 7.6.3.2

Part	Part 3 Use of the PW_MS in the management of Groups of Category C, B, and A PWP projects																			
Topic	Summations of data for selected groups of projects																			
Subject	Does the addition of project costs in the PW_MS give you the information that you want on the cashflow performance of a group of projects i.e., the RAS Graphics Reports or other Graphics Reports?																			
Q.3.2.3	Response														Distribution Statistics					
Sample Sector	Nos	% o/a	No '5'	% '5'	No '4'	% '4'	No '3'	% '3'	No '2'	% '2'	No '1'	% '1'	No 'n/u'	% 'n/u'	H	L	Median	Mode	Mean	SD
All	159	69%	na	na	na	na	1	1%	17	11%	3	2%	136	86%	3	1	2	2	1.90	0.44
HQ & PGM	46	73%	na	na	na	na	0	0%	9	20%	1	2%	36	78%	2	1	2	2	1.90	0.32
PJM	113	67%	na	na	na	na	1	1%	8	7%	2	2%	100	88%	3	1	2	2	1.91	0.54

Q.3.2.4 Is an open question, please refer to Section 7.6.3.2

Part	Part 3 Use of the PW_MS in the management of Groups of Category C, B, and A PWP projects																			
Topic	Progress performance measurement																			
Subject	Does the comparison of baseline dates vs forecast dates and actual dates in the 'Milestone Variance Report', give you the timing information that you want on the performance of the projects in a group that you select?																			
Q.3.3.1	Response														Distribution Statistics					
Sample Sector	Nos	% o/a	No '5'	% '5'	No '4'	% '4'	No '3'	% '3'	No '2'	% '2'	No '1'	% '1'	No 'n/u'	% 'n/u'	H	L	Median	Mode	Mean	SD
All	159	69%	na	na	na	na	0	0%	45	28%	5	3%	109	69%	2	1	2	2	1.90	0.30
HQ & PGM	46	73%	na	na	na	na	0	0%	14	30%	3	7%	29	63%	2	1	2	2	1.82	0.39
PJM	113	67%	na	na	na	na	0	0%	31	27%	2	2%	80	71%	2	1	2	2	1.94	0.24

Q.3.3.2 Is an open question, please refer to Section 7.6.3.3

Part	Part 3 Use of the PW_MS in the management of Groups of Category C, B, and A PWP projects																			
Topic	Progress performance measurement																			
Subject	for WBS, OBS, CRS, FRS Rollup-Data' give you the information that you want on the spending performance of a group of projects that you select?																			
Q.3.3.3	Response														Distribution Statistics					
Sample Sector	Nos	% o/a	No '5'	% '5'	No '4'	% '4'	No '3'	% '3'	No '2'	% '2'	No '1'	% '1'	No 'n/u'	% 'n/u'	H	L	Median	Mode	Mean	SD
All	159	69%	na	na	na	na	0	0%	25	16%	2	1%	132	83%	2	1	2	2	1.93	0.27
HQ & PGM	46	73%	na	na	na	na	0	0%	10	22%	2	4%	34	74%	2	1	2	2	1.83	0.39
PJM	113	67%	na	na	na	na	0	0%	15	13%	0	0%	98	87%	2	2	2	2	2.00	0.00

Q.3.3.4 Is an open question, please refer to Section 7.6.3.3

Part	Part 3 Use of the PW_MS in the management of Groups of Category C, B, and A PWP projects																			
Topic	Progress performance measurement																			
Subject	s the PW_MS provide enough cost and time data/information to identify the poorly performing projects within a group of projects that you select?																			
Q.3.3.5	Response														Distribution Statistics					
Sample Sector	Nos	% o/a	No '5'	% '5'	No '4'	% '4'	No '3'	% '3'	No '2'	% '2'	No '1'	% '1'	No 'n/u'	% 'n/u'	H	L	Median	Mode	Mean	SD
All	157	68%	na	na	na	na	1	1%	28	18%	5	3%	121	77%	4	1	2	2	1.94	0.54
HQ & PGM	45	71%	na	na	na	na	0	0%	12	27%	4	9%	28	62%	2	1	2	2	1.75	0.45
PJM	112	67%	na	na	na	na	1	1%	16	14%	1	1%	93	83%	4	1	2	2	2.11	0.57

Q.3.3.6 Is an open question, please refer to Section 7.6.3.3

Part	Part 3 Use of the PW_MS in the management of Groups of Category C, B, and A PWP projects																			
Topic	Progress performance measurement																			
Subject	Does the PW_MS provide enough data/information in the project diary and used in the Quarterly Reports to help manage a group of projects?																			
Q.3.3.7	Response														Distribution Statistics					
Sample Sector	Nos	% o/a	No '5'	% '5'	No '4'	% '4'	No '3'	% '3'	No '2'	% '2'	No '1'	% '1'	No 'n/u'	% 'n/u'	H	L	Median	Mode	Mean	SD
All	157	68%	na	na	na	na	6	4%	35	22%	0	0%	114	73%	4	2	2	2	2.19	0.45
HQ & PGM	45	71%	na	na	na	na	3	7%	16	36%	0	0%	25	56%	3	2	2	2	2.16	0.37
PJM	112	67%	na	na	na	na	3	3%	19	17%	0	0%	89	79%	4	2	2	2	2.22	0.52

Q.3.3.8 Is an open question, please refer to Section 7.6.3.3

Part	Part 4 'Non-PW_MS methods used for the management of Category C, B and A PWP projects																			
Topic	Project management functions - computer-based																			
Subject	Do you use 'Non-PW_MS' computer-based systems to record/process project data for project management purposes for records of staff resources																			
Q.4.1.1.a	Response														Distribution Statistics					
Sample Sector	Nos	% o/a	No '5'	% '5'	No '4'	% '4'	No '3'	% '3'	No '2'	% '2'	No '1'	% '1'	No 'n/u'	% 'n/u'	H	L	Median	Mode	Mean	SD
All	157	68%	na	na	30	19%	6	4%	22	14%	28	18%	71	45%	4	1	2	4	2.44	1.27
HQ & PGM	45	71%	na	na	13	29%	2	4%	4	9%	7	16%	19	42%	4	1	3.5	4	2.81	1.33
PJM	112	67%	na	na	17	15%	4	4%	18	16%	21	19%	52	46%	4	1	2	1	2.28	1.22

Part	Part 4 'Non-PW_MS methods used for the management of Category C, B and A PWP projects																			
Topic	Project management functions - computer-based																			
Subject	Do you use 'Non-PW_MS' computer-based systems to record/process project data for project management purposes for records of project contacts																			
Q.4.1.1.b	Response														Distribution Statistics					
Sample Sector	Nos	% o/a	No '5'	% '5'	No '4'	% '4'	No '3'	% '3'	No '2'	% '2'	No '1'	% '1'	No 'n/u'	% 'n/u'	H	L	Median	Mode	Mean	SD
All	158	68%	na	na	51	32%	11	7%	25	16%	25	16%	46	29%	4	1	3	4	2.79	1.24
HQ & PGM	45	71%	na	na	17	38%	4	9%	7	16%	6	13%	11	24%	4	1	3.5	4	2.94	1.20
PJM	113	67%	na	na	34	30%	7	6%	18	16%	19	17%	35	31%	4	1	3	4	2.72	1.26

Part	Part 4 'Non-PW_MS methods used for the management of Category C, B and A PWP projects																			
Topic	Project management functions - computer-based																			
Subject	Do you use 'Non-PW_MS' computer-based systems to record/process project data for project management purposes for records of project scope																			
Q.4.1.1.c	Response														Distribution Statistics					
Sample Sector	Nos	% o/a	No '5'	% '5'	No '4'	% '4'	No '3'	% '3'	No '2'	% '2'	No '1'	% '1'	No 'n/u'	% 'n/u'	H	L	Median	Mode	Mean	SD
All	158	68%	na	na	39	25%	8	5%	21	13%	41	26%	49	31%	4	1	2	1	2.41	1.31
HQ & PGM	45	71%	na	na	14	31%	2	4%	5	11%	11	24%	13	29%	4	1	2.5	4	2.59	1.36
PJM	113	67%	na	na	25	22%	6	5%	16	14%	30	27%	36	32%	4	1	2	1	2.34	1.29

Part	Part 4 'Non-PW_MS methods used for the management of Category C, B and A PWP projects																			
Topic	Project management functions - computer-based																			
Subject	Do you use 'Non-PW_MS' computer-based systems to record/process project data for project management purposes for records of project dates																			
Q.4.1.1.d	Response														Distribution Statistics					
Sample Sector	Nos	% o/a	No '5'	% '5'	No '4'	% '4'	No '3'	% '3'	No '2'	% '2'	No '1'	% '1'	No 'n/u'	% 'n/u'	H	L	Median	Mode	Mean	SD
All	158	68%	na	na	56	35%	22	14%	26	16%	19	12%	35	22%	4	1	3	4	2.93	1.14
HQ & PGM	45	71%	na	na	17	38%	8	18%	5	11%	5	11%	10	22%	4	1	3	4	3.06	1.11
PJM	113	67%	na	na	39	35%	14	12%	21	19%	14	12%	25	22%	4	1	3	4	2.89	1.15

Part	Part 4 'Non-PW_MS methods used for the management of Category C, B and A PWP projects																			
Topic	Project management functions - computer-based																			
Subject	Do you use 'Non-PW_MS' computer-based systems to record/process project data for project management purposes for records of project costs																			
Q.4.1.1.e	Response														Distribution Statistics					
Sample Sector	Nos	% o/a	No '5'	% '5'	No '4'	% '4'	No '3'	% '3'	No '2'	% '2'	No '1'	% '1'	No 'n/u'	% 'n/u'	H	L	Median	Mode	Mean	SD
All	158	68%	na	na	63	40%	22	14%	26	16%	13	8%	34	22%	4	1	4	4	3.09	1.07
HQ & PGM	45	71%	na	na	19	42%	7	16%	7	16%	2	4%	10	22%	4	1	4	4	3.23	0.97
PJM	113	67%	na	na	44	39%	15	13%	19	17%	11	10%	24	21%	4	1	3	4	3.03	1.10

Part	Part 4 'Non-PW_MS methods used for the management of Category C, B and A PWP projects																			
Topic	Project management functions - computer-based																			
Subject	Do you use 'Non-PW_MS' computer-based systems to record/process project data for project management purposes for records of works contracts																			
Q.4.1.1.f	Response														Distribution Statistics					
Sample Sector	Nos	% o/a	No '5'	% '5'	No '4'	% '4'	No '3'	% '3'	No '2'	% '2'	No '1'	% '1'	No 'n/u'	% 'n/u'	H	L	Median	Mode	Mean	SD
All	158	68%	na	na	48	30%	20	13%	16	10%	26	16%	48	30%	4	1	3	4	2.82	1.23
HQ & PGM	45	71%	na	na	17	38%	5	11%	4	9%	8	18%	11	24%	4	1	3.5	4	2.91	1.26
PJM	113	67%	na	na	31	27%	15	13%	12	11%	18	16%	37	33%	4	1	3	4	2.78	1.22

Part	Part 4 'Non-PW_MS methods used for the management of Category C, B and A PWP projects																			
Topic	Project management functions - computer-based																			
Subject	Do you use 'Non-PW_MS' computer-based systems to record/process project data for project management purposes for records of project diary																			
Q.4.1.1.g	Response															Distribution Statistics				
Sample Sector	Nos	% o/a	No '5'	% '5'	No '4'	% '4'	No '3'	% '3'	No '2'	% '2'	No '1'	% '1'	No 'n/u'	% 'n/u'	H	L	Median	Mode	Mean	SD
All	158	68%	na	na	28	18%	10	6%	29	18%	42	27%	49	31%	4	1	2	1	2.22	1.21
HQ & PGM	45	71%			9	20%	4	9%	7	16%	12	27%	13	29%	4	1	2	1	2.31	1.26
PJM	113	67%	na	na	19	17%	6	5%	22	19%	30	27%	36	32%	4	1	2	1	2.18	1.20

Part	Part 4 'Non-PW_MS methods used for the management of Category C, B and A PWP projects																			
Topic	Project management functions - computer-based																			
Subject	o you use 'Non-PW_MS' computer-based systems to record/process project data for project management purposes for records of work scheduling/CPM																			
Q.4.1.1.h	Response														Distribution Statistics					
Sample Sector	Nos	% o/a	No '5'	% '5'	No '4'	% '4'	No '3'	% '3'	No '2'	% '2'	No '1'	% '1'	No 'n/u'	% 'n/u'	H	L	Median	Mode	Mean	SD
All	158	68%	na	na	41	26%	13	8%	30	19%	29	18%	44	28%	4	1	2	4	2.58	1.22
HQ & PGM	45	71%	na	na	14	31%	7	16%	3	7%	7	16%	14	31%	4	1	3	4	2.90	1.22
PJM	113	67%	na	na	27	24%	6	5%	27	24%	22	19%	30	27%	4	1	2	2	2.46	1.21

Part	Part 4 'Non-PW_MS methods used for the management of Category C, B and A PWP projects																			
Topic	Project management functions - computer-based																			
Subject	formation technology do you use for 'Non-PW_MS' systems that are used to record/process records of staff resources for project management purposes																			
Q.4.1.2.a	Response														Distribution Statistics					
Sample Sector	Nos	% o/a	No '5'	% '5'	No '4'	% '4'	No '3'	% '3'	No '2'	% '2'	No '1'	% '1'	No 'n/u'	% 'n/u'	H	L	Median	Mode	Mean	SD
All	155	67%	na	na	2	1%	33	21%	19	12%	100	65%	na	na	4	1	1	1	1.59	0.87
HQ & PGM	43	68%	na	na	1	2%	7	16%	7	16%	27	63%	na	na	4	1	1	1	1.57	0.86
PJM	112	67%	na	na	1	1%	26	23%	12	11%	73	65%	na	na	4	1	1	1	1.60	0.87

Part	Part 4 'Non-PW_MS methods used for the management of Category C, B and A PWP projects																			
Topic	Project management functions - computer-based																			
Subject	Formation technology do you use for 'Non-PW_MS' systems that are used to record/process records of project contacts for project management purposes																			
Q.4.1.2.b	Response														Distribution Statistics					
Sample Sector	Nos	% o/a	No '5'	% '5'	No '4'	% '4'	No '3'	% '3'	No '2'	% '2'	No '1'	% '1'	No 'n/u'	% 'n/u'	H	L	Median	Mode	Mean	SD
All	155	67%	na	na	24	15%	44	28%	11	7%	76	49%	na	na	4	1	2	1	2.10	1.18
HQ & PGM	43	68%	na	na	7	16%	14	33%	3	7%	19	44%	na	na	4	1	2	1	2.21	1.19
PJM	112	67%	na	na	17	15%	30	27%	8	7%	57	51%	na	na	4	1	1	1	2.06	1.18

Part	Part 4 'Non-PW_MS methods used for the management of Category C, B and A PWP projects																			
Topic	Project management functions - computer-based																			
Subject	Information technology do you use for 'Non-PW_MS' systems that are used to record/process records of project scope for project management purposes																			
Q.4.1.2.c	Response														Distribution Statistics					
Sample Sector	Nos	% o/a	No '5'	% '5'	No '4'	% '4'	No '3'	% '3'	No '2'	% '2'	No '1'	% '1'	No 'n/u'	% 'n/u'	H	L	Median	Mode	Mean	SD
All	155	67%	na	na	19	12%	24	15%	13	8%	99	64%	na	na	4	1	1	1	1.76	1.11
HQ & PGM	43	68%	na	na	6	14%	7	16%	2	5%	28	65%	na	na	4	1	1	1	1.79	1.17
PJM	112	67%	na	na	13	12%	17	15%	11	10%	71	63%	na	na	4	1	1	1	1.75	1.09

Part	Part 4 'Non-PW_MS methods used for the management of Category C, B and A PWP projects																			
Topic	Project management functions - computer-based																			
Subject	What information technology do you use for 'Non-PW_MS' systems that are used to record/process project dates for project management purposes?																			
Q.4.1.2.d	Response															Distribution Statistics				
Sample Sector	Nos	% o/a	No '5'	% '5'	No '4'	% '4'	No '3'	% '3'	No '2'	% '2'	No '1'	% '1'	No 'n/u'	% 'n/u'	H	L	Median	Mode	Mean	SD
All	151	65%	na	na	27	18%	43	28%	28	19%	53	35%	na	na	4	1	2	1	2.29	1.13
HQ & PGM	43	68%	na	na	10	23%	10	23%	8	19%	15	35%	na	na	4	1	2	1	2.35	1.19
PJM	108	64%	na	na	17	16%	33	31%	20	19%	38	35%	na	na	4	1	2	1	2.27	1.11

Part	Part 4 'Non-PW_MS methods used for the management of Category C, B and A PWP projects																			
Topic	Project management functions - computer-based																			
Subject	What information technology do you use for 'Non-PW_MS' systems that are used to record/process project costs for project management purposes?																			
Q.4.1.2.e	Response														Distribution Statistics					
Sample Sector	Nos	% o/a	No '5'	% '5'	No '4'	% '4'	No '3'	% '3'	No '2'	% '2'	No '1'	% '1'	No 'n/u'	% 'n/u'	H	L	Median	Mode	Mean	SD
All	153	66%	na	na	26	17%	73	48%	9	6%	45	29%	na	na	4	1	3	3	2.52	1.09
HQ & PGM	42	67%	na	na	9	21%	20	48%	2	5%	11	26%	na	na	4	1	3	3	2.64	1.10
PJM	111	66%	na	na	17	15%	53	48%	7	6%	34	31%	na	na	4	1	3	3	2.48	1.09

Part	Part 4 'Non-PW_MS methods used for the management of Category C, B and A PWP projects																			
Topic	Project management functions - computer-based																			
Subject	What information technology do you use for 'Non-PW_MS' systems that are used to record/process works contracts for project management purposes?																			
Q.4.1.2.f	Response														Distribution Statistics					
Sample Sector	Nos	% o/a	No '5'	% '5'	No '4'	% '4'	No '3'	% '3'	No '2'	% '2'	No '1'	% '1'	No 'n/u'	% 'n/u'	H	L	Median	Mode	Mean	SD
All	154	67%	na	na	25	16%	42	27%	12	8%	75	49%	na	na	4	1	2	1	2.11	1.19
HQ & PGM	43	68%	na	na	8	19%	14	33%	2	5%	19	44%	na	na	4	1	3	1	2.26	1.22
PJM	111	66%	na	na	17	15%	28	25%	10	9%	56	50%	na	na	4	1	1	1	2.05	1.17

Part	Part 4 'Non-PW_MS methods used for the management of Category C, B and A PWP projects																			
Topic	Project management functions - computer-based																			
Subject	information technology do you use for 'Non-PW_MS' systems that are used to record/process records of project diary for project management purposes?																			
Q.4.1.2.g	Response														Distribution Statistics					
Sample Sector	Nos	% o/a	No '5'	% '5'	No '4'	% '4'	No '3'	% '3'	No '2'	% '2'	No '1'	% '1'	No 'n/u'	% 'n/u'	H	L	Median	Mode	Mean	SD
All	151	65%	na	na	14	9%	23	15%	14	9%	100	66%	na	na	4	1	1	1	1.68	1.04
HQ & PGM	44	70%	na	na	3	7%	9	20%	3	7%	29	66%	na	na	4	1	1	1	1.68	1.03
PJM	107	64%	na	na	11	10%	14	13%	11	10%	71	66%	na	na	4	1	1	1	1.67	1.05

Part	Part 4 'Non-PW_MS methods used for the management of Category C, B and A PWP projects																			
Topic	Project management functions - computer-based																			
Subject	What information technology do you use for 'Non-PW_MS' systems that are used to record/process work scheduling/CPM for project management purpose?																			
Q.4.1.2.h	Response														Distribution Statistics					
Sample Sector	Nos	% o/a	No '5'	% '5'	No '4'	% '4'	No '3'	% '3'	No '2'	% '2'	No '1'	% '1'	No 'n/u'	% 'n/u'	H	L	Median	Mode	Mean	SD
All	152	66%	na	na	12	8%	23	15%	45	30%	72	47%	na	na	4	1	2	1	1.84	0.96
HQ & PGM	44	70%	na	na	3	7%	5	11%	12	27%	24	55%	na	na	4	1	1	1	1.70	0.93
PJM	108	64%	na	na	9	8%	18	17%	33	31%	48	44%	na	na	4	1	2	1	1.89	0.97

Part	Part 4 'Non-PW_MS methods used for the management of Category C, B and A PWP projects																			
Topic	Project management functions - manual methods																			
Subject	Do you use manual record systems to record/process the records of staff resources for project management purposes?																			
Q.4.2.1.a	Response														Distribution Statistics					
Sample Sector	Nos	% o/a	No '5'	% '5'	No '4'	% '4'	No '3'	% '3'	No '2'	% '2'	No '1'	% '1'	No 'n/u'	% 'n/u'	H	L	Median	Mode	Mean	SD
All	158	68%	na	na	4	3%	24	15%	36	23%	23	15%	68	43%	4	1	2	2	2.10	0.85
HQ & PGM	45	71%	na	na	4	9%	5	11%	7	16%	9	20%	20	44%	4	1	2	1	2.16	1.11
PJM	113	67%	na	na	0	0%	19	17%	29	26%	14	12%	48	42%	3	1	2	2	2.08	0.73

Part	Part 4 'Non-PW_MS methods used for the management of Category C, B and A PWP projects																			
Topic	Project management functions - computer-based																			
Subject	Do you use manual record systems to record/process the records of project contacts for project management purposes?																			
Q.4.2.1.b	Response														Distribution Statistics					
Sample Sector	Nos	% o/a	No '5'	% '5'	No '4'	% '4'	No '3'	% '3'	No '2'	% '2'	No '1'	% '1'	No 'n/u'	% 'n/u'	H	L	Median	Mode	Mean	SD
All	157	68%	na	na	8	5%	38	24%	51	32%	19	12%	41	26%	4	1	2	2	2.30	0.83
HQ & PGM	45	71%	na	na	4	9%	5	11%	10	22%	11	24%	15	33%	4	1	2	1	2.07	1.05
PJM	112	67%	na	na	4	4%	33	29%	41	37%	8	7%	26	23%	4	1	2	2	2.38	0.72

Part	Part 4 'Non-PW_MS methods used for the management of Category C, B and A PWP projects																			
Topic	Project management functions - computer-based																			
Subject	Do you use manual record systems to record/process the records of project scope for project management purposes?																			
Q.4.2.1.c	Response														Distribution Statistics					
Sample Sector	Nos	% o/a	No '5'	% '5'	No '4'	% '4'	No '3'	% '3'	No '2'	% '2'	No '1'	% '1'	No 'n/u'	% 'n/u'	H	L	Median	Mode	Mean	SD
All	156	68%	na	na	10	6%	36	23%	51	33%	20	13%	39	25%	4	1	2	2	2.31	0.86
HQ & PGM	45	71%	na	na	6	13%	5	11%	10	22%	8	18%	16	36%	4	1	2	2	2.31	1.11
PJM	111	66%	na	na	4	4%	31	28%	41	37%	12	11%	23	21%	4	1	2	2	2.31	0.76

Part	Part 4 'Non-PW_MS methods used for the management of Category C, B and A PWP projects																			
Topic	Project management functions - computer-based																			
Subject	Do you use manual record systems to record/process the records of project dates for project management purposes?																			
Q.4.2.1.d	Response														Distribution Statistics					
Sample Sector	Nos	% o/a	No '5'	% '5'	No '4'	% '4'	No '3'	% '3'	No '2'	% '2'	No '1'	% '1'	No 'n/u'	% 'n/u'	H	L	Median	Mode	Mean	SD
All	155	67%	na	na	8	5%	30	19%	56	36%	24	15%	37	24%	4	1	2	2	2.19	0.84
HQ & PGM	45	71%	na	na	4	9%	1	2%	11	24%	12	27%	17	38%	4	1	2	1	1.89	1.03
PJM	110	65%	na	na	4	4%	29	26%	45	41%	12	11%	20	18%	4	1	2	2	2.28	0.75

Part	Part 4 'Non-PW_MS methods used for the management of Category C, B and A PWP projects																			
Topic	Project management functions - computer-based																			
Subject	Do you use manual record systems to record/process the records of project costs for project management purposes?																			
Q.4.2.1.e	Response														Distribution Statistics					
Sample Sector	Nos	% o/a	No '5'	% '5'	No '4'	% '4'	No '3'	% '3'	No '2'	% '2'	No '1'	% '1'	No 'n/u'	% 'n/u'	H	L	Median	Mode	Mean	SD
All	156	68%	na	na	7	4%	33	21%	57	37%	24	15%	34	22%	4	1	2	2	2.19	0.82
HQ & PGM	45	71%	na	na	2	4%	3	7%	12	27%	11	24%	17	38%	4	1	2	2	1.86	0.89
PJM	111	66%	na	na	5	5%	30	27%	45	41%	13	12%	17	15%	4	1	2	2	2.29	0.77

Part	Part 4 'Non-PW_MS methods used for the management of Category C, B and A PWP projects																			
Topic	Project management functions - computer-based																			
Subject	Do you use manual record systems to record/process the records of works contracts for project management purposes?																			
Q.4.2.1.f	Response														Distribution Statistics					
Sample Sector	Nos	% o/a	No '5'	% '5'	No '4'	% '4'	No '3'	% '3'	No '2'	% '2'	No '1'	% '1'	No 'n/u'	% 'n/u'	H	L	Median	Mode	Mean	SD
All	155	67%	na	na	8	5%	31	20%	52	34%	20	13%	44	28%	4	1	2	2	2.24	0.83
HQ & PGM	44	70%	na	na	3	7%	6	14%	10	23%	9	20%	16	36%	4	1	2	2	2.11	0.99
PJM	111	66%	na	na	5	5%	25	23%	42	38%	11	10%	28	25%	4	1	2	2	2.29	0.77

Part	Part 4 'Non-PW_MS methods used for the management of Category C, B and A PWP projects																			
Topic	Project management functions - computer-based																			
Subject	Do you use manual record systems to record/process the records of project diary for project management purposes?																			
Q.4.2.1.g	Response														Distribution Statistics					
Sample Sector	Nos	% o/a	No '5'	% '5'	No '4'	% '4'	No '3'	% '3'	No '2'	% '2'	No '1'	% '1'	No 'n/u'	% 'n/u'	H	L	Median	Mode	Mean	SD
All	155	67%	na	na	5	3%	27	17%	51	33%	25	16%	47	30%	4	1	2	2	2.11	0.81
HQ & PGM	44	70%	na	na	2	5%	7	16%	8	18%	10	23%	17	39%	4	1	2	1	2.04	0.98
PJM	111	66%	na	na	3	3%	20	18%	43	39%	15	14%	30	27%	4	1	2	2	2.14	0.75

Part	Part 4 'Non-PW_MS methods used for the management of Category C, B and A PWP projects																			
Topic	Project management functions - computer-based																			
Subject	Do you use manual record systems to record/process the work-scheduling/CPM project data for project management purposes?																			
Q.4.2.1.h	Response														Distribution Statistics					
Sample Sector	Nos	% o/a	No '5'	% '5'	No '4'	% '4'	No '3'	% '3'	No '2'	% '2'	No '1'	% '1'	No 'n/u'	% 'n/u'	H	L	Median	Mode	Mean	SD
All	155	67%	na	na	3	2%	14	9%	46	30%	45	29%	47	30%	4	1	2	2	1.77	0.78
HQ & PGM	44	70%	na	na	0	0%	1	2%	9	20%	15	34%	19	43%	3	1	1	1	1.44	0.58
PJM	111	66%	na	na	3	3%	13	12%	37	33%	30	27%	28	25%	4	1	2	2	1.87	0.81

Part	Part 4 'Non-PW_MS methods used for the management of Category C, B and A PWP projects																			
Topic	Project management functions - manual methods																			
Subject	What manual record systems tare used o record/process the records of staff resources for project management purposes?																			
Q.4.2.2.a	Response														Distribution Statistics					
Sample Sector	Nos	% o/a	No '5'	% '5'	No '4'	% '4'	No '3'	% '3'	No '2'	% '2'	No '1'	% '1'	No 'n/u'	% 'n/u'	H	L	Median	Mode	Mean	SD
All	154	67%	20	13%	0	0%	40	26%	10	6%	83	54%	na	na	5	1	1	1	2.11	1.41
HQ & PGM	44	70%	8	18%	0	0%	8	18%	1	2%	26	59%	na	na	5	1	1	1	2.14	1.58
PJM	110	65%	12	11%	0	0%	32	29%	9	8%	57	52%	na	na	5	1	1	1	2.10	1.34

Part	Part 4 'Non-PW_MS methods used for the management of Category C, B and A PWP projects																			
Topic	Project management functions - computer-based																			
Subject	What manual record systems are used to record/process the records of project contacts for project management purposes?																			
Q.4.2.2.b	Response														Distribution Statistics					
Sample Sector	Nos	% o/a	No '5'	% '5'	No '4'	% '4'	No '3'	% '3'	No '2'	% '2'	No '1'	% '1'	No 'n/u'	% 'n/u'	H	L	Median	Mode	Mean	SD
All	155	67%	22	14%	7	5%	51	33%	24	15%	51	33%	na	na	5	1	3	1	2.52	1.36
HQ & PGM	45	71%	8	18%	2	4%	7	16%	5	11%	23	51%	na	na	5	1	1	1	2.27	1.56
PJM	110	65%	14	13%	5	5%	44	40%	19	17%	28	25%	na	na	5	1	3	3	2.62	1.27

Part	Part 4 'Non-PW_MS methods used for the management of Category C, B and A PWP projects																			
Topic	Project management functions - computer-based																			
Subject	What manual record systems are used to record/process the records of project scope for project management purposes?																			
Q.4.2.2.c	Response														Distribution Statistics					
Sample Sector	Nos	% o/a	No '5'	% '5'	No '4'	% '4'	No '3'	% '3'	No '2'	% '2'	No '1'	% '1'	No 'n/u'	% 'n/u'	H	L	Median	Mode	Mean	SD
All	153	66%	6	4%	3	2%	84	55%	11	7%	49	32%	na	na	5	1	3	3	2.39	1.08
HQ & PGM	45	71%	4	9%	0	0%	19	42%	0	0%	22	49%	na	na	5	1	3	1	2.20	1.31
PJM	108	64%	2	2%	3	3%	65	60%	11	10%	27	25%	na	na	5	1	3	3	2.46	0.96

Part	Part 4 'Non-PW_MS methods used for the management of Category C, B and A PWP projects																			
Topic	Project management functions - computer-based																			
Subject	What manual record systems are used to record/process the records of project dates for project management purposes?																			
Q.4.2.2.d	Response														Distribution Statistics					
Sample Sector	Nos	% o/a	No '5'	% '5'	No '4'	% '4'	No '3'	% '3'	No '2'	% '2'	No '1'	% '1'	No 'n/u'	% 'n/u'	H	L	Median	Mode	Mean	SD
All	155	67%	19	12%	4	3%	67	43%	12	8%	53	34%	na	na	5	1	3	3	2.51	1.32
HQ & PGM	45	71%	4	9%	0	0%	11	24%	3	7%	27	60%	na	na	5	1	1	1	1.91	1.29
PJM	110	65%	15	14%	4	4%	56	51%	9	8%	26	24%	na	na	5	1	3	3	2.75	1.25

Part	Part 4 'Non-PW_MS methods used for the management of Category C, B and A PWP projects																			
Topic	Project management functions - computer-based																			
Subject	What manual record systems are used to record/process the records of project costs for project management purposes?																			
Q.4.2.2.e	Response														Distribution Statistics					
Sample Sector	Nos	% o/a	No '5'	% '5'	No '4'	% '4'	No '3'	% '3'	No '2'	% '2'	No '1'	% '1'	No 'n/u'	% 'n/u'	H	L	Median	Mode	Mean	SD
All	154	67%	21	14%	2	1%	72	47%	10	6%	49	32%	na	na	5	1	3	3	2.58	1.32
HQ & PGM	45	71%	6	13%	0	0%	13	29%	3	7%	23	51%	na	na	5	1	1	1	2.18	1.42
PJM	109	65%	15	14%	2	2%	59	54%	7	6%	26	24%	na	na	5	1	3	3	2.75	1.24

Part	Part 4 'Non-PW_MS methods used for the management of Category C, B and A PWP projects																			
Topic	Project management functions - computer-based																			
Subject	What manual record systems are used to record/process the records of works contracts for project management purposes?																			
Q.4.2.2.f	Response														Distribution Statistics					
Sample Sector	Nos	% o/a	No '5'	% '5'	No '4'	% '4'	No '3'	% '3'	No '2'	% '2'	No '1'	% '1'	No 'n/u'	% 'n/u'	H	L	Median	Mode	Mean	SD
All	153	66%	14	9%	3	2%	74	48%	5	3%	57	37%	na	na	5	1	3	3	2.42	1.26
HQ & PGM	45	71%	4	9%	1	2%	15	33%	1	2%	24	53%	na	na	5	1	1	1	2.11	1.34
PJM	108	64%	10	9%	2	2%	59	55%	4	4%	33	31%	na	na	5	1	3	3	2.56	1.21

Part	Part 4 'Non-PW_MS methods used for the management of Category C, B and A PWP projects																			
Topic	Project management functions - computer-based																			
Subject	What manual record systems are used to record/process the records of project diary for project management purposes?																			
Q.4.2.2.g	Response														Distribution Statistics					
Sample Sector	Nos	% o/a	No '5'	% '5'	No '4'	% '4'	No '3'	% '3'	No '2'	% '2'	No '1'	% '1'	No 'n/u'	% 'n/u'	H	L	Median	Mode	Mean	SD
All	154	67%	8	5%	10	6%	61	40%	4	3%	71	46%	na	na	5	1	3	1	2.22	1.24
HQ & PGM	45	71%	4	9%	0	0%	12	27%	1	2%	28	62%	na	na	5	1	1	1	1.91	1.31
PJM	109	65%	4	4%	10	9%	49	45%	3	3%	43	39%	na	na	5	1	3	3	2.35	1.20

Part	Part 4 'Non-PW_MS methods used for the management of Category C, B and A PWP projects																			
Topic	Project management functions - computer-based																			
Subject	What manual record systems are used to record/process the work-scheduling/CPM project data for project management purposes?																			
Q.4.2.2.h	Response														Distribution Statistics					
Sample Sector	Nos	% o/a	No '5'	% '5'	No '4'	% '4'	No '3'	% '3'	No '2'	% '2'	No '1'	% '1'	No 'n/u'	% 'n/u'	H	L	Median	Mode	Mean	SD
All	155	67%	12	8%	0	0%	55	35%	12	8%	74	48%	na	na	5	1	2	1	2.11	1.24
HQ & PGM	45	71%	3	7%	0	0%	8	18%	3	7%	31	69%	na	na	5	1	1	1	1.69	1.18
PJM	110	65%	9	8%	0	0%	47	43%	9	8%	43	39%	na	na	5	1	3	3	2.29	1.23

Part	Part 4 'Non-PW_MS methods used for the management of Category C, B and A PWP projects																			
Topic	Management of groups of projects - computer-based functions																			
Subject	Do you use 'Non-PW_MS' computer-based systems Management Information Systems to record/process summary reports of progress project data for management of groups of projects?																			
Q.4.3.1.a	Response														Distribution Statistics					
Sample Sector	Nos	% o/a	No '5'	% '5'	No '4'	% '4'	No '3'	% '3'	No '2'	% '2'	No '1'	% '1'	No 'n/u'	% 'n/u'	H	L	Median	Mode	Mean	SD
All	157	68%	na	na	19	12%	5	3%	11	7%	22	14%	100	64%	4	1	2	1	2.37	1.30
HQ & PGM	45	71%	na	na	9	20%	0	0%	4	9%	9	20%	23	51%	4	1	2	4	2.41	1.40
PJM	112	67%	na	na	10	9%	5	4%	7	6%	13	12%	77	69%	4	1	2	1	2.34	1.26

Part	Part 4 'Non-PW_MS methods used for the management of Category C, B and A PWP projects																			
Topic	Management of groups of projects - computer-based functions																			
Subject	Do you use 'Non-PW_MS' computer-based systems Management Information Systems to record/process lists of groups of projects project data for management of groups of projects?																			
Q.4.3.1.b	Response														Distribution Statistics					
Sample Sector	Nos	% o/a	No '5'	% '5'	No '4'	% '4'	No '3'	% '3'	No '2'	% '2'	No '1'	% '1'	No 'n/u'	% 'n/u'	H	L	Median	Mode	Mean	SD
All	157	68%	na	na	22	14%	7	4%	10	6%	18	11%	100	64%	4	1	3	4	2.58	1.29
HQ & PGM	45	71%	na	na	11	24%	1	2%	3	7%	8	18%	22	49%	4	1	3	4	2.65	1.40
PJM	112	67%	na	na	11	10%	6	5%	7	6%	10	9%	78	70%	4	1	2.5	4	2.53	1.24

Part	Part 4 'Non-PW_MS methods used for the management of Category C, B and A PWP projects																			
Topic	Management of groups of projects - computer-based functions																			
Subject	'Non-PW_MS' computer-based systems Management Information Systems to record/process exception reports project data for management of groups of projects																			
Q.4.3.1.c	Response														Distribution Statistics					
Sample Sector	Nos	% o/a	No '5'	% '5'	No '4'	% '4'	No '3'	% '3'	No '2'	% '2'	No '1'	% '1'	No 'n/u'	% 'n/u'	H	L	Median	Mode	Mean	SD
All	157	68%	na	na	17	11%	7	4%	10	6%	17	11%	106	68%	4	1	2	4	2.47	1.27
HQ & PGM	45	71%	na	na	9	20%	2	4%	2	4%	7	16%	25	56%	4	1	3	4	2.65	1.39
PJM	112	67%	na	na	8	7%	5	4%	8	7%	10	9%	81	72%	4	1	2	1	2.35	1.20

Part	Part 4 'Non-PW_MS methods used for the management of Category C, B and A PWP projects																			
Topic	Management of groups of projects - computer-based functions																			
Subject	'Non-PW_MS' computer-based systems Management Information Systems to record/process progress reports project data for management of groups of projects																			
Q.4.3.1.d	Response														Distribution Statistics					
Sample Sector	Nos	% o/a	No '5'	% '5'	No '4'	% '4'	No '3'	% '3'	No '2'	% '2'	No '1'	% '1'	No 'n/u'	% 'n/u'	H	L	Median	Mode	Mean	SD
All	155	67%	na	na	21	14%	8	5%	13	8%	15	10%	97	63%	4	1	3	4	2.61	1.24
HQ & PGM	45	71%	na	na	9	20%	1	2%	5	11%	5	11%	25	56%	4	1	2.5	4	2.70	1.30
PJM	110	65%	na	na	12	11%	7	6%	8	7%	10	9%	72	65%	4	1	3	4	2.57	1.21

Part	Part 4 'Non-PW_MS methods used for the management of Category C, B and A PWP projects																			
Topic	Management of groups of projects - computer-based functions																			
Subject	What information technology do you use for 'Non-PW_MS' Management Information Systems that are used to record/process summary reports of progress for management of groups of projects?																			
Q.4.3.2.a	Response														Distribution Statistics					
Sample Sector	Nos	% o/a	No '5'	% '5'	No '4'	% '4'	No '3'	% '3'	No '2'	% '2'	No '1'	% '1'	No 'n/u'	% 'n/u'	H	L	Median	Mode	Mean	SD
All	154	67%	na	na	14	9%	15	10%	6	4%	119	77%	na	na	4	1	1	1	1.51	1.00
HQ & PGM	45	71%	na	na	7	16%	5	11%	2	4%	31	69%	na	na	4	1	1	1	1.73	1.18
PJM	109	65%	na	na	7	6%	10	9%	4	4%	88	81%	na	na	4	1	1	1	1.41	0.90

Part	Part 4 'Non-PW_MS methods used for the management of Category C, B and A PWP projects																			
Topic	Management of groups of projects - computer-based functions																			
Subject	What information technology do you use for 'Non-PW_MS' Management Information Systems that are used to record/process lists of groups of projects for management of groups of projects?																			
Q.4.3.2.b	Response														Distribution Statistics					
Sample Sector	Nos	% o/a	No '5'	% '5'	No '4'	% '4'	No '3'	% '3'	No '2'	% '2'	No '1'	% '1'	No 'n/u'	% 'n/u'	H	L	Median	Mode	Mean	SD
All	156	68%	na	na	16	10%	20	13%	6	4%	114	73%	na	na	4	1	1	1	1.60	1.06
HQ & PGM	45	71%	na	na	9	20%	8	18%	1	2%	27	60%	na	na	4	1	1	1	1.98	1.27
PJM	111	66%	na	na	7	6%	12	11%	5	5%	87	78%	na	na	4	1	1	1	1.45	0.92

Part	Part 4 'Non-PW_MS methods used for the management of Category C, B and A PWP projects																			
Topic	Management of groups of projects - computer-based functions																			
Subject	What information technology do you use for 'Non-PW_MS' Management Information Systems that are used to record/process exception reports for management of groups of projects?																			
Q.4.3.2.c	Response														Distribution Statistics					
Sample Sector	Nos	% o/a	No '5'	% '5'	No '4'	% '4'	No '3'	% '3'	No '2'	% '2'	No '1'	% '1'	No 'n/u'	% 'n/u'	H	L	Median	Mode	Mean	SD
All	156	68%	na	na	10	6%	12	8%	7	4%	127	81%	na	na	4	1	1	1	1.39	0.88
HQ & PGM	45	71%	na	na	5	11%	7	16%	2	4%	31	69%	na	na	4	1	1	1	1.69	1.10
PJM	111	66%	na	na	5	5%	5	5%	5	5%	96	86%	na	na	4	1	1	1	1.27	0.75

Part	Part 4 'Non-PW_MS methods used for the management of Category C, B and A PWP projects																			
Topic	Management of groups of projects - computer-based functions																			
Subject	What information technology do you use for 'Non-PW_MS' Management Information Systems that are used to record/process progress reports for management of groups of projects?																			
Q.4.3.2.d	Response														Distribution Statistics					
Sample Sector	Nos	% o/a	No '5'	% '5'	No '4'	% '4'	No '3'	% '3'	No '2'	% '2'	No '1'	% '1'	No 'n/u'	% 'n/u'	H	L	Median	Mode	Mean	SD
All	155	67%	na	na	16	10%	14	9%	14	9%	111	72%	na	na	4	1	1	1	1.58	1.02
HQ & PGM	45	71%	na	na	7	16%	6	13%	3	7%	29	64%	na	na	4	1	1	1	1.80	1.18
PJM	110	65%	na	na	9	8%	8	7%	11	10%	82	75%	na	na	4	1	1	1	1.49	0.95

Part	Part 4 'Non-PW_MS methods used for the management of Category C, B and A PWP projects																			
Topic	Management of groups of projects - manual methods																			
Subject	Do you use manual methods for 'Non-PW_MS' Management Information Systems that are used to record/process summary reports of progress for management of groups of projects?																			
Q.4.4.1.a	Response														Distribution Statistics					
Sample Sector	Nos	% o/a	No '5'	% '5'	No '4'	% '4'	No '3'	% '3'	No '2'	% '2'	No '1'	% '1'	No 'n/u'	% 'n/u'	H	L	Median	Mode	Mean	SD
All	156	68%	na	na	11	7%	9	6%	20	13%	15	10%	101	65%	4	1	2	2	2.29	1.08
HQ & PGM	45	71%	na	na	3	7%	1	2%	6	13%	11	24%	24	53%	4	1	1	1	1.81	1.08
PJM	111	66%	na	na	8	7%	8	7%	14	13%	4	4%	77	69%	4	1	2	2	2.59	0.99

Part	Part 4 'Non-PW_MS methods used for the management of Category C, B and A PWP projects																			
Topic	Management of groups of projects - manual methods																			
Subject	management of groups of projects?																			
Q.4.4.1.b	Response														Distribution Statistics					
Sample Sector	Nos	% o/a	No '5'	% '5'	No '4'	% '4'	No '3'	% '3'	No '2'	% '2'	No '1'	% '1'	No 'n/u'	% 'n/u'	H	L	Median	Mode	Mean	SD
All	156	68%	na	na	8	5%	7	4%	24	15%	15	10%	102	65%	4	1	2	2	2.15	1.00
HQ & PGM	45	71%	na	na	3	7%	1	2%	6	13%	11	24%	24	53%	4	1	1	1	1.81	1.08
PJM	111	66%	na	na	5	5%	6	5%	18	16%	4	4%	78	70%	4	1	2	2	2.36	0.90

Part	Part 4 'Non-PW_MS methods used for the management of Category C, B and A PWP projects																			
Topic	Management of groups of projects - manual methods																			
Subject	manual methods for 'Non-PW_MS' Management Information Systems that are used to record/process exception reports for management of groups of																			
Q.4.4.1.c	Response														Distribution Statistics					
Sample Sector	Nos	% o/a	No '5'	% '5'	No '4'	% '4'	No '3'	% '3'	No '2'	% '2'	No '1'	% '1'	No 'n/u'	% 'n/u'	H	L	Median	Mode	Mean	SD
All	155	67%	na	na	5	3%	5	3%	17	11%	19	12%	107	69%	4	1	2	1	1.91	0.98
HQ & PGM	45	71%	na	na	1	2%	1	2%	6	13%	12	27%	25	56%	4	1	1	1	1.55	0.83
PJM	110	65%	na	na	4	4%	4	4%	11	10%	7	6%	82	75%	4	1	2	2	2.19	1.02

Part	Part 4 'Non-PW_MS methods used for the management of Category C, B and A PWP projects																			
Topic	Management of groups of projects - manual methods																			
Subject	e manual methods for 'Non-PW_MS' Management Information Systems that are used to record/process progress reports for management of groups of p																			
Q.4.4.1.d	Response														Distribution Statistics					
Sample Sector	Nos	% o/a	No '5'	% '5'	No '4'	% '4'	No '3'	% '3'	No '2'	% '2'	No '1'	% '1'	No 'n/u'	% 'n/u'	H	L	Median	Mode	Mean	SD
All	155	67%	na	na	10	6%	12	8%	20	13%	13	8%	100	65%	4	1	2	2	2.35	1.04
HQ & PGM	45	71%	na	na	3	7%	1	2%	6	13%	9	20%	26	58%	4	1	2	1	1.89	1.10
PJM	110	65%	na	na	7	6%	11	10%	14	13%	4	4%	74	67%	4	1	2.5	2	2.58	0.94

Part	Part 4 'Non-PW_MS methods used for the management of Category C, B and A PWP projects																			
Topic	Management of groups of projects - manual methods																			
Subject	What manual methods do you use for 'Non-PW_MS' Management Information Systems that are used to record/process summary reports of progress for management of groups of projects?																			
Q.4.4.2.a	Response														Distribution Statistics					
Sample Sector	Nos	% o/a	No '5'	% '5'	No '4'	% '4'	No '3'	% '3'	No '2'	% '2'	No '1'	% '1'	No 'n/u'	% 'n/u'	H	L	Median	Mode	Mean	SD
All	153	66%	4	3%	1	1%	31	20%	6	4%	111	73%	na	na	5	1	1	1	1.57	1.01
HQ & PGM	45	71%	3	7%	1	2%	7	16%	1	2%	33	73%	na	na	5	1	1	1	1.67	1.22
PJM	108	64%	1	1%	0	0%	24	22%	5	5%	78	72%	na	na	5	1	1	1	1.53	0.90

Part	Part 4 'Non-PW_MS methods used for the management of Category C, B and A PWP projects																			
Topic	Management of groups of projects - manual methods																			
Subject	What manual methods do you use for 'Non-PW_MS' Management Information Systems that are used to record/process lists of groups of projects for management of groups of projects?																			
Q.4.4.2.b	Response														Distribution Statistics					
Sample Sector	Nos	% o/a	No '5'	% '5'	No '4'	% '4'	No '3'	% '3'	No '2'	% '2'	No '1'	% '1'	No 'n/u'	% 'n/u'	H	L	Median	Mode	Mean	SD
All	153	66%	6	4%	1	1%	27	18%	6	4%	113	74%	na	na	5	1	1	1	1.57	1.06
HQ & PGM	45	71%	3	7%	1	2%	7	16%	1	2%	33	73%	na	na	5	1	1	1	1.67	1.22
PJM	108	64%	3	3%	0	0%	20	19%	5	5%	80	74%	na	na	5	1	1	1	1.53	0.98

Part	Part 4 'Non-PW_MS methods used for the management of Category C, B and A PWP projects																			
Topic	Management of groups of projects - manual methods																			
Subject	What manual methods do you use for 'Non-PW_MS' Management Information Systems that are used to record/process exception reports for management of groups of projects?																			
Q.4.4.2.c	Response														Distribution Statistics					
Sample Sector	Nos	% o/a	No '5'	% '5'	No '4'	% '4'	No '3'	% '3'	No '2'	% '2'	No '1'	% '1'	No 'n/u'	% 'n/u'	H	L	Median	Mode	Mean	SD
All	152	66%	3	2%	1	1%	24	16%	5	3%	119	78%	na	na	5	1	1	1	1.45	0.92
HQ & PGM	45	71%	2	4%	1	2%	7	16%	1	2%	34	76%	na	na	5	1	1	1	1.58	1.12
PJM	107	64%	1	1%	0	0%	17	16%	4	4%	85	79%	na	na	5	1	1	1	1.39	0.82

Part	Part 4 'Non-PW_MS methods used for the management of Category C, B and A PWP projects																			
Topic	Management of groups of projects - manual methods																			
Subject	methods do you use for 'Non-PW_MS' Management Information Systems that are used to record/process progress reports for management of groups of projects?																			
Q.4.4.2.d	Response														Distribution Statistics					
Sample Sector	Nos	% o/a	No '5'	% '5'	No '4'	% '4'	No '3'	% '3'	No '2'	% '2'	No '1'	% '1'	No 'n/u'	% 'n/u'	H	L	Median	Mode	Mean	SD
All	153	66%	8	5%	1	1%	31	20%	4	3%	109	71%	na	na	5	1	1	1	1.66	1.14
HQ & PGM	45	71%	3	7%	1	2%	8	18%	1	2%	32	71%	na	na	5	1	1	1	1.71	1.24
PJM	108	64%	5	5%	0	0%	23	21%	3	3%	77	71%	na	na	5	1	1	1	1.64	1.11

8.6 Summary of response to ‘open-ended’ questions – taken from ‘Appendices-datafile.xls’.

Please refer to the following pages.

Appendices, Chapter 8, Section 8.6.

**Tabulated statistical attributes of the analysis in terms of strata of the population sample
open ended questions**

Part	Part 1 Improving the PW_MS				
Topic	Resource Management				
Subject	What should be done to the PW_MS to better satisfy traditional aspects of project management?				
Q.1.1.3	Respondents		Nos suggested amendments		
Sample Sector	Nos	% Pop. sample	Change	Add	Delete
All	60	26%	66	45	14
HQ & PGM	22	35%	27	21	3
PJM	38	23%	39	24	11

Part	Part 1 Improving the PW_MS				
Topic	Resource Management				
Subject	What should be included in a staff resources element of the PW_MS to provide				
Q.1.2.2	Respondents		Nos suggested amendments		
Sample Sector	Nos	% Pop. sample	Change	Add	Delete
All	18	8%	na	na	na
HQ & PGM	12	19%	na	na	na
PJM	6	4%	na	na	na

Part	Part 1 Improving the PW_MS				
Topic	Effort in data capture and data entry				
Subject	What should be done to the PW_MS to better satisfy minimum effort for data capture and for data entry?				
Q.1.3.4	Respondents		Nos suggested amendments		
Sample Sector	Nos	% Pop. sample	Change	Add	Delete
All	47	20%	36	35	14
HQ & PGM	16	25%	13	12	11
PJM	31	18%	23	23	3

Part	Part 1 Improving the PW_MS				
Topic	Added value from the PW_MS				
Subject	What should be done to the PW_MS to make it more useful?				
Q.1.4.3	Respondents		Nos suggested amendments		
Sample Sector	Nos	% Pop. sample	Change	Add	Delete
All	41	18%	19	35	12
HQ & PGM	15	24%	7	15	4
PJM	26	15%	12	20	8

Part	Part 1 Improving the PW_MS				
Topic	Report writing and output				
Subject	What should be done to the PW_MS to better satisfy reports/supply of data?				
Q.1.5.3	Respondents		Nos suggested amendments		
Sample Sector	Nos	% Pop. sample	Change	Add	Delete
All	23	10%	10	18	2
HQ & PGM	13	21%	5	12	2
PJM	10	6%	5	6	0

Part	Part 1 Improving the PW_MS				
Topic	Centralised, single source of data				
Subject	What should be done to the PW_MS to make it better as a centralised, single source of PWP data/information?				
Q.1.6.2	Respondents		Nos suggested amendments		
Sample Sector	Nos	% Pop. sample	Change	Add	Delete
All	22	10%	9	18	2
HQ & PGM	11	17%	1	15	1
PJM	11	7%	8	3	1

Part	Part 1 Improving the PW_MS				
Topic	Effectiveness of the PW_MS				
Subject	What should be done to the PW_MS to better satisfy the management of groups				
Q.1.7.2	Respondents		Nos suggested amendments		
Sample Sector	Nos	% Pop. sample	Change	Add	Delete
All	9	4%	4	6	0
HQ & PGM	6	10%	2	5	0
PJM	3	2%	2	1	0

Part	Part 1 Improving the PW_MS				
Topic	Using the PW_MS				
Subject	What should be done to the PW_MS to better satisfy the management of groups				
Q.1.8.3	Respondents		Nos suggested amendments		
Sample Sector	Nos	% Pop. sample	Change	Add	Delete
All	30	13%	21	15	1
HQ & PGM	12	19%	11	5	0
PJM	18	11%	10	10	1

Part	Part 2 Use of the PW_MS for management of Category C, B, and A PWP projects				
Topic	Project register, diary and contacts				
Subject	What should be done to the project register to better satisfy project information needs?				
Q.2.1.2	Respondents		Nos suggested amendments		
Sample Sector	Nos	% Pop. sample	Change	Add	Delete
All	15	6%	8	6	5
HQ & PGM	6	10%	1	1	4
PJM	9	5%	7	5	1

Part	Part 2 Use of the PW_MS for management of Category C, B, and A PWP projects				
Topic	Project register, diary and contacts				
Subject	What should be done to the project diary to better satisfy project information needs?				
Q.2.1.4	Respondents		Nos suggested amendments		
Sample Sector	Nos	% Pop. sample	Change	Add	Delete
All	15	6%	13	3	9
HQ & PGM	6	10%	6	1	3
PJM	9	5%	7	2	6

Part	Part 2 Use of the PW_MS for management of Category C, B, and A PWP projects				
Topic	Project register, diary and contacts				
Subject	What should be done to the project contacts to better satisfy project information needs?				
Q.2.1.6	Respondents		Nos suggested amendments		
Sample Sector	Nos	% Pop. sample	Change	Add	Delete
All	4	2%	1	0	2
HQ & PGM	1	2%	1	0	0
PJM	3	2%	0	0	2

Part	Part 2 Use of the PW_MS for management of Category C, B, and A PWP projects				
Topic	Project register, diary and contacts				
Subject	What should be done to the work-package register to better satisfy project information needs?				
Q.2.1.8	Respondents		Nos suggested amendments		
Sample Sector	Nos	% Pop. sample	Change	Add	Delete
All	11	5%	0	2	10
HQ & PGM	4	6%	0	0	5
PJM	7	4%	0	2	5

Part	Part 2 Use of the PW_MS for management of Category C, B, and A PWP projects				
Topic	Project register, diary and contacts				
Subject	What should be done to the work-package diary to better satisfy project information needs?				
Q.2.1.10	Respondents		Nos suggested amendments		
Sample Sector	Nos	% Pop. sample	Change	Add	Delete
All	13	6%	5	3	7
HQ & PGM	5	8%	2	2	3
PJM	8	5%	3	1	4

Part	Part 2 Use of the PW_MS for management of Category C, B, and A PWP projects				
Topic	Project Scope				
Subject	What should be done to the scope element of the PW_MS to better satisfy project information needs?				
Q.2.2.2	Respondents		Nos suggested amendments		
Sample Sector	Nos	% Pop. sample	Change	Add	Delete
All	6	3%	3	2	0
HQ & PGM	1	2%	1	0	0
PJM	5	3%	2	2	0

Part	Part 2 Use of the PW_MS for management of Category C, B, and A PWP projects				
Topic	Project cost				
Subject	What should be done to the cost element of the PW_MS to better satisfy project information needs?				
Q.2.3.2	Respondents		Nos suggested amendments		
Sample Sector	Nos	% Pop. sample	Change	Add	Delete
All	30	13%	21	26	0
HQ & PGM	10	16%	9	9	0
PJM	20	12%	12	17	0

Part	Part 2 Use of the PW_MS for management of Category C, B, and A PWP projects				
Topic	Time management and work-scheduling				
Subject	What should be done to the timeplan element of the PW_MS to better satisfy project information needs?				
Q.2.4.2	Respondents		Nos suggested amendments		
Sample Sector	Nos	% Pop. sample	Change	Add	Delete
All	31	13%	14	29	6
HQ & PGM	13	21%	6	11	4
PJM	18	11%	8	18	2

Part	Part 2 Use of the PW_MS for management of Category C, B, and A PWP projects				
Topic	Project planning and monitoring using change orders and baseline control				
Subject	What should be done to the change orders and baseline element of the PW_MS to better satisfy project information needs?				
Q.2.5.2	Respondents		Nos suggested amendments		
Sample Sector	Nos	% Pop. sample	Change	Add	Delete
All	11	5%	8	7	0
HQ & PGM	3	5%	1	2	0
PJM	8	5%	7	5	0

Part	Part 2 Use of the PW_MS for management of Category C, B, and A PWP projects				
Topic	Land delivery				
Subject	What should be done to the land delivery element of the PW_MS to better satisfy project information needs?				
Q.2.6.2	Respondents		Nos suggested amendments		
Sample Sector	Nos	% Pop. sample	Change	Add	Delete
All	12	5%	1	12	7
HQ & PGM	1	2%	0	1	0
PJM	11	7%	1	11	7

Part	Part 2 Use of the PW_MS for management of Category C, B, and A PWP projects				
Topic	Works Contracts				
Subject	What should be done to the works contracts element of the PW_MS to better satisfy project information needs?				
Q.2.7.2	Respondents		Nos suggested amendments		
Sample Sector	Nos	% Pop. sample	Change	Add	Delete
All	7	3%	1	8	1
HQ & PGM	0	0%	0	0	0
PJM	7	4%	1	8	1

Part	Part 3 Use of the PW_MS in the management of Groups of Category C, B, and A PWP projects				
Topic	Works Contracts				
Subject	What should be done to the contacts element of the PW_MS to better satisfy multi-project information needs?				
Q.3.1.2	Respondents		Nos suggested amendments		
Sample Sector	Nos	% Pop. sample	Change	Add	Delete
All	3	1%	1	2	0
HQ & PGM	2	3%	0	2	0
PJM	1	1%	1	0	0

Part	Part 3 Use of the PW_MS in the management of <i>Groups</i> of Category C, B, and A PWP projects				
Topic	Works Contracts				
Subject	What should be done to the traffic lights element of the PW_MS to better satisfy multi-project information needs?				
Q.3.1.4	Respondents		Nos suggested amendments		
Sample Sector	Nos	% Pop. sample	Change	Add	Delete
All	7	3%	2	2	4
HQ & PGM	4	6%	0	1	0
PJM	3	2%	1	0	2

Part	Part 3 Use of the PW_MS in the management of <i>Groups</i> of Category C, B, and A PWP projects				
Topic	Summations of data for selected <i>groups</i> of projects				
Subject	What should be done to the PW_MS to better satisfy multi-project information needs?				
Q.3.2.2	Respondents		Nos suggested amendments		
Sample Sector	Nos	% Pop. sample	Change	Add	Delete
All	4	2%	0	4	0
HQ & PGM	3	5%	0	4	0
PJM	1	1%	0	0	0

Part	Part 3 Use of the PW_MS in the management of <i>Groups</i> of Category C, B, and A PWP projects				
Topic	Summations of data for selected <i>groups</i> of projects				
Subject	What should be done to the adding of costs element in the PW_MS to better satisfy multi-project information needs?				
Q.3.2.4	Respondents		Nos suggested amendments		
Sample Sector	Nos	% Pop. sample	Change	Add	Delete
All	2	1%	0	5	0
HQ & PGM	2	3%	0	5	0
PJM	0	0%	0	0	0

Part	Part 3 Use of the PW_MS in the management of <i>Groups</i> of Category C, B, and A PWP projects				
Topic	Progress performance measurement				
Subject	What should be done to the report of target and actual dates in the PW_MS to better satisfy multi-project information needs?				
Q.3.3.2	Respondents		Nos suggested amendments		
Sample Sector	Nos	% Pop. sample	Change	Add	Delete
All	4	2%	2	4	0
HQ & PGM	3	5%	1	4	0
PJM	1	1%	1	0	0

Part	Part 3 Use of the PW_MS in the management of <i>Groups</i> of Category C, B, and A PWP projects				
Topic	Progress performance measurement				
Subject	What should be done to the actual costs compared to baseline and forecast costs element in the PW_MS to better satisfy multi-project information needs?				
Q.3.3.4	Respondents		Nos suggested amendments		
Sample Sector	Nos	% Pop. sample	Change	Add	Delete
All	0	0%	0	1	0
HQ & PGM	1	2%	0	1	0
PJM	0	0%	0	0	0

Part	Part 3 Use of the PW_MS in the management of <i>Groups</i> of Category C, B, and A PWP projects				
Topic	Progress performance measurement				
Subject	What should be done to identify the poorly performing projects within a group of projects?				
Q.3.3.6	Respondents		Nos suggested amendments		
Sample Sector	Nos	% Pop. sample	Change	Add	Delete
All	0	0%	0	5	0
HQ & PGM	2	3%	0	5	0
PJM	0	0%	0	0	0

Part	Part 3 Use of the PW_MS in the management of <i>Groups</i> of Category C, B, and A PWP projects				
Topic	Progress performance measurement				
Subject	What should be done to the project diary element in the PW_MS to better satisfy multi-project information needs?				
Q.3.3.8	Respondents		Nos suggested amendments		
Sample Sector	Nos	% Pop. sample	Change	Add	Delete
All	0	0%	1	0	0
HQ & PGM	1	2%	1	0	0
PJM	0	0%	0	0	0

8.7 Analysis of questionnaire response

Questionnaire Preliminaries

Q.I.1. Participation in PWP project delivery

Commentary - this question asks the respondent to state the numbers of Category A, B and C PWP projects that they are currently involved with. A few projects would be appropriate for a project manager's use of the PW_MS. More than ten projects would be typical of portfolio-management use of the PW_MS.

With regard to Category A PWP projects.

For the sample overall, the range of the response was from zero projects to two hundred and ninety. The median value was two projects, with a mode of one project and a mean of 13.5 projects. The values for the HQ and the portfolio managers have the same range but a higher mean of 31.5 projects. The median value is six and the mode is zero. The statistics for the project manager strata have a lesser range of zero to one hundred and sixteen. The mode and the median are one project but the mean is 6.3.

The results indicate that the numbers of Category A PWP projects managed by the portfolio-managers varies over a broad range for the population sample – in ten instances more than fifty projects are stated. This is consistent with some HQ staff having a responsibility for all of the works department projects. However, the most frequent value in this range is one project. Eighty respondents of the population sample, fifty three percent of the respondents, state less than five projects. Twenty-six percent of the population sample state one project.

For the 'HQ and PGM' sample strata, twelve respondents state a value less than six PWP projects. Ten respondents state zero projects. Twenty out of the response of forty-four, state a value between ten and fifty projects.

For the 'project manager' sample strata, sixty-eight respondents, out of one hundred and seven, state a value of five or less projects. Seven respondents state a value greater than twenty projects and twelve respondents state a value greater than ten projects.

With regard to Category B PWP projects.

For the sample overall, the range of response was extremes of zero to eighty projects. The median value was one project, with a mode of zero and a mean of 4.8. The values for the 'HQ and portfolio managers' strata have the same range but a mean of 3. The median value is one and the mode is zero. The statistics for the project manager strata have a lesser range of zero to fourteen. The mode is zero and the median is one but the mean is 1.6.

The results indicate that the numbers of Category B PWP projects managed by the portfolio-managers varies over a broad range for the population sample – in eighteen instances more than ten Category B projects are stated. This is consistent with the lesser number of Category B PWP projects in the PWP. Some HQ staff taking a

responsibility for all of the Category B projects for their works department. However, the most frequent value in this range is zero Category B PWP projects. Seventy respondents of the population sample, fifty percent of the respondents, state less than five projects. Thirty-six percent of the respondents state one Category B project.

For the 'HQ and PGM' sample strata, eight respondents state a value less than six PWP projects. Fifteen respondents state zero projects. Sixteen out of the response of forty-one state a value between ten and fifty Category B projects.

For the 'project manager' sample strata, sixty-two respondents, out of one hundred and one, state a value of five or less projects. No respondents state a value greater than twenty projects and two respondents state a value greater than ten projects.

With regard to Category C PWP projects.

For the sample overall, the range of response was zero to fourteen projects. The median and the mode is zero and the mean is 0.4 projects. The values for the 'HQ and portfolio managers' strata have a range of ten to zero, a median and mode of zero but a mean of 0.6. The statistics for the project manager strata have a range of zero to fourteen. The mode and median is zero projects but the mean is 0.3.

The results indicate that the numbers of Category C PWP projects managed by the portfolio-managers is few compared to Category B and especially Category A PWP projects. This is consistent with the lesser number of inception stage projects under development at any one time. The most frequent value in this range is zero Category C PWP projects. Eighty-four percent of the respondents of the population sample state that they are not managing Category C projects.

For the 'HQ and PGM' sample strata, nineteen percent of the respondents state a value of one Category C PWP projects. Seventy-three percent of the respondents state zero projects.

For the 'project manager' sample strata, seven percent of the respondents state a value of one Category C project. Eighty-nine percent state that they are not managing any Category C PWP projects.

Q.I.2 How frequently is the PW_MS used.

Commentary - this question asks how regularly the respondent uses the PW_MS personally or through others logging on and operating the system for them.

Sixty-eight percent of the population sample responded to the first part of this question, namely: ‘the frequency of using the PW_MS by personally logging onto the system’.

Fifty-four percent of the sample-population stated that they never personally log onto the PW_MS. This is the median and mode response but the mean value is close to logging on at a quarterly interval. Seventeen percent respond by saying that they log on at a quarterly interval, twenty-two percent log on monthly, and six percent log on at a weekly interval.

The response is similar for the sub-strata of the population sample. Forty-eight percent of the ‘HQ and Portfolio Manager’ strata stated that they never personally log onto the PW_MS. The median value is to log on a quarterly intervals, whilst the mode response ‘never log on’ but the mean value is logging on at a quarterly interval. Sixteen percent respond by saying that they log on at a quarterly interval, eighteen percent log on monthly, and eighteen percent log on at a weekly interval.

Fifty-seven percent of the ‘Project Manager’ strata stated that they never personally log onto the PW_MS. The median and mode value is to never personally log on, whilst the mode response ‘never log on’ but the mean value is close to logging on at a quarterly interval. Eighteen percent respond by saying that they log on at a quarterly interval, twenty-three percent log on monthly, and two percent log on at a weekly interval.

In general the ‘HQ and Portfolio Managers’ have a great incidence of personally logging onto the PW_MS at more frequent intervals than the quarterly interval stated in the Public Works Project Control Procedures¹.

With regard to the second part of this question, namely: ‘the frequency of using the PW_MS by other staff logging onto the system for you’. Thirty-one percent of the sample-population stated that they never used others as a proxy to log onto the PW_MS. The median value is using others at a frequency of quarterly intervals, and mode response of monthly intervals, whilst the mean value is close to a proxy log on at a quarterly interval. Twenty-three percent respond by saying that they use a proxy at a quarterly interval, forty-four use a proxy operator at a monthly interval, and two percent use a proxy at a weekly interval.

The response is broadly similar for the sub-strata of the population sample.

- Forty percent of the ‘HQ and Portfolio Manager’ strata stated that they never use a proxy operator to log onto the PW_MS for them. The median and mode value is to use a proxy at monthly intervals, but the mean value is close to a quarterly interval. Eight percent respond by saying that use a proxy operator at a quarterly interval, forty-eight use a proxy at a monthly interval, and four percent at a weekly interval.

- Twenty-seven percent of the ‘Project Manager’ strata stated that they never use a proxy operator to log onto the PW_MS. The median value is to use a proxy at quarterly intervals and the mode value is a monthly interval, but the mean value is close to use of a proxy at a quarterly interval. Thirty percent respond by saying that they use a proxy operator at a quarterly interval, forty-two percent log use a proxy at a monthly interval, and one percent log on at a weekly interval.

In general the ‘Project Managers’ have a greater incidence of using a proxy operator to log onto the PW_MS.

Taking the results from both mutually exclusive parts of the question: half of the user community does not personally log onto the PW_MS and approximately one third of the user community uses a proxy operator. The frequency of logging onto the PW_MS is rarely at a weekly interval, it is most often at monthly interval or to lesser degree at the mandated quarterly interval.

Questionnaire Part 1 Improving the PW_MS.

This series of questions is to measure the adequacy of the PW_MS and to identify ideas to improve it.

Questionnaire Part 1 The PW_MS used for traditional project control of scope, cost, and time.

Q.1.1.1 Does the PW_MS satisfy the traditional aspects of project management i.e., information management and control of the scope, the cost, and the time of a project?

Twenty-four percent of the population sample stated that they did not use the PW_MS. Eight percent that the PW_MS ‘never’ satisfied the traditional aspects of project management. Whilst three percent has the opposed view, that it ‘always’ satisfied the traditional aspects of project management. Twenty-six percent stated ‘mostly’ and forty percent responded ‘sometimes’. The mode and median response is ‘sometimes’ with the median value falling between ‘sometimes’ and mostly’. On balance sixty nine percent of the sample population regards the PW_MS as satisfying to some degree, the traditional aspects of project management.

The response is similar in the two sub-strata of the population sample.

- Thirty-two of the ‘HQ and portfolio manager’ strata stated that they did not use the PW_MS. Six percent stated that the PW_MS ‘never’ satisfied the traditional aspects of project management. Whilst two percent has the opposed view, that it ‘always’ satisfied the traditional aspects of project management. Twenty-eight percent stated ‘mostly’ and thirty-two percent responded ‘sometimes’. The mode and median response is ‘sometimes’ with the median value falling between ‘sometimes’ and mostly’. On balance sixty two percent of the ‘HQ and portfolio

manager' strata of the population sample regards the PW_MS as satisfying to some degree, the traditional aspects of project management.

- Twenty-one of the 'project manager' strata stated that they did not use the PW_MS. Eight percent stated that the PW_MS 'never' satisfied the traditional aspects of project management. Whilst three percent has the opposed view, that it 'always' satisfied the traditional aspects of project management. Twenty-six percent stated 'mostly' and forty-three percent responded 'sometimes'. The mode and median response is 'sometimes' with the median value falling between 'sometimes' and 'mostly'. On balance seventy-two percent of the 'project manager' strata of the population sample regards the PW_MS as satisfying to some degree, the traditional aspects of project management.

Q.1.1.2 Should the requirements of those features/functions/procedures of traditional project management listed below be kept the same, reduced, or changed in the PW_MS?

The question is directed at the three fundamental aspects of traditional project management, namely:

- (a) Scope statement
- (b) Cashflows; and
- (c) Work-schedules and baseline dates.

With regard to (a) Scope statement:

Twenty-three percent of the population sample stated that they did not use the PW_MS. Three percent stated that the 'scope statement' aspect of the PW_MS should be 'change'. Whilst sixty-four has the opposed view of 'keep' this feature. Eleven percent responded with 'reduce requirement'. The mode and median response is 'keep' the scope statement feature with the median value falling on the 'reduce requirement' side of 'keep'.

The response is similar in the two sub-strata of the population sample.

- Thirty-nine percent of the 'HQ and portfolio manager' strata of the population sample stated that they did not use the PW_MS. Two percent stated that the 'scope statement' aspect of the PW_MS should be 'change'. Whilst fifty-four percent has the opposed view of 'keep' this feature. Four percent responded with 'reduce requirement'. The mode and median response is 'keep' the scope statement feature with the median value falling on the 'reduce requirement' side of 'keep'.
- Sixteen percent of the 'project manager' strata of the population sample stated that they did not use the PW_MS. Three percent stated that the 'scope statement' aspect of the PW_MS should be 'change'. Whilst sixty-eight percent has the opposed view of 'keep' this feature. Fourteen percent responded with 'reduce requirement'. The mode and median response is 'keep' the scope statement feature with the median value falling on the 'reduce requirement' side of 'keep'.

On balance, the response taken as statistically indicative of the user community as a whole, is that the 'scope statement' feature of the traditional project management aspect of the PW_MS should be kept as present.

With regard to (b) Cashflow features:

Twenty-four percent of the population sample stated that they did not use the PW_MS. Fifteen percent stated that the 'scope statement' aspect of the PW_MS should be 'change'. Whilst thirty-nine percent has the opposed view of 'keep' this feature. Twenty-one percent responded with 'reduce requirement'. The mode and median response is 'keep' the scope statement feature with the mean value falling on the 'reduce requirement' side of 'keep'.

The response is similar in the two sub-strata of the population sample.

- Thirty-eight percent of the 'HQ and portfolio manager' strata of the population sample stated that they did not use the PW_MS. Twenty-one percent stated that the 'scope statement' aspect of the PW_MS should be 'change'. Whilst thirty-two percent has the opposed view of 'keep' this feature. Nine percent responded with 'reduce requirement'. The mode and median response is 'keep' the scope statement feature with the median value falling on the 'reduce requirement' side of 'keep'.
- Nineteen percent of the 'project manager' strata of the population sample stated that they did not use the PW_MS. Twelve percent stated that the 'scope statement' aspect of the PW_MS should be 'change'. Whilst forty-two percent has the opposed view of 'keep' this feature. Twenty-seven percent responded with 'reduce requirement'. The mode and median response is 'keep' the scope statement feature with the median value falling on the 'reduce requirement' side of 'keep'.

On balance, the response taken as statistically indicative of the user community as a whole, is that the 'cashflow' feature of the traditional project management aspect of the PW_MS should be kept as present.

With regard to (c) work-schedule and baseline dates:

Twenty-six percent of the population sample stated that they did not use the PW_MS. Thirteen percent stated that the 'work-schedule and baseline dates' aspect of the PW_MS should be 'change'. Whilst thirty-four percent has the opposed view of 'keep' this feature. Twenty-eight percent responded with 'reduce requirement'. The mode response is 'keep', whilst the median value is 'reduce requirement' for the work schedules and baseline dates feature: with the mean value falling on the 'reduce requirement' side of 'keep'.

The response is similar in the two sub-strata of the population sample.

- Forty-three percent of the 'HQ and portfolio manager' strata of the population sample stated that they did not use the PW_MS. Twenty-three percent stated that the 'work schedule and baseline dates' aspect of the PW_MS should be 'change'. Whilst twenty-six percent has the opposed view of 'keep' this feature. Nine percent responded with 'reduce requirement'. The mode response is 'keep', the

median response is 'reduce requirement' whilst the mean value falls on the 'reduce requirement' side of 'keep'.

- Nineteen percent of the 'project manager' strata of the population sample stated that they did not use the PW_MS. Eight percent stated that the 'work schedule and baseline dates' aspect of the PW_MS should be 'change'. Whilst thirty-seven percent has the opposed view of 'keep' this feature. Thirty-six percent responded with 'reduce requirement'. The mode response is 'keep' but the median response is "reduce the requirement" of the work schedule and baseline dates feature with the median value falling on the 'reduce requirement' side of 'keep'.

On balance, the response taken as statistically indicative of the user community as a whole, is that the 'work schedule and baseline dates' feature of the traditional project management aspect of the PW_MS should be changed or the requirement reduced. This is deduced by noting that the percent response calling for change or reduced requirement is greater than the percent response stating 'keep' the existing features.

Q.1.1.3 Is an open question, the analysis is in Section 8.4

Questionnaire Part 1. Resource Management

Q.1.2.1 Do you want to add a staff resources element into the PW_MS to give you the data that you want on the staff resource demands/capacity/performance?
Commentary - the PW_MS does not include a function for resource-leveling. This question is the measure the user requirement for this facility.

Forty-seven per cent stated that they did not use the PW_MS. Forty-one percent stated that a 'staff resources' feature within the PW_MS was not required. Whilst twelve percent stated that it was required. The mode and the median response is 'no', whilst the median value tends to 'no'.

The response is similar in the two sub-strata of the population sample.

- Fifty-one percent of the 'HQ and portfolio manager' strata of the population sample stated that they did not use the PW_MS. Twenty-three percent stated that the 'staff resources' is not required. Whilst twenty-six percent has the opposed view and wanted the introduction of this feature. The mode, median and mean leans towards a requirement for this feature.
- Forty-six percent of the 'project manager' strata of the population sample stated that they did not use the PW_MS. Forty-eight percent stated that the 'staff resources' feature is not required. Whilst six percent wants this feature within the PW_MS. The mode, median, and the mean leans a 'no' response.

The response, that is taken as statistically indicative of the user community as a whole is that a 'staff resources' feature within the PW_MS that gives data on staff resource demands, capacity, and performance is not required by the user community overall. The staff resources feature is not required by the project manager sub-strata of the

user community. However, the ‘headquarters and portfolio manager’ sub strata gave a balanced view on this requirement with the response tipped towards a requirement for staff resource features within the PW_MS.

Q.1.2.2 Is an open question, the analysis is in Section 8.4

Questionnaire Part 1 Effort in data capture and data entry

Q. 1.3.1 Is the effort needed for data entry into the PW_MS acceptable to you?

Commentary - this question is to measure in broad terms if the effort needed in data entry is deemed to be reasonable to the User population.

Twenty-five percent of the population sample stated that they did not use the PW_MS. Twenty-three percent stated that the ‘effort needed for data entry’ not acceptable. Twelve percent stated that it was ‘sometimes’ acceptable. Fifteen percent stated that the effort was ‘mostly’ acceptable. Whilst eleven percent stated that it was acceptable. The mode and the median response is ‘sometimes’, whilst the mean value tends to ‘sometimes’.

The response is nearly the same in the two sub-strata of the population sample except for a higher degree of dissatisfaction in the ‘HQ and portfolio manager’ sub-strata of the population.

On balance, the response taken as statistically indicative of the user community as a whole, is that the ‘effort in data entry’ to the PW_MS is not satisfactory. Fifty percent of the response in each strata of the population sample gives a negative value. Less than thirty percent gives a positive indication of satisfaction with data entry.

Q.1.3.2 In general, what should be the frequency for regular updating of the PW_MS data for the actions listed below?

Commentary - the PW_MS is currently operating on a quarterly reporting cycle. This makes it mandatory for data to be updated every three months. The PWP Project Control Procedures state that data should be updated at least at monthly intervals or more often if the data is changed. The respondent is asked to choose one of the options for the main categories of data recorded in the PW_MS. The options are: ‘three months’, ‘one month’, ‘weekly’, or ‘as data changes’. The main categories of data listed in the questionnaire are:

- (a) Cost-forecast;*
- (b) Record actual expenditure;*
- (c) Progress/update of the timeplan;*
- (d) Record progress in the project diary; and*
- (e) Record progress in the work-package diary.*

With regard to frequency for regular updating of (a) cost-forecast PW_MS data:

Thirteen percent of the population sample stated that they did not use the PW_MS. Twenty-two percent stated that the update should be 'as data changes'. Zero percent stated a 'weekly' interval for updating. Nineteen percent stated '1 month' frequency. Whilst forty-five percent responded with '3 months' interval. The mode and the median response is '3 months', whilst the mean value is '1 month'.

The response is similar in the two sub-strata of the population sample.

- Sixteen percent of the 'HQ and portfolio manager' strata of the population sample stated that they did not use the PW_MS. Sixteen percent stated that the update should be 'as data changes'. Zero percent stated a 'weekly' interval for updating. Thirty-one percent stated '1 month' frequency. Whilst thirty-eight percent responded with '3 months' interval. The mode response is '3 months' but the median and the mean response is for '1 month' frequency.
- Thirteen percent of the 'project manager' strata of the population sample stated that they did not use the PW_MS. Twenty-five percent stated that the update should be 'as data changes'. Zero percent stated a 'weekly' interval for updating. Fourteen percent stated '1 month' frequency. Whilst forty-eight percent responded with '3 months' interval. The mode and the median response are '3 months' but the mean response is for '1 month' frequency.

On balance, the response that is taken as statistically indicative of the user community as a whole, is that the regular interval for updating the cashflow data within the PW_MS should be the longer interval of '3 months'. The 'HQ and portfolio manager' sub-strata of the population sample prefer a more frequent updating. The 'project manager' sub-strata does this updating work and prefers the longer interval of '3 months'.

With regard to frequency for regular updating of (b) actual expenditure PW_MS data:

Thirteen percent of the population sample stated that they did not use the PW_MS. Ten percent stated that the update should be 'as data changes'. Zero percent stated a 'weekly' interval for updating. Thirty-four percent stated '1 month' frequency. Whilst forty-two percent responded with '3 months' interval. The mode response is '3 months', the median response is '1 month', whilst the mean value tends to '1 month'.

The response is similar in the two sub-strata of the population sample.

- Eleven percent of the 'HQ and portfolio manager' strata of the population sample stated that they did not use the PW_MS. Seven percent stated that the update should be 'as data changes'. Zero percent stated a 'weekly' interval for updating. Forty-seven percent stated '1 month' frequency. Whilst thirty-three percent responded with '3 months' interval. The mode and the median response is '1 months' whilst the mean response tends to '1 month' frequency.
- Fourteen percent of the 'project manager' strata of the population sample stated that they did not use the PW_MS. Eleven percent stated that the update should be 'as data changes'. Zero percent stated a 'weekly' interval for updating. Twenty-

nine percent stated '1 month' frequency. Whilst forty-six percent responded with '3 months' interval. The mode and the median response is '3 months' but the mean response is for '1 month' frequency.

On balance, the response that is taken as statistically indicative of the user community as a whole, is that the regular interval for updating the actual expenditure data within the PW_MS should be the longer interval of '3 months'. The 'HQ and portfolio manager' sub-strata of the population sample prefer a more frequent updating. The 'project manager' sub-strata does this updating work and prefers the longer interval of '3 months'.

With regard to frequency for regular updating of (c) progress/update of the timeplan actions PW_MS data;

Twelve percent of the population sample stated that they did not use the PW_MS. Sixteen percent stated that the update should be 'as data changes'. One percent stated a 'weekly' interval for updating. Twenty-four percent stated '1 month' frequency. Whilst forty-eight percent responded with '3 months' interval. The mode and the median response is '3 months', whilst the mean value tends to '1 month'.

The response is similar in the two sub-strata of the population sample.

- Thirteen percent of the 'HQ and portfolio manager' strata of the population sample stated that they did not use the PW_MS. Twenty-four percent stated that the update should be 'as data changes'. Zero percent stated a 'weekly' interval for updating. Twenty-seven percent stated '1 month' frequency. Whilst thirty-six percent responded with '3 months' interval. The mode response is '3 months', the median response is '1 month' whilst the mean response tends to less than '1 month' frequency.
- Eleven percent of the 'project manager' strata of the population sample stated that they did not use the PW_MS. Thirteen percent stated that the update should be 'as data changes'. One percent stated a 'weekly' interval for updating. Twenty-three percent stated '1 month' frequency. Whilst fifty-three percent responded with '3 months' interval. The mode and the median response is '3 months' but the mean response is for '1 month' frequency.

On balance, the response that is taken as statistically indicative of the user community as a whole, is that the regular interval for updating the progress/update of the timeplan data within the PW_MS should be the longer interval of '3 months'. The 'HQ and portfolio manager' sub-strata of the population sample prefer a more frequent updating. The 'project manager' sub-strata does this updating work and prefers the longer interval of '3 months'.

With regard to the frequency for regular updating of (d) progress/update of record progress in the project diary of the PW_MS:

Thirteen percent of the population sample stated that they did not use the PW_MS. Eleven percent stated that the update should be 'as data changes'. Zero percent stated a 'weekly' interval for updating. Thirty percent stated '1 month' frequency. Whilst forty-six percent responded with '3 months' interval. The mode and the median response is '3 months', whilst the mean value tends to '1 month'.

The response is similar in the two sub-strata of the population sample.

- Sixteen percent of the 'HQ and portfolio manager' strata of the population sample stated that they did not use the PW_MS. Sixteen percent stated that the update should be 'as data changes'. Zero percent stated a 'weekly' interval for updating. Twenty-nine percent stated '1 month' frequency. Whilst forty percent responded with '3 months' interval. The mode response is '3 months', the median response is '1 month' whilst the mean response tends to '1 month' frequency.
- Twelve percent of the 'project manager' strata of the population sample stated that they did not use the PW_MS. Ten percent stated that the update should be 'as data changes'. Zero percent stated a 'weekly' interval for updating. Thirty percent stated '1 month' frequency. Whilst forty-eight percent responded with '3 months' interval. The mode response is '3 months', the median is '1 month', and mean response is for '1 month' frequency.

On balance, the response that is taken as statistically indicative of the user community as a whole, is that the regular interval for recording progress in the project diary within the PW_MS should be the longer interval of '3 months'. The 'HQ and portfolio manager' sub-strata of the population sample are inclined to prefer a more frequent updating. The 'project manager' sub-strata does this updating work and prefers the longer interval of '3 months'.

With regard to the frequency for regular updating of (e) progress/update of record progress in the work-package diary of the PW_MS:

Eighteen percent of the population sample stated that they did not use the PW_MS. Sixteen percent stated that the update should be 'as data changes'. One percent stated a 'weekly' interval for updating. Twenty-four percent stated '1 month' frequency. Whilst forty-one percent responded with '3 months' interval. The mode and the median response is '3 months', whilst the mean value tends to '1 month'.

The response is similar in the two sub-strata of the population sample.

- Eighteen percent of the 'HQ and portfolio manager' strata of the population sample stated that they did not use the PW_MS. Sixteen percent stated that the update should be 'as data changes'. Zero percent stated a 'weekly' interval for updating. Twenty-two percent stated '1 month' frequency. Whilst forty-four percent responded with '3 months' interval. The mode and the median response is '3 months', whilst the mean response tends to '1 month' frequency.
- Nineteen percent of the 'project manager' strata of the population sample stated that they did not use the PW_MS. Sixteen percent stated that the update should be 'as data changes'. One percent stated a 'weekly' interval for updating. Twenty-five percent stated '1 month' frequency. Whilst forty percent responded with '3 months' interval. The mode response is '3 months', the median is '1 month', and mean response is for '1 month' frequency.

On balance, the response that is taken as statistically indicative of the user community as a whole, is that the regular interval for recording progress in the work-package diary within the PW_MS should be the longer interval of '3 months'.

Q.1.3.3 How frequently should we use the PW_MS?

Commentary - this question is in two parts. It measures the extent that the User population favours application of the PW_MS to all, or the high-impact projects. It also measures the recommended updating intervals for all, and for the high-impact, projects. The PW_MS is currently used on a quarterly reporting cycle for all the PWP projects in Category B, and in Category A of the PWP that recorded within the MIS. The projects are diverse. Typically the Category B projects are subject to irregular but frequent change as their definition is least well developed. Category A projects are well-defined and less likely to change but do have monthly expenditure in progress. Some projects are a high priority, others are mundane.

With regard to the first part of the question, the measurement of the extent that the User population favours application of the PW_MS to all, or the high-impact projects. Seven percent of the population sample stated that ‘they did not know’. Thirty-one percent stated that the PW_MS should be used for ‘only high impact projects with full data and partial data for the remainder’. Thirty-six percent stated that the PW_MS should be used ‘only for high impact projects’. Twenty-six percent responded that the use should continue as present i.e., ‘Category A, B and C PWP projects excluding subvented projects.’ The mode, the median, and the mean response is that the PW_MS should be used for ‘only high impact project’.

The response is similar in the two sub-strata of the population sample.

- Seven percent of the ‘HQ and portfolio managers’ strata of the population sample stated that ‘they did not know’. Forty-four percent stated that the PW_MS should be used for ‘only high impact projects with full data and partial data for the remainder’. Twenty-seven percent stated that the PW_MS should be used ‘only for high impact projects’. Twenty-two percent responded that the use should continue as present i.e., ‘Category A, B and C PWP projects excluding subvented projects.’ The mode, and the median is that the PW_MS should be used for ‘high impact project with full data and the remainder with lesser data’
- Seven percent of the ‘project manager’ strata of the population sample stated that ‘they did not know’. Twenty-six percent stated that the PW_MS should be used for ‘only high impact projects with full data and partial data for the remainder’. Thirty-nine percent stated that the PW_MS should be used ‘only for high impact projects’. Twenty-eight percent responded that the use should continue as present i.e., ‘Category A, B and C PWP projects excluding subvented projects.’ The mode, the median, and the mean response is that the PW_MS should be used for ‘only high impact project’

On balance, the response that is taken as statistically indicative of the user community as a whole, is that the application of the PW_MS to the PWP projects should be changed to a greater focus on high impact projects and a lesser focus on the low impact projects. Sixty-seven percent of the response calls for this change. The response calling for this change is balanced between the application of the PW_MS to only high impact projects or full data for high impact and lesser data for the

remainder. The 'HQ and portfolio manager' strata of the population sample favour full data reporting for high impact projects and lesser data for the remainder. The opposite is true for the 'project manager' sub strata of the population sample.

With regard to the second part of the question, the measurement of the extent that the User population recommends updating intervals for all, and for the high-impact, projects.

Seven percent of the population sample stated that 'they did not know'. Forty-five percent stated that the PW_MS updating should be at 'monthly intervals for high impact projects and quarterly intervals for the others'. Ten percent stated that the updating should be at 'monthly intervals for all projects'. Thirty-six percent stated that the updating intervals should be 'quarterly for all projects'. The mode and the median response are 'monthly intervals for high impact projects and quarterly intervals for the others'. The mean response tends to 'monthly intervals for all projects'.

The response is broadly similar in the two sub-strata of the population sample.

- Seven percent of the 'HQ and portfolio manager' strata of the population sample stated that 'they did not know'. Fifty-one percent stated that the PW_MS updating should be at 'monthly intervals for high impact projects and quarterly intervals for the others'. Sixteen percent stated that the updating should be at 'monthly intervals for all projects'. Twenty-four percent stated that the updating intervals should be 'quarterly for all projects'. The mode and the median response are 'monthly intervals for high impact projects and quarterly intervals for the others'. The mean response tends to 'monthly intervals for all projects'.
- Seven percent of the 'project manager' strata of the population sample stated that 'they did not know'. Forty-three percent stated that the PW_MS updating should be at 'monthly intervals for high impact projects and quarterly intervals for the others'. Eight percent stated that the updating should be at 'monthly intervals for all projects'. Forty-one percent stated that the updating intervals should be 'quarterly for all projects'. The mode, the median and the mean response are 'monthly intervals for high impact projects and quarterly intervals for the others'.

On balance, the response that is taken as statistically indicative of the user community as a whole, is that the frequency of updating of the data within the PW_MS should be changed. The majority recommendation of forty-five percent is that the frequency of updating should be at 'monthly intervals for high impact projects and quarterly intervals for the others'. This is opposed by a thirty-six percent response stating that the updating interval should be 'quarter intervals for all projects'.

The 'HQ and portfolio manager' substrata have a greater bias towards the change recommended by the population sample overall, as described in the preceding paragraph. The 'project manager' substrata have an almost equal balance of opinion on this recommendation. Forty-one percent in favour of 'monthly intervals for high impact projects and quarterly intervals for the others'. Forty-three percent response stating that the updating interval should be 'quarter intervals for all projects'.

Q.1.3.4 Is an open question, the analysis is in Section 8.4.

Questionnaire Part 1 Added value from the PW_MS

Q.1.4.1 Is the PW_MS useful to you and worth the effort needed to keep the data on your projects up-to-date?

Commentary - this is a two part question. The first part measures in broad terms the extent that the PW_MS is useful. The second part of the question, measures in broad terms the extent that it is worth the effort of keeping the data up to date.

With regard to the first part of the question, the measurement in broad terms of the extent that the PW_MS is useful.

Fifteen percent of the population sample stated that ‘they did not know’. Twenty-eight percent stated that the PW_MS was ‘not useful’ to them. Forty-five percent stated it was ‘sometimes useful’. Eight percent stated ‘mostly’ useful. Four percent stated that the PW_MS was useful to them. The mode, the median, and the mean response are ‘sometimes’ useful.

The response is broadly similar in the two sub-strata of the population sample.

- Twenty percent of the ‘HQ and portfolio manager’ strata of the population sample stated that ‘they did not know’. Seventeen percent stated that the PW_MS was ‘not useful’ to them. Forty-eight percent stated it was ‘sometimes useful’. Nine percent stated ‘mostly’ useful. Seven percent stated that the PW_MS was useful to them. The mode, the median, and the mean response are ‘sometimes’ useful.
- Thirteen percent of the ‘project manager’ strata of the population sample stated that ‘they did not know’. Thirty-three percent stated that the PW_MS was ‘not useful’ to them. Forty-three percent stated it was ‘sometimes useful’. Seven percent stated ‘mostly’ useful. Four percent stated that the PW_MS was useful to them. The mode, the median, and the mean response are ‘sometimes’ useful.

On balance, the response that is taken as statistically indicative of the user community as a whole, is that the PW_MS is ‘sometimes useful’ to nearly than half of the responses received (forty-three to forty-eight percent). A significant portion of the population, and the second most frequent response state that the PW_MS is not useful to them (seventeen to thirty-three percent). The project manager strata has the highest ‘not useful’ response (thirty-three percent). The mode, median, and tendency of the mean response is that the ‘PW_MS’ is ‘sometimes’ useful to the population sample.

With regard to the second part of the question, the measurement in broad terms of the extent that it is worth the effort of keeping the data up to date.

Fourteen percent of the population sample stated that ‘they did not know’. Thirty-two percent stated that the PW_MS was not worth the effort of keeping the data up to date. Forty-one percent stated it was ‘sometimes’ worth keeping the data up to date. Eight percent stated that it was ‘mostly’ worth keeping the data up to date. Four

percent stated that the PW_MS was worth keeping the data up to date. The mode, the median, and the mean response are ‘sometimes’.

The response is broadly similar in the two sub-strata of the population sample.

- Twenty percent of the ‘HQ and portfolio manager’ strata of the population sample stated that ‘they did not know’. Twenty-six percent stated that the PW_MS was not worth the effort of keeping the data up to date. Forty-one percent stated it was ‘sometimes’ worth keeping the data up to date. Eleven percent stated that it was ‘mostly’ worth keeping the data up to date. Two percent stated that the PW_MS was worth keeping the data up to date. The mode, the median, and the mean response are ‘sometimes’.
- Twelve percent of the ‘project manager’ strata of the population sample stated that ‘they did not know’. Thirty-five percent stated that the PW_MS was not worth the effort of keeping the data up to date. Forty-one percent stated it was ‘sometimes’ worth keeping the data up to date. Seven percent stated that it was ‘mostly’ worth keeping the data up to date. Five percent stated that the PW_MS was worth keeping the data up to date. The mode, the median, and the mean response are ‘sometimes’.

On balance, the response that is taken as statistically indicative of the user community as a whole, is that the PW_MS is ‘sometimes’ worth keeping the data up to date to forty-one percent of the responses received. A significant portion of the population, and the second most frequent response state that the PW_MS is not worth keeping the data up to date (twenty-six to thirty-five percent). The project manager strata has the highest negative response (thirty-five percent). The mode, median, and tendency of the mean response is that the ‘PW_MS’ is ‘sometimes’ worth keeping the data up to date.

Q.1.4.2 Should those features/functions listed below be kept, their use reduced or increased, or be deleted from the PW_MS?

Commentary - the PW_MS is currently operating on a quarterly reporting cycle that requires all items of data to be updated every three months. The PWP Project Control Procedures state that data should be updated at least at monthly intervals or more often if the data is changed. This question is to measure the extent that the User Population is satisfied with the functionality that is offered to them in the PW_MS. The respondent is asked to choose one of the options with regard to the main functions of the PW_MS. The options are: ‘increase’, ‘keep same’, ‘reduce’, ‘delete’ or ‘not used by me’. The PW_MS functions listed in the questionnaire are:

- (a) Activities in the work-schedule of activities;*
- (b) Time analysis for calculation of activity dates, milestones, and delays;*
- (c) Categories-of-cost i.e., construction, contingency, scope contingency, other;*
- (d) Calculation of outturn project cost i.e., sum of current baseline/forecast costs;*
- (e) Screen ‘traffic lights’ to indicate cost deviation from baseline; and*

- (f) *Making available project data for your ready access, i.e., contacts, scope, diary, land.*

With regard to (a) ‘activities in the work-schedule of activities’ features of the PW_MS.

Twenty-one percent of the population sample stated that ‘they did not know’. Six percent stated that this feature should be deleted. Twenty-nine percent stated the feature should be ‘reduced’. Forty-two percent stated ‘keep same’. Three percent responded ‘increase’ this feature. The mode and the median response is ‘keep same’ the ‘activities in the work-schedule of activities’ features of the PW_MS. The mean response is mid-way between ‘reduce’ and ‘keep same’.

The response is broadly similar in the two sub-strata of the population sample.

- Twenty-eight percent of the ‘HQ and portfolio manager’ strata of the population sample stated that ‘they did not know’. Two percent stated that this feature should be deleted. Twenty-four percent stated the feature should be ‘reduced’. Forty-three percent stated ‘keep same’. Two percent responded ‘increase’ this feature. The mode and the median response is ‘keep same’ the ‘activities in the work-schedule of activities’ features of the PW_MS. The mean response is approximately mid-way between ‘reduce’ and ‘keep same’.
- Eighteen percent of the ‘project manager’ strata of the population sample stated that ‘they did not know’. Seven percent stated that this feature should be deleted. Thirty-one percent stated the feature should be ‘reduced’. Forty-one percent stated ‘keep same’. Three percent responded ‘increase’ this feature. The mode and the median response is ‘keep same’ the ‘activities in the work-schedule of activities’ features of the PW_MS. The mean response is approximately mid-way between ‘reduce’ and ‘keep same’.

On balance, the response that is taken as statistically indicative of the user community as a whole, is that the ‘activities in the work-schedule of activities’ features of the PW_MS should be ‘keep same’.

With regard to (b) ‘time analysis for calculation of activity dates, milestones and delays’ features of the PW_MS.

Twenty-one percent of the population sample stated that ‘they did not know’. Nine percent stated that this feature should be deleted. Twenty-two percent stated the feature should be ‘reduced’. Forty-one percent stated ‘keep same’. Eight percent responded ‘increase’ this feature. The mode and the median response is ‘keep same’ the ‘time analysis for calculation of activity dates, milestones and delays’ features of the PW_MS. The mean response tends to ‘keep same’.

The response is broadly similar in the two sub-strata of the population sample.

- Thirty percent of the ‘HQ and portfolio manager’ strata of the population sample stated that ‘they did not know’. Nine percent stated that this feature should be deleted. Seventeen percent stated the feature should be ‘reduced’. Thirty-seven percent stated ‘keep same’. Nine percent responded ‘increase’ this feature. The mode and the median response is ‘time analysis for calculation of activity dates,

milestones and delays' features of the PW_MS. The mean response is approximately mid-way between 'reduce' and 'keep same'.

- Seventeen percent of the 'project manager' strata of the population sample stated that 'they did not know'. Nine percent stated that this feature should be deleted. Twenty-three percent stated the feature should be 'reduced'. Forty-two percent stated 'keep same'. Eight percent responded 'increase' this feature. The mode and the median response is 'time analysis for calculation of activity dates, milestones and delays' features of the PW_MS. The mean response is approximately mid-way between 'reduce' and 'keep same'.

On balance, the response that is taken as statistically indicative of the user community as a whole, is that the 'time analysis for calculation of activity dates, milestones and delays' features of the PW_MS should be 'keep same'.

With regard to (c) 'categories-of-cost' features of the PW_MS.

Twenty-two percent of the population sample stated that 'they did not know'. Four percent stated that this feature should be deleted. Twenty-three percent stated the feature should be 'reduced'. Forty-one percent stated 'keep same'. Eleven percent responded 'increase' this feature. The mode and the median response is 'keep same' the 'categories-of-cost' features of the PW_MS. The mean response tends to 'keep same'.

The response is broadly similar in the two sub-strata of the population sample.

- Thirty percent of the 'HQ and portfolio manager' strata of the population sample stated that 'they did not know'. Two percent stated that this feature should be deleted. Twenty percent stated the feature should be 'reduced'. Thirty-seven percent stated 'keep same'. Eleven percent responded 'increase' this feature. The mode and the median response is 'keep same' the 'categories-of-cost' features of the PW_MS. The mean response is approximately mid-way between 'reduce' and 'keep same'.
- Eighteen percent of the 'project manager' strata of the population sample stated that 'they did not know'. Four percent stated that this feature should be deleted. Twenty-four percent stated the feature should be 'reduced'. Forty-three percent stated 'keep same'. Eleven percent responded 'increase' this feature. The mode and the median response is 'keep same' the 'categories-of-cost time' features of the PW_MS. The mean response is approximately mid-way between 'reduce' and 'keep same'.

On balance, the response that is taken as statistically indicative of the user community as a whole, is that the 'categories-of-cost time' features of the PW_MS should be 'keep same'.

With regard to (d) 'calculation of outturn cost' features of the PW_MS.

Twenty-five percent of the population sample stated that 'they did not know'. Three percent stated that this feature should be deleted. Fourteen percent stated the feature should be 'reduced'. Fifty-three percent stated 'keep same'. Six percent responded 'increase' this feature. The mode and the median response is 'keep same' the

‘calculation of outturn cost’ features of the PW_MS. The mean response tends to ‘keep same’.

The response is broadly similar in the two sub-strata of the population sample.

- Twenty-seven percent of the ‘HQ and portfolio manager’ strata of the population sample stated that ‘they did not know’. Zero percent stated that this feature should be deleted. Nine percent stated the feature should be ‘reduced’. Fifty-six percent stated ‘keep same’. Seven percent responded ‘increase’ this feature. The mode and the median, and the mean response are ‘keep same’ the ‘calculation of outturn cost’ features of the PW_MS.
- Twenty-four percent of the ‘project manager’ strata of the population sample stated that ‘they did not know’. Four percent stated that this feature should be deleted. Fifteen percent stated the feature should be ‘reduced’. Fifty-two percent stated ‘keep same’. Five percent responded ‘increase’ this feature. The mode and the median response is ‘keep same’ the ‘calculation of outturn cost’ features of the PW_MS. The mean response is approximately mid-way between ‘reduce’ and ‘keep same’.

On balance, the response that is taken as statistically indicative of the user community as a whole, is that the ‘calculation of outturn cost’ features of the PW_MS should be ‘keep same’.

With regard to (e) ‘screen traffic lights to indicate deviation from baseline cost’ features of the PW_MS.

Thirty-four percent of the population sample stated that ‘they did not know’. Ten percent stated that this feature should be deleted. Fourteen percent stated the feature should be ‘reduced’. Forty percent stated ‘keep same’. Two percent responded ‘increase’ this feature. The mode and the median response is ‘keep same’ the ‘screen traffic lights to indicate deviation from baseline cost’ features of the PW_MS. The mean response tends to ‘keep same’.

The response is broadly similar in the two sub-strata of the population sample.

- Forty-six percent of the ‘HQ and portfolio manager’ strata of the population sample stated that ‘they did not know’. Nine percent stated that this feature should be deleted. Seven percent stated the feature should be ‘reduced’. Thirty-seven percent stated ‘keep same’. Two percent responded ‘increase’ this feature. The mode and the median, and the mean response are ‘keep same’ the ‘screen traffic lights to indicate deviation from baseline cost’ features of the PW_MS.
- Twenty-nine percent of the ‘project manager’ strata of the population sample stated that ‘they did not know’. Eleven percent stated that this feature should be deleted. Seventeen percent stated the feature should be ‘reduced’. Forty-two percent stated ‘keep same’. Two percent responded ‘increase’ this feature. The mode and the median response is ‘keep same’ the ‘screen traffic lights to indicate deviation from baseline cost’ features of the PW_MS. The mean response is approximately mid-way between ‘reduce’ and ‘keep same’.

On balance, the response that is taken as statistically indicative of the user community as a whole, is that the ‘screen traffic lights to indicate deviation from baseline cost’ features of the PW_MS should be ‘keep same’.

With regard to (f) ‘making available project data for ready access’ features of the PW_MS.

Twenty-four percent of the population sample stated that ‘they did not know’. Four percent stated that this feature should be deleted. Seventeen percent stated the feature should be ‘reduced’. Forty-five percent stated ‘keep same’. Ten percent responded ‘increase’ this feature. The mode and the median response is ‘keep same’ the ‘making available project data for your ready access’ features of the PW_MS. The mean response is midway between ‘reduce’ and ‘keep same’.

The response is broadly similar in the two sub-strata of the population sample.

- Twenty-eight percent of the ‘HQ and portfolio manager’ strata of the population sample stated that ‘they did not know’. Four percent stated that this feature should be deleted. Nine percent stated the feature should be ‘reduced’. Forty-eight percent stated ‘keep same’. Eleven percent responded ‘increase’ this feature. The mode and the median response are ‘keep same’ the ‘making available project data for your ready access’ features of the PW_MS. The mean response tends to ‘keep same’.
- Twenty-two percent of the ‘project manager’ strata of the population sample stated that ‘they did not know’. Four percent stated that this feature should be deleted. Twenty percent stated the feature should be ‘reduced’. Forty-four percent stated ‘keep same’. Ten percent responded ‘increase’ this feature. The mode and the median response is ‘keep same’ the ‘making available project data for your ready access’ features of the PW_MS. The mean response is approximately mid-way between ‘reduce’ and ‘keep same’.

On balance, the response that is taken as statistically indicative of the user community as a whole, is that the ‘making available project data for your ready access’ features of the PW_MS should be ‘keep same’.

Q.1.4.3 Is an open question, the analysis is in Section 8.4.

Questionnaire Part 1 Report writing and output

Q1.5.1 Does the PW_MS provide the reports, or the supply of data, that you need?

Commentary - this is a two part question. The first part measures in broad terms the extent that the supply of PW_MS reports is satisfactory. The second part of the question, measures in broad terms the extent that the supply of data is satisfactory.

With regard to the first part of the question, the measurement in broad terms of the extent that the supply of PW_MS reports is useful.

Twenty-four percent of the population sample stated that ‘they did not know’. Twenty-six percent stated that the PW_MS reports were ‘not useful’ to them. Thirty percent stated it they were ‘sometimes useful’. Sixteen percent stated ‘mostly’ useful. Four percent stated that the PW_MS reports were useful to them. The mode, the median, and the mean response are ‘sometimes’ useful.

The response is broadly similar in the two sub-strata of the population sample.

- Twenty-four percent of the ‘HQ and portfolio manager’ strata of the population sample stated that ‘they did not know’. Twenty percent stated that the PW_MS reports were ‘not useful’ to them. Forty-two percent stated they were ‘sometimes useful’. Nine percent stated ‘mostly’ useful. Four percent stated that the PW_MS reports were useful to them. The mode, the median, and the mean response are ‘sometimes’ useful.
- Twenty-four percent of the ‘project manager’ strata of the population sample stated that ‘they did not know’. Twenty-nine percent stated that the PW_MS reports were ‘not useful’ to them. Twenty-five percent stated they were ‘sometimes useful’. Eighteen percent stated ‘mostly’ useful. Four percent stated that the PW_MS reports were useful to them. The mode response is ‘no’, and the median and the mean response are ‘sometimes’.

On balance, the response that is taken as statistically indicative of the user community as a whole, is that the PW_MS reports are ‘useful’, i.e., ‘sometimes plus mostly’ to nearly half of the responses received (forty-three to fifty-three percent). A significant portion of the population state that the PW_MS reports are not useful to them (Twenty to twenty-nine percent). The project manager strata, of the population sample, has the highest ‘not useful’ response (twenty-nine percent). The mode, median, and tendency of the mean response is that the ‘PW_MS’ reports are ‘sometimes’ useful to the population sample.

With regard to the second part of the question, the measurement in broad terms of the extent that the supply of PW_MS data is useful.

Twenty-four percent of the population sample stated that ‘they did not know’. Twenty-three percent stated that the PW_MS supply of data is ‘not useful’ to them. Thirty-six percent stated it was ‘sometimes useful’. Fourteen percent stated ‘mostly’ useful. Three percent stated that the PW_MS reports were useful to them. The mode, the median, and the mean response are ‘sometimes’ useful.

The response is broadly similar in the two sub-strata of the population sample.

- Twenty-four percent of the ‘HQ and portfolio manager’ strata of the population sample stated that ‘they did not know’. Seventeen percent stated that the PW_MS supply of data was ‘not useful’ to them. Forty-three percent stated they were ‘sometimes useful’. Eleven percent stated ‘mostly’ useful. Four percent stated that the PW_MS supply of data was useful to them. The mode, the median, and the mean response are ‘sometimes’ useful.
- Twenty-four percent of the ‘project manager’ strata of the population sample stated that ‘they did not know’. Twenty-five percent stated that the PW_MS supply of data was ‘not useful’ to them. Thirty-three percent stated they were

‘sometimes useful’. Sixteen percent stated ‘mostly’ useful. Three percent stated that the PW_MS reports were useful to them. The mode, median and the mean response are ‘sometimes’.

On balance, the response that is taken as statistically indicative of the user community as a whole, is that the PW_MS supply of data is are ‘useful’, i.e., ‘sometimes plus mostly’ to nearly half of the responses received (forty-nine to fifty-four percent). A significant portion of the population state that the PW_MS supply of data is not useful to them (seventeen to twenty-five percent). The project manager strata, of the population sample, has the highest ‘not useful’ response (twenty-five percent). The mode, median, and tendency of the mean response is that the ‘PW_MS’ supply of data is ‘sometimes’ useful to the population sample.

Q.1.5.2 Are/would the PW_MS reports, or the supply of data listed below be useful to you?

Commentary - this question is to measure the extent that the User Population is satisfied with the reports output that is offered to them in the PW_MS. The respondent is asked to choose one of the options with regard to the main functions of the PW_MS. The options are: ‘yes’, ‘mostly’, ‘sometimes’, ‘no’ or ‘not used by me’. The PW_MS functions listed in the questionnaire are:

- (a) *Quarterly progress reports on high impact Cat A projects;*
- (b) *Quarterly progress reports on Cat B projects;*
- (c) *Any of the reports listed on the ‘reports’ menu within the PW_MS;*
- (d) *‘FoxPro’ data download from the PW_MS;*
- (e) *Spreadsheet format data download from the PW_SAU; and*
- (f) *Use of SQL to access the PW_MS database.*

With regard to (a) ‘Quarterly progress reports on high impact Cat A projects’.

Thirty-two percent of the population sample stated that this report is ‘not used’. Twenty-four percent stated that this report feature is not useful to them. Seventeen percent stated that it is ‘sometimes’ useful. Nineteen percent responded that it is ‘mostly’ useful. Eight percent stated that it is useful. The mode response is ‘no’, meaning not useful to the population sample. The median is ‘sometimes’ useful, whilst the mean response is on the ‘mostly’ side of ‘sometimes’ useful.

The response is broadly similar in the two sub-strata of the population sample.

- Twenty-eight percent of the ‘HQ and portfolio manager’ strata of the population sample stated that ‘did not use’ this report. Seventeen percent stated that this report is not useful to them. Twenty percent responded that the report is ‘sometimes’ useful. Whilst twenty-six percent responded that it is ‘mostly’ useful. Nine percent stated that it is useful to them. The mode response is ‘mostly’ useful, the median is ‘sometimes’, and the mean response is on the ‘mostly’ side of ‘sometimes’ useful.
- Thirty-four percent of the ‘project manager’ strata of the population sample stated that ‘did not use’ this report. Twenty-seven percent stated that this report is not useful to them. Sixteen percent responded that the report is ‘sometimes’ useful. Whilst sixteen percent responded that it is ‘mostly’ useful. Eight percent stated

that it is useful to them. The mode response is ‘not’ useful, the median is ‘sometimes’, and the mean response is ‘sometimes’ useful.

On balance, the response that is taken as statistically indicative of the user community as a whole, is that the ‘Quarterly progress reports on high impact Cat A projects’ is useful to the population sample to a variable degree. The proportion of the response that states that it is useful or ‘mostly’ useful range from twenty-four to thirty-five percent of the response. The largest response is that this report is not used (twenty-eight to thirty-four percent). The median response is ‘sometimes’ useful. The mode is ‘sometimes’ useful for the population sample overall and for the ‘project manager’ strata of the population sample. The ‘HQ and portfolio manager’ strata have a greater use for this report – the mode is ‘mostly’ useful.

With regard to (a) ‘Quarterly progress reports on high impact Cat A projects’.

Thirty-two percent of the population sample stated that this report is ‘not used’. Twenty-four percent stated that this report feature is not useful to them. Seventeen percent stated that it is ‘sometimes’ useful. Nineteen percent responded that it is ‘mostly’ useful. Eight percent stated that it is useful. The mode response is ‘no’, meaning not useful to the population sample. The median is ‘sometimes’ useful, whilst the mean response is on the ‘mostly’ side of ‘sometimes’ useful.

The response is broadly similar in the two sub-strata of the population sample.

- Twenty-eight percent of the ‘HQ and portfolio manager’ strata of the population sample stated that ‘did not use’ this report. Seventeen percent stated that this report is not useful to them. Twenty percent responded that the report is ‘sometimes’ useful. Whilst twenty-six percent responded that it is ‘mostly’ useful. Nine percent stated that it is useful to them. The mode response is ‘mostly’ useful, the median is ‘sometimes’, and the mean response is on the ‘mostly’ side of ‘sometimes’ useful.
- Thirty-four percent of the ‘project manager’ strata of the population sample stated that ‘did not use’ this report. Twenty-seven percent stated that this report is not useful to them. Sixteen percent responded that the report is ‘sometimes’ useful. Whilst sixteen percent responded that it is ‘mostly’ useful. Eight percent stated that it is useful to them. The mode response is ‘not’ useful, the median is ‘sometimes’, and the mean response is ‘sometimes’ useful.

On balance, the response that is taken as statistically indicative of the user community as a whole, is that the ‘Quarterly progress reports on high impact Cat A projects’ is useful to the population sample to a variable degree. The proportion of the response that states that it is useful or ‘mostly’ useful ranges from twenty-four to thirty-five percent of the response. The largest response is that this report is not used (twenty-eight to thirty-four percent). The median response is ‘sometimes’ useful. The mode is ‘sometimes’ useful for the population sample overall and for the ‘project manager’ strata of the population sample. The ‘HQ and portfolio manager’ strata have a greater use for this report – the mode is ‘mostly’ useful.

With regard to (b) ‘FoxPro’ data download from the PW_MS’.

Sixty-five percent of the population sample stated that this feature is ‘not used’. Twenty-two percent stated that this data download is not useful to them. Nine percent stated that it is ‘sometimes’ useful. Four percent responded that it is ‘mostly’ useful. Zero percent stated that it is useful. The mode and the median response is ‘no’, meaning not useful to the population sample. The mean the mean response is midway between ‘sometimes’ and ‘not useful’.

The response is broadly similar in the two sub-strata of the population sample.

- Fifty-nine percent of the ‘HQ and portfolio manager’ strata of the population sample stated that ‘did not use’ this data download feature. Fifteen percent stated that this data download is not useful to them. Twenty-two percent responded that it is ‘sometimes’ useful. Whilst four percent responded that it is ‘mostly’ useful. Zero percent stated that it is useful to them. The mode and the median response are ‘mostly’ useful, and the mean response tends to ‘sometimes’ useful.
- Sixty-eight percent of the ‘project manager’ strata of the population sample stated that they ‘did not use’ this data download feature. Twenty-four percent stated that this feature is not useful to them. Four percent responded that it is ‘sometimes’ useful. Whilst four percent responded that it is ‘mostly’ useful. Zero percent stated that it is useful to them. The mode and the median response is ‘not’ useful, and the mean response tends to ‘sometimes’ useful.

On balance, the response that is taken as statistically indicative of the user community as a whole, is that the ‘Foxpro Data download from the PW_MS’ is not used or is considered not useful by more than three quarters of the population. The proportion of the response that states that the Fox Pro data download it is useful or ‘mostly’ useful is four percent of the response. The median and the mode response is ‘not useful’ for the population sample overall and also for the ‘project manager’ population strata, but the mode and the median are ‘sometimes useful’ for the ‘HQ and the portfolio manager’ strata.

With regard to (c) ‘any of the reports listed on the ‘reports’ menu within the PW_MS’.

Thirty percent of the population sample stated that these reports are ‘not used’. Twenty-five percent stated that these reports are not useful to them. Thirty-four percent stated that they are ‘sometimes’ useful. Nine percent responded that they are ‘mostly’ useful. Two percent stated that they are useful. The mode, the median, and the mean response is ‘sometimes’ useful to the population sample.

The response is broadly similar in the two sub-strata of the population sample.

- Twenty-nine percent of the ‘HQ and portfolio manager’ strata of the population sample stated that they ‘did not use’ these reports. Sixteen percent stated that these reports are not useful to them. Forty-four percent responded that the reports are ‘sometimes’ useful. Whilst seven percent responded that they are ‘mostly’ useful. Four percent stated that they are useful to them. The mode, median, and mean response is ‘mostly’ useful.

- Thirty percent of the ‘project manager’ strata of the population sample stated that they ‘did not use’ these reports. Twenty-nine percent stated that the reports are not useful to them. Thirty percent responded that the reports are ‘sometimes’ useful. Whilst ten percent responded that they are ‘mostly’ useful. One percent stated that they are useful to them. The mode and the median response is ‘sometimes’, and the mean response tends to ‘sometimes’ useful.

On balance, the response that is taken as statistically indicative of the user community as a whole, is that ‘any of the reports listed on the ‘reports’ menu within the PW_MS’ are useful to the population sample to slight but a variable degree. The proportion of the response that states that they are useful or ‘mostly’ useful is eleven percent of the response. The largest response is that these reports are ‘sometimes’ used (thirty to forty-four percent). The mode, the median and the bias of the mean response are ‘sometimes’ useful.

With regard to (d) ‘any of the reports listed on the ‘reports’ menu within the PW_MS’.

Thirty percent of the population sample stated that these reports are ‘not used’. Twenty-five percent stated that these reports are not useful to them. Thirty-four percent stated that they are ‘sometimes’ useful. Nine percent responded that they are ‘mostly’ useful. Two percent stated that they are useful. The mode, the median, and the mean response is ‘sometimes’ useful to the population sample.

The response is broadly similar in the two sub-strata of the population sample.

- Twenty-nine percent of the ‘HQ and portfolio manager’ strata of the population sample stated that they ‘did not use’ these reports. Sixteen percent stated that these reports are not useful to them. Forty-four percent responded that the reports are ‘sometimes’ useful. Whilst seven percent responded that they are ‘mostly’ useful. Four percent stated that they are useful to them. The mode, median, and mean response is ‘mostly’ useful.
- Thirty percent of the ‘project manager’ strata of the population sample stated that they ‘did not use’ these reports. Twenty-nine percent stated that the reports are not useful to them. Thirty percent responded that the reports are ‘sometimes’ useful. Whilst ten percent responded that they are ‘mostly’ useful. One percent stated that they are useful to them. The mode and the median response is ‘sometimes’, and the mean response tends to ‘sometimes’ useful.

On balance, the response that is taken as statistically indicative of the user community as a whole, is that ‘any of the reports listed on the ‘reports’ menu within the PW_MS’ are useful to the population sample to slight but a variable degree. The proportion of the response that states that they are useful or ‘mostly’ useful is eleven percent of the response. The largest response is that these reports are ‘sometimes’ used (thirty to forty-four percent). The mode, the median and the bias of the mean response, are ‘sometimes’ useful.

With regard to (e) ‘the spreadsheet format data download from the PW_MS’.

Sixty-five percent of the population sample stated that the spreadsheet format data download is ‘not used’. Eighteen percent stated that this data down is not useful to

them. Eleven percent stated that it is 'sometimes' useful. Five percent responded that it is 'mostly' useful. One percent stated that it is useful. The mode, and the median response is 'not' useful to the population sample. The mean is midway between not useful and 'sometimes useful'.

Sixty-three percent of the 'HQ and portfolio manager' strata of the population sample stated that they 'did not use' the spreadsheet data download. Thirteen percent stated that this feature is not useful to them. Seventeen percent responded that it is 'sometimes' useful. Whilst seven percent responded that they are 'mostly' useful. Zero percent stated that they are useful to them. The mode, median, and mean response is 'mostly' useful.

Sixty-six percent of the 'project manager' strata of the population sample stated that they 'did not use' the spreadsheet data download. Twenty percent stated that the feature is not useful to them. Eight percent responded that it is 'sometimes' useful. Whilst four percent responded that they are 'mostly' useful. One percent stated that it is useful to them. The mode and the median response are 'sometimes' useful. The mean response is midway between not and 'sometimes' useful.

On balance, the response that is taken as statistically indicative of the user community as a whole, is that 'the spreadsheet format data download' from the PW_MS' is useful to the population sample to slight but a variable degree. The proportion of the response that states that it is useful or 'mostly' useful is twenty-nine percent of the response. The largest response is that this feature is not used (sixty-three to sixty-six percent). The mode, the median are 'not useful' for the population sample and the 'project manager' strata. The 'HQ and portfolio manager' strata have a mode, median, and the bias of the mean of 'sometimes useful'.

With regard to (f) 'the SQL access to the PW_MS database'.

Sixty-seven percent of the population sample stated that the SQL access to the PW_MS database is 'not used'. Twenty-two percent stated that the SQL access is not useful to them. Four percent stated that it is 'sometimes' useful. Six percent responded that it is 'mostly' useful. One percent stated that it is useful. The mode, and the median response is 'not' useful to the population sample. The mean is midway between not useful and 'sometimes useful'.

Fifty-nine percent of the 'HQ and portfolio manager' strata of the population sample stated that they 'did not use' the SQL access to the PW_MS database. Twenty percent stated that this feature is not useful to them. Seven percent responded that it is 'sometimes' useful. Whilst thirteen percent responded that it is 'mostly' useful. Two percent stated that it is useful to them. The mode response is 'not useful', the median and mean response are 'sometimes useful'.

Seventy-one percent of the 'project manager' strata of the population sample stated that they 'did not use' the SQL data download. Twenty-two percent stated that the feature is not useful to them. Four percent responded that it is 'sometimes' useful. Whilst four percent responded that it is 'mostly' useful. One percent stated that it is useful to them. The mode and the median response is 'not useful'. The mean response is midway between 'not' and 'sometimes' useful.

On balance, the response that is taken as statistically indicative of the user community as a whole, is that 'the SQL access to the PW_MS database' is useful to the population sample to slight but a variable degree. The proportion of the response that states that it is useful or 'mostly' useful is twenty-six percent of the response. The largest response is that this feature is not used (fifty-nine to seventy-one percent). The mode, the median are 'not useful' for the population sample and the 'project manager' strata. The 'HQ and portfolio manager' strata have a mode of 'not useful', a median of 'sometimes useful', and the mean is close to 'sometimes useful'.

Q.1.5.3 Is an open question, the analysis is in Section 8.4.

Questionnaire Part 1 Centralised, single source of data

Q.1.6.1 Is the PW_MS an effective centralised, single source of accurate PWP data/information to project participants?

Commentary - this question measures the extent that the User Population regard the PW_MS as an effective single source of data on the PW_MS.

Twenty-three percent of the population sample stated that they did not use the PW_MS. Twenty-five percent stated that the PW_MS is not an effective, centralised, single-source of accurate PWP data/information. Thirty-six percent stated it 'sometimes' fulfilled this purpose. Eleven percent responded that it is 'mostly' fulfilled this objective. Six percent stated that it did fulfill this need. The mode, the median, and the mean response is 'sometimes' an effective, centralised, single-source of accurate PWP data/information. useful to the population sample.

Twenty percent of the 'HQ and portfolio manager' strata of the population sample stated that they 'did not use' the PW_MS. Thirty percent stated that the PW_MS is not an effective, centralised, single-source of accurate PWP data/information. Thirty-three percent responded that it 'sometimes' meets this need. Whilst fifteen percent responded that it 'mostly' meets this objective. Two percent stated that it is an effective, centralised, single-source of accurate PWP data/information. The mode and the median response is 'sometimes'. The mean response tends to 'sometimes'.

Twenty-four percent of the 'project manager' strata of the population sample stated that they 'did not use' the PW_MS. Twenty-three percent stated that the PW_MS is not an effective, centralised, single-source of accurate PWP data/information. Thirty-eight percent responded that it 'sometimes' meets this objective. Whilst nine percent responded that it 'mostly' fits this purpose. Seven percent stated that it is an effective, centralised, single-source of accurate PWP data/information. The mode, the median, and the mean response are 'sometimes'.

On balance, the response that is taken as statistically indicative of the user community as a whole, is that the PW_MS 'is an effective, centralised, single-source of accurate PWP data/information to some degree to fifty to fifty-four percent of the user population/sub-strata of the population sample. The mode, the median, and the mean response is 'sometimes' meets this requirement for the population overall and the

population sub strata. The largest response is that the PW_MS meets this need ‘sometimes’ (thirty-three to thirty-eight percent).

Q.1.6.2 Is an open question, the analysis is in Section 8.4.

Questionnaire Part 1 Effectiveness of the PW_MS

Q.1.7.1 Is the PW_MS effective for the management of the groups of projects in the hierarchical breakdown-structures in the PW_MS, i.e. WBS OBS, FRS, CRS?

Commentary - this question is to measure the extent that the User Population is satisfied with the effectiveness of the PW_MS in managing groups of projects. The respondent is asked to choose one of the options with regard to the main functions of the PW_MS. The options are: ‘yes’, ‘mostly’, ‘sometimes’, ‘no’ or ‘not used by me’.

Forty-three percent of the population sample stated that they did not use this feature of the PW_MS. Eighteen percent stated that the PW_MS is not effective for the management of the groups of projects in the hierarchical breakdown structures in the WBS, OBS, FRS, and the CRS. Thirty percent stated it ‘sometimes’ fulfilled this purpose. Four percent responded that it is ‘mostly’ fulfilled this objective. Four percent stated that it did fulfill this need. The mode, the median, and the mean response is ‘sometimes’ effective for the management of the groups of projects in the hierarchical breakdown structures in the WBS, OBS, FRS, and the CRS.

Forty-four percent of the ‘HQ and portfolio manager’ strata of the population sample stated that they ‘did not use’ this feature of the PW_MS. Thirteen percent stated that the PW_MS is not effective for the management of the groups of projects in the hierarchical breakdown structures in the WBS, OBS, FRS, and the CRS. Thirty-three percent responded that it ‘sometimes’ meets this need. Whilst four percent responded that it ‘mostly’ meets this objective. Four percent stated that it is an effective for this purpose. The mode, the median, and the mean response is ‘sometimes’.

Forty-two percent of the ‘project manager’ strata of the population sample stated that they ‘did not use’ this feature of the PW_MS. Twenty percent stated that the PW_MS is not effective for the management of the groups of projects in the hierarchical breakdown structures in the WBS, OBS, FRS, and the CRS. Twenty-nine percent responded that it ‘sometimes’ meets this objective. Whilst four percent responded that it ‘mostly’ fits this purpose. Four percent stated that it is effective for this purpose. The mode, the median, and the mean response are ‘sometimes’.

On balance, the response that is taken as statistically indicative of the user community as a whole: is that the PW_MS ‘is effective for the management of the groups of projects in the hierarchical breakdown structures in the WBS, OBS, FRS, and the CRS’ to some degree to thirty-seven to forty-one percent of the user population/sub-strata of the population sample. The mode, the median, and the mean response is ‘sometimes’ meets this requirement for the population overall and the population sub strata. The largest response is that this feature of the PW_MS is not used for this purpose (forty-two to forty-four percent).

Q.1.7.2 Is an open question, the analysis is in Section 8.4.

Questionnaire Part 1 Using the PW_MS

This part of the questionnaire is to measure the adequacy of the PW_MS and to identify how to improve it.

Q.1.8.1 Is the performance of those features/functions/process/uses listed below satisfactory to you?

Commentary - this question is to measure the extent that the User Population is satisfied with the reports output that is offered to them in the PW_MS. The respondent is asked to choose one of the options with regard to the main functions of the PW_MS. The options are: 'OK', 'a bit slow', 'very slow', or 'not used by me'. The PW_MS functions listed in the questionnaire are:

- (a) Logging onto the PW_MS;
- (b) Accessing project data;
- (c) Updating the project timeplan;
- (d) Recording expenditure;
- (e) Creation of a pending change order involving expenditure;
- (g) Writing an entry in the project or work-package;
- (h) Updating the project contacts; and
- (i) Obtaining and printing a report.

With regard to (a) 'the performance of logging onto the PW_MS'.

Thirty-seven percent of the population sample stated that the PW_MS is 'not used'. Twenty-five percent stated that the performance of the PW_MS when logging on is 'very slow'. Thirty-one percent stated that it is 'a bit slow'. Eight percent responded that it is 'OK'. The mode, and the median response is 'a bit slow'. The mean tends to the 'a bit slow' side of 'very slow'.

Thirty-one percent of the 'HQ and portfolio manager' strata of the population sample stated that they 'did not use' the PW_MS. Eighteen percent stated that it is 'very slow' to log onto the PW_MS. Forty-four percent responded that it is 'a bit slow'. Seven percent responded that it is 'OK'. The mode response and the median response is 'very slow'. The mean tends to the 'a bit slow' side of 'very slow'.

Thirty-nine percent of the 'project manager' strata of the population sample stated that they 'did not use' the PW_MS. Twenty-seven percent stated that it is 'very slow' to log onto the PW_MS. Twenty-six percent responded that it is 'a bit slow'. Eight percent responded that it is 'OK'. The mode response is 'very slow', the median response is 'a bit slow'. The mean tends to the 'a bit slow' side of 'very slow'.

On balance, the response that is taken as statistically indicative of the user community as a whole, is that logging onto the PW_MS is considered 'very slow' or 'a bit slow' to fifty-three to sixty-two percent of the population sample. Seven to eight percent of

the population sample/sub strata state that the logging on performance is satisfactory.

With regard to (b) ‘the performance of the PW_MS when accessing project data’.

Thirty-five percent of the population sample stated that this feature of the PW_MS is ‘not used’. Twenty-six percent stated that the performance of the PW_MS when accessing project data is ‘very slow’. Twenty-eight percent stated that it is ‘a bit slow’. Nine percent responded that it is ‘OK’. The mode, and the median response is ‘a bit slow’. The mean tends to the ‘a bit slow’ side of ‘very slow’.

Thirty-one percent of the ‘HQ and portfolio manager’ strata of the population sample stated that they ‘did not use’ this feature of the PW_MS. Sixteen percent stated that it is ‘very slow’ to access project data on the PW_MS. Thirty-eight percent responded that it is ‘a bit slow’. Thirteen percent responded that it is ‘OK’. The mode response, the median response, and the mean response is ‘a bit slow’.

Thirty-seven percent of the ‘project manager’ strata of the population sample stated that they ‘did not use’ this feature of the PW_MS. Thirty percent stated that it is ‘very slow’ to access project data on the PW_MS. Twenty-five percent responded that it is ‘a bit slow’. Eight percent responded that it is ‘OK’. The mode response is a ‘very slow’, the median response is ‘a bit slow’: and the mean response is mid-way between the two.

On balance, the response that is taken as statistically indicative of the user community as a whole, is that accessing project data from the PW_MS is considered ‘very slow’ or ‘a bit slow’ to fifty-four to fifty-five percent of the population sample. Eight to thirteen percent of the population sample/sub strata state that the performance of the PW_MS is satisfactory when accessing project data. In this respect the ‘Hq and portfolio manager’ sub-strata of the population sample are more satisfied than the ‘project manager’ sub-strata.

With regard to (c) ‘the performance of the PW_MS when updating the project timeplan’.

Forty-one percent of the population sample stated that this feature of the PW_MS is ‘not used’. Twenty-eight percent stated that the performance of the PW_MS when updating the project timeplan is ‘very slow’. Twenty-two percent stated that it is ‘a bit slow’. Eight percent responded that it is ‘OK’. The mode response is ‘very slow’, the median response is ‘a bit slow’, whilst the mean response falls between the two.

Forty percent of the ‘HQ and portfolio manager’ strata of the population sample stated that they ‘did not use’ this feature of the PW_MS. Twenty-two percent stated that it is ‘very slow’ to update the project timeplan on the PW_MS. Twenty-two percent responded that it is ‘a bit slow’. Thirteen percent responded that it is ‘OK’. The mode response is ‘very slow’, the median response is ‘a bit slow’, whilst the mean response tends towards the ‘bit slow’ side of ‘very slow’.

Forty-two percent of the 'project manager' strata of the population sample stated that they 'did not use' this feature of the PW_MS. Thirty-one percent stated that it is 'very slow' to update the project timeplan on the PW_MS. Twenty-two percent responded that it is 'a bit slow'. Five percent responded that it is 'OK'. The mode response and the median response is 'very slow', and the mean response is mid-way between 'a bit slow' and 'very slow'.

On balance, the response that is taken as statistically indicative of the user community as a whole, is that updating the project timeplan within the PW_MS is considered 'very slow' or 'a bit slow' to forty-four to fifty-three percent of the population sample. Eight to thirteen percent of the population sample/sub strata state that the performance of the PW_MS is satisfactory when updating the project timeplan. In this respect the 'HQ and portfolio manager' sub-strata of the population sample are more satisfied than the 'project manager' sub-strata.

With regard to (d) 'the performance of the PW_MS when recording expenditure'.

Forty-two percent of the population sample stated that this feature of the PW_MS is 'not used'. Twenty-three percent stated that the performance of the PW_MS when recording expenditures is 'very slow'. Twenty-two percent stated that it is 'a bit slow'. Thirteen percent responded that it is 'OK'. The mode response is 'very slow', the median response is 'a bit slow', whilst the mean response falls between the two with a bias towards 'a bit slow'.

Forty percent of the 'HQ and portfolio manager' strata of the population sample stated that they 'did not use' this feature of the PW_MS. Thirteen percent stated that it is 'very slow' to record expenditures within the PW_MS. Eighteen percent responded that it is 'a bit slow'. Twenty-seven percent responded that it is 'OK'. The mode response is 'OK', the median response is 'a bit slow', whilst the mean response tends towards the 'bit slow' side of 'OK'.

Forty-two percent of the 'project manager' strata of the population sample stated that they 'did not use' this feature of the PW_MS. Twenty-seven percent stated that it is 'very slow' to record expenditures within the PW_MS. Twenty-four percent responded that it is 'a bit slow'. Seven percent responded that it is 'OK'. The mode response is 'very slow', the median response is 'a bit slow', and the mean response is mid-way between 'a bit slow' and 'very slow'.

On balance, the response that is taken as statistically indicative of the user community as a whole, is that recording expenditures within the PW_MS is considered 'very slow' or 'a bit slow' to thirty-one to fifty-one percent of the population sample. Seven to twenty-seven percent of the population sample/sub strata state that the performance of the PW_MS is satisfactory when recording expenditure. In this respect the 'HQ and portfolio manager' sub-strata of the population sample are more satisfied than the 'project manager' sub-strata.

With regard to (e) 'the performance of the PW_MS when creating a pending change order involving cashflow'.

Forty-one percent of the population sample stated that this feature of the PW_MS is 'not used'. Nineteen percent stated that the performance of the PW_MS when creating this type of pending change order is 'very slow'. Twenty-eight percent stated that it is 'a bit slow'. Twelve percent responded that it is 'OK'. The mode response and the median response is 'a bit slow', whilst the mean response falls between 'very slow' and 'a bit slow' with a bias towards 'a bit slow'.

Forty-two percent of the 'HQ and portfolio manager' strata of the population sample stated that they 'did not use' this feature of the PW_MS. Thirteen percent stated that it is 'very slow' to create this type of pending change order within the PW_MS. Twenty-two percent responded that it is 'a bit slow'. Twenty-two percent responded that it is 'OK'. The mode response and the median response is 'a bit slow', whilst the mean response tends towards the 'bit slow' side of 'OK'.

Forty percent of the 'project manager' strata of the population sample stated that they 'did not use' this feature of the PW_MS. Twenty-one percent stated that it is 'very slow' to record expenditures within the PW_MS. Thirty-one percent responded that it is 'a bit slow'. Eight percent responded that it is 'OK'. The mode response and the median response are 'a bit slow', and the mean response is between 'a bit slow' and 'very slow' with a bias towards 'very slow'.

On balance, the response that is taken as statistically indicative of the user community as a whole, is that the creation of a pending change order involving cashflow within the PW_MS is considered 'very slow' or 'a bit slow' to thirty-five to fifty-two percent of the population sample. Eight to twenty-two percent of the population sample/sub strata state that the performance of the PW_MS is satisfactory when creating a cashflow pending change order. In this respect the 'HQ and portfolio manager' sub-strata of the population sample are more satisfied than the 'project manager' sub-strata.

With regard to (f) 'the performance of the PW_MS when writing an entry in the project or work package diary'.

Thirty-nine percent of the population sample stated that this feature of the PW_MS is 'not used'. Seven percent stated that the performance of the PW_MS when writing a diary entry is 'very slow'. Twenty-three percent stated that it is 'a bit slow'. Thirty percent responded that it is 'OK'. The mode response is 'OK', the median response is between 'a bit slow' and 'OK', whilst the mean response falls between 'a bit slow' and 'OK' with a bias towards 'a bit slow'.

Forty percent of the 'HQ and portfolio manager' strata of the population sample stated that they 'did not use' this feature of the PW_MS. Four percent stated that it is 'very slow' to write a diary entry within the PW_MS. Eighteen percent responded that it is 'a bit slow'. Thirty-six percent responded that it is 'OK'. The mode response and the median response are 'OK', whilst the mean response is midway between 'OK' and 'a bit slow'.

Thirty-eight percent of the 'project manager' strata of the population sample stated that they 'did not use' this feature of the PW_MS. Eight percent stated that it is 'very slow' to write a diary entry within the PW_MS. Twenty-six percent responded that it

is 'a bit slow'. Twenty-eight percent responded that it is 'OK'. The mode response is 'OK', the median response are 'a bit slow', and the mean response is between 'a bit slow' and 'very slow' with a bias towards 'a bit slow'.

On balance, the response that is taken as statistically indicative of the user community as a whole, is that the writing of a diary entry within the PW_MS is considered 'very slow' or 'a bit slow' to twenty-two to thirty-four percent of the population sample. Twenty-eight to thirty-six percent of the population sample/sub strata state that the performance of the PW_MS is satisfactory when writing a diary entry within the PW_MS.

With regard to (g) 'the performance of the PW_MS when updating the project contacts'.

Forty-six percent of the population sample stated that this feature of the PW_MS is 'not used'. Seven percent stated that the performance of the PW_MS when updating the project contacts is 'very slow'. Eighteen percent stated that it is 'a bit slow'. Twenty-nine percent responded that it is 'OK'. The mode response and the median response are 'OK', whilst the mean response falls between 'a bit slow' and 'OK' with a bias towards 'a bit slow'.

Forty-nine percent of the 'HQ and portfolio manager' strata of the population sample stated that they 'did not use' this feature of the PW_MS. Four percent stated that it is 'very slow' to update project contacts within the PW_MS. Sixteen percent responded that it is 'a bit slow'. Thirty-one percent responded that it is 'OK'. The mode response and the median response are 'OK', whilst the mean response is midway between 'OK' and a 'bit slow'.

Thirty-eight percent of the 'project manager' strata of the population sample stated that they 'did not use' this feature of the PW_MS. Eight percent stated that it is 'very slow' to update project contacts within the PW_MS. Twenty-six percent responded that it is 'a bit slow'. Twenty-eight percent responded that it is 'OK'. The mode response is 'OK', the median response are 'a bit slow', and the mean response is between 'a bit slow' and 'very slow' with a bias towards 'a bit slow'.

On balance, the response that is taken as statistically indicative of the user community as a whole, is that the updating of project contacts within the PW_MS is considered 'very slow' or 'a bit slow' to twenty to thirty-four percent of the population sample. Twenty-eight to thirty-one percent of the population sample/sub strata state that the performance of the PW_MS is satisfactory when updating project contacts. In this respect the 'HQ and portfolio manager' sub-strata of the population sample are more satisfied than the 'project manager' sub-strata.

With regard to (h) 'the performance of the PW_MS when obtaining and printing a report'.

Thirty-six percent of the population sample stated that this feature of the PW_MS is 'not used'. Eighteen percent stated that the performance of the PW_MS when obtaining and printing a report is 'very slow'. Thirty-four percent stated that it is 'a

bit slow'. Eleven percent responded that it is 'OK'. The mode response and the median response are 'a bit slow', whilst the mean response tends to 'a bit slow'.

Thirty-three percent of the 'HQ and portfolio manager' strata of the population sample stated that they 'did not use' this feature of the PW_MS. Nine percent stated that it is 'very slow' to obtain and print reports from the PW_MS. Fifty-one percent responded that it is 'a bit slow'. Seven percent responded that it is 'OK'. The mode response and the median response are 'OK', whilst the mean response is between a 'bit slow' and 'very slow' but tends to 'a bit slow'.

Thirty-eight percent of the 'project manager' strata of the population sample stated that they 'did not use' this feature of the PW_MS. Twenty-one percent stated that it is 'very slow' to obtain and print reports from the PW_MS. Twenty-eight percent responded that it is 'a bit slow'. Thirteen percent responded that it is 'OK'. The mode response and the median response are 'a bit slow', and the mean response is between 'a bit slow' and 'very slow' with a bias towards 'a bit slow'.

On balance, the response that is taken as statistically indicative of the user community as a whole, is that the obtaining and printing a report from the PW_MS is considered 'very slow' or 'a bit slow' to forty-nine to sixty percent of the population sample. Seven to thirteen percent of the population sample/sub strata state that the performance of the PW_MS is satisfactory when obtaining and printing reports.

Q.1.8.2 In overall terms, is the PW_MS satisfactory to use?

Commentary - this question measures, in broad terms, the extent that the PW_MS is satisfactory to use. The respondent is asked to choose one of the options with regard to the main functions of the PW_MS. The options are: 'yes', 'mostly', 'sometimes', 'no' or 'not used by me'.

Twenty percent of the population sample stated that they did not use this feature of the PW_MS. Thirty-five percent stated that the PW_MS is not satisfactory to use. Thirty percent stated it is 'sometimes' satisfactory to use. Twelve percent responded that it is 'mostly' fulfilled this objective. Two percent stated that it is satisfactory to use. The mode response is 'not' satisfactory, the median response is 'sometimes' satisfactory, and the mean response is between 'sometimes' and 'mostly' but tends to 'mostly' satisfactory.

Twenty-two percent of the 'HQ and portfolio manager' strata of the population sample stated that they 'did not use' the PW_MS. Twenty-four percent stated that the PW_MS is not satisfactory to use. Forty-one percent responded that it is 'sometimes' satisfactory to use. Whilst twelve percent responded that it is 'mostly' satisfactory. Zero percent stated that it is satisfactory. The mode and the median response are 'sometimes' satisfactory, whilst the mean response tends to 'sometimes' satisfactory.

Nineteen percent of the 'project manager' strata of the population sample stated that they 'did not use' the PW_MS. Thirty-nine percent stated that the PW_MS is not satisfactory to use. Twenty-six percent responded that it is 'sometimes' satisfactory. Whilst twelve percent responded that it is 'mostly' satisfactory. Three percent stated

that it is satisfactory to use. The mode response is 'not' satisfactory, the median response is 'sometimes', and the mean response tends to 'sometimes'.

On balance, the response that is taken as statistically indicative of the user community as a whole: is that the PW_MS 'satisfactory to use, to some degree, to forty-one to fifty-three percent of the user population/sub-strata of the population sample. The mode response is 'not satisfactory' for the population sample overall and the 'project manager sub-strata of the population sample. The median response for the population overall and the sub-strata of the population sample are 'sometime' satisfactory. The median response tends to 'sometimes' satisfactory. The largest response for the population sample overall and the 'project manager' sub-strata is that the PW_MS is not satisfactory to use (thirty-five to thirty-nine percent). The largest response for the 'HQ and the portfolio manager' sub-strata is that the PW_MS is 'sometimes' satisfactory to use (forty-one percent).

Q.1.8.3 Is an open question, the analysis is in Section 8.5.

Q.1.8.4 How fast should the PW_MS be?

Commentary - the respondent is asked to choose one comparable performance option. These are, in order of decreasing average response times:

- (a) *A stand-alone PC used for word-processing;*
- (b) *A bank automated teller machine (ATM) i.e., ETC machine;*
- (c) *Using the internet/WWW via a modem; and*
- (d) *I do not know.*

Twenty-three percent of the population sample stated that they did not know how fast the PW_MS should be. Eight percent stated that the PW_MS should be as 'fast as using the Internet/WWW via a modem'. Eighteen percent stated that the PW_MS should be as fast as 'using a bank teller machine (ETC)'. Fifty-one percent that the PW_MS should be as fast as using 'a stand-alone PC for word-processing'. The mode response and the median response is 'as fast as a standalone PC used for word-processing'. The mean response tends to 'as fast as an ETC'.

Fourteen percent of the 'HQ and portfolio manager' sub-strata of the population sample stated that they did not know how fast the PW_MS should be. Two percent stated that the PW_MS should be as 'fast as using the Internet/WWW via a modem'. Twenty-five percent stated that the PW_MS should be as fast as 'using a bank teller machine (ETC)'. Fifty-nine percent that the PW_MS should be as fast as using 'a stand-alone PC for word-processing'. The mode response and the median response is 'as fast as a standalone PC used for word-processing'. The mean response tends to 'as fast as an ETC'.

Twenty-seven percent of the 'project manager' sub-strata of the population sample stated that they did not know how fast the PW_MS should be. Ten percent stated that the PW_MS should be as 'fast as using the Internet/WWW via a modem'. Sixteen percent stated that the PW_MS should be as fast as 'using a bank teller machine (ETC)'. Forty-eight percent that the PW_MS should be as fast as using 'a stand-alone PC for word-processing'. The mode response is as 'fast as a standalone PC used for

word-processing'. The median response is as 'fast as an ETC machine'. The mean response tends to 'as fast as an ETC'.

On balance, the response that is taken as statistically indicative of the user community as a whole: is that the PW_MS should be as fast 'as a standalone PC when used for word-processing, to forty-eight to fifty-nine percent of the user population/sub-strata of the population sample. This is the mode response for the population sample overall and the sub-strata of the population sample. The 'project manager' sub-strata has a median response of 'as fast as an ETC machine. The mean response for the population overall and the sub-strata of the population sample are 'as fast as an ETC machine'. The largest response for the population sample overall and the sub-strata of the population sample is 'as fast as a standalone PC wen used for word-processing'.

Questionnaire Part 1 Ease of use of the PW_MS

Q.1.9.1 *The PW_MS should be as easy to use as?*

The respondent is asked to choose one comparable performance option. These are, in order of increasing complexity of software:

- (a) *Microsoft Excel or Lotus 123 software;*
- (b) *Microsoft Word software;*
- (c) *Foxpro database software;*
- (d) *Work-scheduling software; and*
- (e) *I do not know.*

Sixteen percent of the population sample stated that they did not know how easy the PW_MS should be to use. Six percent stated that the PW_MS should be as easy to use as 'work-scheduling software. Three percent stated that the PW_MS should be as easy to use as 'FoxPro database software'. Twenty-six percent that it should be as easy as 'Microsoft WORD software'. Forty-eight percent that it should be as easy as using 'Microsoft Excel or Lotus 123 software'. The mode response is as easy as using Excel or 123 spreadsheet software. The median response and the trend of the mean response is as easy as using WORD software.

Eighteen percent of the 'HQ and portfolio manager' sub-strata of the population sample stated that they did not know how easy the PW_MS should be to use. Five percent stated that the PW_MS should be as easy to use as 'work-scheduling software. Seven percent stated that the PW_MS should be as easy to use as 'FoxPro database software'. Thirty percent that it should be as easy as 'Microsoft WORD software'. Forty-one percent that it should be as easy as using 'Microsoft Excel or Lotus 123 software'. The mode response is as easy as using Excel or 123 spreadsheet software. The median response and the trend of the mean response is as easy as using WORD software.

Fifteen percent of the 'project manager' sub-strata of the population sample stated that they did not know how easy the PW_MS should be to use. Seven percent stated that the PW_MS should be as easy to use as 'work-scheduling software. Two percent stated that the PW_MS should be as easy to use as 'FoxPro database software'. Twenty-four percent that it should be as easy as 'Microsoft WORD software'. Fifty-

one-one percent that it should be as easy as using ‘Microsoft Excel or Lotus 123 software’. The mode response and the median response are, as easy as using Excel or 123 spreadsheet software. Trend of the mean response is as easy as using WORD software.

On balance, the response that is taken as statistically indicative of the user community as a whole: is that the PW_MS should be as easy to use ‘Microsoft Excel or Lotus 123 spreadsheet software’ to forty-one to fifty-one percent of the user population/sub-strata of the population sample. This is the mode response for the population sample overall and the sub-strata of the population sample. The ‘project manager’ sub-strata has the same response for the median value, otherwise the median is the same as the mode value. The mean response for the population overall and the sub-strata of the population sample are ‘as easy to use as Microsoft WORD software’. The largest response for the population sample overall and the sub-strata of the population sample is ‘as easy to use as Microsoft Excel or Lotus 123 software’.

Questionnaire Part 2, Use of the PW_MS for management of Category C, B, and A PWP projects

This part of the questionnaire sets out to measure the extent that the PW_MS meets the need for a project management tool. It also asks for details of the shortfall and redundancy in these tools.

Questionnaire Part 2 Project Register, Diary and Contacts

Q.2.1.1 Does the project register in the PW_MS contain all the data that you want for your projects?

Commentary - the project register in the PW_MS is a proforma-style screen or report that contains summary details of the project, its timing and costs. This question measures in broad terms the extent that the User population are satisfied that the project register in the PW_MS contains all of the data that they require for their projects.

Twenty-eight percent of the population sample stated that they did not use the PW_MS. Three percent stated that the PW_MS contained ‘too little’ data in the project register. Fifty-four percent stated that the data in the project register was the ‘right amount’. Fourteen percent stated that the data was ‘too much’. The mode and the median response are ‘right amount’. The mean response tends to ‘right amount’.

Thirty-eight percent of the ‘HQ and portfolio manager’ sub-strata of the population sample stated that they did not use the PW_MS. Two percent stated that the PW_MS contained ‘too little’ data in the project register. Forty-seven percent stated that the data in the project register was the ‘right amount’. Thirteen percent stated that the data was ‘too much’. The mode and the median response are ‘right amount’. The mean response tends to ‘right amount’.

Twenty-five percent of the 'project manager' sub-strata of the population sample stated that they did not use the PW_MS. Three percent stated that the PW_MS contained 'too little' data in the project register. Fifty-eight percent stated that the data in the project register was the 'right amount'. Fourteen percent stated that the data was 'too much'. The mode and the median response are 'right amount'. The mean response tends to 'right amount'.

On balance, the response that is taken as statistically indicative of the user community as a whole; is that the data in the project register of the PW_MS is the 'right amount' for forty-seven to fifty-eight percent of the user population/sub-strata of the population sample. This is the mode and the median response for the population sample overall and the sub-strata of the population sample. The mean response for the population overall and the sub-strata of the population sample is the 'right amount'. About fourteen percent of the population sample/sub-strata state the the data in the project register is 'too much'. About three percent state that it is 'too little'.

Q.2.1.2 Is an open question, the analysis is in Section 8.5.

Q.2.1.3 Does the project diary in the PW_MS contain all the data that you want for your projects?

Commentary - the project diary is a free-format notebook containing fifteen sub-sections. The project manager uses these to routinely record statements of progress, and issues over the project life-cycle. This question measures in broad terms the extent that the User population are satisfied that the project diary in the PW_MS contains all of the data that they require for their projects.

Thirty-two percent of the population sample stated that they did not use this feature of the PW_MS. Four percent stated that the PW_MS contained 'too little' data in the project diary. Forty-seven percent stated that the data in the project diary was the 'right amount'. Sixteen percent stated that the data was 'too much'. The mode and the median response are 'right amount'. The mean response tends to 'right amount'.

Forty-three-eight percent of the 'HQ and portfolio manager' sub-strata of the population sample stated that they did not use this feature of the PW_MS. Two percent stated that the PW_MS contained 'too little' data in the project diary. Thirty-four percent stated that the data in the project diary was the 'right amount'. Twenty percent stated that the data was 'too much'. The mode and the median response are 'right amount'. The mean response tends to 'right amount'.

Twenty-seven percent of the 'project manager' sub-strata of the population sample stated that they did not use this feature of the PW_MS. Five percent stated that the PW_MS contained 'too little' data in the project diary. Fifty-two percent stated that the data in the project diary was the 'right amount'. Fourteen percent stated that the data was 'too much'. The mode and the median response are 'right amount'. The mean response tends to 'right amount'.

On balance, the response that is taken as statistically indicative of the user community as a whole: is that the data in the project diary of the PW_MS is the 'right amount' for thirty-four to fifty-two percent of the user population/sub-strata of the population sample. This is the mode and the median response for the population sample overall and the sub-strata of the population sample. The mean response for the population overall and the sub-strata of the population sample is the 'right amount'. Fourteen to twenty percent of the population sample/sub-strata state the data in the project diary is 'too much'. Two to five percent state that it is 'too little'.

Q.2.1.4 Is an open question, the analysis is in Section 8.5.

Q.2.1.5 Does the project contacts in the PW_MS contain all the data that you want for your projects?

Commentary - the project contacts element of the PW_MS is a database of the persons involved in the project and their contact data. It is useful for rapid telephone or fax communications to discuss project issues. It is also used for the creation of fax mailings on generic project issues. This question measures in broad terms the extent that the User population is satisfied that the project contacts in the PW_MS contains all of the data that they require for their projects.

Forty-four percent of the population sample stated that they did not use this feature of the PW_MS. One percent stated that the PW_MS contained 'too little' data in the project contacts. Fifty-three percent stated that the data in the project contacts was the 'right amount'. Three percent stated that the data was 'too much'. The mode and the median response are 'right amount'. The mean response tends to 'right amount'.

Fifty percent of the 'HQ and portfolio manager' sub-strata of the population sample stated that they did not use this feature of the PW_MS. Two percent stated that the PW_MS contained 'too little' data in the project contacts. Forty-eight percent stated that the data in the project contacts was the 'right amount'. Zero percent stated that the data was 'too much'. The mode and the median response are 'right amount'. The mean response tends to 'right amount'.

Forty-one percent of the 'project manager' sub-strata of the population sample stated that they did not use this feature of the PW_MS. Zero percent stated that the PW_MS contained 'too little' data in the project contacts. Fifty-five percent stated that the data in the project contacts was the 'right amount'. Four percent stated that the data was 'too much'. The mode and the median response are 'right amount'. The mean response tends to 'right amount'.

On balance, the response that is taken as statistically indicative of the user community as a whole: is that the data in the project contacts of the PW_MS is the 'right amount' for forty-eight to fifty-five percent of the user population/sub-strata of the population sample. This is the mode and the median response for the population sample overall and the sub-strata of the population sample. The mean response for the population overall and the sub-strata of the population sample tends to the 'right amount'. Zero

to two percent of the population sample/sub-strata state the data in the project diary is 'too much'. Zero to five percent state that it is 'too little'.

Q.2.1.6 Is an open question, the analysis is in Section 8.5.

Q.2.1.7 Does the work-package register in the PW_MS contain all the data that you want for your projects?

Commentary - the work-package register is the equivalent of the project register but it only applies the finer detailed work-package elements linked to the higher level project. Like the project register in the PW_MS, the work-package register is a proforma-style screen or report that contains summary details of the work-package, its timing and costs. This question measures in broad terms the extent that the User population is satisfied that the work-package register in the PW_MS contains all of the data that they require for their projects.

Forty percent of the population sample stated that they did not use this feature of the PW_MS. Three percent stated that the PW_MS contained 'too little' data in the work-package register. Forty-seven percent stated that the data in the work package register was the 'right amount'. Ten percent stated that the data was 'too much'. The mode and the median response are 'right amount'. The mean response tends to 'right amount'.

Fifty-one percent of the 'HQ and portfolio manager' sub-strata of the population sample stated that they did not use this feature of the PW_MS. Two percent stated that the PW_MS contained 'too little' data in the work-package register. Forty-two percent stated that the data in the work-package register was the 'right amount'. Four percent stated that the data was 'too much'. The mode and the median response are 'right amount'. The mean response tends to 'right amount'.

Thirty-six percent of the 'project manager' sub-strata of the population sample stated that they did not use this feature of the PW_MS. Three percent stated that the PW_MS contained 'too little' data in the work-package register. Forty-nine percent stated that the data in the work-package register was the 'right amount'. Thirteen percent stated that the data was 'too much'. The mode and the median response are 'right amount'. The mean response tends to 'right amount'.

On balance, the response that is taken as statistically indicative of the user community as a whole: is that the data in the work-package register of the PW_MS is the 'right amount' for forty-two to forty-nine percent of the user population/sub-strata of the population sample. This is the mode and the median response for the population sample overall and the sub-strata of the population sample. The mean response for the population overall and the sub-strata of the population sample tends to the 'right amount'. Two to three percent of the population sample/sub-strata state the data in the project diary is 'too much'. Four to thirteen percent state that it is 'too little'.

Q.2.1.8 Is an open question, the analysis is in Section 8.5.

Q.2.1.9 Does the work-package diary in the PW_MS contain all the data that you want for your projects?

Commentary - the work-package diary is the equivalent of the project diary but it only applies the finer detailed work-package elements linked to the higher level project. The work-package diary is a free-format notebook containing fifteen sub-sections. The project manager uses these to routinely record statements of progress, and issues over the work-package life-cycle. This question measures in broad terms the extent that the User population is satisfied that the work-package diary in the PW_MS contains all of the data that they require for their projects.

Forty-three percent of the population sample stated that they did not use this feature of the PW_MS. Three percent stated that the PW_MS contained 'too little' data in the work-package diary. Forty-one percent stated that the data in the work package diary was the 'right amount'. Fourteen percent stated that the data was 'too much'. The mode and the median response are 'right amount'. The mean response tends to 'right amount'.

Fifty-seven percent of the 'HQ and portfolio manager' sub-strata of the population sample stated that they did not use this feature of the PW_MS. Two percent stated that the PW_MS contained 'too little' data in the work-package diary. Twenty-three percent stated that the data in the work-package diary was the 'right amount'. Eighteen percent stated that the data was 'too much'. The mode and the median response are 'right amount'. The mean response tends to 'right amount' but is between 'right amount' and 'too much'.

Thirty-seven percent of the 'project manager' sub-strata of the population sample stated that they did not use this feature of the PW_MS. Three percent stated that the PW_MS contained 'too little' data in the work-package diary. Forty-eight percent stated that the data in the work-package diary was the 'right amount'. Thirteen percent stated that the data was 'too much'. The mode and the median response are 'right amount'. The mean response tends to 'right amount'.

On balance, the response that is taken as statistically indicative of the user community as a whole: is that the data in the work-package diary of the PW_MS is the 'right amount' for twenty-three to forty-eight percent of the user population/sub-strata of the population sample. This is the mode and the median response for the population sample overall and the sub-strata of the population sample. The mean response for the population overall and the sub-strata of the population sample tends to the 'right amount'. Thirteen to eighteen percent of the population sample/sub-strata state the data in the project diary is 'too much'. Two to three percent state that it is 'too little'.

Q.2.1.10 Is an open question, the analysis is in Section 8.5.

Questionnaire Part 2 Project Scope

Q.2.2.1 Does the scope element of the PW_MS have all the data and functions that you want for your projects?

Commentary - the project scope element of the PW_MS is a baseline controlled, alphanumeric text statement in free-format that describes the utility, standards and scale of the project. At the minimum, it contains the formal statement of scope written in the project justification endorsed by the Client and approved within Government and by the Finance Committee at the Category A stage of the project life-cycle. This two part question measures in broad terms the extent that the PW_MS contains all the data, and secondly the information, needed about the scope of a project. Respondents are asked to choose one of four options for each part of the question. The options are: 'too much', 'right amount', 'too little', and 'not used'.

With regard to the first part of the question: does the scope element of the PW_MS have all the data that is wanted.

Thirty-five percent of the population sample stated that they did not use this feature of the PW_MS. Four percent stated that the PW_MS contained 'too little' data in the scope statement. Fifty-eight percent stated that the data in the scope statement was the 'right amount'. Three percent stated that the data was 'too much'. The mode and the median response are 'right amount'. The mean response tends to 'right amount'.

Forty percent of the 'HQ and portfolio manager' sub-strata of the population sample stated that they did not use this feature of the PW_MS. Two percent stated that the PW_MS contained 'too little' data in the scope statement. Fifty-six percent stated that the data in the scope statement was the 'right amount'. Two percent stated that the data was 'too much'. The mode, the median and the mean response are 'right amount'.

Thirty-three percent of the 'project manager' sub-strata of the population sample stated that they did not use this feature of the PW_MS. Five percent stated that the PW_MS contained 'too little' data in the scope statement. Fifty-nine percent stated that the data in the work-package diary was the 'right amount'. Three percent stated that the data was 'too much'. The mode and the median response are 'right amount'. The mean response tends to 'right amount'.

On balance, the response that is taken as statistically indicative of the user community as a whole: is that the data in the scope statement of the PW_MS is the 'right amount' for fifty-six to fifty-nine percent of the user population/sub-strata of the population sample. This is the mode and the median response for the population sample overall and the sub-strata of the population sample. The mean response for the population overall and the sub-strata of the population sample tends to the 'right amount'. Two to three percent of the population sample/sub-strata state the data in the scope statement is 'too much'. Two to five percent state that it is 'too little'.

With regard to the second part of the question: does the scope element of the PW_MS have all the functions that are wanted.

Forty-two percent of the population sample stated that they did not use this feature of the PW_MS. Three percent stated that the PW_MS contained 'too little' functions in the scope statement. Fifty-two percent stated that the data in the scope statement was the 'right amount'. Two percent stated that the functions are 'too much'. The mode and the median response are 'right amount'. The mean response tends to 'right amount'.

Forty-eight percent of the 'HQ and portfolio manager' sub-strata of the population sample stated that they did not use this feature of the PW_MS. Zero percent stated that the PW_MS contained 'too little' functions in the scope statement. Fifty percent stated that the functions in the scope statement were the 'right amount'. Two percent stated that the functions were 'too much'. The mode, the median and the mean response are 'right amount'.

Forty percent of the 'project manager' sub-strata of the population sample stated that they did not use this feature of the PW_MS. Five percent stated that the PW_MS contained 'too little' functions in the scope statement. Fifty-three percent stated that the functions in the scope statement were the 'right amount'. Three percent stated that the functions were 'too much'. The mode and the median response are 'right amount'. The mean response tends to 'right amount'.

On balance, the response that is taken as statistically indicative of the user community as a whole: is that the functions in the scope statement of the PW_MS is the 'right amount' for fifty to fifty-three percent of the user population/sub-strata of the population sample. This is the mode and the median response for the population sample overall and the sub-strata of the population sample. The mean response for the population overall and the sub-strata of the population sample tends to the 'right amount'. Two percent of the population sample/sub-strata state the data in the scope statement is 'too much'. Zero to five percent state that it is 'too little'.

Q.2.2.2 Is an open question, the analysis is in Section 8.5.

Questionnaire Part 2 Cost

Q.2.3.1 Does the cost element of the PW_MS have all the data and functions that you want for your projects?

Commentary - the PW_MS contains the approved cashflow for the project by quarter-year periods of time as a baseline. It contains the actual expenditure on the project to-date in quarter periods of time. It also contains the forecast of expenditure for the remaining duration of the project in the same intervals of time. The PW_MS cashflows are separated into construction costs, construction contingency, consultant costs, consultant contingency, and 'other'. 'Other' is used to record the inflation element corresponding to constant price cashflows. The Approved Project Estimate, the budget, is also recorded as a fixed item of controlled data. Comparison of cashflows or totals provides a measure of spending performance.

This two part question measures in broad terms the extent that the PW_MS contains all the data, and secondly the information, needed about the cost of a project. Respondents are asked to choose one of four options for each part of the question. The options are: 'too much', 'right amount', 'too little', and 'not used'.

With regard to the first part of the question: does the cost element of the PW_MS have all the data that is wanted.

Twenty-eight percent of the population sample stated that they did not use this feature of the PW_MS. Eight percent stated that the PW_MS contained 'too little' data in the cost element of the PW_MS. Fifty-one percent stated that the data in the cost element was the 'right amount'. Thirteen percent stated that the data was 'too much'. The mode and the median response are 'right amount'. The mean response tends to 'right amount'.

Thirty-two percent of the 'HQ and portfolio manager' sub-strata of the population sample stated that they did not use this feature of the PW_MS. Two percent stated that the PW_MS contained 'too little' data in the cost element. Fifty-two percent stated that the data in the cost element was the 'right amount'. Fourteen percent stated that the data was 'too much'. The mode, the median and the mean response are 'right amount'.

Twenty-seven percent of the 'project manager' sub-strata of the population sample stated that they did not use this feature of the PW_MS. Ten percent stated that the PW_MS contained 'too little' data in the cost element. Fifty percent stated that the data in the cost element was the 'right amount'. Thirteen percent stated that the data was 'too much'. The mode and the median response are 'right amount'. The mean response tends to 'right amount'.

On balance, the response that is taken as statistically indicative of the user community as a whole: is that the data in the cost element of the PW_MS is the 'right amount' for fifty to fifty-two percent of the user population/sub-strata of the population sample. This is the mode and the median response for the population sample overall and the sub-strata of the population sample. The mean response for the population overall and the sub-strata of the population sample tends to the 'right amount'. Thirteen to fourteen percent of the population sample/sub-strata state the data in the cost element of the PW_MS is 'too much'. Two to ten percent state that it is 'too little'.

With regard to the second part of the question: does the cost element of the PW_MS have all the functions that are wanted.

Thirty-five percent of the population sample stated that they did not use this feature of the PW_MS. Twelve percent stated that the PW_MS contained 'too little' functions in the cost element. Fifty percent stated that the functions in cost element are the 'right amount'. Four percent stated that the functions are 'too much'. The mode and the median response are 'right amount'. The mean response tends to 'right amount'.

Forty-two percent of the 'HQ and portfolio manager' sub-strata of the population sample stated that they did not use this feature of the PW_MS. Nine percent stated that the PW_MS contained 'too little' functions in the cost element. Forty-nine

percent stated that the functions in the cost element were the 'right amount'. Zero percent stated that the functions were 'too much'. The mode, the median and the mean response are 'right amount'.

Thirty-two percent of the 'project manager' sub-strata of the population sample stated that they did not use this feature of the PW_MS. Thirteen percent stated that the PW_MS contained 'too little' functions in the cost element. Fifty percent stated that the functions in the cost element were the 'right amount'. Five percent stated that the functions were 'too much'. The mode and the median response are 'right amount'. The mean response tends to 'right amount'.

On balance, the response that is taken as statistically indicative of the user community as a whole: is that the functions in the cost element of the PW_MS are the 'right amount' for forty-nine to fifty percent of the user population/sub-strata of the population sample. This is the mode and the median response for the population sample overall and the sub-strata of the population sample. The mean response for the population overall and the sub-strata of the population sample tends to the 'right amount'. Zero to five percent of the population sample/sub-strata state the data in the cost element is 'too much'. Nine to thirteen percent state that it is 'too little'.

Q.2.3.2 Is an open question, the analysis is in Section 8.5.

Questionnaire Part 2 Time management and work-scheduling

Q.2.4.1 Does the time plan element of the PW_MS have all the data and functions that you want for your projects?

Commentary - for each PWP project, the PW_MS holds a record of the forecast timeplan of activities for the project. The timeplans of the work activities are in two levels. At the project level, the standard timeplan includes the standard activities in a PWP project. Below the project level are a number of optional, more detailed timeplans for specific project-level activities e.g., land acquisition, or construction. In addition three key dates are recorded separately as baseline targets.

This two part question measures in broad terms the extent that the PW_MS contains all the data, and secondly the information, needed about the work-scheduling of a project. Respondents are asked to choose one of four options for each part of the question. The options are: 'too much', 'right amount', 'too little', and 'not used'.

With regard to the first part of the question: does the time-plan element of the PW_MS have all the data that is wanted.

Thirty-two percent of the population sample stated that they did not use this feature of the PW_MS. Nine percent stated that the PW_MS contained 'too little' data in the time-plan element of the PW_MS. Forty-four percent stated that the data in the time-plan element was the 'right amount'. Fifteen percent stated that the data was 'too much'. The mode and the median response are 'right amount'. The mean response tends to 'right amount'.

Thirty-eight percent of the 'HQ and portfolio manager' sub-strata of the population sample stated that they did not use this feature of the PW_MS. Eleven percent stated that the PW_MS contained 'too little' data in the time-plan element. Forty percent stated that the data in the time-plan element was the 'right amount'. Eleven percent stated that the data was 'too much'. The mode, the median and the mean response are 'right amount'.

Thirty percent of the 'project manager' sub-strata of the population sample stated that they did not use this feature of the PW_MS. Eight percent stated that the PW_MS contained 'too little' data in the time-plan element. Forty-five percent stated that the data in the time-plan element was the 'right amount'. Sixteen percent stated that the data was 'too much'. The mode and the median response are 'right amount'. The mean response tends to 'right amount'.

On balance, the response that is taken as statistically indicative of the user community as a whole: is that the data in the time-plan element of the PW_MS is the 'right amount' for forty to forty-five percent of the user population/sub-strata of the population sample. This is the mode and the median response for the population sample overall and the sub-strata of the population sample. The mean response for the population overall and the sub-strata of the population sample tends to the 'right amount'. Eleven to sixteen percent of the population sample/sub-strata state the data in the time-plan element of the PW_MS is 'too much'. Eight to eleven percent state that it is 'too little'.

With regard to the second part of the question: does the time-plan element of the PW_MS have all the functions that are wanted.

Forty percent of the population sample stated that they did not use this feature of the PW_MS. Sixteen percent stated that the PW_MS contained 'too little' functions in the time-plan element. Thirty-five percent stated that the functions in the time-plan element are the 'right amount'. Nine percent stated that the functions are 'too much'. The mode and the median response are 'right amount'. The mean response tends to 'right amount'.

Forty-seven percent of the 'HQ and portfolio manager' sub-strata of the population sample stated that they did not use this feature of the PW_MS. Twenty-one percent stated that the PW_MS contained 'too little' functions in the time-plan element. Twenty-eight percent stated that the functions in the time-plan element were the 'right amount'. Five percent stated that the functions were 'too much'. The mode, the median and the mean response are 'right amount'.

Thirty-seven percent of the 'project manager' sub-strata of the population sample stated that they did not use this feature of the PW_MS. Fifteen percent stated that the PW_MS contained 'too little' functions in the time-plan element. Thirty-seven percent stated that the functions in the time-plan element were the 'right amount'. Eleven percent stated that the functions were 'too much'. The mode and the median response are 'right amount'. The mean response tends to 'right amount'.

On balance, the response that is taken as statistically indicative of the user community as a whole: is that the functions in the time-plan element of the PW_MS are the 'right

amount' for twenty-eight to thirty-seven percent of the user population/sub-strata of the population sample. This is the mode and the median response for the population sample overall and the sub-strata of the population sample. The mean response for the population overall and the sub-strata of the population sample tends to the 'right amount'. Five to eleven percent of the population sample/sub-strata state the functions in the time-plan element are 'too much'. Fifteen to twenty-one percent state that they are 'too little'. The 'HQ and portfolio manager' sub-strata of the population sample are least satisfied with the time-plan element of the PW_MS.

Q.2.4.2 Is an open question, the analysis is in Section 8.5.

Questionnaire Part 2 Project planning and monitoring using change orders and baseline control

Q.2.5.1 Does the change orders and baseline element of the PW_MS have all the data and functions that you want for your projects?

Commentary - the baseline is the current official, approved plan for the project. The baseline comprises items of scope, date, and cost data that are fixed so they can be used as a 'baseline' for the comparison of actual performance. The baseline data can be changed according to procedural rules that make mandatory the prior approval of the client and the portfolio managers for the proposed change. The process also records an audit trail of the changes.

This two part question measures in broad terms the extent that the PW_MS contains all the data, and secondly the information, needed about the change control of a project. Respondents are asked to choose one of four options for each part of the question. The options are: 'too much', 'right amount', 'too little', and 'not used'.

With regard to the first part of the question: does the 'project planning and monitoring using change orders and baseline control' element of the PW_MS have all the data that is wanted.

Thirty percent of the population sample stated that they did not use this feature of the PW_MS. Four percent stated that the PW_MS contained 'too little' data in the change-order/baseline control element of the PW_MS. Fifty-eight percent stated that the data in the change-order/baseline control element was the 'right amount'. Eight percent stated that the data was 'too much'. The mode and the median response are 'right amount'. The mean response tends to 'right amount'.

Thirty-two percent of the 'HQ and portfolio manager' sub-strata of the population sample stated that they did not use this feature of the PW_MS. Nine percent stated that the PW_MS contained 'too little' data in the change-order/baseline control element. Fifty-two percent stated that the data in the change-order/baseline control element was the 'right amount'. Five percent stated that the data was 'too much'. The mode, the median and the mean response are 'right amount'.

Twenty-nine percent of the 'project manager' sub-strata of the population sample stated that they did not use this feature of the PW_MS. Two percent stated that the

PW_MS contained 'too little' data in the change-order/baseline control element. Sixty percent stated that the data in the change-order/baseline control element was the 'right amount'. Nine percent stated that the data was 'too much'. The mode and the median response are 'right amount'. The mean response tends to 'right amount'.

On balance, the response that is taken as statistically indicative of the user community as a whole: is that the data in the 'project planning and monitoring using change orders and baseline control' element of the PW_MS is the 'right amount' for fifty-two to sixty percent of the user population/sub-strata of the population sample. This is the mode and the median response for the population sample overall and the sub-strata of the population sample. The mean response for the population overall and the sub-strata of the population sample tends to the 'right amount'. Five to nine percent of the population sample/sub-strata state the data in the change order/baseline control element of the PW_MS is 'too much'. Two to nine percent state that it is 'too little'.

With regard to the second part of the question: does the 'project planning and monitoring using change orders and baseline control' element of the PW_MS have all the functions that are wanted.

Thirty-five percent of the population sample stated that they did not use this feature of the PW_MS. Five percent stated that the PW_MS contained 'too little' functions in the change-order/baseline control element of the PW_MS. Fifty-five percent stated that the functions in the change-order/baseline control element were the 'right amount'. Five percent stated that the functions were 'too much'. The mode and the median response are 'right amount'. The mean response tends to 'right amount'.

Forty-two percent of the 'HQ and portfolio manager' sub-strata of the population sample stated that they did not use this feature of the PW_MS. Nine percent stated that the PW_MS contained 'too little' functions in the change-order/baseline control element. Forty-nine percent stated that the functions in the change-order/baseline control element were the 'right amount'. Zero percent stated that the functions were 'too much'. The mode, the median and the mean response are 'right amount'.

Twenty-nine percent of the 'project manager' sub-strata of the population sample stated that they did not use this feature of the PW_MS. Two percent stated that the PW_MS contained 'too little' functions in the change-order/baseline control element. Sixty percent stated that the functions in the change-order/baseline control element were the 'right amount'. Nine percent stated that the functions were 'too much'. The mode and the median response are 'right amount'. The mean response tends to 'right amount'.

On balance, the response that is taken as statistically indicative of the user community as a whole: is that the functions in the 'project planning and monitoring using change orders and baseline control' element of the PW_MS are the 'right amount' for forty-nine to sixty percent of the user population/sub-strata of the population sample. This is the mode and the median response for the population sample overall and the sub-strata of the population sample. The mean response for the population overall and the sub-strata of the population sample tends to the 'right amount'. Zero to nine percent of the population sample/sub-strata state the data in the change order/baseline control element of the PW_MS is 'too much'. Two to nine percent state that it is 'too little'.

Q.2.5.2 Is an open question, the analysis is in Section 8.5.

Questionnaire Part 2 Land delivery

Q.2.6.1 Does the land delivery element of the PW_MS have all the data and functions that you want for your projects?

Commentary - the PW_MS contains data on the land required, and the District Lands Officers responsible for the delivery. Timeplans are used to include the sequence of actions leading to the handover of land in the project work-schedule.

This two part question measures in broad terms the extent that the PW_MS contains all the data, and secondly the information, needed about the supply of land of a project. Respondents are asked to choose one of four options for each part of the question. The options are: 'too much', 'right amount', 'too little', and 'not used'.

With regard to the first part of the question: does the land delivery element of the PW_MS have all the data that is wanted.

Fifty-five percent of the population sample stated that they did not use this feature of the PW_MS. One percent stated that the PW_MS contained 'too little' data in the land delivery element of the PW_MS. Thirty-four percent stated that the data in the land delivery element was the 'right amount'. Nine percent stated that the data was 'too much'. The mode and the median response are 'right amount'. The mean response tends to 'right amount'.

Sixty-three percent of the 'HQ and portfolio manager' sub-strata of the population sample stated that they did not use this feature of the PW_MS. None stated that the PW_MS contained 'too little' data in the land delivery element. Thirty percent stated that the data in the land delivery element was the 'right amount'. Seven percent stated that the data was 'too much'. The mode, the median and the mean response are 'right amount'.

Fifty-one percent of the 'project manager' sub-strata of the population sample stated that they did not use this feature of the PW_MS. Two percent stated that the PW_MS contained 'too little' data in the land delivery element. Thirty-six percent stated that the data in the land delivery element was the 'right amount'. Ten percent stated that the data was 'too much'. The mode and the median response are 'right amount'. The mean response tends to 'right amount'.

On balance, the response that is taken as statistically indicative of the user community as a whole; is that the 'land delivery' element of the PW_MS is not used (fifty-one to sixty-three percent) by the user population/sub-strata of the population sample. The 'land delivery' element of the PW_MS is the 'right amount' for thirty to thirty-six percent of the user population/sub-strata of the population sample. This is the mode and the median response for this minority part of the population sample overall and the sub-strata of the population sample. The mean response also tends to the 'right amount'. Seven to ten percent of the population sample/sub-strata state the data in the

land delivery element of the PW_MS is 'too much'. Zero to two percent state that it is 'too little'.

With regard to the second part of the question: does the land delivery element of the PW_MS have all the functions that are wanted.

Fifty-eight percent of the population sample stated that they did not use this feature of the PW_MS. Six percent stated that the PW_MS contained 'too little' functions in the land delivery element of the PW_MS. Thirty percent stated that the functions in the land delivery element were the 'right amount'. Five percent stated that the functions were 'too much'. The mode and the median response are 'right amount'. The mean response tends to 'right amount'.

Sixty-six percent of the 'HQ and portfolio manager' sub-strata of the population sample stated that they did not use this feature of the PW_MS. Two percent stated that the PW_MS contained 'too little' functions in the land delivery element. Twenty-five percent stated that the functions in the land delivery element were the 'right amount'. Seven percent stated that the functions were 'too much'. The mode, the median and the mean response are 'right amount'.

Fifty-five percent of the 'project manager' sub-strata of the population sample stated that they did not use this feature of the PW_MS. Eight percent stated that the PW_MS contained 'too little' functions in the land delivery element. Thirty-two percent stated that the functions in the land delivery element was the 'right amount'. Ten percent stated that the functions were 'too much'. The mode and the median response are 'right amount'. The mean response tends to 'right amount'.

On balance, the response that is taken as statistically indicative of the user community as a whole: is that the functions in the 'land delivery' element of the PW_MS are not used (fifty-five to sixty-six percent) by the user population/sub-strata of the population sample. The 'land delivery' element of the PW_MS is the 'right amount' for thirty to thirty-six percent of the user population/sub-strata of the population sample. This is the mode and the median response for this minority part of the population sample overall and the sub-strata of the population sample. The mean response also tends to the 'right amount'. Seven to ten percent of the population sample/sub-strata state that the functions in the land delivery element of the PW_MS is 'too much'. Zero to two percent state that they are 'too little'.

Q.2.6.2 Is an open question, the analysis is in Section 8.5.

Questionnaire Part 2 Works contracts

Q.2.7.1 Does the works contracts element of the PW_MS have all the data and functions that you want for your projects?

Commentary - details of works contracts can be recorded in the PW_MS and linked to the work-package. This two part question measures in broad terms the extent that the PW_MS contains all the data, and secondly the information, needed about the

procurement contracts of a project. Respondents are asked to choose one of four options for each part of the question. The options are: 'too much', 'right amount', 'too little', and 'not used'.

With regard to the first part of the question: does the works contracts element of the PW_MS have all the data that is wanted.

Forty-eight percent of the population sample stated that they did not use this feature of the PW_MS. Two percent stated that the PW_MS contained 'too little' data in the works contracts element of the PW_MS. Forty-six percent stated that the data in the works contracts element was the 'right amount'. Five percent stated that the data was 'too much'. The mode and the median response are 'right amount'. The mean response tends to 'right amount'.

Fifty-five percent of the 'HQ and portfolio manager' sub-strata of the population sample stated that they did not use this feature of the PW_MS. None stated that the PW_MS contained 'too little' data in the works contracts element. Forty-five percent stated that the data in the works contracts element was the 'right amount'. Zero percent stated that the data was 'too much'. The mode, the median and the mean response are 'right amount'.

Forty-five percent of the 'project manager' sub-strata of the population sample stated that they did not use this feature of the PW_MS. Three percent stated that the PW_MS contained 'too little' data in the works contracts element. Forty-six percent stated that the data in the works contracts element was the 'right amount'. Six percent stated that the data was 'too much'. The mode and the median response are 'right amount'. The mean response tends to 'right amount'.

On balance, the response that is taken as statistically indicative of the user community as a whole: is that the 'works contract' element of the PW_MS is not used (forty-five to fifty-five percent) by the user population/sub-strata of the population sample. The data within the 'works contract' element of the PW_MS is the 'right amount' for forty-five to forty-six percent of the user population/sub-strata of the population sample. This is the mode and the median response for this part of the population sample overall and the sub-strata of the population sample. The mean response also tends to the 'right amount'. Zero to six percent of the population sample/sub-strata state the data in the works contract element of the PW_MS is 'too much'. Zero to three percent state that it is 'too little'.

With regard to the second part of the question: does the works contract element of the PW_MS have all the functions that are wanted.

Fifty-three percent of the population sample stated that they did not use this feature of the PW_MS. Six percent stated that the PW_MS contained 'too little' functions in the works contract element of the PW_MS. Thirty-seven percent stated that the functions in the works contract element were the 'right amount'. Three percent stated that the functions were 'too much'. The mode and the median response are 'right amount'. The mean response tends to 'right amount'.

Fifty-seven percent of the 'HQ and portfolio manager' sub-strata of the population sample stated that they did not use this feature of the PW_MS. Two percent stated

that the PW_MS contained 'too little' functions in the works contract element. Thirty-nine percent stated that the functions in the works contract element were the 'right amount'. Zero percent stated that the functions were 'too much'. The mode, the median and the mean response are 'right amount'.

Fifty-one percent of the 'project manager' sub-strata of the population sample stated that they did not use this feature of the PW_MS. Eight percent stated that the PW_MS contained 'too little' functions in the works contract element. Thirty-six percent stated that the functions in the works contract element was the 'right amount'. Five percent stated that the functions were 'too much'. The mode and the median response are 'right amount'. The mean response tends to 'right amount'.

On balance, the response that is taken as statistically indicative of the user community as a whole: is that the functions in the 'works contracts' element of the PW_MS are not used (fifty-one to fifty-seven percent) by the user population/sub-strata of the population sample. The functions within the 'works contract' element of the PW_MS is the 'right amount' for thirty-six to thirty-nine percent of the user population/sub-strata of the population sample. This is the mode and the median response for this minority part of the population sample overall and the sub-strata of the population sample. The mean response also tends to the 'right amount'. Zero to five percent of the population sample/sub-strata state that the functions in the works contract element of the PW_MS are 'too much'. Two to eight percent state that they are 'too little'.

Q.2.7.2 Is an open question, the analysis is in Section 8.5.

Questionnaire Part 3 Use of the PW_MS in the management of *groups* of Category C, B, and A, PWP projects

This series of questions is to measure the adequacy of the PW_MS for the purposes of the management of more than one project. It assumes the user has an interest in global performance, i.e., performance of a group of projects overall. This is certainly true for managers at the senior levels but it is an important aspect of the PW_MS and the views of the User population are measured in this element of the survey.

Questionnaire Part 3 Project contacts

Q.3.1.1 Does the contacts element of the PW_MS have all the data and functions that you want to enable you to make effective rapid contact with the project participants?

Commentary - the project contacts element of the PW_MS is a database of the persons involved in the project and their contact data. It is useful for rapid telephone or fax communications to discuss project issues. It is also used for the creation of fax mailings on generic project issues. This two-part question measures in broad terms the extent that the User population is satisfied that the project contacts in the PW_MS contains all of the data that they require for their projects.

With regard to the first part of the question: does the contacts element of the PW_MS have all the data that is wanted for management of groups of projects.

Sixty-six percent of the population sample stated that they did not use this feature of the PW_MS. Two percent stated that the PW_MS contained 'too little' data in the contacts element of the PW_MS for the management of groups of projects. Thirty percent stated that the data in the contacts element was the 'right amount'. One percent stated that the data was 'too much'. The mode and the median response are 'right amount'. The mean response tends to 'right amount'.

Fifty-eight percent of the 'HQ and portfolio manager' sub-strata of the population sample stated that they did not use this feature of the PW_MS. Two stated that the PW_MS contained 'too little' data in the contacts element. Forty percent stated that the data in the contacts element was the 'right amount'. Zero percent stated that the data was 'too much'. The mode, the median and the mean response are 'right amount'.

Sixty-nine percent of the 'project manager' sub-strata of the population sample stated that they did not use this feature of the PW_MS. Two percent stated that the PW_MS contained 'too little' data in the contacts element. Twenty-six percent stated that the data in the contacts element was the 'right amount'. Two percent stated that the data was 'too much'. The mode and the median response are 'right amount'. The mean response tends to 'right amount'.

On balance, the response that is taken as statistically indicative of the user community as a whole: is that the 'contacts' element of the PW_MS is not used for the management of groups of projects (fifty-eight to sixty-nine percent) by the user population/sub-strata of the population sample. The data within the 'contact' element of the PW_MS is the 'right amount' for twenty-six to forty percent of the user population/sub-strata of the population sample. This is the mode and the median response for this part of the population sample overall and the sub-strata of the population sample. The mean response also tends to the 'right amount'. Zero to two percent of the population sample/sub-strata state the data in the contacts element of the PW_MS is 'too much'. Two percent state that it is 'too little'. The 'HQ and portfolio manager' sub-strata of the population sample are the most satisfied.

With regard to the second part of the question: does the works contacts element of the PW_MS have all the functions that are wanted for the management of groups of projects.

Sixty-nine percent of the population sample stated that they did not use this feature of the PW_MS. Three percent stated that the PW_MS contained 'too little' functions in the contacts element of the PW_MS for this purpose. Twenty-seven percent stated that the functions in the contacts element was the 'right amount'. One percent stated that the functions were 'too much'. The mode and the median response are 'right amount'. The mean response tends to 'right amount'.

Fifty-nine percent of the 'HQ and portfolio manager' sub-strata of the population sample stated that they did not use this feature of the PW_MS. Seven percent stated that the PW_MS contained 'too little' functions in the contacts element. Thirty-four

percent stated that the functions in the works contract element were the 'right amount'. Zero percent stated that the functions were 'too much'. The mode, the median and the mean response are 'right amount'.

Seventy-three percent of the 'project manager' sub-strata of the population sample stated that they did not use this feature of the PW_MS. Two percent stated that the PW_MS contained 'too little' functions in the contacts element. Twenty-four percent stated that the functions in the contacts element were the 'right amount'. Two percent stated that the functions were 'too much'. The mode and the median response are 'right amount'. The mean response tends to 'right amount'.

On balance, the response that is taken as statistically indicative of the user community as a whole: is that the functions in the 'contacts' element of the PW_MS are not used (fifty-nine to seventy-three percent) by the user population/sub-strata of the population sample. The functions within the 'contacts' element of the PW_MS is the 'right amount' for twenty-four to thirty-four percent of the user population/sub-strata of the population sample. This is the mode and the median response for this minority part of the population sample overall and the sub-strata of the population sample. The mean response also tends to the 'right amount'. Zero to two percent of the population sample/sub-strata state that the functions in the contacts element of the PW_MS are 'too much'. Two to seven percent state that they are 'too little'.

Q.3.1.2 Is an open question, the analysis is in Section 8.5.

Q.3.1.3 Does the 'traffic-lights' element of the PW_MS screen display of projects show the data that you want, to identify/warn of the projects that are not progressing as planned?

Commentary – 'Figure 7-7 Shows the use of 'traffic light' colour coding to indicate deviations from baseline cashflow' on the PWP work-breakdown-structure. Green colour indicates compliance within specified tolerance. Amber colour indicates deviation beyond the specified tolerance but within specified extreme limits. Red indicates exceptions beyond extreme limits. This two part question measures in broad terms the extent that the User population is satisfied that the 'traffic lights' element of the PW_MS contains all of the data that they require for their projects.

With regard to the first part of the question: does the 'traffic lights' element of the PW_MS have all the data that is wanted for management of groups of projects.

Seventy-four percent of the population sample stated that they did not use this feature of the PW_MS. Three percent stated that the PW_MS contained 'too little' data in the 'traffic lights' element of the PW_MS for the management of groups of projects. Twenty-one percent stated that the data in the 'traffic lights' element was the 'right amount'. Two percent stated that the data was 'too much'. The mode and the median response are 'right amount'. The mean response tends to 'right amount'.

Seventy-four percent of the 'HQ and portfolio manager' sub-strata of the population sample stated that they did not use this feature of the PW_MS. Seven percent stated that the PW_MS contained 'too little' data in the 'traffic lights' element. Twenty percent stated that the data in the 'traffic lights' element was the 'right amount'. Zero percent stated that the data was 'too much'. The mode, the median and the mean response are 'right amount'.

Seventy-three percent of the 'project manager' sub-strata of the population sample stated that they did not use this feature of the PW_MS. Two percent stated that the PW_MS contained 'too little' data in the 'traffic lights'. Twenty-one percent stated that the data in the 'traffic lights' element was the 'right amount'. Three percent stated that the data was 'too much'. The mode and the median response are 'right amount'. The mean response tends to 'right amount'.

On balance, the response that is taken as statistically indicative of the user community as a whole: is that the 'traffic lights' element of the PW_MS is not used for the management of groups of projects (Seventy-three to seventy-four percent) by the user population/sub-strata of the population sample. The data within the 'traffic lights' element of the PW_MS is the 'right amount' for twenty to twenty-one percent of the user population/sub-strata of the population sample. This is the mode and the median response for this part of the population sample overall and the sub-strata of the population sample. The mean response also tends to the 'right amount'. Zero to three percent of the population sample/sub-strata state the data in the 'traffic lights' element of the PW_MS is 'too much'. Two to seven percent state that it is 'too little'.

With regard to the second part of the question: does the 'traffic lights' element of the PW_MS have all the functions that are wanted for the management of groups of projects.

Seventy-five percent of the population sample stated that they did not use this feature of the PW_MS. Four percent stated that the PW_MS contained 'too little' functions in the 'traffic lights' element of the PW_MS for this purpose. Eighteen percent stated that the functions in the 'traffic lights' element were the 'right amount'. Two percent stated that the functions were 'too much'. The mode and the median response are 'right amount'. The mean response tends to 'right amount'.

Seventy-six percent of the 'HQ and portfolio manager' sub-strata of the population sample stated that they did not use this feature of the PW_MS. Seven percent stated that the PW_MS contained 'too little' functions in the 'traffic lights' element. Eighteen percent stated that the functions in the 'traffic lights' element were the 'right amount'. Zero percent stated that the functions were 'too much'. The mode, the median and the mean response are 'right amount'.

Seventy-five percent of the 'project manager' sub-strata of the population sample stated that they did not use this feature of the PW_MS. Four percent stated that the PW_MS contained 'too little' functions in the 'traffic lights' element. Nineteen percent stated that the functions in the 'traffic lights' element were the 'right amount'. Three percent stated that the functions were 'too much'. The mode and the median response are 'right amount'. The mean response tends to 'right amount'.

On balance, the response that is taken as statistically indicative of the user community as a whole: is that the functions in the ‘traffic lights’ element of the PW_MS are not used (seventy-five to seventy-six percent) by the user population/sub-strata of the population sample. The functions within the ‘traffic lights’ element of the PW_MS are the ‘right amount’ for eighteen to nineteen percent of the user population/sub-strata of the population sample. This is the mode and the median response for this minority part of the population sample overall and the sub-strata of the population sample. The mean response also tends to the ‘right amount’. Zero to three percent of the population sample/sub-strata, state that the functions in the ‘traffic lights’ element of the PW_MS are ‘too much’. Four to seven percent state that they are ‘too little’.

Q.3.1.4 Is an open question, the analysis is in Section 8.5.

Questionnaire Part 3 Summations of data for selected *groups* of projects

Q.3.2.1 Does the PW_MS provide enough information on groups of projects that you select?

Commentary - the PW_MS can aggregate cost data for groups of projects and provide reports that group together the information on them. This question measures in broad terms the extent that the User population is satisfied with the supply of information on groups of projects.

Seventy-eight percent of the population sample stated that they did not use this feature of the PW_MS. Three percent stated that the PW_MS provided ‘too little’ information on groups of projects. Sixteen percent stated that the information provided was the ‘right amount’. Two percent stated that the information was ‘too much’. The mode and the median response are ‘right amount’. The mean response tends to ‘right amount’.

Sixty-two percent of the ‘HQ and portfolio manager’ sub-strata of the population sample stated that they did not use this feature of the PW_MS. Seven percent stated that the PW_MS provided ‘too little’ information on groups of projects. Twenty-seven percent stated that the information on groups of projects was the ‘right amount’. Four percent stated that the information was ‘too much’. The mode, the median and the mean response are ‘right amount’.

Eighty-five percent of the ‘project manager’ sub-strata of the population sample stated that they did not use this feature of the PW_MS. One percent stated that the PW_MS contained ‘too little’ information on groups of projects. Twelve percent stated that the information was the ‘right amount’. Two percent stated that it was ‘too much’. The mode and the median response are ‘right amount’. The mean response tends to ‘right amount’.

On balance, the response that is taken as statistically indicative of the user community as a whole: is that the information on groups of projects is not used for the management of groups of projects (Sixty-two to eighty-five percent) by the user population/sub-strata of the population sample. The information on groups of projects

is the 'right amount' for twelve to twenty-seven percent of the user population/sub-strata of the population sample. This is the mode and the median response for this part of the population sample overall and the sub-strata of the population sample. The mean response also tends to the 'right amount'. Two to four percent of the population sample/sub-strata state the information on groups of projects is 'too much'. One to seven percent state that it is 'too little'. The 'HQ and portfolio manager' sub-strata of the population sample most favour this aspect of the PW_MS.

Q.3.2.2 Is an open question, the analysis is in Section 8.5.

Q.3.2.3 Does the addition of project costs in the PW_MS give you the information that you want on the cashflow performance of a group of projects i.e., the RAS Graphics Reports or other Graphics Reports?

Commentary - this question is a sub-question of Q.3.2.1 and specifically measures the extent that the User population is satisfied with the addition of project costs to give indicate the cashflow performance of a group of projects.

Eighty-six percent of the population sample stated that they did not use this feature of the PW_MS. Two percent stated that the addition of costs within the PW_MS provided 'too little' information on cashflow performance of a group of projects. Eleven percent stated that the information provided was the 'right amount'. One percent stated that the information was 'too much'. The mode and the median response are 'right amount'. The mean response tends to 'right amount'.

Seventy-eight percent of the 'HQ and portfolio manager' sub-strata of the population sample stated that they did not use this feature of the PW_MS. Two percent stated that the PW_MS provided 'too little' information on cashflow performance of a group of projects. Twenty percent stated that the information on groups of projects was the 'right amount'. Zero percent stated that the information was 'too much'. The mode, the median and the mean response are 'right amount'.

Eighty-eight percent of the 'project manager' sub-strata of the population sample stated that they did not use this feature of the PW_MS. Two percent stated that the PW_MS contained 'too little' information on cashflow performance of a group of projects. Seven percent stated that the information was the 'right amount'. One percent stated that it was 'too much'. The mode and the median response are 'right amount'. The mean response tends to 'right amount'.

On balance, the response that is taken as statistically indicative of the user community as a whole; is that the addition of project costs within the PW_MS to provide cashflow performance of a group of projects is not used (Seventy-eight to eighty-eight percent) by the user population/sub-strata of the population sample. The addition of cashflow information on groups of projects is the 'right amount' for seven to twenty percent of the user population/sub-strata of the population sample. This is the mode and the median response for this part of the population sample overall and the sub-strata of the population sample. The mean response also tends to the 'right amount'. Zero to one percent of the population sample/sub-strata state the addition of information on the cashflow performance of a group of projects is 'too much'. Two

percent state that it is 'too little'. The 'HQ and portfolio manager' sub-strata of the population sample most favour this aspect of the PW_MS.

Q.3.2.4 Is an open question, the analysis is in Section 8.5.

Questionnaire Part 3 Progress performance measurement

Q.3.3.1 Does the comparison of baseline dates vs forecast dates and actual dates in the 'Milestone Variance Report', give you the timing information that you want on the performance of the projects in a group that you select?

Commentary - the PW_MS provides comparisons of work-schedule to baseline time-related data in specific reports for groups of projects. This question is to measure the extent that the User population is satisfied with this time-related performance of a group of projects.

Sixty-nine percent of the population sample stated that they did not use this feature of the PW_MS. Three percent stated that the comparison of baseline dates Vs forecast dates and actual dates within the PW_MS provided 'too little' information on performance of a group of projects. Twenty-eight percent stated that the information provided was the 'right amount'. Zero percent stated that the information was 'too much'. The mode and the median response are 'right amount'. The mean response tends to 'right amount'.

Sixty-three percent of the 'HQ and portfolio manager' sub-strata of the population sample stated that they did not use this feature of the PW_MS. Seven percent stated that the PW_MS provided 'too little' information on milestone dates/work-schedule performance of a group of projects. Thirty percent stated that the milestone dates/work schedule information on groups of projects was the 'right amount'. Zero percent stated that the information was 'too much'. The mode, the median and the mean response are 'right amount'.

Seventy-one percent of the 'project manager' sub-strata of the population sample stated that they did not use this feature of the PW_MS. Two percent stated that the PW_MS contained 'too little' information on milestone dates/work schedule performance of a group of projects. Twenty-seven percent stated that the information was the 'right amount'. Zero percent stated that it was 'too much'. The mode and the median response are 'right amount'. The mean response tends to 'right amount'.

On balance, the response that is taken as statistically indicative of the user community as a whole; is that the comparison of baseline dates Vs forecast dates and actual dates in the 'Milestone Variance Report' within the PW_MS to provide timing information on the performance of a group of projects is not used (Sixty-three to seventy-one percent) by the user population/sub-strata of the population sample. This information is the 'right amount' for twenty-seven to thirty percent of the user population/sub-strata of the population sample. This is the mode and the median response for this part of the population sample overall and the sub-strata of the population sample. The mean response also tends to the 'right amount'. Zero percent of the population

sample/sub-strata state the comparison of timing information is ‘too much’. Two to seven percent state that it is ‘too little’.

Q.3.3.2 Is an open question, the analysis is in Section 8.5.

Q.3.3.3 *Does the comparison of **baseline costs compared to forecast and actual costs** in the ‘Resource Allocation System Report’, the ‘Graphics Report for WBS, OBS, CRS, FRS Rollup-Data’ give you the information that you want on the spending performance of a group of projects that you select?*

Commentary - the PW_MS provides comparisons of baseline costs to actual and corresponding forecast costs for groups of projects. This question is to measure the extent that the User population is satisfied with this time-related performance of a group of projects.

Eighty-three percent of the population sample stated that they did not use this feature of the PW_MS. One percent stated that the comparison of baseline costs compared to forecast and actual costs in the ‘Resource Allocation System Report’, the ‘Graphics Report for WBS, OBS, CRS, FRS Rollup-Data’ provides ‘too little’ information wanted on the spending performance of a group of projects selected by the user. Sixteen percent stated that the information provided was the ‘right amount’. Zero percent stated that the information was ‘too much’. The mode and the median response are ‘right amount’. The mean response tends to ‘right amount’.

Seventy-four percent of the ‘HQ and portfolio manager’ sub-strata of the population sample stated that they did not use this feature of the PW_MS. Four percent stated that the comparison of baseline costs compared to forecast and actual costs in the ‘Resource Allocation System Report’, the ‘Graphics Report for WBS, OBS, CRS, FRS Rollup-Data’ provides ‘too little’ information wanted on the spending performance of a group of projects selected by the user. Twenty-two percent stated that the information provided was the ‘right amount’. Zero percent stated that the information was ‘too much’. The mode, the median and the mean response are ‘right amount’.

Eighty-seven percent of the ‘project manager’ sub-strata of the population sample stated that they did not use this feature of the PW_MS. Zero percent stated that the comparison of baseline costs compared to forecast and actual costs in the ‘Resource Allocation System Report’, the ‘Graphics Report for WBS, OBS, CRS, FRS Rollup-Data’ provides ‘too little’ information wanted on the spending performance of a group of projects selected by the user. Thirteen percent stated that the information was the ‘right amount’. Zero percent stated that it was ‘too much’. The mode and the median response are ‘right amount’. The mean response tends to ‘right amount’.

On balance, the response that is taken as statistically indicative of the user community as a whole: is that the comparison of baseline costs compared to forecast and actual costs in the ‘Resource Allocation System Report’, the ‘Graphics Report for WBS, OBS, CRS, FRS Rollup-Data’ is ‘not used’ (seventy-four to eighty-seven percent) by

the user population/sub-strata of the population sample. The information is the ‘right amount’ for thirteen to twenty-two percent of the user population/sub-strata of the population sample. This is the mode and the median response for this part of the population sample overall and the sub-strata of the population sample. The mean response also tends to the ‘right amount’. Zero percent of the population sample/sub-strata state the comparison of information is ‘too much’. Four to zero percent state that it is ‘too little’.

Q.3.3.4 Is an open question, the analysis is in Section 8.5.

Q.3.3.5 *Does the PW_MS provide enough cost and time data/information to identify the poorly performing projects within a **group** of projects that you select?*

Commentary –the ‘traffic lights’ feature within the PW_MS indicates when actual expenditure deviates from the baseline cashflow. The milestone dates on the project register screen shows the deviation from the baseline outturn cost and from the three milestone dates monitored within the software. Other reports provide performance data for projects that are grouped according to selections selected by the User within criteria permitted by the software. The question measures the degree of user satisfaction with this aspect of the system.

Seventy-seven percent of the population sample stated that they did not use this feature of the PW_MS. Three percent stated that the PW_MS provide ‘too little’ cost and time data/information to identify the poorly performing projects within a group of projects that you selected by the user. Eighteen percent stated that the information provided was the ‘right amount’. One percent stated that the information was ‘too much’. The mode and the median response are ‘right amount’. The mean response tends to ‘right amount’.

Sixty-two percent of the ‘HQ and portfolio manager’ sub-strata of the population sample stated that they did not use this feature of the PW_MS. Nine percent stated that the PW_MS provides ‘too little’ cost and time data/information to identify the poorly performing projects within a group of projects selected by the user. Twenty-seven percent stated that the information provided was the ‘right amount’. Zero percent stated that the information was ‘too much’. The mode, the median and the mean response are ‘right amount’.

Eighty-three percent of the ‘project manager’ sub-strata of the population sample stated that they did not use this feature of the PW_MS. One percent stated that the PW_MS provides ‘too little’ cost and time data/information to identify the poorly performing projects within a group of projects selected by the user. Fourteen percent stated that the information was the ‘right amount’. One percent stated that it was ‘too much’. The mode and the median response are ‘right amount’. The mean response tends to ‘right amount’.

On balance, the response that is taken as statistically indicative of the user community as a whole; is that the cost and time data/information to identify the poorly performing

projects within a group of projects selected by the user is ‘not used’ by the population sample/sub-strata (sixty-two to eighty-three percent) by the user population/sub-strata of the population sample. The information is the ‘right amount’ for fourteen to twenty-seven percent of the user population/sub-strata of the population sample. This is the mode and the median response for this part of the population sample overall and the sub-strata of the population sample. The mean response also tends to the ‘right amount’. Zero to one percent of the population sample/sub-strata state the comparison of information is ‘too much’. One to nine percent state that it is ‘too little’.

Q.3.3.6 Is an open question, the analysis is in Section 8.5.

*Q.3.3.7 Does the PW_MS provide enough **data/information in the project diary** and used in the Quarterly Reports to help manage a **group** of projects?*

Commentary - the PW_MS contains a diary record that contains up-to-date free format text record of what is happening on the project in the form of an electronic diary which is split into a nineteen topic sections. The question measures the degree of user satisfaction with this aspect of the system.

Seventy-three percent of the population sample stated that they did not use this feature of the PW_MS. Zero percent stated that the PW_MS provides ‘too little’ data/information in the project diary and used in the Quarterly Reports to help manage a group of projects. Twenty-two percent stated that the information provided was the ‘right amount’. Four percent stated that the information was ‘too much’. The mode and the median response are ‘right amount’. The mean response tends to ‘right amount’.

Fifty-six percent of the ‘HQ and portfolio manager’ sub-strata of the population sample stated that they did not use this feature of the PW_MS. Zero percent stated that the PW_MS provides ‘too little’ data/ information in the project diary and used in the Quarterly Reports to help manage a group of projects. Thirty-six percent stated that the information provided was the ‘right amount’. Seven percent stated that the information was ‘too much’. The mode, the median and the mean response are ‘right amount’.

Seventy-nine percent of the ‘project manager’ sub-strata of the population sample stated that they did not use this feature of the PW_MS. Zero percent stated that the PW_MS provides ‘too little’ data/ information in the project diary and used in the Quarterly Reports to help manage a group of projects. Seventeen percent stated that the information was the ‘right amount’. Three percent stated that it was ‘too much’. The mode and the median response are ‘right amount’. The mean response tends to ‘right amount’.

On balance, the response that is taken as statistically indicative of the user community as a whole; is that the data/ information in the project diary and used in the Quarterly Reports to help manage a group of projects is ‘not used’ (fifty-six to seventy-nine

percent) by the user population/sub-strata of the population sample. The information is the 'right amount' for seventeen to thirty-six percent of the user population/sub-strata of the population sample. This is the mode and the median response for this part of the population sample overall and the sub-strata of the population sample. The mean response also tends to the 'right amount'. Three to seven percent of the population sample/sub-strata state the comparison of information is 'too much'. Zero percent state that it is 'too little'. The "HQ and portfolio manager" sub-strata of the population sample are the most supportive of this aspect of the PW_MS.

Q.3.3.8 Is an open question, the analysis is in Section 8.5.

Questionnaire Part 4 'NON-PW_MS' Methods used for the management of Category C, B, and A PWP projects.

Commentary -this series of questions measures the extent that other information technology and manual systems are used to manage PWP projects singly or in-groups. From this information we can determine the need to integrate the PW_MS with the other systems and to identify features that should be included in the PW_MS, or not.

Questionnaire Part 4 Project management functions – computer-based

Q.4.1.1 Do you use 'Non-PW_MS' computer-based systems to record/process project data for project management purposes for the following items?

Commentary - this question is to measure the extent that the User Population uses other MIS for project management purposes. The question is in eight parts because the other systems may not have comprehensive project management functionality. The respondent is asked to choose one of the options with regard to the main functions of the PW_MS. The options are: 'yes', 'mostly', 'sometimes', or 'not used by me'. The project management functions listed in the questionnaire are:

- (a) Records of staff resources;
- (b) Records of project contacts;
- (c) Records of project scope;
- (d) Records of project dates;
- (e) Records of project costs;
- (f) Records of works contracts;
- (g) Records of project diary; and
- (h) Work scheduling/CPM.

With regard to (a) 'the use of non-PW_MS computer-based methods to record/process data on staff resources for project management purposes.

Forty-five percent of the population sample stated that this process is 'not used'. Eighteen percent stated 'no'. Fourteen percent stated 'sometimes'. Four percent

stated 'mostly', whilst nineteen percent responded 'yes'. The mode response, other than 'not used', is 'yes', the median response is 'sometimes' and the mean is between 'sometimes' and 'mostly' but tends towards 'sometimes'.

Forty-two percent of the 'HQ and portfolio manager' strata of the population sample stated that this process is 'not used'. Sixteen percent stated 'no'. Nine percent responded 'sometimes'. Four percent stated 'mostly', whilst twenty-nine percent stated 'yes'. The mode response, other than 'not used', is 'yes', the median response is mid-way between 'yes' and 'mostly'. The mean is between 'sometimes' and 'mostly' but tends towards 'mostly'.

Forty-six percent of the 'project manager' strata of the population sample stated that this process is 'not used'. Nineteen percent stated 'no'. Sixteen percent responded 'sometimes'. Four percent stated 'mostly', whilst fifteen percent stated 'yes'. The mode response, other than 'not used', is 'no', the median response is sometimes. The mean is between 'sometimes' and 'mostly' but tends towards 'sometimes'.

On balance, the response that is taken as statistically indicative of the user community as a whole, is that the use of non-PW_MS computer-based methods to record/process data on staff resources for project management purposes is 'not used' by the largest portion of the population sample/sub strata (forty-two to forty-six percent). Nineteen to thirty-three percent have a high degree of the use on non-PW_MS computer-based methods for managing staff resources for project management purposes. Thirty-six to forty-two percent state that they have some use of non-PW_MS computer systems for this purpose. The 'HQ and portfolio manager' sub-strata have the greatest use of non-PW_MS computer-based systems for this purpose.

With regard to (b) 'the use of non-PW_MS computer-based methods to record/process data on project contacts for project management purposes.

Twenty-nine percent of the population sample stated that this process is 'not used'. Sixteen percent stated 'no'. Sixteen percent stated 'sometimes'. Seven percent stated 'mostly', whilst thirty-two percent responded 'yes'. The mode response, other than 'not used', is 'yes', the median response is 'sometimes' and the mean is between 'sometimes' and 'mostly' but tends towards 'mostly'.

Twenty-four percent of the 'HQ and portfolio manager' strata of the population sample stated that this process is 'not used'. Thirteen percent stated 'no'. Sixteen percent responded 'sometimes'. Nine percent stated 'mostly', whilst thirty-eight percent stated 'yes'. The mode response, other than 'not used', is 'yes', the median response is mid-way between 'yes' and 'mostly'. The mean is close to 'mostly'.

Thirty-one percent of the 'project manager' strata of the population sample stated that this process is 'not used'. Seventeen percent stated 'no'. Sixteen percent responded 'sometimes'. Six percent stated 'mostly', whilst thirty percent stated 'yes'. The mode response, other than 'not used', is 'yes', the median response is between 'yes' and 'sometimes'. The mean is between 'sometimes' and 'mostly' but tends towards 'mostly'.

On balance, the response that is taken as statistically indicative of the user community as a whole, is that the use of non-PW_MS computer-based methods to record/process data on project contacts for project management purposes is 'not used' by twenty-four to thirty-one percent of the population sample/sub strata. Thirty-eight to forty-seven percent have a high degree of the use on non-PW_MS computer-based methods for managing project contacts for project management purposes. Fifty-three to sixty percent state that they have some use of non-PW_MS computer systems for this purpose. The 'HQ and portfolio manager' sub-strata have the greatest use of non-PW_MS computer-based systems for this purpose.

With regard to (c) 'the use of non-PW_MS computer-based methods to record/process data on project scopes for project management purposes.

Thirty-one percent of the population sample stated that this process is 'not used'. Twenty-six percent stated 'no'. Thirteen percent stated 'sometimes'. Five percent stated 'mostly', whilst twenty-five percent responded 'yes'. The mode response, other than 'not used', is 'no', the median response is 'sometimes' and the mean is between 'sometimes' and 'mostly' but tends towards 'sometimes'.

Twenty-nine percent of the 'HQ and portfolio manager' strata of the population sample stated that this process is 'not used'. Twenty-four percent stated 'no'. Eleven percent responded 'sometimes'. Four percent stated 'mostly', whilst thirty-one percent stated 'yes'. The mode response, other than 'not used', is 'yes', the median response is mid-way between 'mostly' and 'sometimes'. The mean is close to 'mostly'.

Thirty-two percent of the 'project manager' strata of the population sample stated that this process is 'not used'. Twenty-seven percent stated 'no'. Fourteen percent responded 'sometimes'. Five percent stated 'mostly', whilst twenty-two percent stated 'yes'. The mode response, other than 'not used' respondents: is 'no', the median response is 'sometimes'. The mean is between 'sometimes' and 'mostly' but tends towards 'sometimes'.

On balance, the response that is taken as statistically indicative of the user community as a whole, is that the use of non-PW_MS computer-based methods to record/process data on project scope for project management purposes is 'not used' by twenty-nine to thirty-two percent of the population sample/sub strata. Twenty-seven to thirty-five percent have a high degree of the use on non-PW_MS computer-based methods for managing project contacts for project management purposes. Forty-three to forty-six percent state that they have some use of non-PW_MS computer systems for this purpose.

With regard to (d) 'the use of non-PW_MS computer-based methods to record/process data on project dates for project management purposes.

Twenty-two percent of the population sample stated that this process is 'not used'. Twelve percent stated 'no'. Sixteen percent stated 'sometimes'. Fourteen percent stated 'mostly', whilst thirty-five percent responded 'yes'. The mode response, other than 'not used', is 'yes', the median response is 'mostly' and the mean is close to 'mostly'.

Twenty-two percent of the 'HQ and portfolio manager' strata of the population sample stated that this process is 'not used'. Eleven percent stated 'no'. Eleven percent responded 'sometimes'. Eighteen percent stated 'mostly', whilst thirty-eight percent stated 'yes'. The mode response, other than 'not used', is 'yes', the median response is 'mostly', and the mean is close to 'mostly'.

Twenty-two percent of the 'project manager' strata of the population sample stated that this process is 'not used'. Twelve percent stated 'no'. Nineteen percent responded 'sometimes'. Twelve percent stated 'mostly', whilst thirty-five percent stated 'yes'. The mode response, other than 'not used' respondents: is 'yes', the median response is 'mostly'. The mean is between 'sometimes' and 'mostly' but tends towards 'mostly'.

On balance, the response that is taken as statistically indicative of the user community as a whole, is that the use of non-PW_MS computer-based methods to record/process data on project dates for project management purposes is 'not used' by twenty-two percent of the population sample/sub strata. Forty-seven to fifty-six percent have a high degree of the use on non-PW_MS computer-based methods for managing project dates for project management purposes. Sixty-five to sixty-seven percent state that they have some use of non-PW_MS computer systems for this purpose.

With regard to (e) 'the use of non-PW_MS computer-based methods to record/process data on project costs for project management purposes.

Twenty-two percent of the population sample stated that this process is 'not used'. Eight percent stated 'no'. Sixteen percent stated 'sometimes'. Fourteen percent stated 'mostly', whilst forty percent responded 'yes'. The mode and the median response, other than 'not used', are 'yes', and the mean is close to 'mostly'.

Twenty-two percent of the 'HQ and portfolio manager' strata of the population sample stated that this process is 'not used'. Four percent stated 'no'. Sixteen percent responded 'sometimes'. Sixteen percent stated 'mostly', whilst forty-two percent stated 'yes'. The mode and the median response, other than 'not used', are 'yes', and the mean is close to 'mostly'.

Twenty-one percent of the 'project manager' strata of the population sample stated that this process is 'not used'. Ten percent stated 'no'. Seventeen percent responded 'sometimes'. Thirteen percent stated 'mostly', whilst thirty-nine percent stated 'yes'. The mode response, other than 'not used' respondents: is 'yes', the median response is 'mostly'. The mean is close to 'mostly'.

On balance, the response that is taken as statistically indicative of the user community as a whole, is that the use of non-PW_MS computer-based methods to record/process data on project costs for project management purposes is 'not used' by twenty-one to twenty-two percent of the population sample/sub strata. Fifty-two to fifty-six percent have a high degree of the use on non-PW_MS computer-based methods for managing project costs for project management purposes. Sixty to sixty-two percent state that they have some use of non-PW_MS computer systems for this purpose.

With regard to (f) 'the use of non-PW_MS computer-based methods to record/process data on works contracts for project management purposes.

Thirty percent of the population sample stated that this process is 'not used'. Sixteen percent stated 'no'. Ten percent stated 'sometimes'. Thirteen percent stated 'mostly', whilst thirty percent responded 'yes'. The mode response, other than 'not used', is 'yes', the median is 'mostly', and the mean tends towards 'mostly'.

Twenty-four percent of the 'HQ and portfolio manager' strata of the population sample stated that this process is 'not used'. Eighteen percent stated 'no'. Nine percent responded 'sometimes'. Eleven percent stated 'mostly', whilst thirty-eight percent stated 'yes'. The mode response, other than 'not used', is 'yes', the median is 'mostly', and the mean is close to 'mostly'.

Thirty-three percent of the 'project manager' strata of the population sample stated that this process is 'not used'. Sixteen percent stated 'no'. Eleven percent responded 'sometimes'. Thirteen percent stated 'mostly', whilst twenty-seven percent stated 'yes'. The mode response, other than 'not used' respondents: is 'yes', the median response is 'mostly'. The mean is close to 'mostly'.

On balance, the response that is taken as statistically indicative of the user community as a whole, is that the use of non-PW_MS computer-based methods to record/process data on works contracts for project management purposes is 'not used' by twenty-four to thirty-three percent of the population sample/sub strata. Forty to forty-nine percent have a high degree of the use on non-PW_MS computer-based methods for managing works contracts for project management purposes. Fifty-one to fifty-eight percent state that they have some use of non-PW_MS computer systems for this purpose.

With regard to (g) 'the use of non-PW_MS computer-based methods to record/process data on project diary for project management purposes.

Thirty-one percent of the population sample stated that this process is 'not used'. Twenty-seven percent stated 'no'. Eighteen percent stated 'sometimes'. Six percent stated 'mostly', whilst eighteen percent responded 'yes'. The mode response, other than 'not used', is 'no', the median is 'sometimes', and the mean tends towards 'sometimes'.

Twenty-nine percent of the 'HQ and portfolio manager' strata of the population sample stated that this process is 'not used'. Twenty-seven percent stated 'no'. Sixteen percent responded 'sometimes'. Nine percent stated 'mostly', whilst twenty percent stated 'yes'. The mode response, other than 'not used', is 'no', the median is 'sometimes', and the mean is close to 'sometimes'.

Thirty-two percent of the 'project manager' strata of the population sample stated that this process is 'not used'. Twenty-seven percent stated 'no'. Nineteen percent responded 'sometimes'. Five percent stated 'mostly', whilst seventeen percent stated 'yes'. The mode response, other than 'not used' respondents: is 'no', the median response is 'sometimes'. The mean is midway between 'sometimes' and 'mostly'.

On balance, the response that is taken as statistically indicative of the user community as a whole, is that the use of non-PW_MS computer-based methods to record/process a project diary for project management purposes is 'not used' by twenty-one to thirty-two percent of the population sample/sub strata. Twenty-two to twenty-nine percent have a high degree of the use on non-PW_MS computer-based methods for managing

a project diary for project management purposes. Forty-one to forty-five percent state that they have some use of non-PW_MS computer systems for this purpose.

With regard to (h) ‘the use of non-PW_MS computer-based methods to record/process data on work scheduling/CPM for project management purposes.

Twenty-eight percent of the population sample stated that this process is ‘not used’. Eighteen percent stated ‘no’. Nineteen percent stated ‘sometimes’. Eight percent stated ‘mostly’, whilst twenty-six percent responded ‘yes’. The mode response, other than ‘not used’, is ‘yes’, the median is ‘sometimes’, and the mean is between ‘mostly’ and ‘sometimes’ but tends towards ‘mostly’.

Thirty-one percent of the ‘HQ and portfolio manager’ strata of the population sample stated that this process is ‘not used’. Sixteen percent stated ‘no’. Seven percent responded ‘sometimes’. Sixteen percent stated ‘mostly’, whilst thirty-one percent stated ‘yes’. The mode response, other than ‘not used’, is ‘yes’, the median is ‘sometimes’, and the mean is close to ‘mostly’.

Twenty-seven percent of the ‘project manager’ strata of the population sample stated that this process is ‘not used’. Nineteen percent stated ‘no’. Twenty-four percent responded ‘sometimes’. Five percent stated ‘mostly’, whilst twenty-four percent stated ‘yes’. The mode and the median response, other than ‘not used’: are ‘sometimes’. The mean is midway between ‘sometimes’ and ‘mostly’.

On balance, the response that is taken as statistically indicative of the user community as a whole, is that the use of non-PW_MS computer-based methods to record/process work scheduling/CPM for project management purposes is ‘not used’ by twenty-seven to thirty-one percent of the population sample/sub strata. Twenty-nine to forty-seven percent have a high degree of the use on non-PW_MS computer-based methods for managing a work schedule/CPM for project management purposes. Fifty-three to fifty-four percent state that they have some use of non-PW_MS computer systems for this purpose. The ‘HQ and portfolio manager’ sub-strata of the population sample are the greatest users of non-PW_MS computer-based systems for this purpose.

*Q.4.1.2 What **information technology** do you use for ‘Non-PW_MS’ systems that are used to record/process project data for project management purposes?*

Commentary - this is a further question from Q.4.1.1 that is to identify the type of computer software used as the basis for the other MIS. As before, the question is in eight parts because the other systems may not have comprehensive project management functionality. The respondent is asked to choose one of the options with regard to the type of software used in the other MIS. The options are: ‘database’, ‘spreadsheet’, ‘package software’, or ‘none’. In addition, the user is asked to name the MIS so that it can be further evaluated if necessary. The project management functions listed in the questionnaire correspond with the items in Q.4.1.1, namely are:

- (a) Records of staff resources;*
- (b) Records of project contacts;*
- (c) Records of project scope;*
- (d) Records of project dates;*
- (e) Records of project costs;*

- (j) *Records of works contracts;*
- (k) *Records of project diary; and*
- (l) *Work scheduling/CPM.*

With regard to (a) ‘the use of non-PW_MS computer-based methods to record/process data on records of staff resources for project management purposes.

Sixty-five percent of the population sample stated ‘none’ [no] computer-based information technology is used. Twelve percent stated ‘package software’. Twenty-one percent stated ‘spreadsheets’. One percent stated ‘database’. The mode and the median response are ‘none’, and the mean is between ‘none’ and ‘package software’ but tends towards ‘package software’.

Sixty-three percent of the ‘HQ and portfolio manager’ sub-strata of the population sample stated ‘none’ [no] computer-based information technology is used. Sixteen percent stated ‘package software’. Sixteen percent stated ‘spreadsheets’. Two percent stated ‘database’. The mode and the median response are ‘none’, and the mean is between ‘none’ and ‘package software’ but tends towards ‘package software’.

Sixty-five percent of the ‘project manager’ strata of the population sample stated ‘none’ [no] computer-based information technology is used. Eleven percent stated ‘package software’. Twenty-three percent stated ‘spreadsheets’. One percent stated ‘database’. The mode and the median response are ‘none’, and the mean is between ‘none’ and ‘package software’ but tends towards ‘package software’.

On balance, the response that is taken as statistically indicative of the user community as a whole, is that the non-PW_MS computer-based software used to record/process staff resource data for project management purposes is ‘none’ for sixty-three to sixty-five percent of the population sample/sub strata. Eleven to sixteen percent use ‘package software’. Sixteen to twenty-three percent state ‘spreadsheets’. One to two percent state ‘database’. The mode and the median response is ‘none’, the mean is between ‘none’ and ‘package software’. Thirty-eight respondents named the software that they used for this purpose- the low level of response means that this data is not representative of the population. This information is provided in Table 8-2, the items shown in italic font are in-house systems developed by a team within the works department or by IT professionals on their behalf. In general, these in-house systems do not satisfy commercial standards for the development and documentation of software .

Software	Frequency
Excel	13
Staff Resource Model	9
Primavera P3	5
Lotus/Excel	3
WORD	2
<i>SRPS (Architectural Services Dept)</i>	2
<i>SURETRACK</i>	1

Table 8-2 Non-PW_MS software used to record/process staff resource data for project management

With regard to (b) ‘the use of non-PW_MS computer-based methods to record/process project contacts data for project management purposes.

Forty-nine percent of the population sample stated ‘none’ [no] computer-based information technology is used. Seven percent stated ‘package software’. Twenty-eight percent stated ‘spreadsheets’. Fifteen percent stated ‘database’. The mode response is ‘none’, the median response is ‘package software’, and the mean is between ‘package software’ and ‘spreadsheet’ but tends towards ‘package software’.

Forty-four percent of the ‘HQ and portfolio manager’ sub-strata of the population sample stated ‘none’ [no] computer-based information technology is used. Seven percent stated ‘package software’. Thirty-three percent stated ‘spreadsheets’. Sixteen percent stated ‘database’. The mode response is ‘none’, the median response is ‘package software’, and the mean is between ‘package software’ and ‘spreadsheet’ but tends towards ‘package software’.

Fifty-one percent of the ‘project manager’ strata of the population sample stated ‘none’ [no] computer-based information technology is used. Seven percent stated ‘package software’. Twenty-seven percent stated ‘spreadsheets’. Fifteen percent stated ‘database’. The mode and the median response are ‘none’, and the mean is close to ‘package software’.

On balance, the response that is taken as statistically indicative of the user community as a whole, is that the non-PW_MS computer-based software used to record/process project contacts data for project management purposes is ‘none’ for forty-four to fifty-one percent of the population sample/sub strata. Seven percent use ‘package software’. Twenty-seven to thirty-three percent state ‘spreadsheets’. Fifteen to sixteen percent state ‘database’. The mode response is ‘none’. Forty-seven respondents named the software that they used for this purpose- the low level of response means that this data is not representative of the population. This information is provided in Table 8-3, the items shown in italic font are in-house systems developed by a team within the works department or by IT professionals on their behalf. In general, these in-house systems do not satisfy commercial standards for the development and documentation of software.

Software	Frequency
<i>PCIS</i>	13
Excel	12
WORD	7
Lotus	6
Lotus/Excel	4
<i>INFORM</i>	2
Excel/Word	1
FoxPro	1
<i>LAFIS</i>	1

Table 8-3 Non-PW_MS software used to record/process project contacts data for project management.

With regard to (c) ‘the use of non-PW_MS computer-based methods to record/process project scope data for project management purposes.

Sixty-four percent of the population sample stated ‘none’ [no] computer-based information technology is used. Eight percent stated ‘package software’. Fifteen percent stated ‘spreadsheets’. Twelve percent stated ‘database’. The mode and median response are ‘none’, and the mean is between ‘none’ and ‘package software’ but tends towards ‘package software’.

Sixty-five percent of the ‘HQ and portfolio manager’ sub-strata of the population sample stated ‘none’ [no] computer-based information technology is used. Five percent stated ‘package software’. Sixteen percent stated ‘spreadsheets’. Fourteen percent stated ‘database’. The mode and median response are ‘none’, and the mean is between ‘none’ and ‘package software’ but tends towards ‘package software’.

Sixty-three percent of the ‘project manager’ strata of the population sample stated ‘none’ [no] computer-based information technology is used. Ten percent stated ‘package software’. Fifteen percent stated ‘spreadsheets’. Twelve percent stated ‘database’. The mode and the median response are ‘none’, and the mean is close to ‘package software’.

On balance, the response that is taken as statistically indicative of the user community as a whole, is that the non-PW_MS computer-based software used to record/process project scope data for project management purposes is ‘none’ for sixty-three to sixty-five percent of the population sample/sub strata. Ten percent use ‘package software’. Fifteen percent state ‘spreadsheets’. Twelve percent state ‘database’. The mode and median response is ‘none’. Forty-seven respondents named the software that they used for this purpose- the low level of response means that this data is not representative of the population. This information is provided in Table 8-4, the items shown in italic font are in-house systems developed by a team within the works department or by IT professionals on their behalf. In general, these in-house systems do not satisfy commercial standards for the development and documentation of software .

Software	Frequency
WORD	13
PCIS	10
Excel	5
Lotus	2
Lotus/Excel	1
Excel/Word	1
LAFIS	1
INFORM	1
PQP	1

Table 8-4 Non-PW_MS software used to record/process project scope for project management

With regard to (d) ‘the use of non-PW_MS computer-based methods to record/process project dates for project management purposes.

Thirty-five percent of the population sample stated ‘none’ [no] computer-based information technology is used. Nineteen percent stated ‘package software’. Twenty-eight percent stated ‘spreadsheets’. Eighteen percent stated ‘database’. The mode

response is 'none', the median response is 'package software', and the mean is between 'package software' and 'spreadsheet' but tends towards 'package software'.

Thirty-five percent of the 'HQ and portfolio manager' sub-strata of the population sample stated 'none' [no] computer-based information technology is used. Nineteen percent stated 'package software'. Twenty-three percent stated 'spreadsheets'. Twenty-three percent stated 'database'. The mode response is 'none', the median response is 'package software', and the mean is between 'package software' and 'spreadsheet' but tends towards 'package software'.

Thirty-five percent of the 'project manager' strata of the population sample stated 'none' [no] computer-based information technology is used. Nineteen percent stated 'package software'. Thirty-one percent stated 'spreadsheets'. Sixteen percent stated 'database'. The mode response is 'none', the median response is 'package software', and the mean is between 'package software' and 'spreadsheet' but tends towards 'package software'.

On balance, the response that is taken as statistically indicative of the user community as a whole, is that the non-PW_MS computer-based software used to record/process project data for project management purposes is 'none' for thirty-five percent of the population sample/sub strata. Nineteen percent use 'package software'. Twenty-three to thirty-one percent state 'spreadsheets'. Sixteen percent state 'database'. The mode response is 'none', the median response is 'package software', and the mean is between 'package software' and 'spreadsheet' but tends towards 'package software'. Sixty-four respondents named the software that they used for this purpose- the low level of response means that this data is not representative of the population. This information is provided in Table 8-5, the items shown in italic font are in-house systems developed by a team within the works department or by IT professionals on their behalf. In general, these in-house systems do not satisfy commercial standards for the development and documentation of software .

Software	Frequency
<i>PCIS</i>	15
Excel	9
SURETRACK	5
MS PROJECT	4
WORD	4
Lotus	4
FoxPro	3
Lotus/Excel	1
TIMELINE	1
Excel/Word	1
<i>LAFIS</i>	1
<i>INFORM</i>	1
Primavera P3	1
<i>PQP/INFORM</i>	1
MS OFFICE	1
LAN	1

Table 8-5 Non-PW_MS software used to record/process project dates for project management.

With regard to (e) ‘the use of non-PW_MS computer-based methods to record/process project costs for project management purposes.

Twenty-nine percent of the population sample stated ‘none’ [no] computer-based information technology is used. Six percent stated ‘package software’. Forty-eight percent stated ‘spreadsheets’. Seventeen percent stated ‘database’. The mode and median response are ‘spreadsheets’, and the mean is midway between ‘spreadsheet’ and ‘database’.

Twenty-six percent of the ‘HQ and portfolio manager’ sub-strata of the population sample stated ‘none’ [no] computer-based information technology is used. Five percent stated ‘package software’. Forty-eight percent stated ‘spreadsheets’. Twenty-one percent stated ‘database’. The mode and the median response are ‘spreadsheet’, and the mean is between ‘spreadsheet’ and ‘database’ but tends towards ‘spreadsheet’.

Thirty-one percent of the ‘project manager’ strata of the population sample stated ‘none’ [no] computer-based information technology is used. Six percent stated ‘package software’. Forty-eight percent stated ‘spreadsheets’. Fifteen percent stated ‘database’. The mode and median response are ‘spreadsheets’, and the mean is midway between ‘spreadsheet’ and ‘database’.

On balance, the response that is taken as statistically indicative of the user community as a whole, is that the non-PW_MS computer-based software used to record/process project cost data for project management purposes is ‘none’ for twenty-six to thirty-one percent of the population sample/sub strata. Five to six percent use ‘package software’. Forty-eight percent state ‘spreadsheets’. Fifteen to nineteen percent state ‘database’. The mode and median response are ‘spreadsheets’, and the mean is midway between ‘spreadsheet’ and ‘database’. Sixty-two respondents named the software that they used for this purpose- the low level of response means that this data is not representative of the population. This information is provided in Table 8-6, the items shown in italic font are in-house systems developed by a team within the works department or by IT professionals on their behalf. In general, these in-house systems do not satisfy commercial standards for the development and documentation of software .

Software	Frequency
Excel	23
<i>PCIS</i>	15
Lotus	8
Lotus/Excel	6
FoxPro	3
WORD	2
<i>LAFIS</i>	2
<i>INFORM</i>	2
LAN	1

Table 8-6 Non-PW_MS software used to record/process project costs data for project management.

With regard to (f) ‘the use of non-PW_MS computer-based methods to record/process works contracts data for project management purposes.

Forty-nine percent of the population sample stated ‘none’ [no] computer-based information technology is used. Eight percent stated ‘package software’. Twenty-seven percent stated ‘spreadsheets’. Sixteen percent stated ‘database’. The mode response is ‘none’, the median response is ‘package software’, and the mean tends to ‘package software’.

Forty-four percent of the ‘HQ and portfolio manager’ sub-strata of the population sample stated ‘none’ [no] computer-based information technology is used. Five percent stated ‘package software’. Thirty-three percent stated ‘spreadsheets’. Nineteen percent stated ‘database’. The mode response is ‘none’, the median response is ‘spreadsheet’, and the mean tends to ‘package software’.

Fifty percent of the ‘project manager’ strata of the population sample stated ‘none’ [no] computer-based information technology is used. Nine percent stated ‘package software’. Twenty-five percent stated ‘spreadsheets’. Fifteen percent stated ‘database’. The mode and median response are ‘none’, and the mean is close to ‘package software’.

On balance, the response that is taken as statistically indicative of the user community as a whole, is that the non-PW_MS computer-based software used to record/process project cost data for project management purposes is ‘none’ for forty-four to fifty percent of the population sample/sub strata. Five to nine percent use ‘package software’. Twenty-five to thirty-three percent state ‘spreadsheets’. Fifteen to nineteen percent state ‘database’. The mode is ‘none’. Forty-six respondents named the software that they used for this purpose- the low level of response means that this data is not representative of the population. This information is provided in Table 8-7, the items shown in italic font are in-house systems developed by a team within the works department or by IT professionals on their behalf. In general, these in-house systems do not satisfy commercial standards for the development and documentation of software .

Software	Frequency
<i>PCIS</i>	15
WORD	9
Excel	8
FoxPro	4
Lotus	2
<i>INFORM</i>	2
Lotus/Excel	1
Excel/Word	1
<i>LAFIS</i>	1
Timeline	1
MSProject	1
<i>CMIS</i>	1

Table 8-7 Non-PW_MS software used to record/process works contracts for project management.

With regard to (g) ‘the use of non-PW_MS computer-based methods to record/process project diary data for project management purposes.

Sixty-six percent of the population sample stated ‘none’ [no] computer-based information technology is used. Nine percent stated ‘package software’. Fifteen percent stated ‘spreadsheets’. Nine percent stated ‘database’. The mode and the median response is ‘none’, and the mean is between ‘none’ and ‘software package’ but tends to ‘package software’.

Sixty-six percent of the ‘HQ and portfolio manager’ sub-strata of the population sample stated ‘none’ [no] computer-based information technology is used. Seven percent stated ‘package software’. Twenty percent stated ‘spreadsheets’. Seven percent stated ‘database’. The mode and the median response is ‘none’, and the mean is between ‘none’ and ‘software package’ but tends to ‘package software’.

Sixty-six percent of the ‘project manager’ strata of the population sample stated ‘none’ [no] computer-based information technology is used. Ten percent stated ‘package software’. Thirteen percent stated ‘spreadsheets’. Ten percent stated ‘database’. The mode and median response are ‘none’, and the mean is close to ‘package software’.

On balance, the response that is taken as statistically indicative of the user community as a whole, is that the non-PW_MS computer-based software used to record/process project diary data for project management purposes is ‘none’ for sixty-six percent of the population sample/sub strata. Seven to ten percent use ‘package software’. Thirteen to twenty percent state ‘spreadsheets’. Seven to ten percent state ‘database’. The mode and median response are ‘none’, and the mean is close to ‘package software’ for the population sample and the sub-strata of the population sample. Twenty-nine respondents named the software that they used for this purpose- the low level of response means that this data is not representative of the population. This information is provided in Table 8-8, the items shown in italic font are in-house systems developed by a team within the works department or by IT professionals on their behalf. In general, these in-house systems do not satisfy commercial standards for the development and documentation of software.

Software	Frequency
WORD	14
Excel	6
Lotus/Excel	2
FoxPro	2
PCIS	2
<i>INFORM</i>	2
MSPProject	1

Table 8-8 Non-PW_MS software used to record/process project diary data for project management

With regard to (h) ‘the use of non-PW_MS computer-based methods to record/process work schedule/CPM data for project management purposes.

Forty-seven percent of the population sample stated ‘none’ [no] computer-based information technology is used. Thirty percent stated ‘package software’. Fifteen percent stated ‘spreadsheets’. Eight percent stated ‘database’. The mode response is ‘none’, the median is ‘package software’, and the mean is between ‘none’ and ‘software package’ but tends to ‘package software’.

Fifty-five percent of the ‘HQ and portfolio manager’ sub-strata of the population sample stated ‘none’ [no] computer-based information technology is used. Twenty-seven percent stated ‘package software’. Eleven percent stated ‘spreadsheets’. Seven percent stated ‘database’. The mode and the median response is ‘none’, and the mean is between ‘none’ and ‘software package’ but tends to ‘package software’.

Forty-four percent of the ‘project manager’ strata of the population sample stated ‘none’ [no] computer-based information technology is used. Thirty-one percent stated ‘package software’. Seventeen percent stated ‘spreadsheets’. Nine percent stated ‘database’. The mode response is ‘none’, the median is ‘package software’, and the mean is between ‘none’ and ‘software package’ but tends to ‘package software’.

On balance, the response that is taken as statistically indicative of the user community as a whole, is that the non-PW_MS computer-based software used to record/process work schedule/CPM data for project management purposes is ‘none’ for forty-four to fifty-five percent of the population sample/sub strata. Thirty to thirty-one percent use ‘package software’. Eleven to seventeen percent state ‘spreadsheets’. Seven to eight percent state ‘database’. The mode response is ‘none’. Five-five respondents named the software that they used for this purpose- the low level of response means that this data is not representative of the population. This information is provided in Table 8-9, the items shown in italic font are in-house systems developed by a team within the works department or by IT professionals on their behalf. In general, these in-house systems do not satisfy commercial standards for the development and documentation of software.

Software	Frequency
SURETRACK	16
MSPROJECT	15
TIMELINE	10
Excel	3
Primavera P3	3
WORD	2
<i>PCIS</i>	2
Lotus/Excel	1
Lotus	1
Foxpro	1
<i>INFORM</i>	1

Table 8-9 Non-PW_MS software used to record/process work schedule/CPM data for project management

Questionnaire Part 4 Project management functions – Manual methods

*Q.4.2.1 Do you use **manual record systems** to record/process the following project data **for project management** purposes?*

Commentary - this question is the same as Q 4.1.1 except it is to measure the extent that the User Population uses manual methods for project management purposes. The question is in eight parts because the manual methods may not have comprehensive project management functionality. The respondent is asked to choose one of the options with regard to the main functions of the PW_MS. The options are: 'yes', 'mostly', 'sometimes', or 'not used by me'. The project management functions listed in the questionnaire are:

- (a) Records of staff resources;*
- (b) Records of project contacts;*
- (c) Records of project scope;*
- (d) Records of project dates;*
- (e) Records of project costs;*
- (f) Records of works contracts;*
- (g) Records of project diary; and*
- (h) Work scheduling/CPM.*

With regard to (a) 'the use of manual record systems to record/process data on staff resources for project management purposes.

Forty-three percent of the population sample stated that this process is 'not used'. Fifteen percent stated 'no'. Twenty-three percent stated 'sometimes'. Fifteen percent stated 'mostly', whilst three percent responded 'yes'. The mode and the median response, other than 'not used', are 'sometimes', and the mean is close to 'sometimes'.

Forty-four percent of the 'HQ and portfolio manager' strata of the population sample stated that this process is 'not used'. Twenty percent stated 'no'. sixteen percent responded 'sometimes'. Eleven percent stated 'mostly', whilst nine percent stated 'yes'. The mode response, other than 'not used', is 'no', the median response is 'sometimes'. The mean is between 'sometimes' and 'mostly' but tends towards 'sometimes'.

Forty-two percent of the 'project manager' strata of the population sample stated that this process is 'not used'. Twelve percent stated 'no'. Twenty-six percent responded 'sometimes'. Seventeen percent stated 'mostly', whilst zero percent stated 'yes'. The mode and the median response, other than 'not used', are 'sometimes', and the mean response is close to 'sometimes'.

On balance, the response that is taken as statistically indicative of the user community as a whole, is that the use of manual record systems to record/process data on staff resources for project management purposes is 'not used' by the largest portion of the population sample/sub strata (forty-two to forty-four percent). Seventeen to nineteen percent have a high degree of the use of manual record systems or managing staff resources for project management purposes. Twenty-nine to forty-one percent state that they have some use of manual record systems for this purpose.

With regard to (b) 'the use of manual record systems to record/process data on project contacts for project management purposes.

Twenty-six percent of the population sample stated that this process is 'not used'. Twelve percent stated 'no'. Thirty-two percent stated 'sometimes'. Twenty-four percent stated 'mostly', whilst five percent responded 'yes'. The mode response and

the median, other than 'not used', is 'sometimes', the mean is between 'sometimes' and 'mostly' but tends towards 'sometimes'.

Thirty-three percent of the 'HQ and portfolio manager' strata of the population sample stated that this process is 'not used'. Twenty-four percent stated 'no'. Twenty-two percent responded 'sometimes'. Eleven percent stated 'mostly', whilst nine percent stated 'yes'. The mode response, other than 'not used', is 'sometimes', the median response is 'no'. The mean is close to 'sometimes'.

Twenty-three percent of the 'project manager' strata of the population sample stated that this process is 'not used'. Seven percent stated 'no'. Thirty-seven percent responded 'sometimes'. Twenty-nine percent stated 'mostly', whilst four percent stated 'yes'. The mode and the median response, other than 'not used', are 'sometimes'. The mean is between 'sometimes' and 'mostly' but tends towards 'sometimes'.

On balance, the response that is taken as statistically indicative of the user community as a whole, is that the use of manual record systems to record/process data on project contacts for project management purposes is 'not used' by twenty-three to thirty-three percent of the population sample/sub strata. Twenty to thirty-three percent have a high degree of the use of manual record systems for managing project contacts for project management purposes. Forty to forty-four percent state that they have some use of manual record systems for this purpose.

With regard to (c) 'the use of manual record systems to record/process data on project scope for project management purposes.'

Twenty-five percent of the population sample stated that this process is 'not used'. Thirteen percent stated 'no'. Thirty-three percent stated 'sometimes'. Twenty-three percent stated 'mostly', whilst six percent responded 'yes'. The mode and the median response, other than 'not used', are 'sometimes', and the mean is between 'sometimes' and 'mostly' but tends towards 'sometimes'.

Thirty-six percent of the 'HQ and portfolio manager' strata of the population sample stated that this process is 'not used'. Eighteen percent stated 'no'. Twenty-two percent responded 'sometimes'. Eleven percent stated 'mostly', whilst thirteen percent stated 'yes'. The mode and the median response, other than 'not used', are 'sometimes' and the mean is between 'sometimes' and 'mostly' but tends towards 'sometimes'.

Twenty-one percent of the 'project manager' strata of the population sample stated that this process is 'not used'. Eleven percent stated 'no'. Thirty-seven percent responded 'sometimes'. Twenty-eight percent stated 'mostly', whilst four percent stated 'yes'. The mode and the median response, other than 'not used' respondents: are 'sometimes', and the mean is between 'sometimes' and 'mostly' but tends towards 'sometimes'.

On balance, the response that is taken as statistically indicative of the user community as a whole, is that the use of manual record systems to record/process data on project scope for project management purposes is 'not used' by twenty-one to thirty-six percent of the population sample/sub strata. Twenty-four to thirty-two percent have a

high degree of the use of manual records for managing project scope for project management purposes. Forty-six to sixty-nine percent state that they have some use of manual records for this purpose. Manual records are used less by the 'HQ and portfolio manager' sub-strata of the population sample.

With regard to (d) 'the use of manual record systems to record/process data on project dates for project management purposes.'

Twenty-four percent of the population sample stated that this process is 'not used'. Fifteen percent stated 'no'. Thirty-six percent stated 'sometimes'. Nineteen percent stated 'mostly', whilst five percent responded 'yes'. The mode and the median response, other than 'not used' respondents: are 'sometimes', and the mean is between 'sometimes' and 'mostly' but tends towards 'sometimes'.

Thirty-eight percent of the 'HQ and portfolio manager' strata of the population sample stated that this process is 'not used'. Twenty-seven percent stated 'no'. Twenty-four percent responded 'sometimes'. Two percent stated 'mostly', whilst nine percent stated 'yes'. The mode and the median response, other than 'not used' respondents: are 'sometimes', and the mean is between 'sometimes' and 'mostly' but tends towards 'sometimes'.

Eighteen percent of the 'project manager' strata of the population sample stated that this process is 'not used'. Eleven percent stated 'no'. Forty-one percent responded 'sometimes'. Twenty-six percent stated 'mostly', whilst five stated 'yes'. The mode and the median response, other than 'not used' respondents: are 'sometimes', and the mean is between 'sometimes' and 'mostly' but tends towards 'sometimes'.

On balance, the response that is taken as statistically indicative of the user community as a whole, is that the use of manual record systems to record/process data on project dates for project management purposes is 'not used' by eighteen to thirty-eight percent of the population sample/sub strata. Eleven to thirty percent have a high degree of the use of manual records for managing project dates for project management purposes. Thirty-five to seventy-one percent state that they have some use of manual records for this purpose. Manual records are used less by the 'HQ and portfolio manager' sub-strata of the population sample.

With regard to (e) 'the use of manual record systems to record/process data on project costs for project management purposes.'

Twenty-two percent of the population sample stated that this process is 'not used'. Fifteen percent stated 'no'. Thirty-seven percent stated 'sometimes'. Twenty-one percent stated 'mostly', whilst four percent responded 'yes'. The mode and the median response, other than 'not used', are 'sometimes', and the mean tends to 'sometimes'.

Thirty-eight percent of the 'HQ and portfolio manager' strata of the population sample stated that this process is 'not used'. Twenty-seven percent stated 'no'. Twenty-four percent responded 'sometimes'. Two percent stated 'mostly', whilst

nine percent stated 'yes'. The mode and the median response, other than 'not used', are 'sometimes', and the mean tends to 'sometimes'.

Fifteen percent of the 'project manager' strata of the population sample stated that this process is 'not used'. Twelve percent stated 'no'. Forty-one percent responded 'sometimes'. Twenty-seven percent stated 'mostly', whilst five percent stated 'yes'. The mode and the median response, other than 'not used', are 'sometimes', and the mean tends to 'sometimes'.

On balance, the response that is taken as statistically indicative of the user community as a whole, is that the use of manual record systems to record/process data on project costs for project management purposes is 'not used' by fifteen to thirty-eight percent of the population sample/sub strata. Eleven to thirty-two percent have a high degree of the use manual record systems for managing project costs for project management purposes. Thirty-eight to seventy-five percent state that they have some use of manual records for this purpose. Manual records are used less by the 'HQ and portfolio manager' sub-strata of the population sample.

With regard to (f) 'the use of manual record systems to record/process data on works contracts for project management purposes.

Twenty-eight percent of the population sample stated that this process is 'not used'. Thirteen percent stated 'no'. Thirty-four percent stated 'sometimes'. Twenty percent stated 'mostly', whilst five percent responded 'yes'. The mode and the median response, other than 'not used', are 'sometimes', and the mean tends to 'sometimes'..

Thirty-six percent of the 'HQ and portfolio manager' strata of the population sample stated that this process is 'not used'. Twenty percent stated 'no'. Twenty-three percent responded 'sometimes'. Fourteen percent stated 'mostly', whilst seven percent stated 'yes'. The mode and the median response, other than 'not used', are 'sometimes', and the mean tends to 'sometimes'.

Twenty-five percent of the 'project manager' strata of the population sample stated that this process is 'not used'. Ten percent stated 'no'. Thirty-eight percent responded 'sometimes'. Twenty-three percent stated 'mostly', whilst five percent stated 'yes'. The mode and the median response, other than 'not used', are 'sometimes', and the mean tends to 'sometimes'.

On balance, the response that is taken as statistically indicative of the user community as a whole, is that the use of manual record systems to record/process data on works contracts for project management purposes is 'not used' by twenty-five to thirty-six percent of the population sample/sub strata. Twenty-one to twenty-eight percent have a high degree of the use of manual record systems for managing works contracts for project management purposes. Forty-four to sixty-six percent state that they have some use of manual record systems for this purpose. The 'HQ and portfolio manager' sub-strata has a lesser use of manual record systems.

With regard to (g) 'the use of manual record systems to record/process data on project diary for project management purposes.

Thirty percent of the population sample stated that this process is 'not used'. Sixteen percent stated 'no'. Thirty-three percent stated 'sometimes'. Seventeen percent stated 'mostly', whilst three percent responded 'yes'. The mode and the median response, other than 'not used', are 'sometimes', and the mean tends to 'sometimes'.

Thirty-nine percent of the 'HQ and portfolio manager' strata of the population sample stated that this process is 'not used'. Twenty-three percent stated 'no'. Eighteen percent responded 'sometimes'. Sixteen percent stated 'mostly', whilst five percent stated 'yes'. The mode and the median response, other than 'not used', are 'sometimes', and the mean tends to 'sometimes'.

Twenty-seven percent of the 'project manager' strata of the population sample stated that this process is 'not used'. Fourteen percent stated 'no'. Thirty-nine percent responded 'sometimes'. Eighteen percent stated 'mostly', whilst three percent stated 'yes'. The mode and the median response, other than 'not used', are 'sometimes', and the mean tends to 'sometimes'.

On balance, the response that is taken as statistically indicative of the user community as a whole, is that the use of manual record systems to record/process a project diary for project management purposes is 'not used' by twenty-seven to thirty-nine percent of the population sample/sub strata. Twenty to twenty-one percent have a high degree of the use on manual records systems for managing a project diary for project management purposes. Thirty-nine to sixty percent state that they have some use of manual systems for this purpose. The 'HQ and portfolio manager' sub-strata has a lesser use of manual record systems.

With regard to (h) 'the use of manual record systems to record/process data on work scheduling/CPM for project management purposes.

Thirty percent of the population sample stated that this process is 'not used'. Twenty-nine percent stated 'no'. Thirty percent stated 'sometimes'. Nine percent stated 'mostly', whilst two percent responded 'yes'. The mode and the median response, other than 'not used', are 'sometimes', and the mean tends to 'sometimes'.

Forty-three percent of the 'HQ and portfolio manager' strata of the population sample stated that this process is 'not used'. Thirty-four percent stated 'no'. Twenty percent responded 'sometimes'. Two percent stated 'mostly', whilst zero percent stated 'yes'. The mode and the median response, other than 'not used', are 'sometimes', and the mean tends to 'sometimes'.

Twenty-five percent of the 'project manager' strata of the population sample stated that this process is 'not used'. Twenty-seven percent stated 'no'. Thirty-three percent responded 'sometimes'. Twelve percent stated 'mostly', whilst three percent stated 'yes'. The mode and the median response, other than 'not used', are 'sometimes', and the mean tends to 'sometimes'.

On balance, the response that is taken as statistically indicative of the user community as a whole, is that the use of manual record systems to record/process work scheduling/CPM for project management purposes is 'not used' by twenty-five to forty-three percent of the population sample/sub strata. Two to fifteen percent have a high degree of the use of manual record/systems for managing a work schedule/CPM

for project management purposes. Twenty-two to forty-eight percent state that they have some use of manual systems for this purpose. The 'HQ and portfolio manager' sub-strata of the population sample are the lesser users of manual systems for this purpose.

*Q.4.2.2 What **manual records** do you most use to record/process project data for project management purposes?_*

Commentary - this is a further question from Q.4.2.1 that is to identify the type of physical records that are used as the basis for the manual systems. As before, the question is in eight parts because the other systems may not have comprehensive project management functionality. The respondent is asked to choose one of the options with regard to the type of software used in the other MIS. The options are: 'form', 'diary', 'file', 'personal file' or 'none'. The project management unctions listed in the questionnaire correspond with the items in Q.4.1.1 and Q.4.2.1, namely:

- (a) Records of staff resources;*
- (b) Records of project contacts;*
- (c) Records of project scope;*
- (d) Records of project dates;*
- (e) Records of project costs;*
- (i) Records of works contracts;*
- (j) Records of project diary; and*
- (k) Work scheduling/CPM.*

With regard to (a) 'the type of manual record systems used to record/process data on staff resources for project management purposes.

Fifty-four percent of the population sample stated 'none'. Six percent stated 'personal file'. Twenty-six percent stated 'file'. Zero percent stated 'diary', whilst thirteen percent responded 'form'. The mode and the median response are 'none', whilst the mean is close to 'personal file'.

Fifty-nine percent of the 'HQ and portfolio manager' strata of the population sample stated 'none'. Two percent stated 'personal file'. Eighteen percent stated 'file'. Zero percent stated 'diary', whilst eighteen percent responded 'form'. The mode and the median response are 'none', whilst the mean is close to 'personal file'.

Fifty-two percent of the population sample stated 'none'. Eight percent stated 'personal file'. Twenty-nine percent stated 'file'. Zero percent stated 'diary', whilst eleven percent responded 'form'. The mode and the median response are 'none', whilst the mean is close to 'personal file'.

On balance, the response that is taken as statistically indicative of the user community as a whole, is that the use of manual record systems to record/process data on staff resources for project management purposes is 'not used' by the largest portion of the

population sample/sub strata (fifty-two to fifty-nine percent). Otherwise, document files are clearly the dominant type of manual records used to record/process data on staff resources for project management purposes.

With regard to (b) ‘the type of manual record systems used to record/process data on project contacts for project management purposes.

Thirty-three percent of the population sample stated that manual records are ‘none’. Fifteen percent stated ‘personal file’. Thirty-three percent stated ‘file’. Five percent stated ‘diary’, whilst fourteen percent responded ‘form’. The mode response is ‘none’, the median response is ‘file’, and the mean is between ‘personal file’ and ‘file’.

Fifty-one percent of the ‘HQ and portfolio manager’ strata of the population sample stated that manual records are ‘none’. Eleven percent stated ‘personal file’. Sixteen percent stated ‘file’. Four percent stated ‘diary’, whilst eighteen percent responded ‘form’. The mode and the median response are ‘none’, and the mean is between ‘personal file’ and ‘file’ but tends to ‘personal file’.

Twenty-five percent of the ‘project manager’ strata of the population sample stated that manual records are ‘none’. Seventeen percent stated ‘personal file’. Forty percent stated ‘file’. Five percent stated ‘diary’, whilst thirteen percent responded ‘form’. The mode response and the median response are ‘file’, and the mean is between ‘personal file’ and ‘file’ but tends to ‘file’.

On balance, the response that is taken as statistically indicative of the user community as a whole, is that the type of manual record systems used to record/process data on project contacts for project management purposes are ‘files’. However, the dominant response for the ‘HQ and portfolio manager’ strata of the population sample is ‘none’.

With regard to (c) ‘the type of manual record systems used to record/process data on project scope for project management purposes.

Thirty-two percent of the population sample stated that ‘none’ manual records are used. Seven percent stated ‘personal files’. Fifty-five percent stated ‘files’. Two percent stated ‘diary’, whilst four percent responded ‘form’. The mode and the median response, are ‘files’, and the mean is between ‘personal files’ and ‘files’.

Forty-nine percent of the ‘HQ and portfolio manager’ strata of the population sample stated that ‘none’ manual records are used. Zero percent stated ‘personal files’. Forty-two percent stated ‘files’. Zero percent stated ‘diary’, whilst nine percent responded ‘form’. The mode response is ‘none’, the median is ‘files’, and the mean is between ‘personal files’ and ‘files’ but tends to ‘personal files’.

Twenty-five percent of the ‘project manager’ strata of the population sample stated that ‘none’ manual records are used. Ten percent stated ‘personal files’. Sixty percent stated ‘files’. Three percent stated ‘diary’, whilst two percent responded ‘form’. The mode and the median response, are ‘files’, and the mean is between ‘personal files’ and ‘files’.

On balance, the response that is taken as statistically indicative of the user community as a whole, is that the type of manual record systems used to record/process data on project scope for project management purposes are 'files'. However the 'HQ and portfolio manager' strata have a dominant response of 'none'.

With regard to (d) 'the type use of manual record systems used to record/process data on project dates for project management purposes.'

Thirty-four percent of the population sample stated that 'none' manual records are used. Eight percent stated 'personal files'. Forty-three percent stated 'files'. Three percent stated 'diary', whilst twelve percent responded 'form'. The mode and the median response, are 'files', and the mean is between 'personal files' and 'files'.

Sixty percent of the 'HQ and portfolio manager' strata of the population sample stated that 'none' manual records are used. Seven percent stated 'personal files'. Twenty-four percent stated 'files'. Zero percent stated 'diary', whilst nine percent responded 'form'. The mode and the median response are 'none', and the mean tends to 'personal files'.

Twenty-four percent of the 'project manager' strata of the population sample stated that 'none' manual records are used. Eight percent stated 'personal files'. Fifty-one percent stated 'files'. Four percent stated 'diary', whilst fourteen percent responded 'form'. The mode and the median response, are 'files', and the mean tends to 'files'.

On balance, the response that is taken as statistically indicative of the user community as a whole, is that the type of manual record systems used to record/process data on project dates for project management purposes are 'files'. However the 'HQ and portfolio manager' strata have a dominant response of 'none'.

With regard to (e) 'the type of manual record systems used to record/process data on project costs for project management purposes.'

Thirty-two percent of the population sample stated that 'none' manual records are used. Six percent stated 'personal files'. Forty-seven percent stated 'files'. One percent stated 'diary', whilst fourteen percent responded 'form'. The mode and the median response, are 'files', and the mean is between 'personal files' and 'files'.

Fifty-one percent of the 'HQ and portfolio manager' strata of the population sample stated that 'none' manual records are used. Seven percent stated 'personal files'. Twenty-nine percent stated 'files'. Zero percent stated 'diary', whilst thirteen percent responded 'form'. The mode and the median response are 'none', and the mean is between 'personal files' and 'files'.

Twenty-four percent of the 'project manager' strata of the population sample stated that 'none' manual records are used. Six percent stated 'personal files'. Fifty-four percent stated 'files'. Two percent stated 'diary', whilst fourteen percent responded 'form'. The mode and the median response, are 'files', and the mean tends to 'files'.

On balance, the response that is taken as statistically indicative of the user community as a whole, is that the type of manual record systems used to record/process data on project costs for project management purposes are 'files'. However the 'HQ and portfolio manager' strata have a dominant response of 'none'.

With regard to (f) ‘the type of manual record systems used to record/process data on works contracts for project management purposes.

Thirty-seven percent of the population sample stated that ‘none’ manual records are used. Three percent stated ‘personal files’. Forty-eight percent stated ‘files’. Two percent stated ‘diary’, whilst nine percent responded ‘form’. The mode and the median response, are ‘ files’, and the mean is between ‘personal files’ and ‘files’.

Fifty-three percent of the ‘HQ and portfolio manager’ strata of the population sample stated that ‘none’ manual records are used. Two percent stated ‘personal files’. Thirty-three percent stated ‘files’. Two percent stated ‘diary’, whilst nine percent responded ‘form’. The mode and the median response are ‘none’, and the mean tends to ‘personal files’.

Thirty-one percent of the ‘project manager’ strata of the population sample stated that ‘none’ manual records are used. Four percent stated ‘personal files’. Fifty-five percent stated ‘files’. Two percent stated ‘diary’, whilst nine percent responded ‘form’. The mode and the median response, are ‘ files’, and the mean is between ‘personal files’ and ‘files’.

On balance, the response that is taken as statistically indicative of the user community as a whole, is that the type of manual record systems used to record/process data on works contracts for project management purposes are ‘files’. However the ‘HQ and portfolio manager’ strata have a dominant response of ‘none’.

With regard to (g) ‘the type of manual record systems used to record/process data on project diary for project management purposes.

Forty-six percent of the population sample stated that ‘none’ manual records are used. Three percent stated ‘personal files’. Forty percent stated ‘files’. Six percent stated ‘diary’, whilst five percent responded ‘form’. The mode response is ‘none’, the median response is ‘files’, and the mean is between ‘personal files’ and ‘files’ but tends to ‘personal files’.

Sixty-two percent of the ‘HQ and portfolio manager’ strata of the population sample stated that ‘none’ manual records are used. Two percent stated ‘personal files’. Twenty-seven percent stated ‘files’. Zero percent stated ‘diary’, whilst nine percent responded ‘form’. The mode and the median response are ‘none’, and the mean tends to ‘personal files’.

Thirty-nine percent of the ‘project manager’ strata of the population sample stated that ‘none’ manual records are used. Three percent stated ‘personal files’. Forty-five percent stated ‘files’. Nine percent stated ‘diary’, whilst four percent responded ‘form’. The mode and the median response, are ‘ files’, and the mean is between ‘personal files’ and ‘files’ but tends to ‘personal files’.

On balance, the response that is taken as statistically indicative of the user community as a whole, is that the type of manual record systems used to record/process data on project diary for project management purposes are ‘files’. However the ‘HQ and portfolio manager’ strata have a dominant response of ‘none’.

With regard to (h) ‘the type of manual record systems used to record/process data on work scheduling/CPM for project management purposes.

Forty-eight percent of the population sample stated that ‘none’ manual records are used. Eight percent stated ‘personal files’. Thirty-five percent stated ‘files’. Zero percent stated ‘diary’, whilst eight percent responded ‘form’. The mode response is ‘none’, the median response is ‘files’, and the mean is between ‘personal files’ and ‘files’ but tends to ‘personal files’.

Sixty-nine percent of the ‘HQ and portfolio manager’ strata of the population sample stated that ‘none’ manual records are used. Seven percent stated ‘personal files’. Eighteen percent stated ‘files’. Zero percent stated ‘diary’, whilst seven percent responded ‘form’. The mode and the median response are ‘none’, and the mean tends to ‘personal files’.

Thirty-nine percent of the ‘project manager’ strata of the population sample stated that ‘none’ manual records are used. Eight percent stated ‘personal files’. Forty-three percent stated ‘files’. Zero percent stated ‘diary’, whilst eight percent responded ‘form’. The mode and the median response, are ‘files’, and the mean is between ‘personal files’ and ‘files’ but tends to ‘personal files’.

On balance, the response that is taken as statistically indicative of the user community as a whole, is that the type of manual record systems used to record/process data on work schedules/CPM for project management purposes are ‘none’. However the ‘project manager’ strata have a dominant response of ‘files’.

Questionnaire Part 4 Management of groups of projects – computer-based functions

Q.4.3.1 Do you use ‘Non-PW_MS’ computer-based systems Management Information Systems to record/process project data for management of groups of projects?

Commentary - this question is to measure the extent that the User Population uses other MIS for the management of a portfolio-of-projects. The question is in four parts because the other systems may not have comprehensive portfolio-management management functionality. The respondent is asked to choose one of the options with regard to the main functions of the PW_MS. The options are: ‘yes’, ‘mostly’, ‘sometimes’, or ‘not used by me’. The portfolio management functions listed in the questionnaire are:

- (a) Summary reports of progress;*
- (b) Lists of groups of projects;*
- (c) Exception reports;*
- (d) Progress reports.*

With regard to (a) ‘the use of non-PW_MS computer-based Management Information Systems to record/process data on summary reports of progress for the management of groups of projects.

Sixty-four percent of the population sample stated that this process is ‘not used’. Fourteen percent stated ‘no’. Seven percent stated ‘sometimes’. Three percent stated

‘mostly’, whilst twelve percent responded ‘yes’. The mode response, other than ‘not used’, is ‘no’ whilst the median is ‘sometimes’, and the mean is close to ‘sometimes’.

Fifty-one percent of the ‘HQ and portfolio manager’ strata of the population sample stated that this process is ‘not used’. Twenty percent stated ‘no’. Nine percent responded ‘sometimes’. Zero percent stated ‘mostly’, whilst twenty percent stated ‘yes’. The mode response, other than ‘not used’, is ‘yes’, the median response is ‘sometimes’. The mean is between ‘sometimes’ and ‘mostly’ but tends towards ‘sometimes’.

Sixty-nine percent of the ‘project manager’ strata of the population sample stated that this process is ‘not used’. Twelve percent stated ‘no’. Six percent responded ‘sometimes’. Four percent stated ‘mostly’, whilst nine percent stated ‘yes’. The mode response, other than ‘not used’, is ‘no’ and the median is ‘sometimes’, whilst the mean response is close to ‘sometimes’.

On balance, the response that is taken as statistically indicative of the user community as a whole, is that the use of non-PW_MS computer-based MIS to record/process summary reports of progress of groups of projects is ‘not used’ by the largest portion of the population sample/sub strata (fifty-one to sixty-nine percent). Thirteen to twenty percent have a high degree of the use of non-PW_MS MIS for summary reporting progress of groups of projects. Nineteen to twenty-nine percent state that they have some use of non-PW_MS MIS for this purpose.

With regard to (b) ‘the use of non-PW_MS computer-based Management Information Systems to record/process data on lists of groups of projects for the management of groups of projects.

Sixty-four percent of the population sample stated that this process is ‘not used’. Eleven percent stated ‘no’. Six percent stated ‘sometimes’. Four percent stated ‘mostly’, whilst fourteen percent responded ‘yes’. The mode response, other than ‘not used’, is ‘yes’ whilst the median is ‘mostly’, and the mean is close to ‘sometimes’.

Forty-nine percent of the ‘HQ and portfolio manager’ strata of the population sample stated that this process is ‘not used’. Eighteen percent stated ‘no’. Seven percent responded ‘sometimes’. Two percent stated ‘mostly’, whilst twenty-four percent stated ‘yes’. The mode response, other than ‘not used’, is ‘yes’, the median response is ‘mostly’. The mean is between ‘sometimes’ and ‘mostly’ but tends towards ‘mostly’.

Seventy percent of the ‘project manager’ strata of the population sample stated that this process is ‘not used’. Nine percent stated ‘no’. Six percent responded ‘sometimes’. Five percent stated ‘mostly’, whilst ten percent stated ‘yes’. The mode response, other than ‘not used’, is ‘yes’ and the median and mean are between ‘sometimes’ and ‘mostly’.

On balance, the response that is taken as statistically indicative of the user community as a whole, is that the use of non-PW_MS computer-based MIS to record/process of lists of groups of projects is ‘not used’ by the largest portion of the population sample/sub strata (forty-nine to seventy percent). Fifteen to twenty-six percent have a

high degree of the use of non-PW_MS MIS for reporting on lists of groups of projects. Twenty-one to thirty-three percent state that they have some use of non-PW_MS MIS for this purpose.

With regard to (c) ‘the use of non-PW_MS computer-based Management Information Systems to record/process exception reports of projects for the management of *groups of projects*.’

Sixty-eight percent of the population sample stated that this process is ‘not used’. Eleven percent stated ‘no’. Six percent stated ‘sometimes’. Four percent stated ‘mostly’, whilst eleven percent responded ‘yes’. The mode response, other than ‘not used’, is ‘yes’ whilst the median is ‘sometimes’, and the mean is between ‘sometimes’ and ‘mostly’.

Fifty-six percent of the ‘HQ and portfolio manager’ strata of the population sample stated that this process is ‘not used’. Sixteen percent stated ‘no’. Four percent responded ‘sometimes’. Four percent stated ‘mostly’, whilst twenty percent stated ‘yes’. The mode response, other than ‘not used’, is ‘yes’, the median response is ‘mostly’. The mean is between ‘sometimes’ and ‘mostly’ but tends towards ‘mostly’.

Seventy-two percent of the ‘project manager’ strata of the population sample stated that this process is ‘not used’. Nine percent stated ‘no’. Seven percent responded ‘sometimes’. Four percent stated ‘mostly’, whilst seven percent stated ‘yes’. The mode response, other than ‘not used’, is ‘no’, the median is ‘sometimes’, and the mean is between ‘sometimes’ and ‘mostly’ but tends to ‘sometimes’.

On balance, the response that is taken as statistically indicative of the user community as a whole, is that the use of non-PW_MS computer-based MIS to record/process exception reports of groups of projects is ‘not used’ by the largest portion of the population sample/sub strata (fifty-six to sixty-eight percent). Eleven to twenty-four percent have a high degree of the use of non-PW_MS MIS for exception reports on lists of groups of projects. Eighteen to twenty-eight percent state that they have some use of non-PW_MS MIS for this purpose.

With regard to (d) ‘the use of non-PW_MS computer-based Management Information Systems to record/process progress reports for the management of *groups of projects*.’

Sixty-three percent of the population sample stated that this process is ‘not used’. Ten percent stated ‘no’. Eight percent stated ‘sometimes’. Five percent stated ‘mostly’, whilst fourteen percent responded ‘yes’. The mode response, other than ‘not used’, is ‘yes’ whilst the median is ‘sometimes’, and the mean is between ‘sometimes’ and ‘mostly’ but tends to ‘mostly’.

Fifty-six percent of the ‘HQ and portfolio manager’ strata of the population sample stated that this process is ‘not used’. Eleven percent stated ‘no’. Eleven percent responded ‘sometimes’. Two percent stated ‘mostly’, whilst twenty percent stated ‘yes’. The mode response, other than ‘not used’, is ‘yes’, the median response is ‘mostly’. The mean is between ‘sometimes’ and ‘mostly’ but tends towards ‘mostly’.

Sixty-five percent of the ‘project manager’ strata of the population sample stated that this process is ‘not used’. Nine percent stated ‘no’. Seven percent responded

‘sometimes’. Six percent stated ‘mostly’, whilst eleven percent stated ‘yes’. The mode response, other than ‘not used’, is ‘yes’, the median is ‘mostly’, and the mean is between ‘sometimes’ and ‘mostly’ but tends to ‘mostly’.

On balance, the response that is taken as statistically indicative of the user community as a whole, is that the use of non-PW_MS computer-based MIS to record/process progress reports of groups of projects is ‘not used’ by the largest portion of the population sample/sub strata (fifty-six to sixty-five percent). Seventeen to twenty-two percent have a high degree of the use of non-PW_MS MIS for progress reports on groups of projects. Twenty-four to thirty-three percent state that they have some use of non-PW_MS MIS for this purpose.

Q.4.3.2 *What **information technology** do you use **for ‘Non-PW_MS’ Management Information Systems** that are used to record/process project data for management of **groups** of projects?*

Commentary - this is a further question from Q.4.3.1 that is to identify the type of computer software used as the basis for the other portfolio MIS. As before, the question is in four parts because the other systems may not have comprehensive portfolio management functionality. The respondent is asked to choose one of the options with regard to the type of software used in the other MIS. The options are: ‘database’, ‘spreadsheet’, ‘package software’, or ‘none’. In addition, the user is asked to name the portfolio MIS so that it can be further evaluated if necessary. The portfolio management functions listed in the questionnaire correspond with the items in Q.4.3.1, namely:

- (a) Summary reports of progress;*
- (b) Lists of groups of projects;*
- (c) Exception reports;*
- (d) Progress reports.*

With regard to (a) what IT is used for ‘the use of non-PW_MS computer-based methods to record/process summary reports of progress for groups of projects. Seventy-seven percent of the population sample stated ‘none’ [no] computer-based information technology is used. Four percent stated ‘package software’. Ten percent stated ‘spreadsheets’. Nine percent stated ‘database’. The mode and the median response are ‘none’, and the mean is between ‘none’ and ‘package software’ but tends towards ‘package software’.

Sixty-nine percent of the ‘HQ and portfolio manager’ sub-strata of the population sample stated ‘none’ [no] computer-based information technology is used. Four percent stated ‘package software’. Eleven percent stated ‘spreadsheets’. Sixteen percent stated ‘database’. The mode and the median response are ‘none’, and the mean is between ‘none’ and ‘package software’ but tends towards ‘package software’.

Eighty-one percent of the ‘project manager’ strata of the population sample stated ‘none’ [no] computer-based information technology is used. Four percent stated ‘package software’. Nine three percent stated ‘spreadsheets’. Six percent stated

‘database’. The mode and the median response are ‘none’, and the mean is between ‘none’ and ‘package software’ but tends towards ‘none’.

On balance, the response that is taken as statistically indicative of the user community as a whole, is that the non-PW_MS computer-based software used to record/process summary reports of progress for a group of projects is ‘none’ for sixty-nine to eighty-one percent of the population sample/sub strata. Four percent use ‘package software’. Nine to eleven percent state ‘spreadsheets’. Six to sixteen percent state ‘database’. The mode and the median response is ‘none’, the mean is between ‘none’ and ‘package software’. Seventeen respondents named the software that they used for this purpose- the low level of response means that this data is not representative of the population. This information is provided in Table 8-10, the items shown in italic font are in-house systems developed by a team within the works department or by IT professionals on their behalf. In general, these in-house systems do not satisfy commercial standards for the development and documentation of software.

Software	Frequency
<i>PCIS</i>	6
Foxpro	4
Excel	2
WORD	1
MSProject	1
Lotus	1
DBase	1

Table 8-10 Non-PW_MS software used to record/process summary reports of groups of projects.

With regard to (b) what IT is used for ‘the use of non-PW_MS computer-based methods to record/process on lists of groups of projects.

Seventy-three percent of the population sample stated ‘none’ [no] computer-based information technology is used. Four percent stated ‘package software’. Thirteen percent stated ‘spreadsheets’. Ten percent stated ‘database’. The mode and the median response are ‘none’, and the mean is between ‘none’ and ‘package software’ but tends towards ‘package software’.

Sixty percent of the ‘HQ and portfolio manager’ sub-strata of the population sample stated ‘none’ [no] computer-based information technology is used. Two percent stated ‘package software’. Eighteen percent stated ‘spreadsheets’. Twenty percent stated ‘database’. The mode and the median response are ‘none’, and the mean is between ‘none’ and ‘package software’ but tends towards ‘package software’.

Seventy-eight percent of the ‘project manager’ strata of the population sample stated ‘none’ [no] computer-based information technology is used. Five percent stated ‘package software’. Eleven percent stated ‘spreadsheets’. Six percent stated ‘database’. The mode and the median response are ‘none’, and the mean is between ‘none’ and ‘package software’ but tends towards ‘none’.

On balance, the response that is taken as statistically indicative of the user community as a whole, is that the non-PW_MS computer-based software used to record/process data on lists of projects for the management of a group of projects is ‘none’ for sixty

to seventy-eight percent of the population sample/sub strata. Two to five percent use ‘package software’. Eleven to eighteen percent state ‘spreadsheets’. Six to twenty percent state ‘database’. The mode and the median response is ‘none’, the mean is between ‘none’ and ‘package software’. Seventeen respondents named the software that they used for this purpose- the low level of response means that this data is not representative of the population. This information is provided in Table 8-11, the items shown in italic font are in-house systems developed by a team within the works department or by IT professionals on their behalf. In general, these in-house systems do not satisfy commercial standards for the development and documentation of software.

Software	Frequency
Excel	6
Foxpro	3
<i>PCIS</i>	3
Word	2
Excel/Word	1
<i>Inform</i>	1
MSProject	1

Table 8-11 Non-PW_MS software used to record/process lists of project data for groups of projects.

With regard to (c) what IT is used for ‘the use of non-PW_MS computer-based methods to record/process exception reports on groups of projects.

Eighty-one percent of the population sample stated ‘none’ [no] computer-based information technology is used. Four percent stated ‘package software’. Eight percent stated ‘spreadsheets’. Six percent stated ‘database’. The mode and the median response are ‘none’, and the mean is between ‘none’ and ‘package software’ but tends towards ‘none’.

Sixty-nine percent of the ‘HQ and portfolio manager’ sub-strata of the population sample stated ‘none’ [no] computer-based information technology is used. Four percent stated ‘package software’. Sixteen percent stated ‘spreadsheets’. Eleven percent stated ‘database’. The mode and the median response are ‘none’, and the mean is between ‘none’ and ‘package software’ but tends towards ‘package software’.

Eighty-six percent of the ‘project manager’ strata of the population sample stated ‘none’ [no] computer-based information technology is used. Five percent stated ‘package software’. Five percent stated ‘spreadsheets’. Five percent stated ‘database’. The mode and the median response are ‘none’, and the mean is between ‘none’ and ‘package software’ but tends towards ‘none’.

On balance, the response that is taken as statistically indicative of the user community as a whole, is that the non-PW_MS computer-based software used to record/process exception reports for groups of projects is ‘none’ for sixty-nine to eighty-six percent

of the population sample/sub strata. Four to five percent use ‘package software’. Five to sixteen percent state ‘spreadsheets’. Five to eleven percent state ‘database’. The mode and the median response is ‘none’, the mean is between ‘none’ and ‘package software’. Seventeen respondents named the software that they used for this purpose- the low level of response means that this data is not representative of the population. This information is provided in Table 8-12, the items shown in italic font are in-house systems developed by a team within the works department or by IT professionals on their behalf. In general, these in-house systems do not satisfy commercial standards for the development and documentation of software.

Software	Frequency
<i>PCIS</i>	4
Word	3
Foxpro	3
Excel	2
Lotus/Excel	1
Excel/Word	1
<i>Inform</i>	1

Table 8-12 Non-PW_MS software used to record/process exception reports of groups of projects

With regard to (d) what IT is used for ‘the use of non-PW_MS computer-based methods to record/process progress reports on groups of projects.

Seventy-two percent of the population sample stated ‘none’ [no] computer-based information technology is used. Nine percent stated ‘package software’. Nine percent stated ‘spreadsheets’. Ten percent stated ‘database’. The mode and the median response are ‘none’, and the mean is between ‘none’ and ‘package software’ but tends towards ‘package software’.

Sixty-four percent of the ‘HQ and portfolio manager’ sub-strata of the population sample stated ‘none’ [no] computer-based information technology is used. Seven percent stated ‘package software’. Thirteen percent stated ‘spreadsheets’. Sixteen percent stated ‘database’. The mode and the median response are ‘none’, and the mean is between ‘none’ and ‘package software’ but tends towards ‘package software’.

Seventy-five percent of the ‘project manager’ strata of the population sample stated ‘none’ [no] computer-based information technology is used. Ten percent stated ‘package software’. Seven percent stated ‘spreadsheets’. Eight percent stated ‘database’. The mode and the median response are ‘none’, and the mean is between ‘none’ and ‘package software’ but tends towards ‘none’.

On balance, the response that is taken as statistically indicative of the user community as a whole, is that the non-PW_MS computer-based software used to record/process

progress reports for groups of projects is ‘none’ for sixty-four to seventy-five percent of the population sample/sub strata. Seven to ten percent use ‘package software’. Seven to thirteen percent state ‘spreadsheets’. Eight to sixteen percent state ‘database’. The mode and the median response is ‘none’, the mean is between ‘none’ and ‘package software’. Twenty-four respondents named the software that they used for this purpose- the low level of response means that this data is not representative of the population. This information is provided in Table 8-13, the items shown in italic font are in-house systems developed by a team within the works department or by IT professionals on their behalf. In general, these in-house systems do not satisfy commercial standards for the development and documentation of software.

Software	Frequency
Word	8
<i>PCIS</i>	6
Excel	3
Foxpro	3
Excel/word	1
<i>Inform</i>	1
DBase	1
<i>CMIS</i>	1

Table 8-13 Non-PW_MS software used to record/process progress reports on groups of projects.

Questionnaire Part 4 Management of *groups* of projects – Manual Methods

*Q.4.4.1 Do you use **manual methods** to record/process project data for management of **groups** of projects?*

Commentary - this question is the same as Q 4.3.1 except it is to measure the extent that the User Population uses manual methods for portfolio management purposes. The question is in four parts because the manual methods may not have comprehensive portfolio management functionality. The respondent is asked to choose one of the options with regard to the main functions of the PW_MS. The options are: ‘yes’, ‘mostly’, ‘sometimes’, or ‘not used by me’. The portfolio management functions the same as listed in Q.4.3.1 of the questionnaire, namely:

- (a) Summary reports of progress;*
- (b) Lists of groups of projects;*
- (c) Exception reports;*
- (d) Progress reports.*

With regard to (a) ‘the use of manual methods to record/process data on summary reports of progress for the management of *groups* of projects.

Sixty-five percent of the population sample stated that this process is 'not used'. Ten percent stated 'no'. Thirteen percent stated 'sometimes'. Six percent stated 'mostly', whilst seven percent responded 'yes'. The mode and the median response, other than 'not used', are 'sometimes' whilst the mean tends to 'sometimes'.

Fifty-three percent of the 'HQ and portfolio manager' strata of the population sample stated that this process is 'not used'. Twenty-four percent stated 'no'. Thirteen percent responded 'sometimes'. Two percent stated 'mostly', whilst seven percent stated 'yes'. The mode and the median response, other than 'not used', are 'no'. The mean is between 'no' and 'sometimes' but tends towards 'sometimes'.

Sixty-nine percent of the 'project manager' strata of the population sample stated that this process is 'not used'. Four percent stated 'no'. Thirteen percent responded 'sometimes'. Seven percent stated 'mostly', whilst seven percent stated 'yes'. The mode and the median response, other than 'not used', are 'sometimes', whilst the mean response is close to 'sometimes'.

On balance, the response that is taken as statistically indicative of the user community as a whole, is that the use of manual methods to record/process summary reports of progress of groups of projects is 'not used' by the largest portion of the population sample/sub strata (fifty-three to sixty-nine percent). Nine to fourteen percent have a high degree of the use of manual methods for summary reporting progress of groups of projects. Twenty-two to twenty-seven percent state that they have some use of manual methods for this purpose.

With regard to (b) 'the use of manual methods to record/process data on lists of groups of projects for the management of groups of projects.'

Sixty-five percent of the population sample stated that this process is 'not used'. Ten percent stated 'no'. Fifteen percent stated 'sometimes'. Four percent stated 'mostly', whilst five percent responded 'yes'. The mode and the median response, other than 'not used', are 'sometimes', and the mean is close to 'sometimes'.

Fifty-three percent of the 'HQ and portfolio manager' strata of the population sample stated that this process are 'not used'. Twenty-four percent stated 'no'. Thirteen percent responded 'sometimes'. Two percent stated 'mostly', whilst seven percent stated 'yes'. The mode and the median response, other than 'not used', are 'no'. The mean is between 'no' and 'sometimes' but tends towards 'sometimes'.

Seventy percent of the 'project manager' strata of the population sample stated that this process is 'not used'. Four percent stated 'no'. Sixteen percent responded 'sometimes'. Five percent stated 'mostly', whilst five percent stated 'yes'. The mode and the median response, other than 'not used', are 'sometimes', and the mean tends to 'sometimes'.

On balance, the response that is taken as statistically indicative of the user community as a whole, is that the use of manual methods to record/process of lists of groups of projects is 'not used' by the largest portion of the population sample/sub strata (Fifty-three to seventy percent). Nine to ten percent have a high degree of the use of manual methods for reporting on lists of groups of projects. Twenty-two to twenty-six percent state that they have some use of manual methods for this purpose.

With regard to (c) ‘the use of manual methods to record/process exception reports of projects for the management of *groups* of projects.

Sixty-nine percent of the population sample stated that this process is ‘not used’. Twelve percent stated ‘no’. Eleven percent stated ‘sometimes’. Three percent stated ‘mostly’, whilst three percent responded ‘yes’. The mode response, other than ‘not used’, is ‘no’ whilst the median is ‘sometimes’, and the mean tends to ‘sometimes’.

Fifty-six percent of the ‘HQ and portfolio manager’ strata of the population sample stated that this process is ‘not used’. Twenty-seven percent stated ‘no’. Thirteen percent responded ‘sometimes’. Two percent stated ‘mostly’, whilst two percent stated ‘yes’. The mode response, other than ‘not used’, is ‘no’, the median response is ‘no’. The mean is between ‘no’ and ‘sometimes’ but tends towards ‘sometimes’.

Seventy-five percent of the ‘project manager’ strata of the population sample stated that this process is ‘not used’. Six percent stated ‘no’. Ten percent responded ‘sometimes’. Four percent stated ‘mostly’, whilst four percent stated ‘yes’. The mode and the median response, other than ‘not used’, are ‘sometimes’, and the mean is between ‘sometimes’ and ‘mostly’ but tends to ‘sometimes’.

On balance, the response that is taken as statistically indicative of the user community as a whole, is that the use of manual methods to record/process exception reports of groups of projects is ‘not used’ by the largest portion of the population sample/sub strata (fifty-six to seventy-five percent). Four to eight percent have a high degree of the use of manual methods for producing exception reports on lists of groups of projects. Seventeen to eighteen percent state that they have some use of manual methods for this purpose.

With regard to (d) ‘the use of manual methods to record/process progress reports for the management of *groups* of projects.

Sixty-five percent of the population sample stated that this process is ‘not used’. Eight percent stated ‘no’. Thirteen percent stated ‘sometimes’. Eight percent stated ‘mostly’, whilst six percent responded ‘yes’. The mode and the median response, other than ‘not used’, are ‘sometimes’, and the mean is between ‘sometimes’ and ‘mostly’ but tends to ‘sometimes’.

Fifty-eight percent of the ‘HQ and portfolio manager’ strata of the population sample stated that this process is ‘not used’. Twenty percent stated ‘no’. Thirteen percent responded ‘sometimes’. Two percent stated ‘mostly’, whilst seven percent stated ‘yes’. The mode response, other than ‘not used’, is ‘sometimes’, the median response is ‘no’. The mean is between ‘no’ and ‘sometimes’ but tends towards ‘sometimes’.

Sixty-seven percent of the ‘project manager’ strata of the population sample stated that this process is ‘not used’. Four percent stated ‘no’. Thirteen percent responded ‘sometimes’. Ten percent stated ‘mostly’, whilst six percent stated ‘yes’. The mode response, other than ‘not used’, is ‘sometimes’, the median is midway between ‘sometimes’ and ‘mostly’, whilst the mean is between ‘sometimes’ and ‘mostly’ but tends to ‘mostly’.

On balance, the response that is taken as statistically indicative of the user community as a whole, is that the use of manual methods to record/process progress reports of groups of projects is 'not used' by the largest portion of the population sample/sub strata (fifty-eight to sixty-seven percent). Nine to sixteen percent have a high degree of the use of manual methods for progress reports on groups of projects. Twenty-two to twenty-nine percent state that they have some use of manual methods for this purpose.

*Q.4.4.2 What **manual records** do you most use to record/process project data for project management purposes?*

Commentary - this is a further question from Q.4.4.1 that is to identify the type of physical records that are used as the basis for the manual systems. As before, the question is in four parts because the manual systems may not have comprehensive portfolio management functionality. The respondent is asked to choose one of the options with regard to the type of software used in the other MIS. The options are: 'form', 'diary', 'file', 'personal file' or 'none'. The project management functions listed in the questionnaire correspond with the items in Q.4.3.1 and Q.4.4.1, namely:

- (a) Summary reports of progress;*
- (b) Lists of groups of projects;*
- (c) Exception reports;*
- (d) Progress reports.*

With regard to (a) 'the type of manual record systems used to record/process summary reports of progress for the management of groups of projects.

Seventy-three percent of the population sample stated 'none'. Four percent stated 'personal file'. Twenty percent stated 'file'. One percent stated 'diary', whilst three percent responded 'form'. The mode and the median response are 'none', whilst the mean is between 'personal file' and 'file'.

Seventy-three percent of the 'HQ and portfolio manager' strata of the population sample stated 'none'. Two percent stated 'personal file'. Sixteen percent stated 'file'. Two percent stated 'diary', whilst seven percent responded 'form'. The mode and the median response are 'none', whilst the mean tends to 'personal file'.

Seventy-two percent of the population sample stated 'none'. Five percent stated 'personal file'. Twenty-two percent stated 'file'. Zero percent stated 'diary', whilst one percent responded 'form'. The mode and the median response are 'none', whilst the mean is midway between 'personal file' and 'file'.

On balance, the response that is taken as statistically indicative of the user community as a whole, is that the use of manual record systems to record/process summary reports of progress for the management of groups of projects is 'not used' by the largest portion of the population sample/sub strata (seventy-two to seventy-three percent). Otherwise, document files are clearly the dominant type of manual records used for these purposes.

With regard to (b) 'the type of manual record systems used to record/process data on lists of groups of projects for the management of groups of projects.

Seventy-four percent of the population sample stated that manual records are 'none'. Four percent stated 'personal file'. Eighteen percent stated 'file'. One percent stated 'diary', whilst four percent responded 'form'. The mode and the median response are 'none', and the mean is between 'personal file' and 'file'.

Seventy-three percent of the 'HQ and portfolio manager' strata of the population sample stated that manual records are 'none'. Two percent stated 'personal file'. Sixteen percent stated 'file'. Two percent stated 'diary', whilst seven percent responded 'form'. The mode and the median response are 'none', and the mean is between 'none' and 'personal file' but tends to 'personal file'.

Seventy-four percent of the 'project manager' strata of the population sample stated that manual records are 'none'. Five percent stated 'personal file'. Nineteen percent stated 'file'. Zero percent stated 'diary', whilst three percent responded 'form'. The mode response and the median response are 'none', and the mean is between 'none' and 'personal file'.

On balance, the response that is taken as statistically indicative of the user community as a whole, is that the type of manual record systems used to record/process data on project contacts for project management purposes are 'files'. However, the dominant response for the 'HQ and portfolio manager' strata of the population sample is 'none'.

With regard to (c) 'the type of manual record systems used to record/process exception reports for the management of *groups* of projects.'

Seventy-eight percent of the population sample stated that 'none' manual records are used. Three percent stated 'personal files'. Sixteen percent stated 'files'. One percent stated 'diary', whilst two percent responded 'form'. The mode and the median response, are 'none', and the mean is between 'none' and 'personal files'.

Seventy-six percent of the 'HQ and portfolio manager' strata of the population sample stated that 'none' manual records are used. Two percent stated 'personal files'. Sixteen percent stated 'files'. Two percent stated 'diary', whilst four percent responded 'form'. The mode and the median response are 'none', and the mean is between 'none' and 'personal files' but tends to 'personal files'.

Seventy-nine percent of the 'project manager' strata of the population sample stated that 'none' manual records are used. Four percent stated 'personal files'. Sixteen percent stated 'files'. Zero percent stated 'diary', whilst one percent responded 'form'. The mode and the median response, are 'none', and the mean is between 'none' and 'personal files'.

On balance, the response that is taken as statistically indicative of the user community as a whole, is that the type of manual record systems used to record/process exception reports for the management of groups of projects are 'none'. Otherwise the use of 'files' is the dominant manual method.

With regard to (d) 'the type of manual record systems used to record/process progress reports for the management of *groups* of projects.'

Seventy-one percent of the population sample stated that 'none' manual records are used. Three percent stated 'personal files'. Twenty percent stated 'files'. One percent stated 'diary', whilst five percent responded 'form'. The mode and the median response, are 'none', and the mean is between 'none' and 'personal files'.

Seventy-one percent of the 'HQ and portfolio manager' strata of the population sample stated that 'none' manual records are used. Two percent stated 'personal files'. Eighteen percent stated 'files'. Two percent stated 'diary', whilst seven percent responded 'form'. The mode and the median response are 'none', and the mean is between 'none' and 'personal files' but tends to 'personal files'.

Seventy-one percent of the 'project manager' strata of the population sample stated that 'none' manual records are used. Three percent stated 'personal files'. Twenty-one percent stated 'files'. Zero percent stated 'diary', whilst five percent responded 'form'. The mode and the median response, are 'none', and the mean is between 'none' and 'personal files'.

On balance, the response that is taken as statistically indicative of the user community as a whole, is that the type of manual record systems used to record/process progress reports for the management of groups of projects are 'none'. Otherwise the use of 'files' is the dominant manual method.

8.8 References

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- ¹ Works Branch. 1995. Public Works Project Control Procedures. Works Branch: Government of Hong Kong.

Chapter Nine - Appendices

9 Chapter Nine - Stochastic modeling of an alternative approach to PMIS

9.1 Layout of Appendices

For ease of reference, the Appendices for this Chapter of the Thesis are laid out in the order referenced within the Thesis, Chapter Nine.

9.2 Not Used

9.3 Statistical analysis of the empirical data

1989-90

Refer to the main Thesis Chapter Nine Section 9.3.

1990-91

This data is taken from the ‘Annual Report of the Director of Accounting Services and the Accounts for the year ended 31 March 1991’¹. Reference is also made to the forecast of this spending programme taken from the ‘Estimates for the year ending 31 March 1991: Volume III – Fund Accounts, Memorandum Notes, and Payments and receipts’².

The portfolio of Category A projects to be analyzed for this element of the research includes 1,286 mutually exclusive projects. The ‘Original Estimate’ of expenditure on these projects was HK\$ 14,043 million¹. The ‘Amended Estimate’ expenditure on the same items was HK\$ 18,049 million but the audited expenditure was HK\$ 11,930 million¹. The outcome was an under-expenditure of thirty-three percent of the funds approved for expenditure i.e., the ‘Amended Estimate’ less ‘Actual’ resulted in an ‘outturn variance’ of HK\$ 6,119 million.

This portfolio of projects is the entire PWP for 1990-1991 except for the exclusion of items listed in the Head of Expenditure ‘Land Acquisition (Head 701 PWP Items)’ and ‘Capital Subventions and Major Systems and Equipment (Head 708 PWP Items)’; and the ‘omnibus’ items defined in the Thesis, Chapter Two Section 2.9.1. Table 9-1 states the statistical attributes of the data set used in this analysis.

Expenditure	No Projects	Statistics (Units are HK \$ 000's)					
		Low	High	Mode	Mean	Median	S.D.
Original est		0	0	0	10,920	1,460	30,379
Amended est	1286	366,429	484,415	1	14,035	2,615	36,809
Actual		-2,558	479,347	0	9,277	345	31,303
Outturn		0	182,803	1	4,758	1,122	13,224

Table 9-1 Statistical attributes of the portfolio of projects taken from the 1990-1991 Public Works Programme of projects.

In 1990/91 The HKGSAR introduced a new Head of Expenditure '704 Drainage'. The composition of the portfolio in terms of numbers of projects and the value of the 'Amended Estimate' by 'Heads of Expenditure' is displayed in Table 9-2. Heads of Expenditure 703 'Buildings' and 707 'New Towns and Public Housing' predominate in size and total value compared to the twelve percent or less of the portfolio contributed by the other Heads of Expenditure.

Code	Head of Expenditure	By No. Projects		By 'Amended Estimate' Value	
		Nos	%	Value <i>HK\$000's</i>	%
702	Port & Airport Development	22	2%	745,515	4%
703	Buildings	315	24%	5,200,910	29%
704	Drainage	49	4%	1,078,620	6%
705	Civil Engineering	70	5%	1,006,553	6%
706	Highways	130	10%	2,248,499	12%
707	New Towns & Public Housing (exc HK Housing Authority)	605	47%	6,842,810	38%
709	Waterworks	95	7%	926,687	5%

Table 9-2 Composition of the 1990-91 data set in terms of 'Heads of Expenditure'.

The 1990-1991 PWP portfolio of one thousand two hundred and eighty six projects to be analysed for this research contains fifty-one number out of seventy-eight catagories of works. This is taken to indicate a good degree of diversity (sixty-five per cent) of types of infrastructure projects contained within the portfolio. The categories of public works that each comprise more than one percent of the portfolio are listed in Table 9-3. These projects comprise eighty-six percent by number and eighty-eight percent by value of the data set to be analyzed.

Category of public works	ID	By Project No.		By Value (HK\$ 000's)	
		No	%	Amended Est Value	%
Civil engineering – land development	CL	189	15%	\$3,413,933	19%
Transport – roads	TH	151	12%	\$ 3,599,311	20%
Water supply - fresh water supplies	WF	80	6%	\$ 791,209	4%
Education – primary	EP	66	5%	\$ 184,314	1%
Environmental engineering - sewerage and sewage treatment	DS	65	5%	\$ 1,586,890	9%
Education – secondary	ES	56	4%	\$ 481,589	3%
Law and order – police	LP	52	4%	\$ 438,571	2%
Recreation, culture and amenities - open spaces	RO	48	4%	\$ 178,156	1%
Recreation, culture and amenities - sports facilities	RS	46	4%	\$ 167,983	1%
Social welfare and community building - community centres and halls	SC	45	3%	\$ 173,254	1%
Air and sea communications – airport	AA	38	3%	\$ 765,452	4%
Support - internal security	GF	35	3%	\$ 80,782	0%
Environmental engineering - refuse disposal	DR	34	3%	\$ 337,051	2%
Public safety - fire services	BF	33	3%	\$ 154,431	1%
Support – offices	GO	31	2%	\$ 1,153,860	6%
Health – hospitals	MH	29	2%	\$ 1,346,091	7%
Transport – footbridges and pedestrian tunnels	TB	29	2%	\$ 113,190	1%
Support – quarters	GQ	23	2%	\$ 716,415	4%
Water supply – combined fresh/salt water supply projects	WC	21	2%	\$ 173,337	1%
Support – Government buildings	GG	20	2%	\$ 152,199	1%
Sub-totals			86%	\$16,008,018	88%

Table 9-3 Categories of work that are greater than one percent of the 1990-91 PWP data set.

The dominant categories of work in the data set in terms of planned expenditure in the 1990-91 financial year:

- TH ‘Transport – roads’, 20% by value but 12% by number of projects;
- CL ‘Civil engineering – land development’, 19% by value but 15% by projects;
- DS ‘Environmental engineering – Sewerage and sewerage treatment’, 9% by value but 5% by number of projects.

Table 9-4 shows the statistical attributes of these sub-portfolios of projects. These indicate a reasonable amount of diversity in the dominant sub-portfolios of projects with the mode and the median values indicating that the majority of the project values are at the low-value end of the range of values.

Cat of Work	No Projects	Statistical attributes in terms of ‘Amended Estimate’ (HK\$ 000's)					
		Low	High	Mode	Mean	Median	SD
TH	151	1	366,429	1	23,836	3,700	52,755
CL	189	11	205,927	111	18,036	6,771	28,792
DS	65	17	389,800	1110	24,643	4,735	60,428

Table 9-4 Statistical attributes of the dominant sub-portfolios in the 1990-91 dataset.

Planned expenditure variable

The planned expenditure variable is 'Amended Estimate' in the data source. The statistical attributes of this variable within the data set for this analysis are stated in Table 9-1. These indicate that the values of 'Amended Estimate' expenditure within the data-set are predominantly at the low-value end of the range of values. Whereas, 'Table 9-5 Percentiles for 'Amended Estimate' variable in the 1990-91 data set' shows the distribution of the values of the variable 'Amended Estimate' of each project in the 1990-91 data set. In this case ninety-five percent of the number of projects contains forty-nine percent of the total value of the planned expenditure on the projects.

Percentile (No Projects)	Thresh-hold Value of 'Amended Estimate of a project (HK \$ 000's)	Cum Value (HK \$ 000's)	Cum Value (%)
5%	11	187	0.001%
10%	88.5	3097	0.02%
15%	166.75	10917	0.06%
20%	258	24933	0.14%
25%	437.25	46100	0.3%
30%	633	81539	0.5%
35%	999	132907	0.7%
40%	1371	206876	1%
45%	1951.5	313962	2%
50%	2615	457480	3%
55%	3579	654398	4%
60%	4995	937290	5%
65%	6785.75	1315364	7%
70%	8600.5	1812831	10%
75%	10486.25	2429508	13%
80%	14235	3223490	18%
85%	21247.75	4330577	24%
90%	33187	6028058	33%
95%	59339.5	8834900	49%

Table 9-5 Percentiles for 'Amended Estimate' variable in the 1990-91 data set

'Outturn variance' variable

The outturn variance is the difference between the 'Amended Estimate' and 'Actual' expenditure. The statistical attributes of this variable within the data set for this analysis are stated in Table 9-1. These indicate that the values of 'Outturn' expenditure within the data-set are predominantly at the low-value end of the range of values. Whereas, 'Table 9-6 Percentiles for 'Outturn variance' variable in the 1990-91 dataset' shows the distribution of the values of the variable 'Outturn variance' of the projects in the 1990-91 data set. Ninety-five percent of the number of projects contains fifty percent of the total value of the variance between planned and actual expenditure on the projects.

Percentile (No Projects)	Thresh-hold Value of 'Outturn variance' for a project (HK \$ 000's)	Cum Value (HK \$ 000's)	Cum Value (%)
5%	1	49	0.001%
10%	28	741	0.01%
15%	79	4,022	0.07%
20%	122	10,519	0.2%
25%	194	20,625	0.3%
30%	277	35,852	0.6%
35%	418	58,058	0.9%
40%	600	92,066	1.5%
45%	869	138,438	2.3%
50%	1,122	204,348	3%
55%	1,440	285,881	5%
60%	1,873	393,768	6%
65%	2,278	527,242	8%
70%	3,214	701,917	12%
75%	4,212	936,552	15%
80%	5,468	1,250,248	20%
85%	7,599	1,665,646	27%
90%	10,570	2,226,714	36%
95%	17,823	3,083,315	50%

Table 9-6 Percentiles for 'Outturn variance' variable in the 1990-91 dataset.

Probability curve fitting

For the purpose of this analysis, the probability curve of the values of the 'ratio of outturn variance' for a project is required within the range of zero to 0.2. The two-step curve-fitting approach is described in the Thesis at Section 2.9.2. In the first step, the curve-fitting range corresponds to values of percent 'Outturn Variance' from zero to two hundred percent. There ten instances out of 1286 data pairs where this threshold is exceeded. These are unrepresentative outliers and are not included in the frequency distribution shown in Figure 9-1. The statistical attributes of the data sets for this frequency distribution are listed in Table 9-7.

Using the distribution fitting methods within the Crystal Ball[®] software, ten standard probability distributions are fitted to the data array of 'Outturn variance/Amended Estimate' with the statistical attributes stated in Table 9-7. The distribution fit for the ten probability distributions tested are shown in Table 9-8.

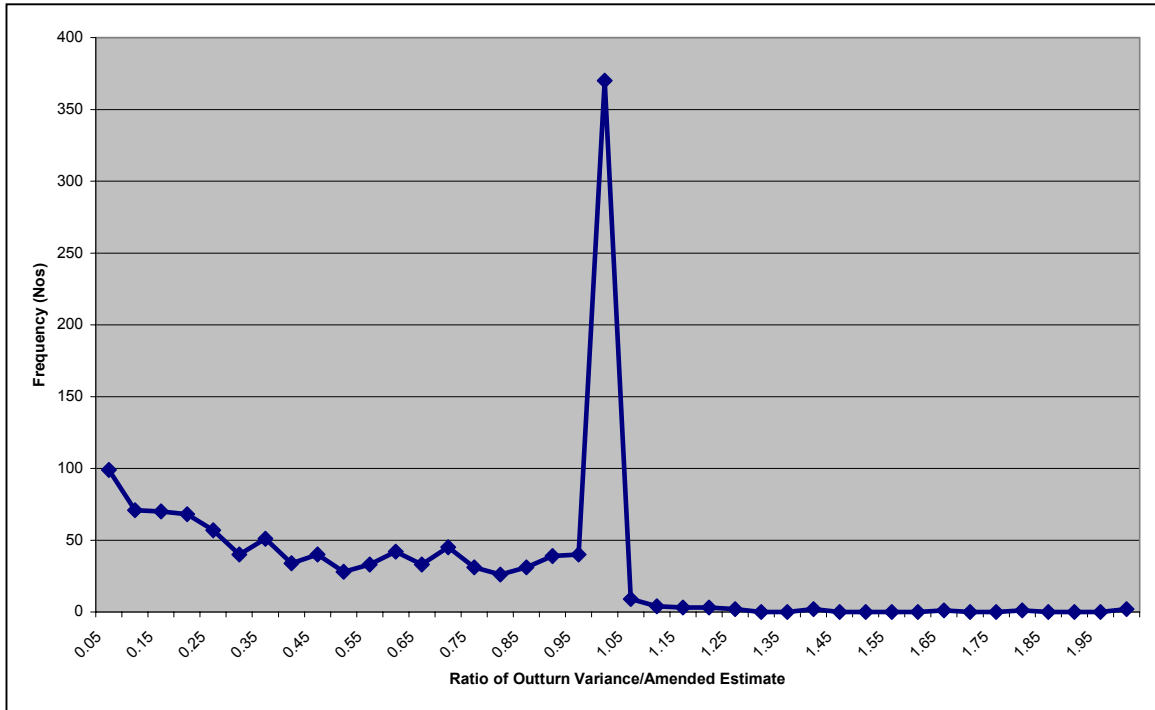


Figure 9-1 Frequency distribution of the ratio of 'Outturn Variance/Amended Estimate' for 1990-91 data set.

Attribute	Value
No data pairs	1275
Low Value	0
High Value	2
Mode Value	1
Mean Value	0.5844
Median Value	0.6054
Standard Deviation Value	0.3773

Table 9-7 Statistical attributes of frequency distribution of 'Outturn Variance' ratio

Distribution	Chi-square	Kolmogorov-Smirnov	Anderson-Darling
Triangular	2,446.84 ($\theta = 0.000$)	0.2413	57.4038
Weibull	3,011.64 ($\theta = 0.000$)	0.1596	78.9371
Normal	3,219.37 ($\theta = 0.000$)	0.1463	53.7176
Beta	3,324.81 ($\theta = 0.000$)	0.1408	64.4391
Logistic	3,360.23 ($\theta = 0.000$)	0.1354	49.4192
Extreme Value	3,438.68 ($\theta = 0.000$)	0.1465	52.3160
Exponential	3,522.47 ($\theta = 0.000$)	0.1599	69.1125
Gamma	3,682.79 ($\theta = 0.000$)	0.1918	131.1133
Lognormal	3,895.11 ($\theta = 0.000$)	0.1932	80.3072
Uniform	3,999.11 ($\theta = 0.000$)	0.4788	354.0858

Table 9-8 Distribution fit for probability curves against 'Outturn Variance/Amended Estimate' in 1990-91 data set

A good fit is not achieved with any of these ten probability distributions. The step-two curve fitting, within the x-axis range of zero to 0.2 therefore applies as described

in Section 2.9.2 of the methodology. The analysis required for the purpose of this research will involve Monte Carlo analysis using a probability distribution constrained within x-axis ranges of zero to 0.2. If we constrain distribution fitting to the data pairs within the range of zero to 0.2 then the statistical attributes of the data pairs are as shown in Table 9-9 and the probability histogram for this range is shown in Figure 9-2.

Attribute	Value
No data pairs	308
Low Value	0
High Value	0.2
Mode Value	0.0
Mean Value	0.0906
Median Value	0.0922
Standard Deviation Value	0.0614

Table 9-9 Statistical attributes of frequency distribution of 'Outturn Variance' ratio for x-axis values of 0 to 0.2.

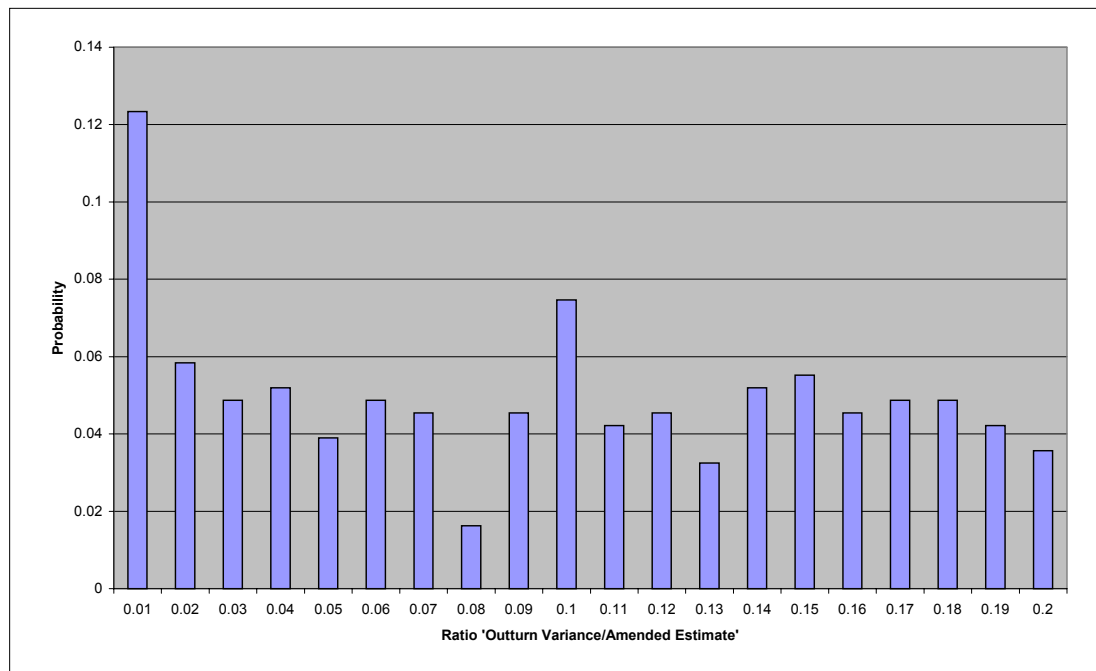


Figure 9-2 Probability histogram for the ratio of Outturn Variance/Amended Estimate within the ratio range of 0-0.2

The distribution fit for the ten probability distributions tested are shown in Table 9-10.

Distribution	Chi-square	Kolmogorov-Smirnov	Anderson-Darling
Triangular	140.967 ($\theta = 0.000$)	0.1975	32.8525
Weibull	145.532 ($\theta = 0.000$)	0.1051	14.2845
Normal	122.338 ($\theta = 0.000$)	0.0896	4.9729
Beta	30.792 ($\theta = 0.0094$)	0.0682	16.7794
Logistic	117.649 ($\theta = 0.000$)	0.0856	4.9555
Extreme Value	90.506 ($\theta = 0.000$)	0.0886	6.1051
Exponential	164.162 ($\theta = 0.000$)	0.1561	27.4707
Gamma	529.851 ($\theta = 0.000$)	0.3696	88.1354
Lognormal	256.325 ($\theta = 0.000$)	0.1568	35.1879
Uniform	43.377 ($\theta = 0.0002$)	0.0920	9.2809

Table 9-10 Distribution fit for probability curves against 'Outturn Variance/Amended Estimate' in the range $x = 0$ to 0.2 in the 1990-91 data set

The fit to the distribution curves is not good but the Beta distribution is the closest fit in terms of the Chi-square test and the Kolmogorov-Smirnov test. The fit to this distribution is shown in Figure 9-3.

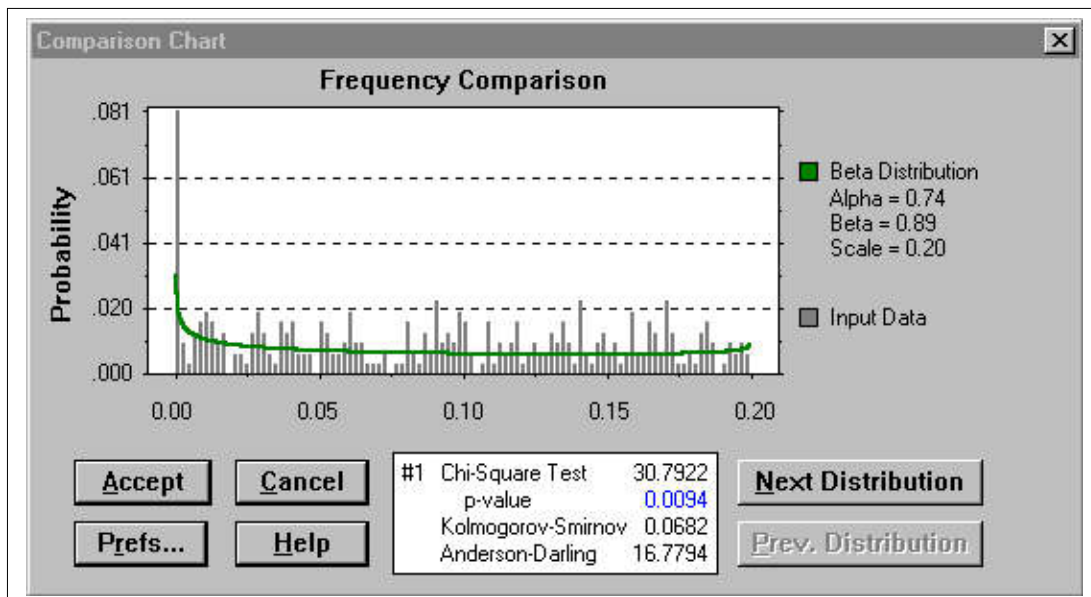


Figure 9-3 Showing the fit of to a Beta distribution for x -range of 0 to 0.2 , 1990-91 data set.

This distribution is used in the stochastic analysis described in Section 9.4.

1991-92

This data is taken from the 'Annual Report of the Director of Accounting Services and the Accounts for the year ended 31 March 1992'³. Reference is also made to the forecast of this spending programme taken from the 'Estimates for the year ending 31 March 1992: Volume III – Fund Accounts, Memorandum Notes, and Payments and receipts'⁴.

The portfolio of Category A projects to be analyzed for this element of the research includes 1,224 mutually exclusive projects. The 'Original Estimate' of expenditure on these projects was HK\$ 17,043.026 million³. The 'Amended Estimate' expenditure on the same items was HK\$ 19,784.45 million but the audited expenditure was HK\$ 10,743.87 million³. The outcome was an under-expenditure of forty-six percent of the funds approved for expenditure i.e., the 'Amended Estimate' less 'Actual' resulted in an 'outturn variance' of HK\$ 9,040.58 million.

This portfolio of projects is the entire PWP for 1991-1992 except for the exclusion of items listed in the Head of Expenditure 'Land Acquisition (Head 701 PWP Items)' and 'Capital Subventions and Major Systems and Equipment (Head 708 PWP Items)'; and the 'omnibus' items defined in Section 2.9.1. Table 9-11 shows the statistical attributes of the data set used in this analysis.

Expenditure	No Projects	Statistics (<i>Units are HK \$ 000's</i>)					
		Low	High	Mode	Mean	Median	S.D.
Original est	1224	0	955,980	0	14,360	1,676	47,713
Amended est		0	955,980	113	16,164	2,961	49,326
Actual		-7,928	451,634	0	8,778	417	31,288
Outturn		0	645,201	11	7,386	1,319	28,606

Table 9-11 Statistical attributes of the portfolio of projects taken from the 1991-1992 Public Works Programme of projects.

The composition of the portfolio in terms of numbers of projects and the value of the 'Amended Estimate' by 'Heads of Expenditure' is displayed in Table 9-12. Heads of Expenditure 703 'Buildings' and 707 'New Towns and Public Housing' predominate in size and total value compared to the sixteen percent or less of the portfolio contributed by the other Heads of Expenditure.

Code	Head of Expenditure	By No. Projects		By 'Amended Estimate' Value	
		Nos	%	Value <i>HK\$000's</i>	%
702	Port & Airport Development	36	3%	3,201,624	16%
703	Buildings	291	24%	4,330,992	22%
704	Drainage	57	5%	1,417,609	7%
705	Civil Engineering	76	6%	1,583,973	8%
706	Highways	114	9%	1,806,492	9%
707	New Towns & Public Housing (exc HK Housing Authority)	560	46%	6,394,844	32%
709	Waterworks	90	7%	1,048,916	5%

Table 9-12 Composition of the 1991-92 data set in terms of 'Heads of Expenditure'.

The 1991-1992 PWP portfolio of one thousand two hundred and twenty-four projects to be analysed for this research contains fifty one number out of seventy-eight categories of works. This is taken to indicate a good degree of diversity (sixty-five per cent) of types of infrastructure projects contained within the portfolio. For ease of reference, the categories of public works that each comprise more than one percent of the portfolio are listed in Table 9-13. These projects comprise ninety-four percent by number and ninety-eight percent by value of the data set to be analyzed.

Category of public works	ID	By Project No.		By Value (HK\$ 000's)	
		No	%	Amended Est Value	%
Civil engineering – land development	CL	185	15%	\$5,081,851	26%
Transport – roads	TH	136	11%	\$2,993,271	15%
Water supply - fresh water supplies	WF	77	6%	\$1,025,336	5%
Environmental engineering - sewerage and sewage treatment	DS	68	6%	\$1,944,153	10%
Education – primary	EP	65	5%	\$293,182	1%
Education – secondary	ES	55	4%	\$462,708	2%
Law and order – police	LP	48	4%	\$374,449	2%
Air and sea communications – airport	AA	42	3%	\$1,150,288	6%
Environmental engineering - refuse disposal	DR	41	3%	\$778,355	4%
Recreation, culture and amenities – open spaces	RO	41	3%	\$82,777	<1%
Social welfare and community building - community centres and halls	SC	41	3%	\$243,178	1%
Recreation, culture and amenities – sports facilities	RS	37	3%	\$85,347	<1%
Support - internal security	GF	30	2%	\$54,716	<1%
Support – Government buildings	GG	28	2%	\$303,145	2%
Support – offices	GO	28	2%	\$1,064,343	5%
Health – hospitals	MH	27	2%	\$1,415,206	7%
Support – quarters	GQ	26	2%	\$295,461	1%
Public safety - fire services	BF	25	2%	\$130,909	1%
Transport – footbridges and pedestrian tunnels	TB	25	2%	\$175,663	1%
Water supply – combined fresh/salt water supply projects	WC	21	2%	\$202,953	1%
Civil engineering – drainage and erosion protection	CD	19	2%	\$208,122	1%
Law and Order – correctional services	LC	17	1%	\$250,526	1%
Health – clinics	MC	14	1%	\$100,231	1%
Transport – railways	TR	10	1%	\$58,299	<1%
Water supply – salt water supplies	WS	9	1%	\$69,199	<1%
Air and sea communications –port works	AP	8	1%	\$123,475	1%
Housing – rural housing improvement	HH	8	1%	\$88,973	<1%
Recreation, culture and amenities – cultural facilities	RE	8	1%	\$62,025	<1%
Transport – bridges and tunnels	TT	8	1%	\$7,727	<1%
Food supply – abbatoirs, wholesale markets etc	FS	7	1%	\$170,977	1%
Sub-totals			94%	\$19,296,845	98%

Table 9-13 Categories of work that are greater than one percent of the 1991-92 PWP data set.

The dominant categories of work in the data set in terms of planned expenditure in the 1991-92 financial year, are:

- CL ‘Civil engineering – land development’, 26% by value but 15% by projects;
- TH ‘Transport – roads’, 15% by value but 11% by number of projects;
- DS ‘Environmental engineering – Sewerage and sewerage treatment’, 10% by value but 6% by number of projects.

Table 9-14 shows the statistical attributes of these sub-portfolios of projects. These indicate a reasonable amount of diversity in the dominant sub-portfolios of projects with the mode and the median values indicating that the majority of the project values are at the low-value end of the range of values.

Cat of Work	No Projects	Statistical attributes in terms of ‘Amended Estimate’ (HK\$ 000’s)					
		Low	High	Mode	Mean	Median	SD
CL	185	10	955,980	565	27,469	5,910	86,488
TH	136	0	285,390	22,600	22,009	6,108	42,119
DS	68	6	468,710	398	28,590	3,911	74,810

Table 9-14 Statistical attributes of the dominant sub-portfolios in the 1991-92 dataset.

Planned expenditure variable

The planned expenditure variable is ‘Amended Estimate’ in the data source. The statistical attributes of this variable within the data set for this analysis are stated in Table 9-12. These indicate that the values of ‘Amended Estimate’ expenditure within the data-set are predominantly at the low-value end of the range of values. Whereas, ‘Table 9-15 Percentiles for ‘Amended Estimate’ variable in the 1991-92 data set’, shows the distribution of the values of the variable ‘Amended Estimate’ of each project in the 1991-92 data set. Ninety-five percent of the number of projects contains forty-nine percent of the total value of the planned expenditure on the projects.

Percentile (No Projects)	Thresh-hold Value of 'Amended Estimate of a project (HK \$ 000's)	Cum Value (HK \$ 000's)	Cum Value (%)
5%	24	707	0.004%
10%	110	1,082	0.01%
15%	177	12,351	0.06%
20%	289	26,024	0.13%
25%	477	48,942	0.25%
30%	701	83,035	0.42%
35%	1,017	137,732	0.7%
40%	1,406	208,032	1.05%
45%	2,000	314,829	1.59%
50%	2,960	459,796	2.32%
55%	3,964	669,842	3.39%
60%	5,490	956,301	4.83%
65%	7,017	1,333,490	6.74%
70%	10,163	1,864,277	9.42%
75%	13,003	2,567,435	12.98%
80%	16,950	499,557	17.69%
85%	25,016	4,725,966	23.89%
90%	36,027	6,552,200	33.12%
95%	66,483	9,402,822	47.53%

Table 9-15 Percentiles for 'Amended Estimate' variable in the 1991-92 data set

'Outturn variance' variable

The statistical attributes of this variable within the data set for this analysis are also stated in Table 9-11. These indicate that the values of 'Outturn' expenditure within the data-set are predominantly at the low-value end of the range of values. Whereas, 'Table 9-16 Percentiles for 'Outturn variance' variable in the 1991-92 dataset.' shows the distribution of the values of the variable 'Outturn variance' of the projects in the 1990-91 data set. Ninety-five percent of the number of projects contains forty-four percent of the total value of the variance between planned and actual expenditure on the projects.

Percentile (No Projects)	Thresh-hold Value of ‘Outturn variance’ for a project (HK \$ 000’s)	Cum Value (HK \$ 000’s)	Cum Value (%)
5%	11	425	0.005%
10%	49	1,942	0.02%
15%	97	6,106	0.07%
20%	147	13,350	0.15%
25%	229	24,847	0.27%
30%	340	42,334	0.47%
35%	498	67,574	0.75%
40%	656	102,969	1.14%
45%	899	149,737	1.66%
50%	1,318	216,601	2.4%
55%	1,734	310,060	3.43%
60%	2,134	428,424	4.74%
65%	2,912	579,815	6.41%
70%	3,937	788,610	8.72%
75%	5,616	1,071,749	11.85%
80%	6,969	1,453,160	16.07%
85%	9,944	1,980,051	21.9%
90%	14,901	2,704,177	29.91%
95%	28,467	3,954,589	43.74%

Table 9-16 Percentiles for 'Outturn variance' variable in the 1991-92 dataset.

Correlation and curve fitting in the 1991-92 data set

For the purpose of this analysis, the probability curve of the values of the ‘ratio of outturn variance’ for a project is required within the range of zero to 0.2. The two-step curve-fitting approach is described in the Thesis at Section 2.9.2. In the first step, the curve-fitting range corresponds to values of percent ‘Outturn Variance’ from zero to two hundred percent. There 11 instances out of 1224 data pairs where this threshold is exceeded. These are unrepresentative outliers and are not included in the frequency distribution shown in Figure 9-4. The statistical attributes of the data sets for this frequency distribution are listed in Table 9-19.

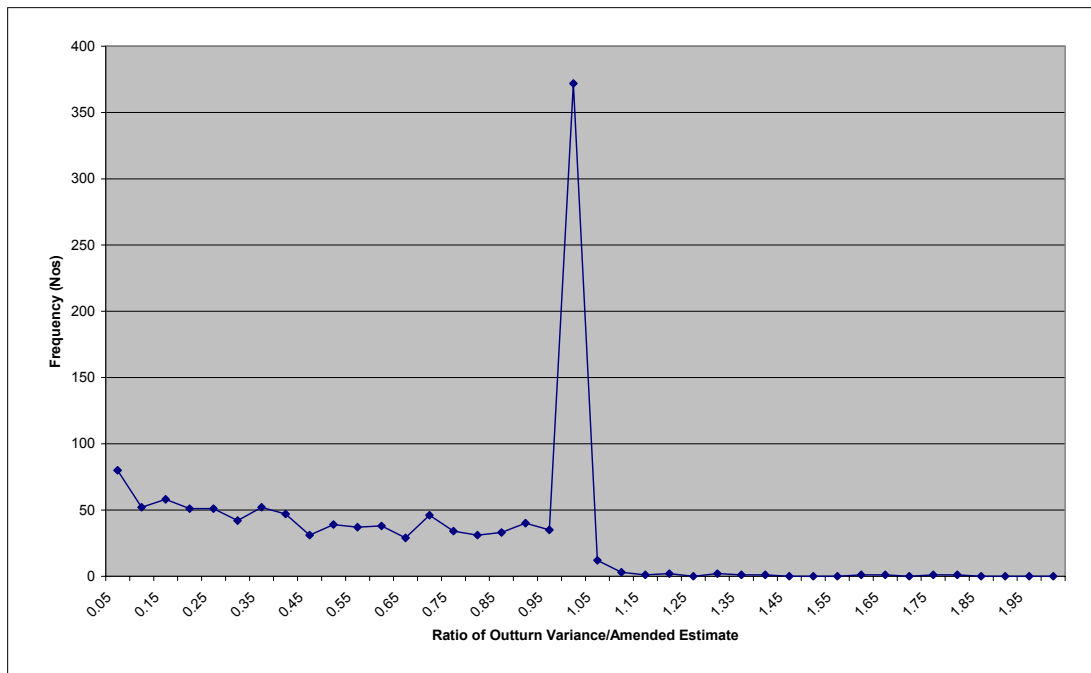


Figure 9-4 Frequency distribution of the ratio of 'Outturn Variance/Amended Estimate' for 1991-92 data set.

Attribute	Value
No data pairs	1224
Low Value	0
High Value	1.7875
Mode Value	1.0
Mean Value	0.6097
Median Value	0.6561
Standard Deviation Value	0.3638

Table 9-17 Statistical attributes of frequency distribution of 'Outturn Variance' ratio, 1991-92 dataset

Using the distribution fitting methods within the Crystal Ball/ software, ten standard probability distributions are fitted to the data array of 'Outturn variance/Amended Estimate' with the statistical attributes stated in Table 9-17. The distribution fit for the probability distributions tested are shown in Table 9-18.

Distribution	Chi-square	Kolmogorov-Smirnov	Anderson-Darling
Triangular	3,513.78 ($\theta = 0.000$)	0.1862	42.7488
Weibull	2,654.50 ($\theta = 0.000$)	0.1591	70.4609
Normal	2,753.61 ($\theta = 0.000$)	0.1515	49.9096
Beta	3,031.11 ($\theta = 0.000$)	0.1424	56.9506
Logistic	3,147.39 ($\theta = 0.000$)	0.1452	46.0162
Extreme Value	2,717.28 ($\theta = 0.000$)	0.1361	44.9966
Exponential	3,322.72 ($\theta = 0.000$)	0.1745	81.5390
Gamma	3,142.94 ($\theta = 0.000$)	0.1988	137.7415
Lognormal	3,773.00 ($\theta = 0.000$)	0.2014	81.2970
Uniform	2,781.89 ($\theta = 0.000$)	0.4199	216.8437

Table 9-18 Distribution fit for probability curves against 'Outturn Variance/Amended Estimate' in 1991-92 data set

A good fit is not achieved with any of these ten probability distributions. The step-two curve fitting, within the x-axis range of zero to 0.2 therefore applies as described in Section 2.9.2 of the methodology. The analysis required for the purpose of this research will involve Monte Carlo analysis using a probability distribution constrained within x-axis ranges of zero to 0.2. If we constrain distribution fitting to the data pairs within the range of zero to 0.2 then the statistical attributes of the data pairs are as shown in Table 9-19 and the probability histogram for this range is shown in Figure 9-5.

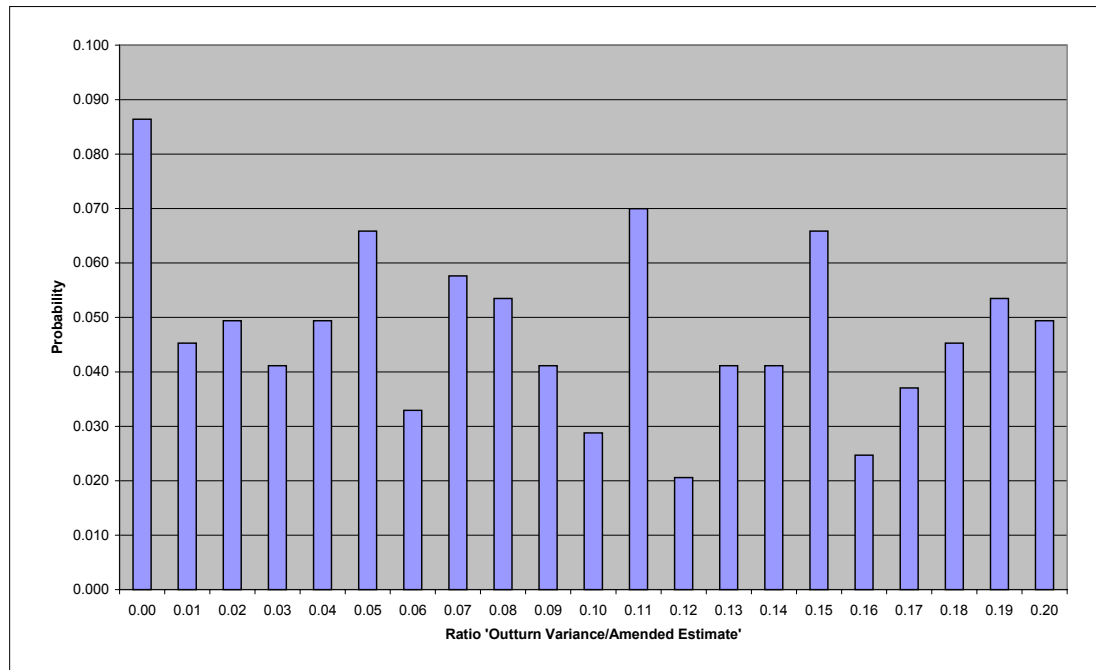


Figure 9-5 Probability histogram for the ratio of Outturn Variance/Amended Estimate within the ratio range of 0-0.2, for the 1991-92 dataset.

Attribute	Value
No data pairs	244
Low Value	0
High Value	0.2
Mode Value	0.0
Mean Value	0.0907
Median Value	0.0848
Standard Deviation Value	0.0631

Table 9-19 Statistical attributes of frequency distribution of 'Outturn Variance' ratio for x-axis values of 0 to 0.2, 1991-92 dataset.

The distribution fit for the ten probability distributions tested for this range are shown in Table 9-20.

Distribution	Chi-square	Kolmogorov-Smirnov	Anderson-Darling
Triangular	123.08 ($\theta = 0.000$)	0.1863	26.7737
Weibull	108.18 ($\theta = 0.000$)	0.1032	10.6479
Normal	73.80 ($\theta = 0.000$)	0.0925	3.8597
Beta	28.21 ($\theta = 0.0133$)	0.0861	20.8098
Logistic	104.34 ($\theta = 0.000$)	0.0922	3.8199
Extreme Value	75.87 ($\theta = 0.000$)	0.0939	3.9692
Exponential	139.87 ($\theta = 0.000$)	0.1214	28.4704
Gamma	416.39 ($\theta = 0.000$)	0.4110	85.2830
Lognormal	137.84 ($\theta = 0.000$)	0.1566	35.7748
Uniform	43.11 ($\theta = 0.0001$)	0.1006	8.7317

Table 9-20 Distribution fit for probability curves against 'Outturn Variance/Amended Estimate' in the range $x = 0$ to 0.2 in the 1991-92 data set

The fit to the distribution curves is not good but the Beta distribution is the closest fit in terms of the Chi-square test and the Kolmogorov-Smirnov test. The fit to this distribution is shown in Figure 9-6.

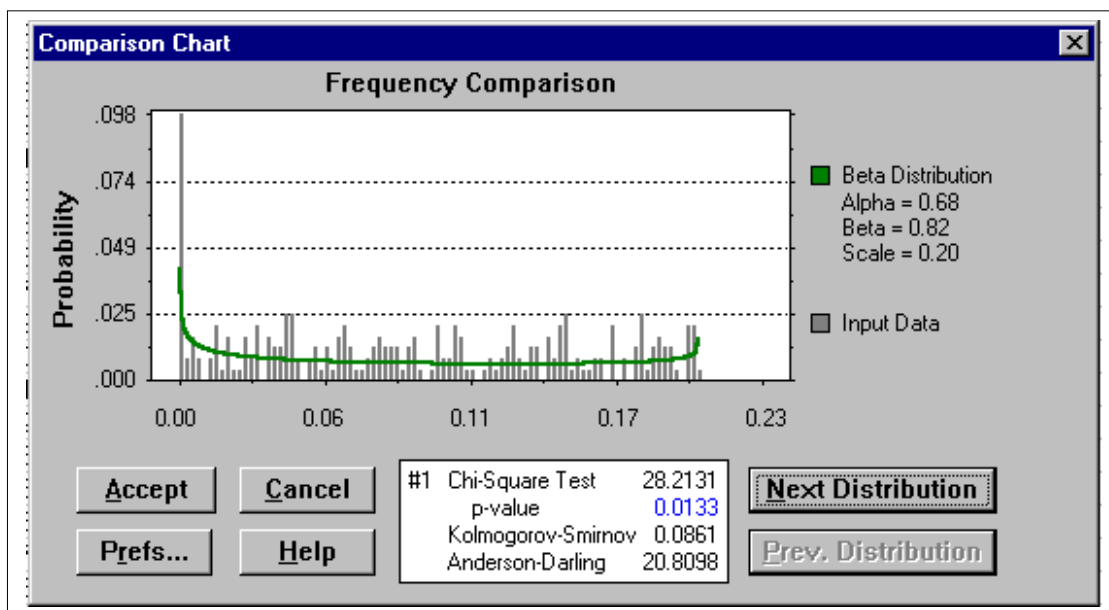


Figure 9-6 Showing the fit of to a Beta distribution for x -range of 0 to 0.2 , 1991-92 data set.

This distribution is used in the stochastic analysis described in Section 9.4.

1992-93

This data is taken from the ‘Annual Report of the Director of Accounting Services and the Accounts for the year ended 31 March 1993’⁵. Reference is also made to the forecast of this spending programme taken from the ‘Estimates for the year ending 31 March 1993: Volume III – Fund Accounts, Memorandum Notes, and Payments and receipts’⁶.

The portfolio of Category A projects to be analyzed for this element of the research includes 1,143 mutually exclusive projects. The ‘Original Estimate’ of expenditure on these projects was HK\$ 18,457.611 million⁵. The ‘Amended Estimate’ expenditure on the same items was HK\$ 21,202.805 million but the audited expenditure was HK\$ 13,892.833 million⁵. The outcome was an under-expenditure of thirty-five percent of the funds approved for expenditure i.e., the ‘Amended Estimate’ less ‘Actual’ resulted in an ‘outturn variance’ of HK\$ 7,309.97 million.

This portfolio of projects is the entire PWP for 1992-1993 except for the exclusion of items listed in the Head of Expenditure ‘Land Acquisition (Head 701 PWP Items)’ and ‘Capital Subventions and Major Systems and Equipment (Head 708 PWP Items)’; and the ‘omnibus’ items defined in Section 2.9.1 of the Thesis. Table 9-21 states the statistical attributes of the data set used in this analysis.

Expenditure	No Project	Statistics (<i>Units are HK \$ 000's</i>)					
		Low	High	Mode	Mean	Median	S.D.
Original est		0	1,443,000	0	16,148	1,314	71,975
Amended est	1143	0	1,482,000	11	18,550	2,310	78,344
Actual		-19,896	1,478,651	0	12,155	486	64,867
Outturn		0	392,057	11	6,395	779	24,813

Table 9-21 Statistical attributes of the portfolio of projects taken from the 1992-1993 Public Works Programme of projects.

The composition of the portfolio in terms of numbers of projects and the value of the ‘Amended Estimate’ by ‘Heads of Expenditure’ is displayed in Table 9-22. Heads of Expenditure 703 ‘Buildings’ and 707 ‘New Towns and Public Housing’ predominate in size and total value compared to the sixteen percent or less of the portfolio contributed by each of the other Heads of Expenditure. Significantly, in 1992-93 the scale of the new airport development results in an increase in the number of high value projects in Head 702 ‘Port and Airport Development’: it has become the dominant Head of Expenditure at thirty-eight percent of the planned expenditure for this portfolio of projects.

Code	Head of Expenditure	By No. Projects		By 'Amended Estimate' Value	
		Nos	%	Value <i>HK\$000's</i>	%
702	Port & Airport Development	43	4%	8,031,264	38%
703	Buildings	236	21%	3,102,780	15%
704	Drainage	69	6%	1,168,864	6%
705	Civil Engineering	80	7%	2,229,204	11%
706	Highways	98	9%	1,249,065	6%
707	New Towns & Public Housing (exc HK Housing Authority)	534	47%	4,479,355	21%
709	Waterworks	83	7%	942,273	4%

Table 9-22 Composition of the 1992-93 data set in terms of 'Heads of Expenditure'.

The 1992-1993 PWP portfolio of one thousand one hundred and forty-three projects to be analysed for this research contains fifty-three number out of seventy-eight categories of works. This is taken to indicate a good degree of diversity (sixty-five per cent) of types of infrastructure projects contained within the portfolio.

The categories of public works that each comprise more than one percent of the portfolio are listed in Table 9-23. These projects comprise ninety-four percent by number and ninety-six percent by value of the data set to be analyzed.

Category of public works	ID	By Project No.		By Value (HK\$ 000's)	
		No	%	Amended Est Value	%
Civil engineering – land development	CL	191	17%	\$6,198,609	29%
Transport – roads	TH	132	12%	\$4,447,759	21%
Environmental engineering – sewerage and sewage treatment	DS	78	7%	\$1,371,681	6%
Water supply - fresh water supplies	WF	74	6%	\$883,322	4%
Education – secondary	ES	52	5%	\$280,983	1%
Education – primary	EP	49	4%	\$164,229	1%
Environmental engineering – refuse disposal	DR	44	4%	\$1,420,088	7%
Air and sea communications – airport	AA	40	3%	\$926,851	4%
Recreation, culture and amenities - open spaces	RO	38	3%	\$104,517	<1%
Law and order – police	LP	36	3%	\$313,725	1%
Recreation, culture and amenities - sports facilities	RS	33	3%	\$47,210	<1%
Social welfare and community building - community centres and halls	SC	33	3%	\$113,638	1%
Health – hospitals	MH	26	2%	1,325,548	6%
Government offices –intra-Governmental services	KA	24	2%	\$561,520	3%
Public safety - fire services	BF	20	2%	\$50,092	<1%
Civil engineering – drainage and erosion protection	CD	18	2%	\$109,187	1%
Water supply – combined fresh/salt water supply projects	WC	18	2%	\$148,578	1%
Law and Order – correctional services	LC	15	1%	\$151,956	1%
Support – others	GK	14	1%	\$359,035	2%
Quarters – intra-Governmental services	JB	12	1%	\$40,981	<1%
Health – clinics	MC	12	1%	\$108,796	1%
Housing – rural housing improvement	HH	11	1%	\$77,522	<1%
Support –intra-Governmental services	GI	9	1%	\$23,407	<1%
Water supply – salt water supplies	WS	9	1%	\$52,550	<1%
Education – tertiary	ET	8	1%	\$54,626	<1%
Environmental engineering –pollution control	DP	7	1%	\$85,490	<1%
Food supply – abattoirs, wholesale markets etc	FS	7	1%	\$455,539	2%
Recreation, culture and amenities - cultural facilities	RE	7	1%	\$44,115	<1%
Air and sea communications –port works	AP	6	1%	\$36,423	<1%
Fitting out –intra-Governmental services	II	6	1%	\$15,398	<1%
Recreation, culture and amenities – cemeteries, columbaria, etc	RB	6	1%	\$8,997	<1%
Transport – interchanges and termini	TI	6	1%	\$5,460	<1%
Transport – railways	TR	6	1%	\$109,258	<1%
Transport – bridges and tunnels	TT	6	1%	\$66,005	<1%
Sub-totals			94%	\$20,328,878	96%

Table 9-23 Categories of work that are greater than one percent of the 1992-93 PWP data set.

The dominant categories of work in the data set in terms of planned expenditure in the 1992-93 financial year:

- CL ‘Civil engineering – land development’, 29% by value but 17% by projects;
- TH ‘Transport – roads’, 21% by value but 12% by number of projects;
- DS ‘Environmental engineering – Sewerage and sewerage treatment’, 6% by value but 7% by number of projects.

Table 9-24 shows the statistical attributes of these sub-portfolios of projects. These indicate a reasonable amount of diversity in the dominant sub-portfolios of projects with the mode and the median values indicating that the majority of the project values are at the low-value end of the range of values.

Cat of Work	No Projects	Statistical attributes in terms of ‘Amended Estimate’ (HK\$ 000’s)					
		Low	High	Mode	Mean	Median	SD
CL	191	11	1,221,000	1055	32,453	3,365	117,633
TH	132	6	1,482,000	53	33,695	4,943	155,009
DS	33	0	163,350	-	17,074	1,980	38,955

Table 9-24 Statistical attributes of the dominant sub-portfolios in the 1992-93 dataset.

Planned expenditure variable

The planned expenditure variable is ‘Amended Estimate’ in the data source. The statistical attributes of this variable within the data set for this analysis are stated in Table 9-21. These indicate that the values of ‘Amended Estimate’ expenditure within the data-set are predominantly at the low-value end of the range of values. Whereas, ‘Table 9-25 Percentiles for ‘Amended Estimate’ variable in the 1992-93 data set’, shows the distribution of the values of the variable ‘Amended Estimate’ of each project in the 1992-93 data set. Ninety-five percent of the number of projects contains thirty-seven percent of the total value of the planned expenditure on the projects.

Percentile (No Projects)	Thresh-hold Value of 'Amended Estimate of a project (HK \$ 000's)	Cum Value (HK \$ 000's)	Cum Value (%)
5%	11	601	0.003%
10%	54	1,870	0.009%
15%	106	6,810	0.032%
20%	211	16,203	0.076%
25%	364	30,765	0.15%
30%	600	58,428	0.28%
35%	945	100,220	0.47%
40%	1,166	159,541	0.75%
45%	1,651	239,015	1.13%
50%	2,310	352,055	1.66%
55%	3,120	509,678	2.40%
60%	4,200	723,924	3.41%
65%	5,356	995,267	4.69%
70%	7,386	1,354,685	6.39%
75%	10,045	1,847,136	8.71%
80%	14,714	2,528,950	11.93%
85%	20,563	3,503,519	16.92%
90%	37,339	5,016,141	23.66%
95%	74,470	7,948,193	37.49%

Table 9-25 Percentiles for 'Amended Estimate' variable in the 1992-93 data set

'Outturn variance' variable

The statistical attributes of this variable within the data set for this analysis are also stated in Table 9-21. These indicate that the values of 'Outturn' expenditure within the data-set are predominantly at the low-value end of the range of values. Whereas, 'Table 9-26 Percentiles for 'Outturn variance' variable in the 1992-93 dataset.', shows the distribution of the values of the variable 'Outturn variance' of the projects in the 1992-93 data set. Ninety-five percent of the number of projects contains thirty-seven percent of the total value of the variance between planned and actual expenditure on the projects.

Percentile (No Projects)	Thresh-hold Value of 'Outturn variance' for a project (HK \$ 000's)	Cum Value (HK \$ 000's)	Cum Value (%)
5%	4	72	0.0001%
10%	11	622	0.009%
15%	40	1,955	0.03%
20%	71	4,992	0.07%
25%	124	10,524	0.1%
30%	209	19,924	0.3%
35%	301	34,008	0.5%
40%	427	55,029	0.8%
45%	569	82,998	1.14%
50%	779	121,952	1.67%
55%	1050	174,281	2.38%
60%	1,327	241,055	3.30%
65%	1,835	330,788	4.52%
70%	2,546	456,004	6.29%
75%	3,641	633,819	8.67%
80%	4,757	871,138	11.92%
85%	6,751	1,194,584	16.34%
90%	11,081	1,700,619	23.26%
95%	26,334	2,680,221	36.67%

Table 9-26 Percentiles for 'Outturn variance' variable in the 1992-93 dataset.

Probability curve fitting in the 1992-93 data set

For the purpose of this analysis, the probability curve of the values of the 'ratio of outturn variance' for a project is required within the range of zero to 0.2. The two-step curve-fitting approach is described in the Thesis at Section 2.9.2. In the first step, the curve-fitting range corresponds to values of percent 'Outturn Variance' from zero to two hundred percent. There are 26 instances out of 1143 data pairs where this threshold is exceeded. These are unrepresentative outliers and are not included in the frequency distribution shown in Figure 9-7. The statistical attributes of the data sets for this frequency distribution are listed in Table 9-27.

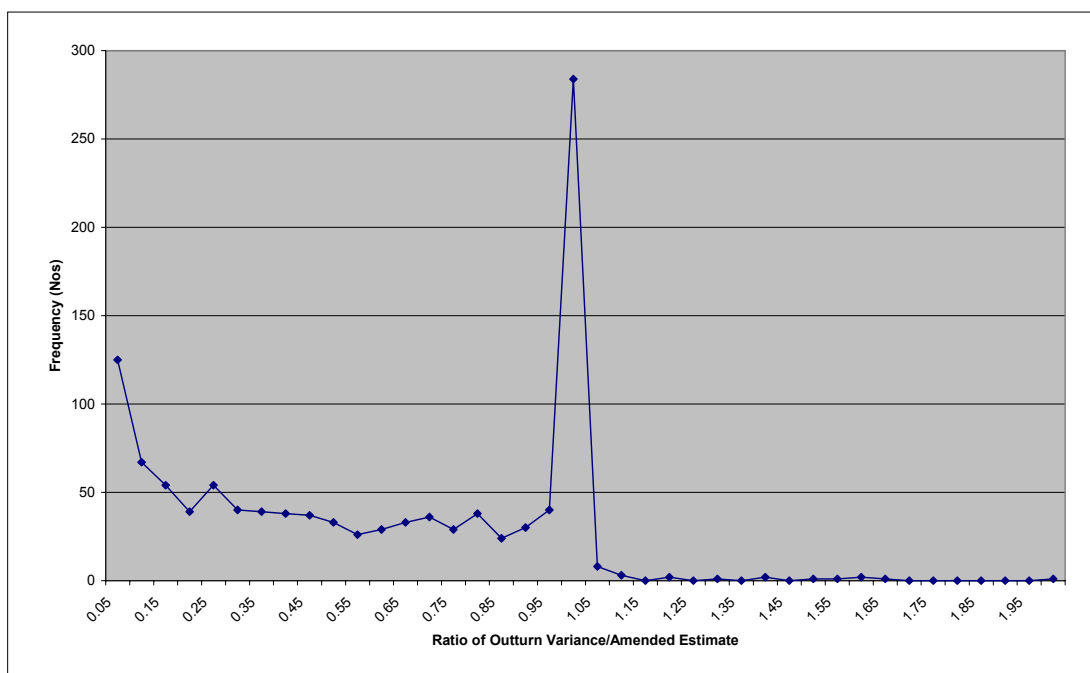


Figure 9-7 Frequency distribution of the ratio of 'Outturn Variance/Amended Estimate' for 1992-93 data set.

Attribute	Value
No data pairs	1117
Low Value	0
High Value	2.000
Mode Value	1.0
Mean Value	0.5568
Median Value	0.5637
Standard Deviation Value	0.3806

Table 9-27 Statistical attributes of frequency distribution of 'Outturn Variance' ratio, 1992-93 dataset

Using the distribution fitting methods within the Crystal Ball/ software, ten standard probability distributions are fitted to the data array of 'Outturn variance/Amended Estimate' with the statistical attributes stated in Table 9-27. The distribution fit for the probability distributions tested are shown in Table 9-28.

Distribution	Chi-square	Kolmogorov-Smirnov	Anderson-Darling
Triangular	1,991.71 ($\theta = 0.000$)	0.2436	63.7651
Weibull	2,544.99 ($\theta = 0.000$)	0.1396	72.2859
Normal	2,486.37 ($\theta = 0.000$)	0.1285	40.5210
Beta	1,994.25 ($\theta = 0.000$)	0.1239	57.2526
Logistic	2,231.60 ($\theta = 0.000$)	0.1198	37.4034
Extreme Value	2,095.70 ($\theta = 0.000$)	0.1270	39.8536
Exponential	2,246.55 ($\theta = 0.000$)	0.1471	54.6492
Gamma	1,963.29 ($\theta = 0.000$)	0.2019	118.5457
Lognormal	2,974.02 ($\theta = 0.000$)	0.2004	76.0496
Uniform	2,660.98 ($\theta = 0.000$)	0.4803	351.0266

Table 9-28 Distribution fit for probability curves against 'Outturn Variance/Amended Estimate' in 1992-93 data set

A good fit is not achieved with any of these ten probability distributions. The step-two curve fitting, within the x-axis range of zero to 0.2 therefore applies as described in Section 2.9.2 of the methodology. The analysis required for the purpose of this research will involve Monte Carlo analysis using a probability distribution constrained within x-axis ranges of zero to 0.2. If we constrain distribution fitting to the data pairs within the range of zero to 0.2 then the statistical attributes of the data pairs are as shown in Table 9-29 and the probability histogram for this range is shown in Figure 9-8.

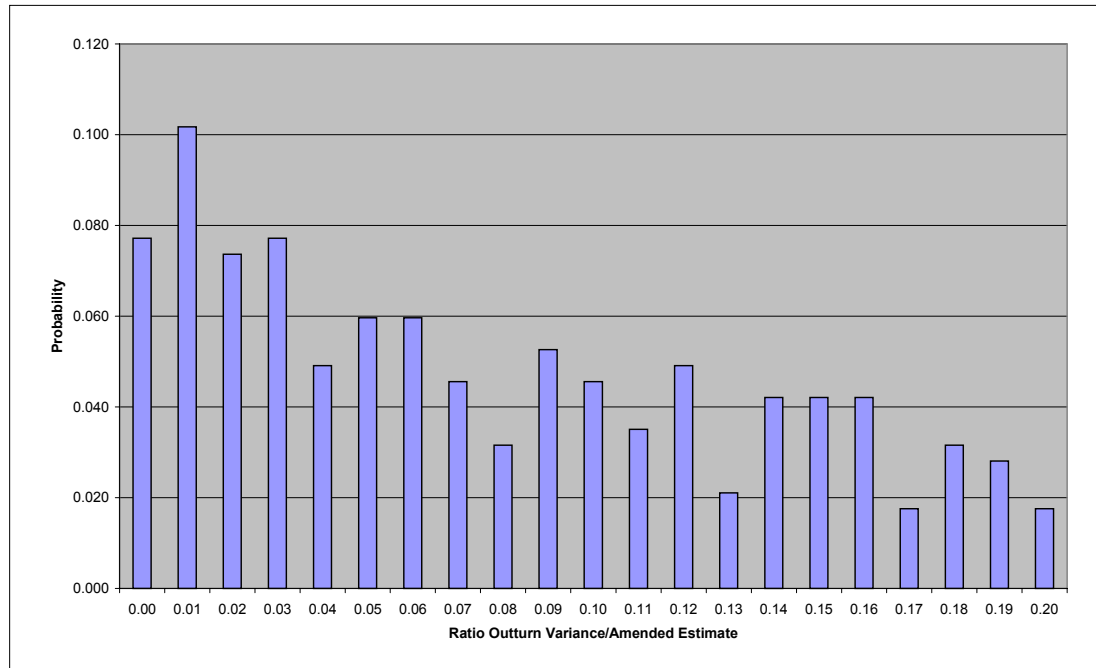


Figure 9-8 Probability histogram for the ration of Outturn Variance/Amended Estimate within the ratio range of 0-0.2, for the 1992-93 dataset.

Attribute	Value
No data pairs	285
Low Value	0
High Value	0.199
Mode Value	0.0
Mean Value	0.0727
Median Value	0.0611
Standard Deviation Value	0.0587

Table 9-29 Statistical attributes of frequency distribution of 'Outturn Variance' ratio for x-axis values of 0 to 0.2, 1992-93 dataset.

The distribution fit for the ten probability distributions tested for this range are shown in Table 9-30.

Distribution	Chi-square	Kolmogorov-Smirnov	Anderson-Darling
Triangular	68.40 ($\theta = 0.000$)	0.0978	13.8984
Weibull	98.13 ($\theta = 0.000$)	0.1038	14.1643
Normal	196.93 ($\theta = 0.000$)	0.1080	6.4084
Beta	31.73 ($\theta = 0.007$)	0.0772	19.9126
Logistic	132.27 ($\theta = 0.000$)	0.1297	5.9475
Extreme Value	104.53 ($\theta = 0.000$)	0.0840	5.1934
Exponential	98.80 ($\theta = 0.000$)	0.0982	26.7361
Gamma	361.20 ($\theta = 0.000$)	0.3441	77.4005
Lognormal	159.60 ($\theta = 0.0000$)	0.1432	36.0534
Uniform	125.2 ($\theta = 0.000$)	0.2071	40.0722

Table 9-30 Distribution fit for probability curves against 'Outturn Variance/Amended Estimate' in the range $x = 0$ to 0.2 in the 1992-93 data set

The fit to the distribution curves is not good but the Beta distribution is the closest fit in terms of the Chi-square test and the Kolmogorov-Smirnov test. The fit to this distribution is shown in .

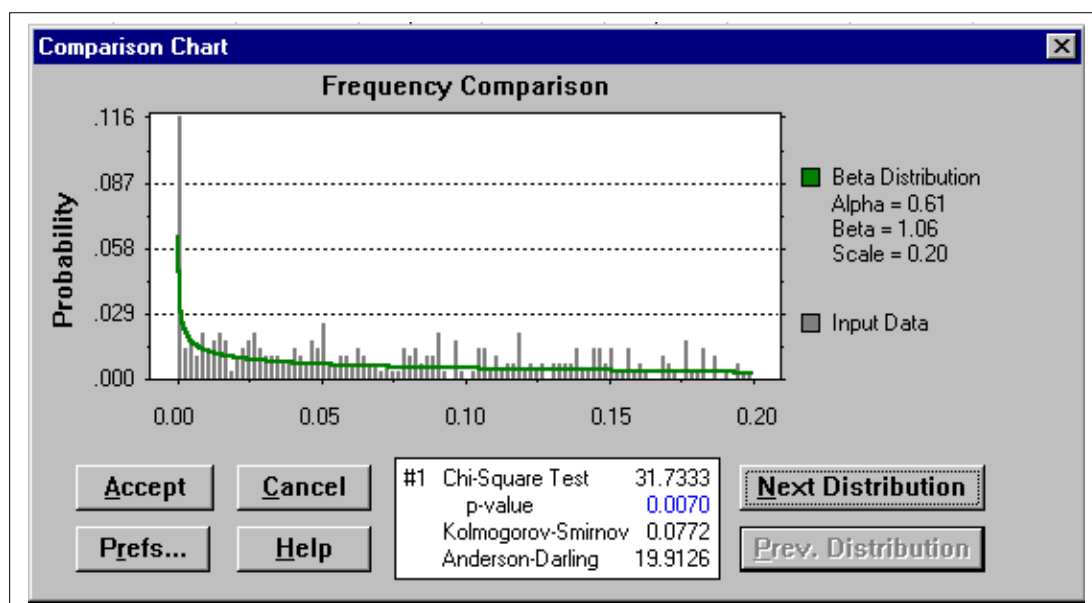


Figure 9-9 Showing the fit of to a Beta distribution for x -range of 0 to 0.2 , 1992-93 data set.

This distribution is used in the stochastic analysis described in Section 9.4.

1993-94

This data is taken from the 'Annual Report of the Director of Accounting Services and the Accounts for the year ended 31 March 1994'⁷. Reference is also made to the forecast of this spending programme taken from the 'Estimates for the year ending 31 March 1994: Volume III – Fund Accounts, Memorandum Notes, and Payments and receipts'⁸.

The portfolio of Category A projects to be analyzed for this element of the research includes 1,130 mutually exclusive projects. The 'Original Estimate' of expenditure on these projects was HK\$ 19,946.572 million⁷. The 'Amended Estimate' expenditure on the same items was HK\$ 27,722.274 million but the audited expenditure was HK\$ 20,958.233 million⁷. The outcome was an under-expenditure of twenty-four percent of the funds approved for expenditure i.e., the 'Amended Estimate' less 'Actual' resulted in an 'outturn variance' of HK\$ 6,764.04 million.

This portfolio of projects is the entire PWP for 1993-1994 except for the exclusion of items listed in the Head of Expenditure 'Land Acquisition (Head 701 PWP Items)' and 'Capital Subventions and Major Systems and Equipment (Head 708 PWP Items)'; and the 'omnibus' items defined in Section 2.9.1. of the Thesis. Table 9-31 states the statistical attributes of the data set used in this analysis.

Expenditure	No Project	Statistics (<i>Units are HK \$ 000's</i>)					
		Low	High	Mode	Mean	Median	S.D.
Original est	1130	0	2,440,000	0	17,652	715	102,761
Amended est		0	2,580,000	10	24,533	1,668	147,416
Actual		-14,757	2,424,908	0	18,547	387	127,073
Outturn		0	708,723	10	5,986	540	36,791

Table 9-31 Statistical attributes of the portfolio of projects taken from the 1993-1994 Public Works Programme of projects.

The composition of the portfolio in terms of numbers of projects and the value of the 'Amended Estimate' by 'Heads of Expenditure' is displayed in Table 9-32. Heads of Expenditure 703 'Buildings' and 707 'New Towns and Public Housing' predominate in terms of size and total value compared to the eleven percent or less of the portfolio contributed by each of the other Heads of Expenditure excepting 702 'Port and Airport Development'. In 1993-94 the scale of the new airport development maintains a large number of high value projects in Head 702 'Port and Airport Development': it is still the dominant Head of Expenditure at forty percent of the planned expenditure for this portfolio of projects.

Code	Head of Expenditure	By No. Projects		By 'Amended Estimate' Value	
		Nos	%	Value <i>HK\$000's</i>	%
702	Port & Airport Development	50	4%	11,141,692	40%
703	Buildings	250	22%	8,549,049	31%
704	Drainage	66	6%	918,946	3%
705	Civil Engineering	76	7%	1,820,219	7%
706	Highways	103	9%	1,017,579	4%
707	New Towns & Public Housing (exc HK Housing Authority)	495	44%	2,971,114	11%
709	Waterworks	90	8%	1,303,675	5%

Table 9-32 Composition of the 1993-94 data set in terms of 'Heads of Expenditure'.

The 1993-1994 PWP portfolio of one thousand one hundred and thirty projects to be analyzed for this research contains fifty-nine number out of seventy-eight categories of works. This is taken to indicate a good degree of diversity (seventy-six per cent) of types of infrastructure projects contained within the portfolio.

The categories of public works that each comprise more than one percent in number of the portfolio are listed in Table 9-32. These projects comprise in total, eighty-seven percent by number and eighty-one percent by value of the data set to be analyzed.

Category of public works	ID	By Project No.		By Value (HK\$ 000's)	
		No	%	Amended Est Value	%
Civil engineering – land development	CL	189	17%	\$5,311,819	19%
Transport – roads	TH	141	13%	\$7,708,047	28%
Environmental engineering - sewerage and sewage treatment	DS	76	7%	\$1,047,837	4%
Water supply - fresh water supplies	WF	76	7%	\$1,287,197	5%
Education – secondary	ES	47	4%	\$209,803	1%
Environmental engineering - refuse disposal	DR	42	4%	\$1,101,505	4%
Education – primary	EP	42	4%	\$125,842	<1%
Law and order – police	LP	41	4%	\$281,047	1%
Air and sea communications – airport	AA	37	3%	\$387,645	1%
Recreation, culture and amenities - open spaces	RO	34	3%	\$61,766	<1%
Social welfare and community building - community centres and halls	SC	32	3%	\$134,772	<1%
Health – hospitals	MH	30	3%	\$930,565	3%
Government offices –intra-Governmental services	KA	26	2%	\$2,850,355	10%
Water supply – combined fresh/salt water supply projects	WC	26	2%	\$355,960	1%
Recreation, culture and amenities – sports facilities	RS	23	2%	\$25,386	<1%
Civil engineering – drainage and erosion protection	CD	20	2%	\$142,145	<1%
Transport – footbridges and pedestrian tunnels	TB	20	2%	\$114,386	<1%
Public safety - fire services	BF	19	2%	\$112,753	<1%
Health – clinics	MC	14	1%	\$50,473	<1%
Support – others	GK	13	1%	\$75,686	<1%
Housing – rural housing improvement	HH	13	1%	\$77,550	<1%
Education – tertiary	ET	12	1%	\$96,306	<1%
Law and Order – correctional services	LC	11	1%	\$79,769	<1%
Sub-totals			87%	\$22,568,614	81%

Table 9-33 Categories of work that are greater than one percent of the 1993-94 PWP data set.

The dominant categories of work in the data set in terms of planned expenditure in the 1993-94 financial year:

- CL ‘Civil engineering – land development’, 19% by value but 17% by projects;
- TH ‘Transport – roads’, 28% by value but 13% by number of projects;
- WF ‘Water supply – fresh water supplies’, 5% by value but 7% by number of projects.

Table 9-34 shows the statistical attributes of these sub-portfolios of projects. These indicate a reasonable amount of diversity in the dominant sub-portfolios of projects with the mode and the median values indicating that the majority of the project values are at the low-value end of the range of values.

Cat of Work	No Projects	Statistical attributes in terms of 'Amended Estimate' (HK\$ 000's)					
		Low	High	Mode	Mean	Median	SD
CL	189	10	1,244,000	100	28,105	2,758	109,778
TH	141	10	2,580,000	10	54,667	2,450	274,065
WF	76	5	551,600	55	16,937	1,295	65,238
DS	76	0	205,000	2,000	13,787	2,330	33,827

Table 9-34 Statistical attributes of the dominant sub-portfolios in the 1993-94 dataset.

Planned expenditure variable

The planned expenditure variable is 'Amended Estimate' in the data source. The statistical attributes of this variable within the data set for this analysis are stated in Table 9-31. These indicate that the values of 'Amended Estimate' expenditure within the data-set are predominantly at the low-value end of the range of values. Whereas, 'Table 9-35 Percentiles for 'Amended Estimate' variable in the 1993-94 data set' shows the distribution of the values of the variable 'Amended Estimate' of each project in the 1993-94 data set. Ninety-five percent of the number of projects contains twenty-four percent of the total value of the planned expenditure on the projects.

Percentile (No Projects)	Thresh-hold Value of 'Amended Estimate of a project (HK \$ 000's)	Cum Value (HK \$ 000's)	Cum Value (%)
5%	10	682	0.002%
10%	20	1,125	0.004%
15%	55	3,485	0.013%
20%	113	8,246	0.03%
25%	221	17,950	0.07%
30%	390	35,072	0.13%
35%	550	63,386	0.3%
40%	896	100,975	0.4%
45%	1,200	164,020	0.6%
50%	1,668	242,007	0.9%
55%	2,160	356,665	1.3%
60%	3,050	500,600	1.8%
65%	4,197	699,385	2.5%
70%	6,000	1,019,998	3.7%
75%	8,637	1,382,877	5.0%
80%	11,710	1,958,845	7.1%
85%	17,049	2,765,127	10%
90%	33,910	4,886,934	15%
95%	64,559	6,538,520	24%

Table 9-35 Percentiles for 'Amended Estimate' variable in the 1993-94 data set

'Outturn variance' variable

The statistical attributes of this variable within the data set for this analysis are also stated in Table 9-31. These indicate that the values of 'Outturn' expenditure within the data-set are predominantly at the low-value end of the range of values. Whereas,

‘Table 9-36 Percentiles for ‘Outturn variance’ variable in the 1993-94 dataset.’ shows the distribution of the values of the variable ‘Outturn variance’ of the projects in the 1993-94 data set. Ninety-five percent of the number of projects contains twenty-four percent of the total value of the variance between planned and actual expenditure on the projects.

Percentile (No Projects)	Thresh-hold Value of ‘Outturn variance’ for a project (HK \$ 000’s)	Cum Value (HK \$ 000’s)	Cum Value (%)
5%	3	53	0.001%
10%	10	680	0.01%
15%	20	1,349	0.02%
20%	44	3,013	0.05%
25%	70	6,136	0.09%
30%	110	11,488	0.17%
35%	167	19,208	0.28%
40%	270	31,263	0.46%
45%	395	50,807	0.75%
50%	540	77,349	1.14%
55%	771	113,469	1.68%
60%	1,000	168,895	2.50%
65%	1,242	225,216	3.33%
70%	1,557	304,823	4.51%
75%	1,972	403,224	5.96%
80%	2,689	533,366	7.89%
85%	4,426	726,710	10.74%
90%	7,153	1,036,106	15.32%
95%	15,878	1,634,995	24.17%

Table 9-36 Percentiles for ‘Outturn variance’ variable in the 1993-94 dataset.

Probability curve fitting in the 1993-94 data set

For the purpose of this analysis, the probability curve of the values of the ‘ratio of outturn variance’ for a project is required within the range of zero to 0.2. The two-step curve-fitting approach is described in the Thesis at Section 2.9.2. In the first step, the curve-fitting range corresponds to values of percent ‘Outturn Variance’ from zero to two hundred percent. There are 14 instances out of 1130 data pairs where this threshold is exceeded. These are unrepresentative outliers and are not included in the frequency distribution shown in Figure 9-10. The statistical attributes of the data sets for this frequency distribution are listed in Table 9-37.

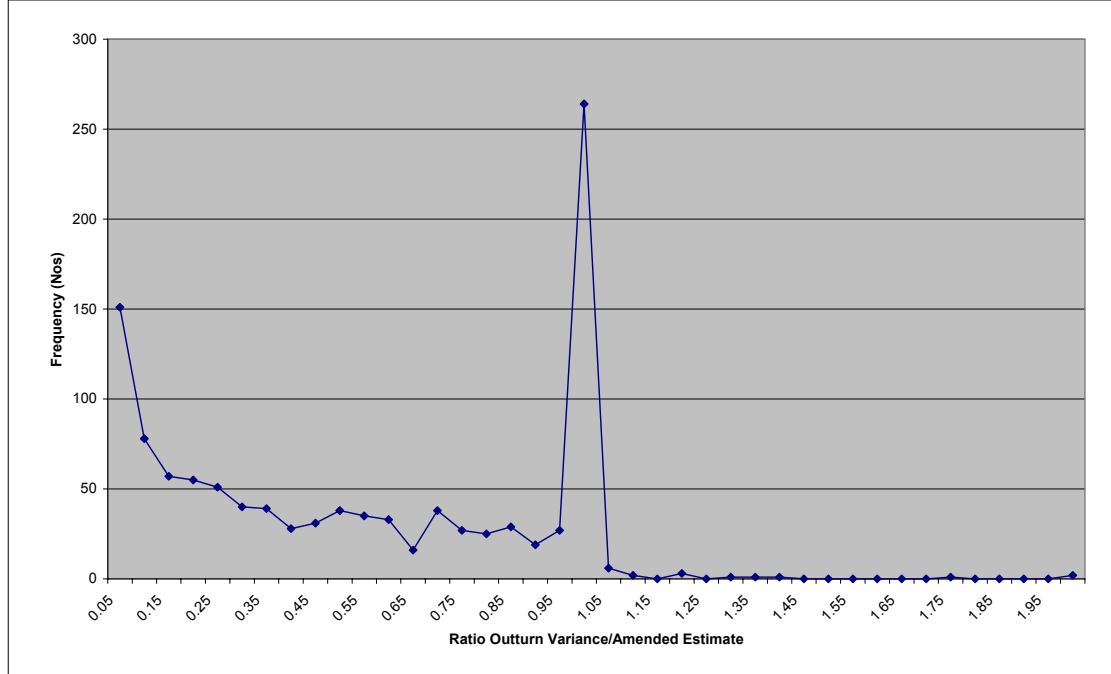


Figure 9-10 Frequency distribution of the ratio of 'Outturn Variance/Amended Estimate' for 1993-94 data set.

Attribute	Value
No data pairs	1098
Low Value	0
High Value	2.000
Mode Value	1.0
Mean Value	0.5147
Median Value	0.4745
Standard Deviation Value	0.3854

Table 9-37 Statistical attributes of frequency distribution of 'Outturn Variance' ratio, 1993-94 dataset

Using the distribution fitting methods within the Crystal Ball/ software, ten standard probability distributions are fitted to the data array of 'Outturn variance/Amended Estimate' with the statistical attributes stated in Table 9-37. The distribution fit for the probability distributions tested are shown in Table 9-38.

Distribution	Chi-square	Kolmogorov-Smirnov	Anderson-Darling
Triangular	2,034.79 ($\theta = 0.000$)	0.2483	95.9057
Weibull	1,985.48 ($\theta = 0.000$)	0.1313	72.3176
Normal	2,133.94 ($\theta = 0.000$)	0.1298	42.4520
Beta	2,116.51 ($\theta = 0.000$)	0.1142	49.4084
Logistic	2,017.31 ($\theta = 0.000$)	0.1197	38.5653
Extreme Value	2,005.83 ($\theta = 0.000$)	0.1253	39.1764
Exponential	1,846.64 ($\theta = 0.000$)	0.1291	45.2152
Gamma	2,324.19 ($\theta = 0.000$)	0.1782	93.8701
Lognormal	2,345.06 ($\theta = 0.000$)	0.1865	65.3902
Uniform	2,261.88 ($\theta = 0.000$)	0.4849	418.8717

Table 9-38 Distribution fit for probability curves against 'Outturn Variance/Amended Estimate' in 1993-94 data set

A good fit is not achieved with any of these ten probability distributions. The step-two curve fitting, within the x-axis range of zero to 0.2 therefore applies as described in Section 2.9.2 of the methodology. The analysis required for the purpose of this research will involve Monte Carlo analysis using a probability distribution constrained within x-axis ranges of zero to 0.2. If we constrain distribution fitting to the data pairs within the range of zero to 0.2 then the statistical attributes of the data pairs are as shown in Table 9-39 and the probability histogram for this range is shown in Figure 9-11.

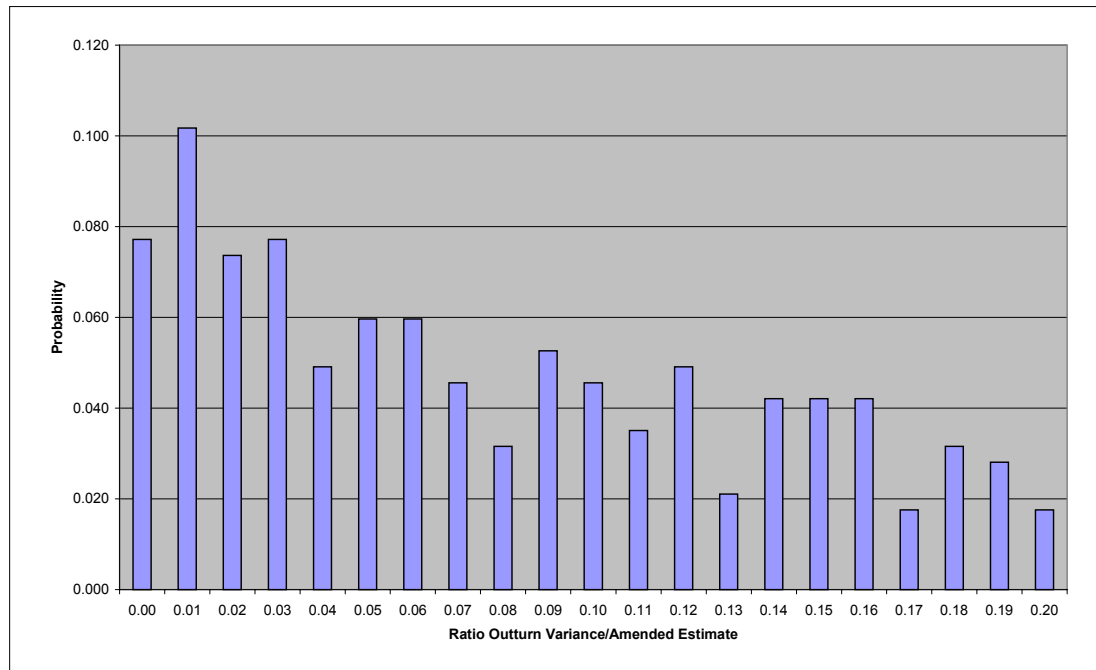


Figure 9-11 Probability histogram for the ration of Outturn Variance/Amended Estimate within the ratio range of 0-0.2, for the 1993-94 dataset.

Attribute	Value
No data pairs	285
Low Value	0
High Value	0.199
Mode Value	0.0
Mean Value	0.0727
Median Value	0.0611
Standard Deviation Value	0.0587

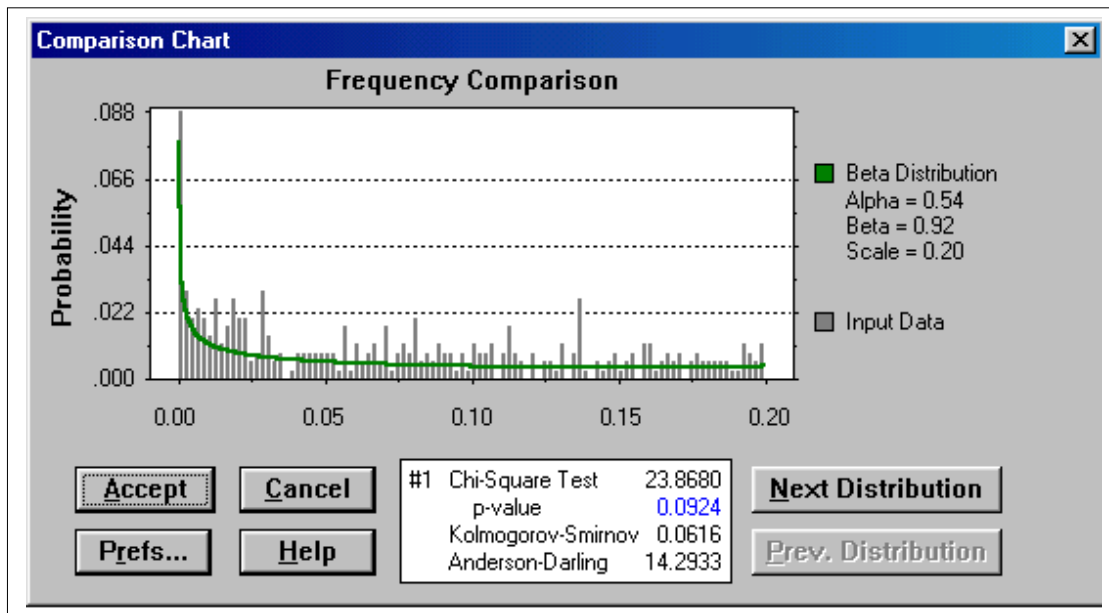
Table 9-39 Statistical attributes of frequency distribution of 'Outturn Variance' ratio for x-axis values of 0 to 0.2, 1993-94 dataset.

The distribution fit for the ten probability distributions tested for this range are shown in Table 9-40.

Distribution	Chi-square	Kolmogorov-Smirnov	Anderson-Darling
Triangular	111.26 ($\theta = 0.000$)	0.1053	17.8972
Weibull	146.68 ($\theta = 0.000$)	0.1101	15.5456
Normal	226.80 ($\theta = 0.000$)	0.1341	9.0566
Beta	23.87 ($\theta = 0.0924$)	0.0616	14.2933
Logistic	150.67 ($\theta = 0.000$)	0.1384	8.2374
Extreme Value	130.50 ($\theta = 0.000$)	0.1128	7.6552
Exponential	104.22 ($\theta = 0.000$)	0.0919	22.1381
Gamma	329.21 ($\theta = 0.000$)	0.2940	70.4148
Lognormal	179.88 ($\theta = 0.000$)	0.1343	29.8286
Uniform	152.67 ($\theta = 0.000$)	0.2195	46.7784

Table 9-40 Distribution fit for probability curves against 'Outturn Variance/Amended Estimate' in the range $x = 0$ to 0.2 in the 1993-94 data set

The fit to the distribution curves is not good but the Beta distribution is the closest fit in terms of the Chi-square test and the Kolmogorov-Smirnov test. The fit to this



distribution is shown in Figure 9-12.

Figure 9-12 Showing the fit of to a Beta distribution for x -range of 0 to 0.2 , 1993-94 data set.

This distribution is used in the stochastic analysis described in Section 9.4.

1994-95

This data is taken from the ‘Annual Report of the Director of Accounting Services and the Accounts for the year ended 31 March 1995’⁹. Reference is also made to the forecast of this spending programme taken from the ‘Estimates for the year ending 31 March 1995: Volume III – Fund Accounts, Memorandum Notes, and Payments and receipts’¹⁰.

The portfolio of Category A projects to be analyzed for this element of the research includes 1,131 mutually exclusive projects. The ‘Original Estimate’ of expenditure on these projects was HK\$ 21,228.934 million⁹. The ‘Amended Estimate’ expenditure on the same items was HK\$ 26,097.54 million but the audited expenditure was HK\$ 20,014.477 million⁹. The outcome was an under-expenditure of twenty-three percent of the funds approved for expenditure i.e., the ‘Amended Estimate’ less ‘Actual’ resulted in an ‘outturn variance’ of HK\$ 6,083.06 million.

This portfolio of projects is the entire PWP for 1994-1995 except for the exclusion of items listed in the Head of Expenditure ‘Land Acquisition (Head 701 PWP Items)’ and ‘Capital Subventions and Major Systems and Equipment (Head 708 PWP Items)’; and the ‘omnibus’ items defined in Section 2.9.1 of the Thesis. Table 9-41 states the statistical attributes of the data set used in this analysis.

Expenditure	No Project	Statistics (<i>Units are HK \$ 000's</i>)					
		Low	High	Mode	Mean	Median	S.D.
Original est		0	2,587,000	0	18,770	608	109,090
Amended est	1131	0	2,838,000	10	23,075	1,604	119,946
Actual		-4,634	2,763,068	0	17,696	290	113,586
Outturn		0	382,000	10	5,378	581	21,509

Table 9-41 Statistical attributes of the portfolio of projects taken from the 1994-1995 Public Works Programme of projects.

The composition of the portfolio in terms of numbers of projects and the value of the ‘Amended Estimate’ by ‘Heads of Expenditure’ is displayed in Table 9-42. Heads of Expenditure 703 ‘Buildings’ and 707 ‘New Towns and Public Housing’ predominate in terms of size and total value compared to the eleven percent or less of the portfolio contributed by each of the other Heads of Expenditure excepting 702 ‘Port and Airport Development’. In 1994-95 the scale of the new airport development maintains a large number of high value projects in Head 702 ‘Port and Airport Development’: it is still the dominant Head of Expenditure at forty-eight percent of the planned expenditure for this portfolio of projects. A new head of expenditure, ‘Housing’ has been introduced to include the housing –related infrastructure PWP projects.

Code	Head of Expenditure	By No. Projects		By 'Amended Estimate' Value	
		Nos	%	Value <i>HK\$000's</i>	%
702	Port & Airport Development	61	5%	12,606,924	48%
703	Buildings	251	22%	3,626,864	14%
704	Drainage	62	5%	759,173	3%
705	Civil Engineering	75	7%	2,292,395	9%
706	Highways	98	9%	1,931,016	7%
707	New Towns & Public Housing (exc HK Housing Authority)	491	43%	3,492,274	13%
709	Waterworks	92	8%	1,384,394	5%
711	Housing	1	<1%	4,500	<1%

Table 9-42 Composition of the 1994-95 data set in terms of 'Heads of Expenditure'.

The 1994-1995 PWP portfolio of one thousand one hundred and thirty-one projects to be analysed for this research contains sixty-nine number out of seventy-eight categories of works. This is taken to indicate a good degree of diversity (eighty-one per cent) of types of infrastructure projects contained within the portfolio.

The categories of public works that each comprise more than one percent in number of the portfolio are listed in Table 9-43. These projects comprise in total, eighty-nine percent by number and ninety-two percent by value of the data set to be analyzed.

Category of public works	ID	By Project No.		By Value (HK\$ 000's)	
		No	%	Amended Est Value	%
Civil engineering – land development	CL	202	18%	\$5,791,200	22%
Transport – roads	TH	143	13%	\$9,088,869	35%
Water supply - fresh water supplies	WF	76	7%	\$1,357,321	5%
Environmental engineering - sewerage and sewage treatment	DS	69	6%	\$846,220	3%
Education – secondary	ES	45	4%	\$221,584	1%
Environmental engineering - refuse disposal	DR	41	4%	\$1,560,639	6%
Education – primary	EP	41	4%	\$173,478	1%
Air and sea communications – airport	AA	37	3%	\$210,188	1%
Recreation, culture and amenities - open spaces	RO	34	3%	\$66,051	<1%
Law and order – police	LP	33	3%	\$322,134	1%
Health – hospitals	MH	27	2%	\$1,005,122	4%
Social welfare and community building - community centres and halls	SC	26	2%	\$162,769	1%
Water supply – combined fresh/salt water supply projects	WC	24	2%	\$698,420	3%
Government offices –intra-Governmental services	KA	23	2%	\$279,354	1%
Transport – footbridges and pedestrian tunnels	TB	23	2%	\$97,481	<1%
Public safety - fire services	BF	22	2%	\$111,530	<1%
Civil engineering – drainage and erosion protection	CD	22	2%	\$247,876	1%
Air and sea communications –port works	AP	16	1%	\$450,518	2%
Support – others	GK	16	1%	\$180,822	1%
Education – tertiary	ET	15	1%	\$103,345	<1%
Housing – rural housing improvement	HH	15	1%	\$125,332	<1%
Health – clinics	MC	14	1%	\$87,842	<1%
Recreation, culture and amenities - sports facilities	RS	14	1%	\$8,793	<1%
Water supply – salt water supplies	WS	12	1%	\$26,656	<1%
Support – intra-Governmental services	GI	11	1%	\$751,750	3%
Law and Order – correctional services	LC	11	1%	\$44,321	<1%
Sub-totals			89%	\$24,019,615	92%

Table 9-43 Categories of work that are greater than one percent of the 1994-95 PWP data set.

The dominant categories of work in the data set in terms of planned expenditure in the 1994-95 financial year:

- CL ‘Civil engineering – land development’, 22% by value but 18% by projects;
- TH ‘Transport – roads’, 35% by value but 13% by number of projects; and
- WF ‘Water supply – fresh water supplies’, 5% by value but 7% by number of projects.

Table 9-44 shows the statistical attributes of these sub-portfolios of projects. These indicate a reasonable amount of diversity in the dominant sub-portfolios of projects

with the mode and the median values indicating that the majority of the project values are at the low-value end of the range of values.

Cat of Work	No Projects	Statistical attributes in terms of 'Amended Estimate' (HK\$ 000's)					
		Low	High	Mode	Mean	Median	SD
CL	202	0	839,000	10	28,669	2,366	96,421
TH	143	10	2,838,000	10	63,559	1,732	291,590
WF	76	1	497,256	10	17,859	1,720	61,462

Table 9-44 Statistical attributes of the dominant sub-portfolios in the 1994-95 dataset.

Planned expenditure variable

The planned expenditure variable is 'Amended Estimate' in the data source. The statistical attributes of this variable within the data set for this analysis are stated in Table 9-41. These indicate that the values of 'Amended Estimate' expenditure within the data-set are predominantly at the low-value end of the range of values. Whereas, 'Table 9-45 Percentiles for 'Amended Estimate' variable in the 1994-95 data set', shows the distribution of the values of the variable 'Amended Estimate' of each project in the 1994-95 data set. Ninety-five percent of the number of projects contains twenty-eight percent of the total value of the planned expenditure on the projects.

Percentile (No Projects)	Thresh-hold Value of 'Amended Estimate of a project (HK \$ 000's)	Cum Value (HK \$ 000's)	Cum Value (%)
5%	10	1,068	0.004%
10%	10	1,068	0.004%
15%	42	2,219	0.009%
20%	100	6,389	0.024%
25%	178	13,418	0.051%
30%	321	27,843	0.11%
35%	520	55,373	0.21%
40%	780	86,854	0.33%
45%	1,142	140,363	0.54%
50%	1,604	219,118	0.84%
55%	2,367	329,783	1.26%
60%	3,120	498,502	1.91%
65%	4,564	699,808	2.68%
70%	6,240	1,024,373	3.93%
75%	8,870	1,413,155	5.42%
80%	12,480	2,051,442	7.86%
85%	20,592	2,893,386	11.09%
90%	33,280	4,401,204	16.86%
95%	86,320	7,375,830	28.26%

Table 9-45 Percentiles for 'Amended Estimate' variable in the 1994-95 data set

‘Outturn variance’ variable

The statistical attributes of this variable within the data set for this analysis are also stated in Table 9-41. These indicate that the values of ‘Outturn’ expenditure within the data-set are predominantly at the low-value end of the range of values. Whereas, ‘Table 9-46 Percentiles for ‘Outturn variance’ variable in the 1994-95 dataset.’, shows the distribution of the values of the variable ‘Outturn variance’ of the projects in the 1994-95 data set. Ninety-five percent of the number of projects contains thirty-three percent of the total value of the variance between planned and actual expenditure on the projects.

Percentile (No Projects)	Thresh-hold Value of ‘Outturn variance’ for a project (HK \$ 000’s)	Cum Value (HK \$ 000’s)	Cum Value (%)
5%	5	82	0.001%
10%	10	1,111	0.018%
15%	11	1,210	0.02%
20%	32	2,368	0.04%
25%	56	4,960	0.08%
30%	107	9,852	0.16%
35%	184	18,124	0.30%
40%	279	30,969	0.51%
45%	402	49,623	0.82%
50%	581	78,145	1.29%
55%	800	116,403	1.91%
60%	1,113	170,711	2.81%
65%	1,454	240,545	3.95%
70%	1,987	335,839	5.52%
75%	2,612	463,376	7.62%
80%	3,676	632,632	10.40%
85%	5,200	894,333	14.70%
90%	8,776	1,278,774	21.02%
95%	18,335	1,989,314	32.70%

Table 9-46 Percentiles for ‘Outturn variance’ variable in the 1994-95 dataset.

Probability curve fitting in the 1994-95 data set

For the purpose of this analysis, the probability curve of the values of the ‘ratio of outturn variance’ for a project is required within the range of zero to 0.2. The two-step curve-fitting approach is described in the Thesis at Section 2.9.2. In the first step, the curve-fitting range corresponds to values of percent ‘Outturn Variance’ from zero to two hundred percent. There are 16 instances out of 1131 data pairs where this threshold is exceeded. These are unrepresentative outliers and are not included in the frequency distribution shown in Figure 9-13. The statistical attributes of the data sets for this frequency distribution are listed in Table 9-47.

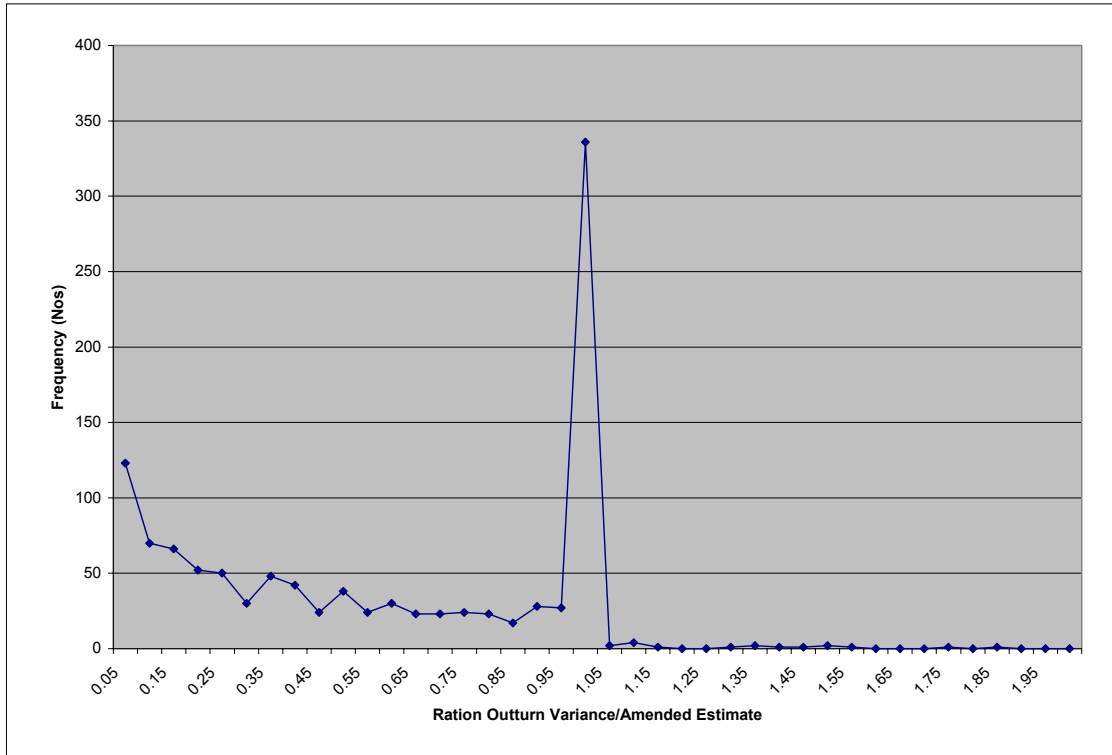


Figure 9-13 Frequency distribution of the ratio of 'Outturn Variance/Amended Estimate' for 1994-95 data set.

Attribute	Value
No data pairs	1115
Low Value	0.000
High Value	1.820
Mode Value	1.000
Mean Value	0.556
Median Value	0.528
Standard Deviation Value	0.390

Table 9-47 Statistical attributes of frequency distribution of 'Outturn Variance' ratio, 1994-95 dataset

Using the distribution fitting methods within the Crystal Ball software, ten standard probability distributions are fitted to the data array of 'Outturn variance/Amended Estimate' with the statistical attributes stated in Table 9-47. The distribution fit for the probability distributions tested are shown in Table 9-48.

Distribution	Chi-square	Kolmogorov-Smirnov	Anderson-Darling
Triangular	3091.92 ($\theta = 0.000$)	0.2010	48.0235
Weibull	3258.31 ($\theta = 0.000$)	0.1708	78.9501
Normal	3147.98 ($\theta = 0.000$)	0.1617	52.5760
Beta	3101.39 ($\theta = 0.000$)	0.1438	51.7453
Logistic	2965.25 ($\theta = 0.000$)	0.1442	47.3086
Extreme Value	2713.80 ($\theta = 0.000$)	0.1600	48.1910
Exponential	2982.89 ($\theta = 0.000$)	0.1504	52.4977
Gamma	2521.90 ($\theta = 0.000$)	0.1789	101.5926
Lognormal	3812.90 ($\theta = 0.000$)	0.1981	69.1757
Uniform	2923.64 ($\theta = 0.000$)	0.4354	281.5766

Table 9-48 Distribution fit for probability curves against 'Outturn Variance/Amended Estimate' in 1994-95 data set

A good fit is not achieved with any of these ten probability distributions. The step-two curve fitting, within the x-axis range of zero to 0.2 therefore applies as described in Section 2.9.2 of the methodology. The analysis required for the purpose of this research will involve Monte Carlo analysis using a probability distribution constrained within x-axis ranges of zero to 0.2. If we constrain distribution fitting to the data pairs within the range of zero to 0.2 then the statistical attributes of the data pairs are as shown in Table 9-49 and the probability histogram for this range is shown in Figure 9-14.

Attribute	Value
No data pairs	311
Low Value	0
High Value	0.200
Mode Value	0.0
Mean Value	0.0795
Median Value	0.0705
Standard Deviation Value	0.0605

Table 9-49 Statistical attributes of frequency distribution of 'Outturn Variance' ratio for x-axis values of 0 to 0.2, 1994-95 dataset.

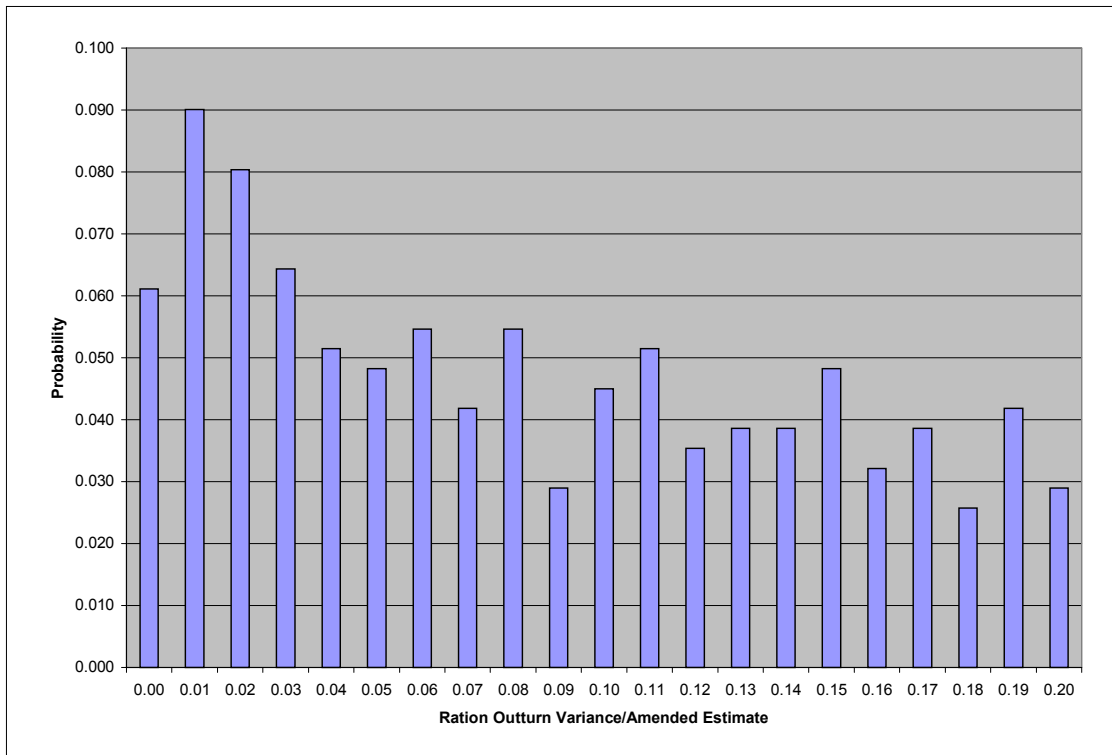


Figure 9-14 Probability histogram for the ration of Outturn Variance/Amended Estimate within the ratio range of 0-0.2, for the 1994-95 dataset.

The distribution fit for the ten probability distributions tested for this range are shown in Table 9-50.

Distribution	Chi-square	Kolmogorov-Smirnov	Anderson-Darling
Triangular	77.61 ($\theta = 0.000$)	0.1219	14.8711
Weibull	110.36 ($\theta = 0.000$)	0.1077	12.6529
Normal	94.23 ($\theta = 0.000$)	0.1004	6.2174
Beta	15.18 ($\theta = 0.4388$)	0.0611	13.3640
Logistic	178.91 ($\theta = 0.000$)	0.1151	5.9323
Extreme Value	140.30 ($\theta = 0.000$)	0.0868	5.6177
Exponential	79.68 ($\theta = 0.000$)	0.1052	20.2681
Gamma	339.34 ($\theta = 0.000$)	0.3127	71.2203
Lognormal	176.10 ($\theta = 0.000$)	0.1484	28.3921
Uniform	74.68 ($\theta = 0.000$)	0.1549	25.8708

Table 9-50 Distribution fit for probability curves against 'Outturn Variance/Amended Estimate' in the range $x = 0$ to 0.2 in the 1993-94 data set

The fit to the distribution curves is not good but the Beta distribution is the closest fit in terms of the Chi-square test and the Kolmogorov-Smirnov test. The fit to this distribution is shown in Figure 9-15.

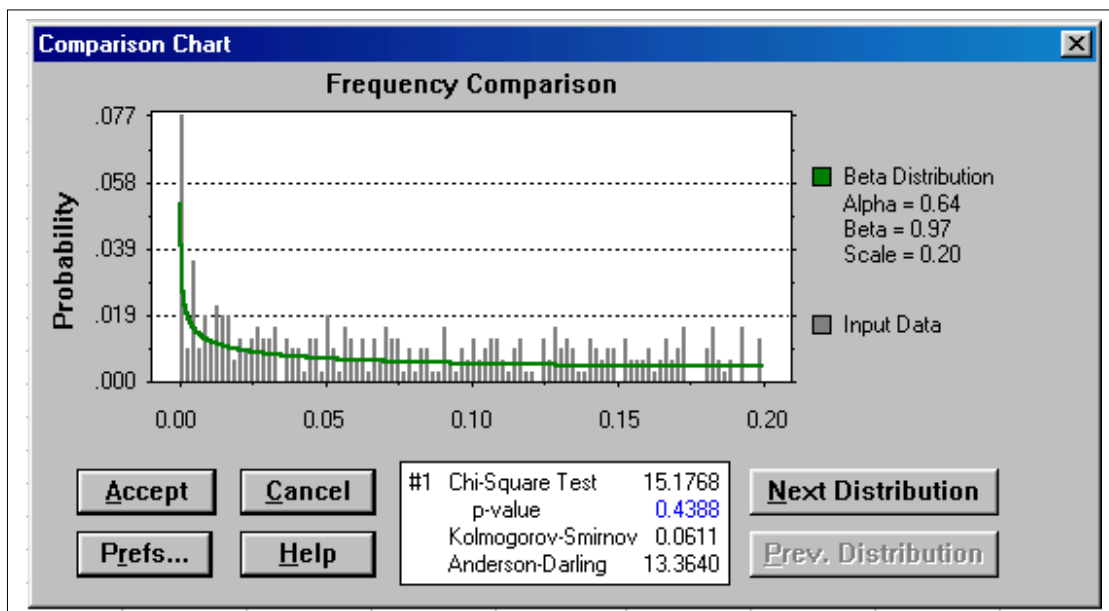


Figure 9-15 Showing the fit of to a Beta distribution for x-range of 0 to 0.2, 1994-95 data set.

This distribution is used in the stochastic analysis described in Section 9.4.

1995-96

This data is taken from the ‘Annual Report of the Director of Accounting Services and the Accounts for the year ended 31 March 1996’¹¹. Reference is also made to the forecast of this spending programme taken from the ‘Estimates for the year ending 31 March 1996: Volume III – Fund Accounts, Memorandum Notes, and Payments and receipts’¹².

The portfolio of Category A projects to be analyzed for this element of the research includes 1,086 mutually exclusive projects. The ‘Original Estimate’ of expenditure on these projects was HK\$ 23,057.893 million¹¹. The ‘Amended Estimate’ expenditure on the same items was HK\$ 31,312.13 million but the audited expenditure was HK\$ 22,850.412 million¹¹. The outcome was an under-expenditure of twenty-seven percent of the funds approved for expenditure i.e., the ‘Amended Estimate’ less ‘Actual’ resulted in an ‘outturn variance’ of HK\$ 8,461.716 million.

This portfolio of projects is the entire PWP for 1995-1996 except for the exclusion of items listed in the Head of Expenditure ‘Land Acquisition (Head 701 PWP Items)’

and 'Capital Subventions and Major Systems and Equipment (Head 708 PWP Items)'; and the 'omnibus' items defined in Section 2.9.1 of the Thesis. Table 9-51 states the statistical attributes of the data set used in this analysis.

Expenditure	No Project	Statistics (<i>Units are HK \$ 000's</i>)					
		Low	High	Mode	Mean	Median	S.D.
Original est		0	1,930,000	0	21,232	1,000	98,506
Amended est	1086	0	1,943,000	10	28,833	2,200	117,721
Actual		-1,974	1,935,741	0	21,041	533	100,845
Outturn		-3	975,626	10	7,792	714	42,722

Table 9-51 Statistical attributes of the portfolio of projects taken from the 1995-1996 Public Works Programme of projects.

The composition of the portfolio in terms of numbers of projects and the value of the 'Amended Estimate' by 'Heads of Expenditure' is displayed in Table 9-51. Heads of Expenditure 702 'Port and Airport Development', 703 'Buildings' and 707 'New Towns and Public Housing' predominate in terms of size and total value compared to the eleven percent or less of the portfolio contributed by each of the other Heads of Expenditure. In 1995-96, the new airport development remains the highest value sub-portfolio of projects: it is still the dominant Head of Expenditure, at forty-two percent of the planned expenditure for this portfolio of projects.

Code	Head of Expenditure	By No. Projects		By 'Amended Estimate' Value	
		Nos	%	Value <i>HK\$000's</i>	%
702	Port & Airport Development	64	6%	13,291,203	42%
703	Buildings	378	35%	7,104,931	23%
704	Drainage	74	7%	924,823	3%
705	Civil Engineering	76	7%	1,887,935	6%
706	Highways	101	9%	2,445,970	8%
707	New Towns & Public Housing (exc HK Housing Authority)	294	27%	3,955,323	13%
709	Waterworks	88	8%	1,516,606	5%
711	Housing	11	1%	185,337	1%

Table 9-52 Composition of the 1995-96 data set in terms of 'Heads of Expenditure'.

The 1995-1996 PWP portfolio of one thousand and eighty-six projects to be analysed for this research contains sixty-one number out of seventy-eight categories of works. This is taken to indicate a good degree of diversity (seventy-eight per cent) of types of infrastructure projects contained within the portfolio.

The thirty-two categories of public works that each comprise more than one percent in number of the portfolio are listed in Table 9-53. These projects comprise in total, ninety-three percent by number and ninety-eight percent by value of the data set to be analyzed.

Category of public works	ID	By Project No.		By Value (HK\$ 000's)	
		No	%	Amended Est Value	%
Civil engineering – land development	CL	194	18%	\$6,073,879	19%
Transport – roads	TH	137	13%	\$8,756,403	28%
Environmental engineering - sewerage and sewage treatment	DS	80	7%	\$906,933	3%
Water supply – fresh water supplies	WF	77	7%	\$1,490,282	5%
Education – secondary	ES	45	4%	\$286,962	1%
Environmental engineering - refuse disposal	DR	44	4%	\$1,115,249	4%
Education – primary	EP	34	3%	\$173,478	1%
Law and order – police	LP	28	3%	\$280,068	1%
Health – hospitals	MH	27	2%	\$774,987	2%
Air and sea communications – airport	AA	26	2%	\$66,253	<1%
Water supply – combined fresh/salt water supply projects	WC	26	2%	\$969,955	3%
Civil engineering – drainage and erosion protection	CD	25	2%	\$355,535	1%
Recreation, culture and amenities - open spaces	RO	25	2%	\$67,976	<1%
Transport – footbridges and pedestrian tunnels	TB	23	2%	\$187,966	1%
Social welfare and community building - community centres and halls	SC	22	2%	\$1,505,778	5%
Public safety - fire services	BF	20	2%	\$148,107	<1%
Government offices –intra-Governmental services	KA	20	2%	\$1,555,470	5%
Education – tertiary	ET	15	1%	\$77,038	<1%
Support – others	GK	15	1%	\$882,205	3%
Housing – rural housing improvement	HH	14	1%	\$191,350	1%
Law and Order – correctional services	LC	14	1%	\$74,411	<1%
Health – clinics	MC	14	1%	\$109,719	<1%
Air and sea communications –port works	AP	13	1%	\$1,577,749	5%
Water supply – salt water supplies	WS	12	1%	\$70,759	<1%
Support – intra-Governmental services	GI	11	1%	\$1,816,915	6%
Recreation, culture and amenities - sports facilities	RS	11	1%	\$29,510	<1%
Quarters – intra-Governmental services	JB	9	1%	\$200,988	1%
Transport – traffic control	TC	8	1%	\$103,124	<1%
Food supply – abattoirs, wholesale markets etc	FS	7	1%	\$27,168	<1%
Recreation, culture and amenities - cultural facilities	RE	7	1%	\$39,890	<1%
Air and Sea Communications – support	AG	6	1%	\$245,600	1%
Environmental engineering – pollution control	DP	6	1%	\$271,442	1%
Sub-totals			93%	\$30,560,597	98%

Table 9-53 Categories of work that are greater than one percent of the 1995-96 PWP data set.

The dominant categories of work in the data set in terms of planned expenditure in the 1995-96 financial year:

- CL ‘Civil engineering – land development’, 19% by value but 18% by projects;
- TH ‘Transport – roads’, 28% by value but 13% by number of projects; and
- WF ‘Water supply – fresh water supplies’, 5% by value but 7% by number of projects.

Table 9-54 shows the statistical attributes of these sub-portfolios of projects. These indicate a reasonable amount of diversity in the dominant sub-portfolios of projects with the mode and the median values indicating that the majority of the project values are at the low-value end of the range of values.

Cat of Work	No Projects	Statistical attributes in terms of ‘Amended Estimate’ (HK\$ 000’s)					
		Low	High	Mode	Mean	Median	SD
CL	194	10	570,000	500	31,309	2,889	84,956
TH	137	8	1,943,000	20	63,915	3,475	240,083
WF	77	1	488,593	550	19,354	4,400	62,466

Table 9-54 Statistical attributes of the dominant sub-portfolios in the 1995-96 dataset

Planned expenditure variable

The planned expenditure variable is ‘Amended Estimate’ in the data source. The statistical attributes of this variable within the data set for this analysis are stated in Table 9-51. These indicate that the values of ‘Amended Estimate’ expenditure within the data-set are predominantly at the low-value end of the range of values. Whereas, ‘Table 9-55 Percentiles for ‘Amended Estimate’ variable in the 1995-96 data set’, shows the distribution of the values of the variable ‘Amended Estimate’ of each project in the 1995-96 data set. Ninety-five percent of the number of projects contains twenty-nine percent of the total value of the planned expenditure on the projects.

Percentile (No Projects)	Thresh-hold Value of 'Amended Estimate of a project (HK \$ 000's)	Cum Value (HK \$ 000's)	Cum Value (%)
5%	10	896	0.003%
10%	10	896	0.004%
15%	60	2,565	0.008%
20%	170	8,361	0.027%
25%	302	21,214	0.068%
30%	500	48,703	0.16%
35%	800	77,561	0.25%
40%	1,102	130,472	0.42%
45%	1,653	204,721	0.65%
50%	2,200	312,964	1.00%
55%	3,065	456,490	1.46%
60%	4,530	669,353	2.14%
65%	6,142	956,795	3.06%
70%	8,800	1,373,749	4.39%
75%	12,098	1,914,973	6.12%
80%	16,500	2,708,741	8.65%
85%	25,000	3,812,610	12.18%
90%	40,965	5,523,678	17.64%
95%	108,857	9,100,561	29.06%

Table 9-55 Percentiles for 'Amended Estimate' variable in the 1995-96 data set

'Outturn variance' variable

The statistical attributes of this variable within the data set for this analysis are also stated in Table 9-51. These indicate that the values of 'Outturn' expenditure within the data-set are predominantly at the low-value end of the range of values. Whereas, 'Table 9-56 Percentiles for 'Outturn variance' variable in the 1995-96 dataset.', shows the distribution of the values of the variable 'Outturn variance' of the projects in the 1995-96 data set. Ninety-five percent of the number of projects contains thirty percent of the total value of the variance between planned and actual expenditure on the projects.

Percentile (No Projects)	Thresh-hold Value of ‘Outturn variance’ for a project (HK \$ 000’s)	Cum Value (HK \$ 000’s)	Cum Value (%)
5%	5	115	0.001%
10%	10	926	0.011%
15%	19	1,208	0.014%
20%	50	3,140	0.04%
25%	99	6,805	0.08%
30%	172	13,829	0.16%
35%	259	25,299	0.30%
40%	388	42,663	0.50%
45%	531	69,350	0.82%
50%	714	101,418	1.20%
55%	992	147,557	1.74%
60%	1,296	210,055	2.48%
65%	1,868	293,580	3.47%
70%	2,438	408,805	4.83%
75%	3,500	562,956	6.65%
80%	4,784	792,114	9.36%
85%	7,549	1,107,032	13.08%
90%	12,268	1,622,496	19.18%
95%	25,015	2,573,118	32.70%

Table 9-56 Percentiles for 'Outturn variance' variable in the 1995-96 dataset.

Probability curve fitting in the 1995-96 data set

For the purpose of this analysis, the probability curve of the values of the ‘ratio of outturn variance’ for a project is required within the range of zero to 0.2. The two-step curve-fitting approach is described in the Thesis at Section 2.9.2. In the first step, the curve-fitting range corresponds to values of percent ‘Outturn Variance’ from zero to two hundred percent. There are 10 instances out of 1086 data pairs where this threshold is exceeded. These are unrepresentative outliers and are not included in the frequency distribution shown in Figure 9-16. The statistical attributes of the data sets for this frequency distribution are listed in Table 9-57.

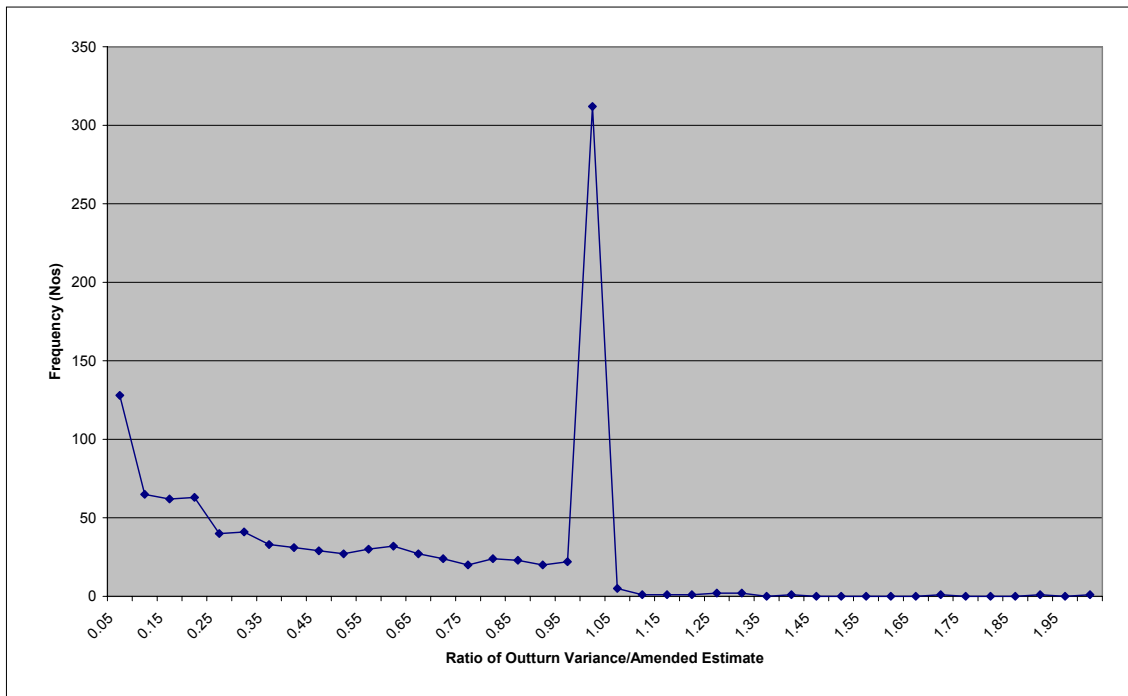


Figure 9-16 Frequency distribution of the ratio of 'Outturn Variance/Amended Estimate' for 1995-96 data set.

Attribute	Value
No data pairs	1069
Low Value	-0.030
	1.9545
Mode Value	1.000
Mean Value	0.5448
Median Value	0.5189
Standard Deviation Value	0.3915

Table 9-57 Statistical attributes of frequency distribution of 'Outturn Variance' ratio, 1995-96 dataset

Using the distribution fitting methods within the Crystal Ball[®] software, ten standard probability distributions are fitted to the data array of 'Outturn variance/Amended Estimate' with the statistical attributes stated in Table 9-57. The distribution fit for the probability distributions tested are shown in Table 9-58.

Distribution	Chi-square	Kolmogorov-Smirnov	Anderson-Darling
Triangular	2771.64 ($\theta = 0.000$)	0.2372	64.2060
Weibull	3019.55 ($\theta = 0.000$)	0.1618	73.2849
Normal	2447.69 ($\theta = 0.000$)	0.1606	50.3578
Beta	2514.50 ($\theta = 0.000$)	0.1407	49.1160
Logistic	3052.27 ($\theta = 0.000$)	0.1435	45.1872
Extreme Value	2871.06 ($\theta = 0.000$)	0.1527	46.2754
Exponential	2853.98 ($\theta = 0.000$)	0.1452	45.3081
Gamma	2675.10 ($\theta = 0.000$)	0.1584	69.8088
Lognormal	2830.13 ($\theta = 0.000$)	0.1902	60.3794
Uniform	3120.52 ($\theta = 0.000$)	0.4734	337.8540

Table 9-58 Distribution fit for probability curves against 'Outturn Variance/Amended Estimate' in 1995-96 data set

A good fit is not achieved with any of these ten probability distributions. The step-two curve fitting, within the x-axis range of zero to 0.2 therefore applies as described in Section 2.9.2 of the methodology. The analysis required for the purpose of this research will involve Monte Carlo analysis using a probability distribution constrained within x-axis ranges of zero to 0.2. If we constrain distribution fitting to the data pairs within the range of zero to 0.2 then the statistical attributes of the data pairs are as shown in Table 9-59 and the probability histogram for this range is shown in Figure 9-14.

Attribute	Value
No data pairs	317
Low Value	0
High Value	0.200
Mode Value	0.0
Mean Value	0.0832
Median Value	0.0780
Standard Deviation Value	0.0615

Table 9-59 Statistical attributes of frequency distribution of 'Outturn Variance' ratio for x-axis values of 0 to 0.2, 1995-96 dataset.

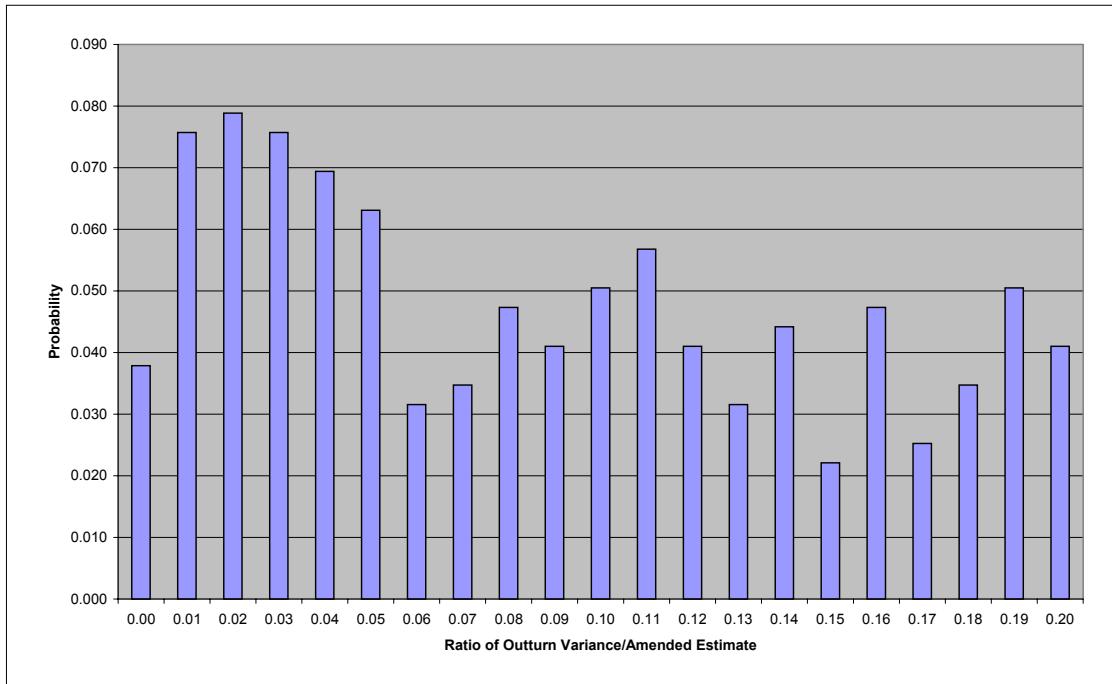


Figure 9-17 Probability histogram for the ration of Outturn Variance/Amended Estimate within the ratio range of 0-0.2, for the 1995-96 dataset.

The distribution fit for the ten probability distributions tested for this range are shown in Table 9-60.

Distribution	Chi-square	Kolmogorov-Smirnov	Anderson-Darling
Triangular	90.63 ($\theta = 0.000$)	0.1907	15.9758
Weibull	119.66 ($\theta = 0.000$)	0.0879	8.8863
Normal	90.00 ($\theta = 0.000$)	0.1111	6.1261
Beta	14.29 ($\theta = 0.5769$)	0.0379	5.2441
Logistic	162.05 ($\theta = 0.000$)	0.1083	5.8097
Extreme Value	152.34 ($\theta = 0.000$)	0.0759	5.1957
Exponential	85.21 ($\theta = 0.000$)	0.1087	11.1780
Gamma	240.92 ($\theta = 0.000$)	0.2660	49.0689
Lognormal	155.24 ($\theta = 0.000$)	0.1432	17.4285
Uniform	55.43 ($\theta = 0.000$)	0.1553	17.2398

Table 9-60 Distribution fit for probability curves against 'Outturn Variance/Amended Estimate' in the range $x = 0$ to 0.2 in the 1995-96 data set

The fit to the distribution curves is not good but the Beta distribution is the closest fit in terms of the Chi-square test and the Kolmogorov-Smirnov test. The fit to this distribution is shown in Figure 9-18.

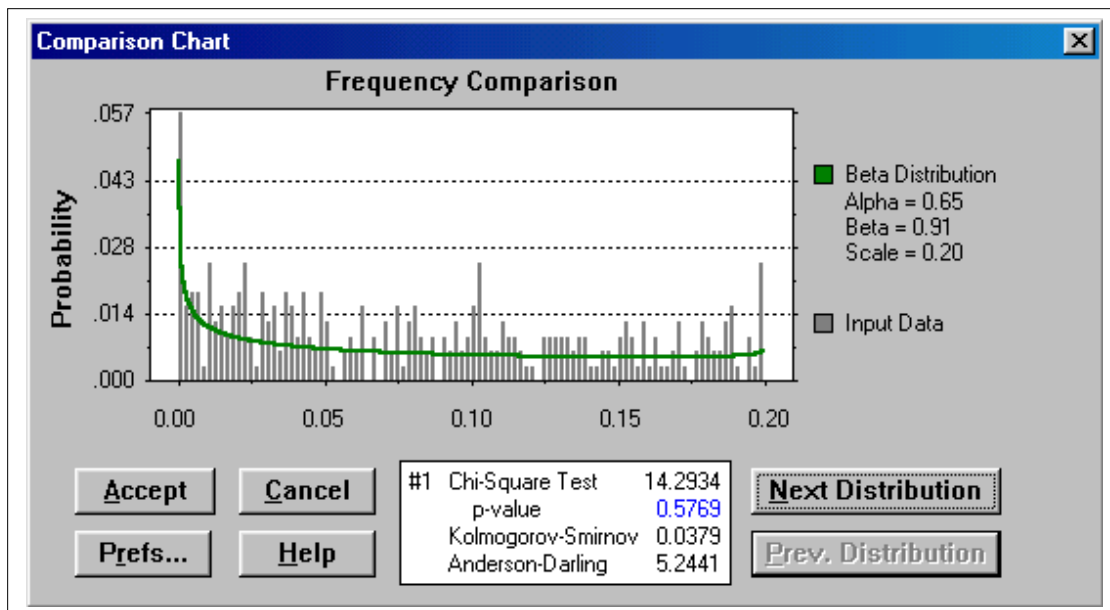


Figure 9-18 Showing the fit of to a Beta distribution for x-range of 0 to 0.2, 1995-96 data set.

This distribution is used in the stochastic analysis described in Section 9.4.

1996-97

This data is taken from the ‘Annual Report of the Director of Accounting Services and the Accounts for the year ended 31 March 1997’¹³. Reference is also made to the forecast of this spending programme taken from the ‘Estimates for the year ending 31 March 1997: Volume III – Fund Accounts, Memorandum Notes, and Payments and receipts’¹⁴.

The portfolio of Category A projects to be analyzed for this element of the research includes 1,096 mutually exclusive projects. The ‘Original Estimate’ of expenditure on these projects was HK\$ 24,016.769 million¹³. The ‘Amended Estimate’ expenditure on the same items was HK\$ 28,509.688 million but the audited expenditure was HK\$ 20,968.067 million¹³. The outcome was an under-expenditure of twenty-six percent of the funds approved for expenditure i.e., the ‘Amended Estimate’ less ‘Actual’ resulted in an ‘outturn variance’ of HK\$ 7,541.621 million.

This portfolio of projects is the entire PWP for 1996-1997 except for the exclusion of items listed in the Head of Expenditure ‘Land Acquisition (Head 701 PWP Items)’ and ‘Capital Subventions and Major Systems and Equipment (Head 708 PWP Items)’; and the ‘omnibus’ items defined in Section 2.9.1 of the Thesis. Table 9-61 states the statistical attributes of the data set used in this analysis.

Expenditure	No Project	Statistics (Units are HK \$ 000's)					
		Low	High	Mode	Mean	Median	S.D.
Original est		0	1,625,250	0	21,913	1,000	97,332
Amended est	1096	0	1,777,380	10	26,012	1,929	109,729
Actual		-507	1,535,359	0	19,131	498	84,661
Outturn		0	1,360,618	10	6,881	582	46,950

Table 9-61 Statistical attributes of the portfolio of projects taken from the 1996-1997 Public Works Programme of projects.

The composition of the portfolio in terms of numbers of projects and the value of the 'Amended Estimate' by 'Heads of Expenditure' is displayed in Table 9-62. Heads of Expenditure 702 'Port and Airport Development', 703 'Buildings' and 707 'New Towns and Public Housing' predominate in terms of size and total value compared to the nine percent or less of the portfolio contributed by each of the other Heads of Expenditure. In 1996-97, the new airport development remains the highest value sub-portfolio of projects: it is still the dominant Head of Expenditure at thirty-six percent of the planned expenditure for this portfolio of projects, although this dominance is decreasing from the forty-two percent of the previous year.

Code	Head of Expenditure	By No. Projects		By 'Amended Estimate' Value	
		Nos	%	Value <i>HK\$000's</i>	%
702	Port & Airport Development	62	6%	10,160,431	36%
703	Buildings	402	37%	8,529,964	30%
704	Drainage	78	7%	1,097,945	4%
705	Civil Engineering	65	6%	1,567,567	5%
706	Highways	92	8%	2,455,503	9%
707	New Towns & Public Housing (exc HK Housing Authority)	304	28%	3,262,587	11%
709	Waterworks	84	8%	1,188,068	4%
711	Housing	9	1%	247,623	1%

Table 9-62 Composition of the 1996-97 data set in terms of 'Heads of Expenditure'.

The 1996-1997 PWP portfolio of one thousand and ninety-six projects to be analysed for this research contains fifty-three number out of seventy-eight catagories of works. This is taken to indicate a good degree of diversity (sixty-eight per cent) of types of infrastructure projects contained within the portfolio.

The twenty-three categories of public works that each comprise more than one percent in number of the portfolio are listed in Table 9-63. These projects comprise in total, ninety-five percent by number and ninety-five percent by value of the data set to be analyzed.

Category of public works	ID	By Project No.		By Value (HK\$ 000's)	
		No	%	Amended Est Value	%
Civil engineering – land development	CL	195	18%	\$4,520,676	16%
Transport – roads	TH	133	12%	\$6,602,992	23%
Environmental engineering – sewerage and sewage treatment	DS	77	7%	\$963,420	3%
Water supply – fresh water supplies	WF	72	7%	\$1,199,210	4%
Education – secondary	ES	62	6%	\$411,973	1%
Education – primary	EP	56	5%	\$380,794	1%
Environmental engineering - refuse disposal	DR	39	4%	\$716,712	3%
Recreation, culture and amenities – open spaces	RO	36	3%	\$35,884	<1%
Civil engineering – drainage and erosion protection	CD	30	3%	\$575,809	2%
Health – hospitals	MH	27	2%	\$820,420	3%
Water supply – combined fresh/salt water supply projects	WC	26	2%	\$662,251	2%
Government offices –intra-Governmental services	KA	24	2%	\$868,582	3%
Education – tertiary	ET	23	2%	\$217,688	1%
Transport – footbridges and pedestrian tunnels	TB	22	2%	\$267,598	1%
Law and order – police	LP	22	2%	\$118,738	<1%
Social welfare and community building - community centres and halls	SC	21	2%	\$1,803,299	6%
Air and sea communications – airport	AA	20	2%	\$26,111	<1%
Housing – rural housing improvement	HH	19	2%	\$261,820	1%
Support – others	GK	16	1%	\$1,879,358	7%
Air and sea communications –port works	AP	15	1%	\$1,101,513	4%
Health – clinics	MC	12	1%	\$139,101	<1%
Water supply – salt water supplies	WS	12	1%	\$101,639	<1%
Law and Order – correctional services	LC	11	1%	\$141,063	<1%
Support – intra-Governmental services	GI	10	1%	\$1,995,870	7%
Recreation, culture and amenities – sports facilities	RS	10	1%	\$73,166	<1%
Public safety - fire services	BF	10	1%	\$59,083	<1%
Recreation, culture and amenities – cultural facilities	RE	8	1%	\$201,341	1%
Transport – traffic control	TC	7	1%	\$140,043	<1%
Civil Engineering – multi-purpose	CG	7	1%	\$21,743	<1%
Quarters – intra-Governmental services	JB	7	1%	\$20,390	<1%
Quarters – internal security	JA	6	1%	\$675,905	2%
Government offices - others	KO	6	1%	\$161,172	1%
Environmental engineering – pollution control	DP	6	1%	\$271,442	1%
Sub-totals			95%	\$27,165,364	95%

Table 9-63 Categories of work that are greater than one percent of the 1996-97 PWP data set.

The dominant categories of work in the data set in terms of planned expenditure in the 1996-97 financial year:

- CL ‘Civil engineering – land development’, 16% by value but 18% by projects;
- TH ‘Transport – roads’, 23% by value but 12% by number of projects; and
- WF ‘Water supply – fresh water supplies’, 3% by value but 7% by number of projects.

Table 9-64 shows the statistical attributes of these sub-portfolios of projects. These indicate a reasonable amount of diversity in the dominant sub-portfolios of projects with the mode and the median values indicating that the majority of the project values are at the low-value end of the range of values.

Cat of Work	No Projects	Statistical attributes in terms of ‘Amended Estimate’ (HK\$ 000’s)					
		Low	High	Mode	Mean	Median	SD
CL	195	5	653,000	10	23,183	2,143	68,659
TH	133	10	1,334,000	100	49,647	3,600	167,084
WF	72	1	268,736	1	16,656	4,225	37,750

Table 9-64 Statistical attributes of the dominant sub-portfolios in the 1996-97 dataset

Planned expenditure variable

The planned expenditure variable is ‘Amended Estimate’ in the data source. The statistical attributes of this variable within the data set for this analysis are stated in Table 9-61. These indicate that the values of ‘Amended Estimate’ expenditure within the data-set are predominantly at the low-value end of the range of values. Whereas, ‘Table 9-65 Percentiles for ‘Amended Estimate’ variable in the 1996-97 data set’, shows the distribution of the values of the variable ‘Amended Estimate’ of each project in the 1996-97 data set. Ninety-five percent of the number of projects contains thirty-three percent of the total value of the planned expenditure on the projects.

Percentile (No Projects)	Thresh-hold Value of ‘Amended Estimate of a project (HK \$ 000’s)	Cum Value (HK \$ 000’s)	Cum Value (%)
5%	10	830	0.003%
10%	20	1,228	0.004%
15%	71	3,236	0.011%
20%	110	8,944	0.031%
25%	218	17,360	0.061%
30%	400	34,842	0.122%
35%	614	61,994	0.217%
40%	1,000	119,763	0.42%
45%	1,298	165,445	0.58%
50%	1,929	252,112	0.88%
55%	2,655	373,760	1.31%
60%	3,700	546,188	1.92%
65%	5,440	801,576	2.81%
70%	8,183	1,158,231	4.06%
75%	12,557	1,708,015	5.99%
80%	18,400	2,573,764	9.03%
85%	27,058	3,753,424	13.17%
90%	45,000	5,749,104	20.17%
95%	102,180	9,435,524	33.10%

Table 9-65 Percentiles for ‘Amended Estimate’ variable in the 1996-97 data set

‘Outturn variance’ variable

The statistical attributes of this variable within the data set for this analysis are also stated in Table 9-61. These indicate that the values of ‘Outturn’ expenditure within the data-set are predominantly at the low-value end of the range of values. Whereas, ‘Table 9-66 Percentiles for ‘Outturn variance’ variable in the 1996-97 dataset.’, shows the distribution of the values of the variable ‘Outturn variance’ of the projects in the 1996-97 data set. Ninety-five percent of the number of projects contains thirty-one percent of the total value of the variance between planned and actual expenditure on the projects.

Percentile (No Projects)	Thresh-hold Value of ‘Outturn variance’ for a project (HK \$ 000’s)	Cum Value (HK \$ 000’s)	Cum Value (%)
5%	6	86	0.001%
10%	10	908	0.012%
15%	18	1,294	0.017%
20%	39	2,830	0.04%
25%	82	5,856	0.08%
30%	117	11,441	0.15%
35%	195	19,498	0.30%
40%	305	32,981	0.44%
45%	458	53,093	0.7%
50%	582	81,437	1.1%
55%	858	120,218	1.6%
60%	1,219	176,444	2.3%
65%	1,614	252,971	3.3%
70%	2,304	361,262	4.8%
75%	3,132	508,925	6.7%
80%	4,454	718,795	9.5%
85%	6,960	1,023,846	13.6%
90%	10,471	1,495,366	19.8%
95%	21,358	2,317,728	30.7%

Table 9-66 Percentiles for 'Outturn variance' variable in the 1996-97 dataset.

Probability curve fitting in the 1996-97 data set

For the purpose of this analysis, the probability curve of the values of the ‘ratio of outturn variance’ for a project is required within the range of zero to 0.2. The two-step curve-fitting approach is described in the Thesis at Section 2.9.2. In the first step, the curve-fitting range corresponds to values of percent ‘Outturn Variance’ from zero to two hundred percent. There are 4 instances out of 1096 data pairs where this threshold is exceeded. These are unrepresentative outliers and are not included in the frequency distribution shown in Figure 9-19. The statistical attributes of the data sets for this frequency distribution are listed in Table 9-67.

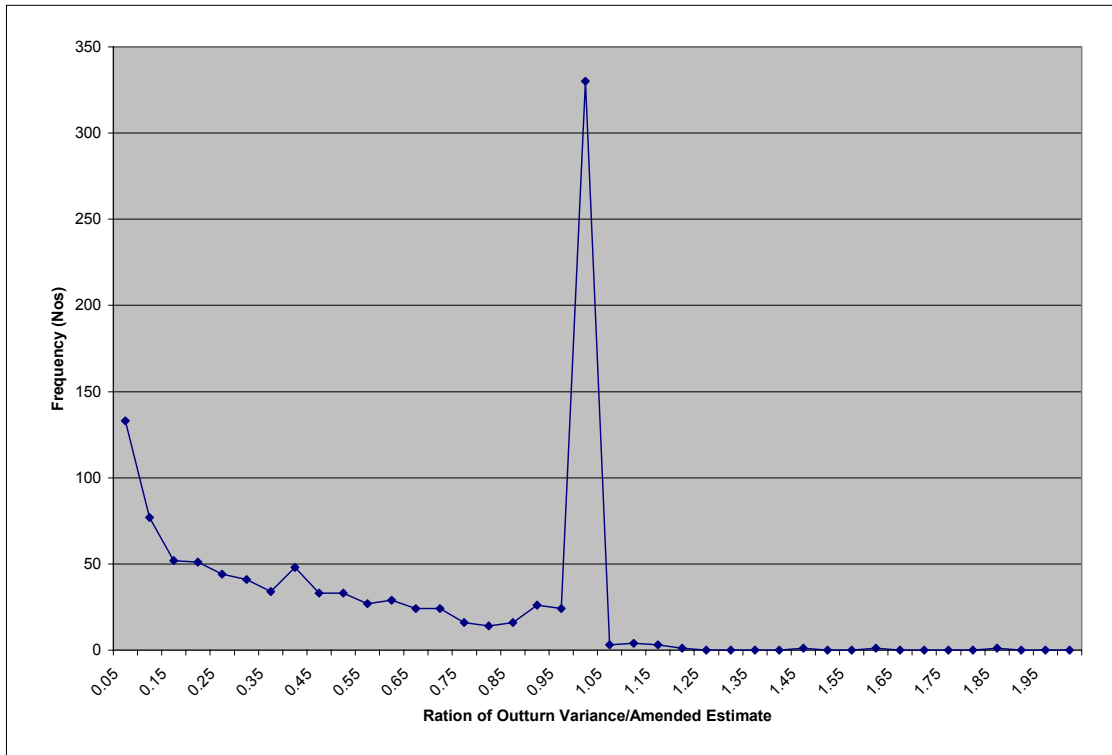


Figure 9-19 Frequency distribution of the ratio of 'Outturn Variance/Amended Estimate' for 1996-97 data set.

Attribute	Value
No data pairs	1090
Low Value	0.0000
High Value	1.8500
Mode Value	1.0000
Mean Value	0.5434
Median Value	0.5000
Standard Deviation Value	0.3897

Table 9-67 Statistical attributes of frequency distribution of 'Outturn Variance' ratio, 1996-97 dataset

Using the distribution fitting methods within the Crystal Ball software, ten standard probability distributions are fitted to the data array of 'Outturn variance/Amended Estimate' with the statistical attributes stated in Table 9-67. The distribution fit for the probability distributions tested are shown in Table 9-68.

Distribution	Chi-square	Kolmogorov-Smirnov	Anderson-Darling
Triangular	3000.07 ($\theta = 0.000$)	0.2117	57.9767
Weibull	3292.47 ($\theta = 0.000$)	0.1731	81.7561
Normal	2741.37 ($\theta = 0.000$)	0.1731	54.9478
Beta	2722.73 ($\theta = 0.000$)	0.1499	53.5727
Logistic	3345.61 ($\theta = 0.000$)	0.1537	48.4504
Extreme Value	3105.99 ($\theta = 0.000$)	0.1626	48.6350
Exponential	3117.85 ($\theta = 0.000$)	0.1543	50.8874
Gamma	2961.67 ($\theta = 0.000$)	0.1700	89.7941
Lognormal	3075.75 ($\theta = 0.000$)	0.1963	67.6910
Uniform	3243.50 ($\theta = 0.000$)	0.4467	308.5848

Table 9-68 Distribution fit for probability curves against 'Outturn Variance/Amended Estimate' in 1996-97 data set

A good fit is not achieved with any of these ten probability distributions. The step-two curve fitting, within the x-axis range of zero to 0.2 therefore applies as described in Section 2.9.2 of the methodology. The analysis required for the purpose of this research will involve Monte Carlo analysis using a probability distribution constrained within x-axis ranges of zero to 0.2. If we constrain distribution fitting to the data pairs within the range of zero to 0.2 then the statistical attributes of the data pairs are as shown in Table 9-69 and the probability histogram for this range is shown in Figure 9-20.

Attribute	Value
No data pairs	313
Low Value	0
High Value	0.200
Mode Value	0.0
Mean Value	0.0748
Median Value	0.0647
Standard Deviation Value	0.0596

Table 9-69 Statistical attributes of frequency distribution of 'Outturn Variance' ratio for x-axis values of 0 to 0.2, 1996-97 dataset.

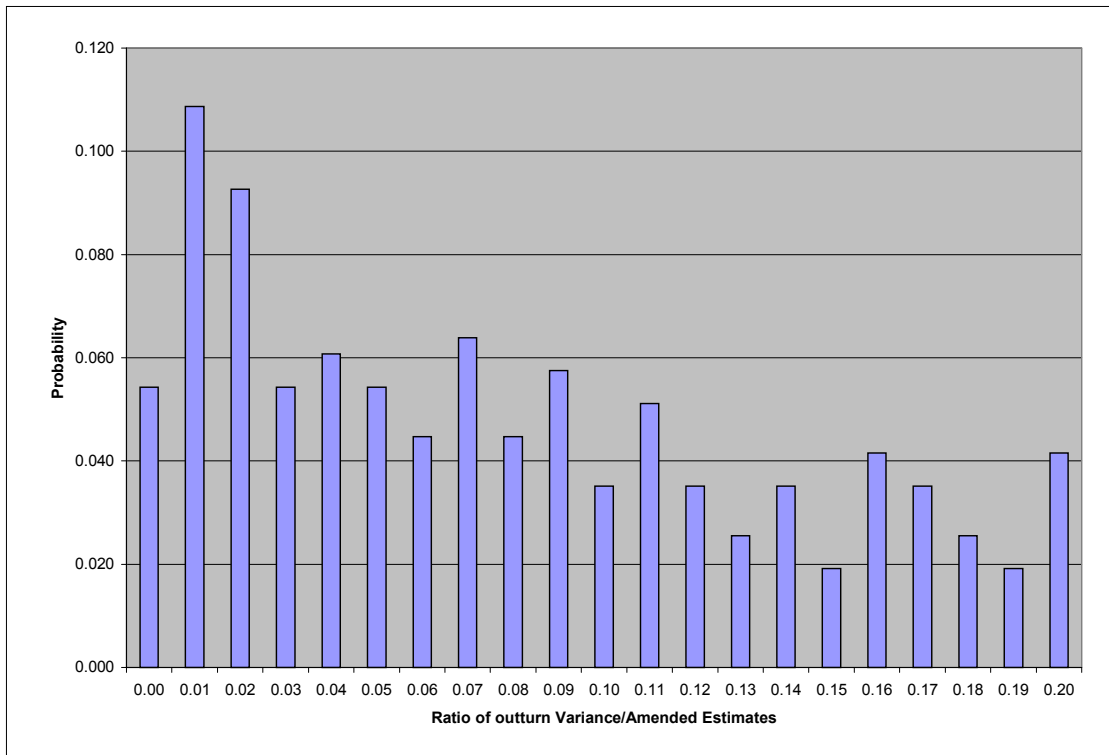


Figure 9-20 Probability histogram for the ration of Outturn Variance/Amended Estimate within the ratio range of 0-0.2, for the 1996-97 dataset.

The distribution fit for the ten probability distributions tested for this range are shown in Table 9-70.

Distribution	Chi-square	Kolmogorov-Smirnov	Anderson-Darling
Triangular	67.42 ($\theta = 0.000$)	0.0897	10.710
Weibull	67.30 ($\theta = 0.000$)	0.0959	10.357
Normal	214.08 ($\theta = 0.000$)	0.1053	6.5789
Beta	14.23 ($\theta = 0.5159$)	0.0543	10.6757
Logistic	153.14 ($\theta = 0.000$)	0.1262	5.9339
Extreme Value	104.58 ($\theta = 0.000$)	0.0911	15.5243
Exponential	73.31 ($\theta = 0.000$)	0.0914	15.5243
Gamma	303.44 ($\theta = 0.000$)	0.2939	62.0347
Lognormal	133.83 ($\theta = 0.000$)	0.1309	23.6170
Uniform	108.95 ($\theta = 0.000$)	0.1923	36.4230

Table 9-70 Distribution fit for probability curves against 'Outturn Variance/Amended Estimate' in the range $x = 0$ to 0.2 in the 1996-97 data set

The fit to the distribution curves is not good but the Beta distribution is the closest fit in terms of the Chi-square test and the Kolmogorov-Smirnov test. The fit to this distribution is shown in Figure 9-21.

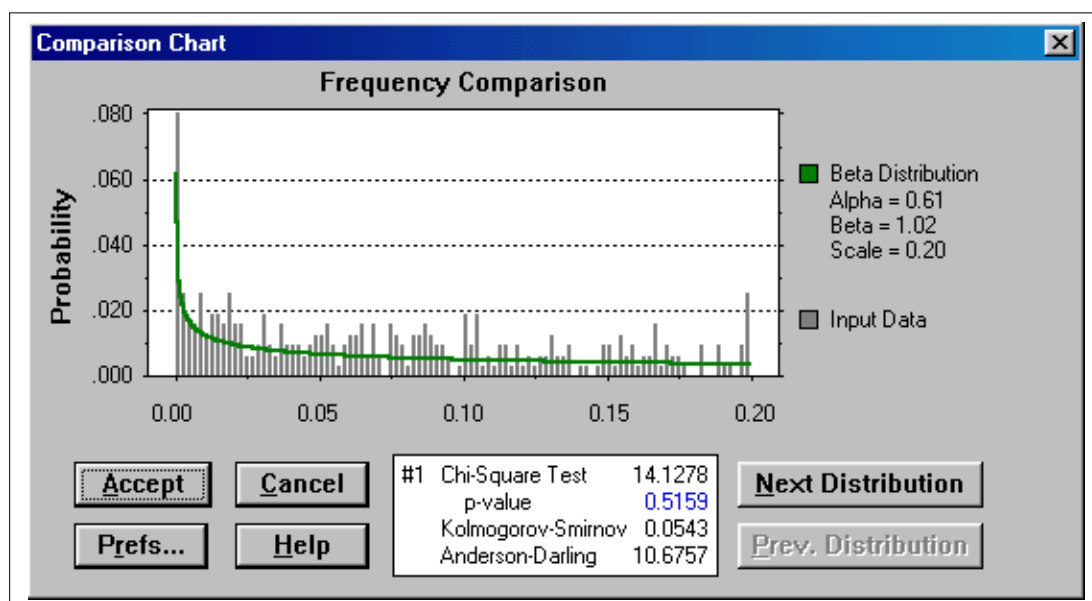


Figure 9-21 Showing the fit of to a Beta distribution for x-range of 0 to 0.2, 1996-97 data set.

This distribution is used in the stochastic analysis described in Section 9.4.

1997-98

This data is taken from the ‘Annual Report of the Director of Accounting Services and the Accounts for the year ended 31 March 1998’¹⁵. Reference is also made to the forecast of this spending programme taken from the ‘Estimates for the year ending 31 March 1998: Volume III – Fund Accounts, Memorandum Notes, and Payments and receipts’¹⁶.

The portfolio of Category A projects to be analyzed for this element of the research includes 1,048 mutually exclusive projects. The ‘Original Estimate’ of expenditure on these projects was HK\$ 19,386.9 million¹⁵. The ‘Amended Estimate’ expenditure on the same items was HK\$ 23,649.8 million but the audited expenditure was HK\$ 18,336.6 million¹⁵. The outcome was an under-expenditure of twenty-two percent of the funds approved for expenditure i.e., the ‘Amended Estimate’ less ‘Actual’ resulted in an ‘outturn variance’ of HK\$ 5,313.195 millions.

This portfolio of projects is the entire PWP for 1997-1998 except for the exclusion of items listed in the Head of Expenditure ‘Land Acquisition (Head 701 PWP Items)’ and ‘Capital Subventions and Major Systems and Equipment (Head 708 PWP Items)’; and the ‘omnibus’ items defined in Section 2.9.1 of the Thesis. Table 9-71 states the statistical attributes of the data set used in this analysis.

Expenditure	No Project	Statistics (Units are HK \$ 000's)					
		Low	High	Mode	Mean	Median	S.D.
Original est	1048	0	866,000	10	18,499	1,000	63,936
Amended est		0	866,000	10	22,567	2,000	72,163
Actual		-4,700	748,473	0	17,497	450	64,343
Outturn		0	237,500	10	5,070	699	16,492

Table 9-71 Statistical attributes of the portfolio of projects taken from the 1997-1998 Public Works Programme of projects.

The composition of the portfolio in terms of numbers of projects and the value of the 'Amended Estimate' by 'Heads of Expenditure' is displayed in Table 9-72. Heads of Expenditure 702 'Port and Airport Development', 703 'Buildings' and 707 'New Towns and Public Housing' predominate in terms of size and total value compared to the eleven percent or less of the portfolio contributed by each of the other Heads of Expenditure. In 1997-98, the new airport development has fallen to the second-highest value sub-portfolio of projects: 'Buildings' is the dominant Head of Expenditure at twenty-eight percent of the planned expenditure for this portfolio of projects.

Code	Head of Expenditure	By No. Projects		By 'Amended Estimate' Value	
		Nos	%	Value <i>HK\$000's</i>	%
702	Port & Airport Development	58	6%	5,559,579	24%
703	Buildings	379	36%	6,735,354	28%
704	Drainage	75	7%	1,220,801	5%
705	Civil Engineering	54	5%	2,643,527	11%
706	Highways	95	9%	2,338,491	10%
707	New Towns & Public Housing (exc HK Housing Authority)	282	27%	3,421,058	14%
709	Waterworks	79	8%	739,157	3%
711	Housing	26	2%	991,838	4%

Table 9-72 Composition of the 1997-98 data set in terms of 'Heads of Expenditure'.

The 1997-1998 PWP portfolio of one thousand and forty-eight projects to be analyzed for this research contains forty-eight number out of seventy-eight categories of works. This is taken to indicate a good degree of diversity (sixty-two per cent) of types of infrastructure projects contained within the portfolio.

The twenty-three categories of public works that each comprise more than one percent in number of the portfolio are listed in Table 9-73. These projects comprise in total, ninety-five percent by number and ninety-five percent by value of the data set to be analyzed.

Category of public works	ID	By Project No.		By Value (HK\$ 000's)	
		No	%	Amended Est Value	%
Civil engineering – land development	CL	189	18%	\$3,603,953	15%
Transport – roads	TH	130	12%	\$4,111,059	17%
Water supply – fresh water supplies	WF	69	7%	1,304,609	6%
Environmental engineering – sewerage and sewage treatment	DS	68	6%	\$1,036,752	4%
Education – secondary	ES	68	6%	\$507,895	2%
Education – primary	EP	59	6%	\$446,295	2%
Recreation, culture and amenities – open spaces	RO	35	3%	\$15,775	<1%
Environmental engineering - refuse disposal	DR	34	3%	\$2,042,899	9%
Civil engineering – drainage and erosion protection	CD	31	3%	\$598,070	3%
Education – tertiary	ET	29	3%	\$584,262	2%
Water supply – combined fresh/salt water supply projects	WC	29	3%	\$411,202	2%
Health – hospitals	MH	22	2%	\$343,361	1%
Transport – footbridges and pedestrian tunnels	TB	22	2%	\$276,344	1%
Housing – rural housing improvement	HH	21	2%	\$365,308	2%
Government offices –intra-Governmental services	KA	19	2%	\$1,420,040	6%
Social welfare and community building - community centres and halls	SC	18	2%	\$730,258	3%
Support – others	GK	17	2%	\$909,440	4%
Air and sea communications –port works	AP	16	2%	\$431,105	2%
Air and sea communications – airport	AA	16	2%	\$3,574	<1%
Health – clinics	MC	15	1%	\$96,682	<1%
Law and Order – correctional services	LC	13	1%	\$249,504	1%
Water supply – salt water supplies	WS	13	1%	\$102,295	<1%
Law and order – police	LP	12	1%	\$87,644	<1%
Sub-totals			90%	\$19,678,326	83%

Table 9-73 Categories of work that are greater than one percent of the 1997-98 PWP data set.

The dominant categories of work in the data set in terms of planned expenditure in the 1997-98 financial year:

- CL ‘Civil engineering – land development’, 15% by value but 18% by projects;
- TH ‘Transport – roads’, 17% by value but 12% by number of projects; and
- WF ‘Water supply – fresh water supplies’, 6% by value and 7% by number of projects

Table 9-74 shows the statistical attributes of these sub-portfolios of projects. These indicate a reasonable amount of diversity in the dominant sub-portfolios of projects with the mode and the median values indicating that the majority of the project values are at the low-value end of the range of values.

Cat of Work	No Projects	Statistical attributes in terms of 'Amended Estimate' (HK\$ 000's)					
		Low	High	Mode	Mean	Median	SD
CL	189	0	239,360	10	19,069	1,800	38,534
TH	130	10	611,000	500	31,624	4,317	83,564
WF	69	1	464,100	1	18,907	2,284	60,705

Table 9-74 Statistical attributes of the dominant sub-portfolios in the 1997-98 dataset

Planned expenditure variable

The planned expenditure variable is 'Amended Estimate' in the data source. The statistical attributes of this variable within the data set for this analysis are stated in Table 9-71. These indicate that the values of 'Amended Estimate' expenditure within the data-set are predominantly at the low-value end of the range of values. Whereas, 'Table 9-75 Percentiles for 'Amended Estimate' variable in the 1997-98 data set', shows the distribution of the values of the variable 'Amended Estimate' of each project in the 1997-98 data set. Ninety-five percent of the number of projects contains forty-two percent of the total value of the planned expenditure on the projects.

Percentile (No Projects)	Thresh-hold Value of 'Amended Estimate of a project (HK \$ 000's)	Cum Value (HK \$ 000's)	Cum Value (%)
5%	10	1,098	0.005%
10%	10	1,098	0.005%
15%	50	2,559	0.011%
20%	100	6,999	0.030%
25%	200	13,746	0.058%
30%	411	27,383	0.116%
35%	692	55,811	0.236%
40%	1,000	115,024	0.486%
45%	1,350	163,356	0.69%
50%	2,000	254,233	1.08%
55%	3,037	377,909	1.6%
60%	4,704	583,958	2.5%
65%	6,555	871,350	3.7%
70%	10,817	1,303,596	5.5%
75%	15,900	2,020,561	8.5%
80%	23,440	3,003,780	12.7%
85%	31,923	4,447,952	18.8%
90%	46,233	6,478,884	27.4%
95%	98,697	9,816,771	41.5%

Table 9-75 Percentiles for 'Amended Estimate' variable in the 1997-98 data set

‘Outturn variance’ variable

The statistical attributes of this variable within the data set for this analysis are also stated in Table 9-71. These indicate that the values of ‘Outturn’ expenditure within the data-set are predominantly at the low-value end of the range of values. Whereas, ‘Table 9-76 Percentiles for ‘Outturn variance’ variable in the 1997-98 dataset.’, shows the distribution of the values of the variable ‘Outturn variance’ of the projects in the 1997-98 data set. Ninety-five percent of the number of projects contains forty-four percent of the total value of the variance between planned and actual expenditure on the projects.

Percentile (No Projects)	Thresh-hold Value of ‘Outturn variance’ for a project (HK \$ 000’s)	Cum Value (HK \$ 000’s)	Cum Value (%)
5%	3	53	0.001%
10%	10	1,213	0.023%
15%	10	1,213	0.023%
20%	32	1,884	0.035%
25%	58	4,367	0.08%
30%	100	9,153	0.17%
35%	177	15,474	0.29%
40%	298	27,059	0.51%
45%	489	47,208	0.9%
50%	699	77,726	1.5%
55%	915	119,191	2.2%
60%	1,174	173,716	3.3%
65%	2,000	245,018	4.6%
70%	2,148	341,705	6.4%
75%	3,132	482,909	9.1%
80%	4,716	684,896	12.9%
85%	7,084	978,519	18.4%
90%	12,403	1,487,317	28%
95%	22,590	2,327,253	43.8%

Table 9-76 Percentiles for ‘Outturn variance’ variable in the 1997-98 dataset.

Probability curve fitting in the 1997-98 data set

For the purpose of this analysis, the probability curve of the values of the ‘ratio of outturn variance’ for a project is required within the range of zero to 0.2. The two-step curve-fitting approach is described in the Thesis at Section 2.9.2. In the first step, the curve-fitting range corresponds to values of percent ‘Outturn Variance’ from zero to two hundred percent. There are 6 instances out of 1048 data pairs where this threshold is exceeded. These are unrepresentative outliers and are not included in the frequency distribution shown in Figure 9-22. The statistical attributes of the data sets for this frequency distribution are listed in Table 9-77.

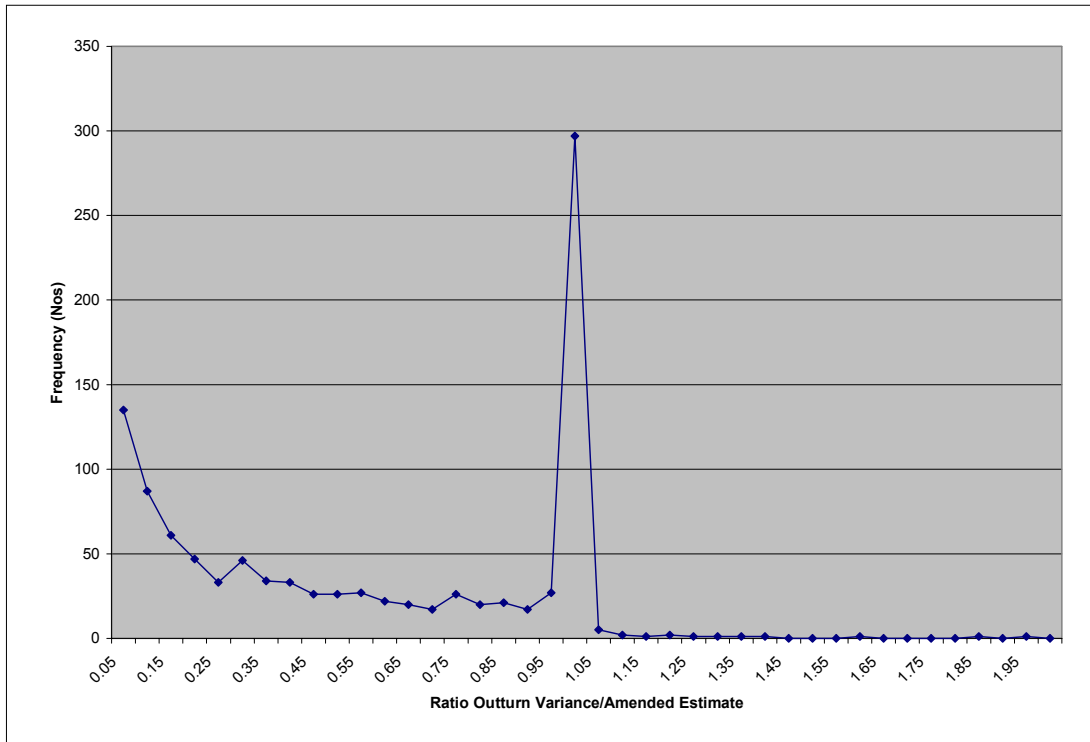


Figure 9-22 Frequency distribution of the ratio of 'Outturn Variance/Amended Estimate' for 1997-98 data set.

Attribute	Value
No data pairs	1039
Low Value	0.0000
High Value	1.9091
Mode Value	1.0000
Mean Value	0.5310
Median Value	0.4725
Standard Deviation Value	0.3973

Table 9-77 Statistical attributes of frequency distribution of 'Outturn Variance' ratio, 1997-98 dataset

Using the distribution fitting methods within the Crystal Ball/ software, ten standard probability distributions are fitted to the data array of 'Outturn variance/Amended Estimate' with the statistical attributes stated in Table 9-77. The distribution fit for the probability distributions tested are shown in Table 9-78.

Distribution	Chi-square	Kolmogorov-Smirnov	Anderson-Darling
Triangular	2424.61 ($\theta = 0.000$)	0.2244	72.9433
Weibull	2325.31 ($\theta = 0.000$)	0.1683	79.1671
Normal	2660.71 ($\theta = 0.000$)	0.1614	53.1671
Beta	2398.92 ($\theta = 0.000$)	0.1415	48.8367
Logistic	2903.16 ($\theta = 0.000$)	0.1450	47.2012
Extreme Value	2962.23 ($\theta = 0.000$)	0.1602	48.3239
Exponential	2198.48 ($\theta = 0.000$)	0.1483	46.4691
Gamma	2685.66 ($\theta = 0.000$)	0.1575	74.5822
Lognormal	2712.88 ($\theta = 0.000$)	0.1909	59.3593
Uniform	3190.76 ($\theta = 0.000$)	0.4601	340.5083

Table 9-78 Distribution fit for probability curves against 'Outturn Variance/Amended Estimate' in 1997-98 data set

A good fit is not achieved with any of these ten probability distributions. The step-two curve fitting, within the x-axis range of zero to 0.2 therefore applies as described in Section 2.9.2 of the methodology. The analysis required for the purpose of this research will involve Monte Carlo analysis using a probability distribution constrained within x-axis ranges of zero to 0.2. If we constrain distribution fitting to the data pairs within the range of zero to 0.2 then the statistical attributes of the data pairs are as shown in Table 9-79 and the probability histogram for this range is shown in Figure 9-26.

Attribute	Value
No data pairs	330
Low Value	0
High Value	0.200
Mode Value	0.0
Mean Value	0.0759
Median Value	0.0646
Standard Deviation Value	0.0589

Table 9-79 Statistical attributes of frequency distribution of 'Outturn Variance' ratio for x-axis values of 0 to 0.2, 1997-98 dataset.

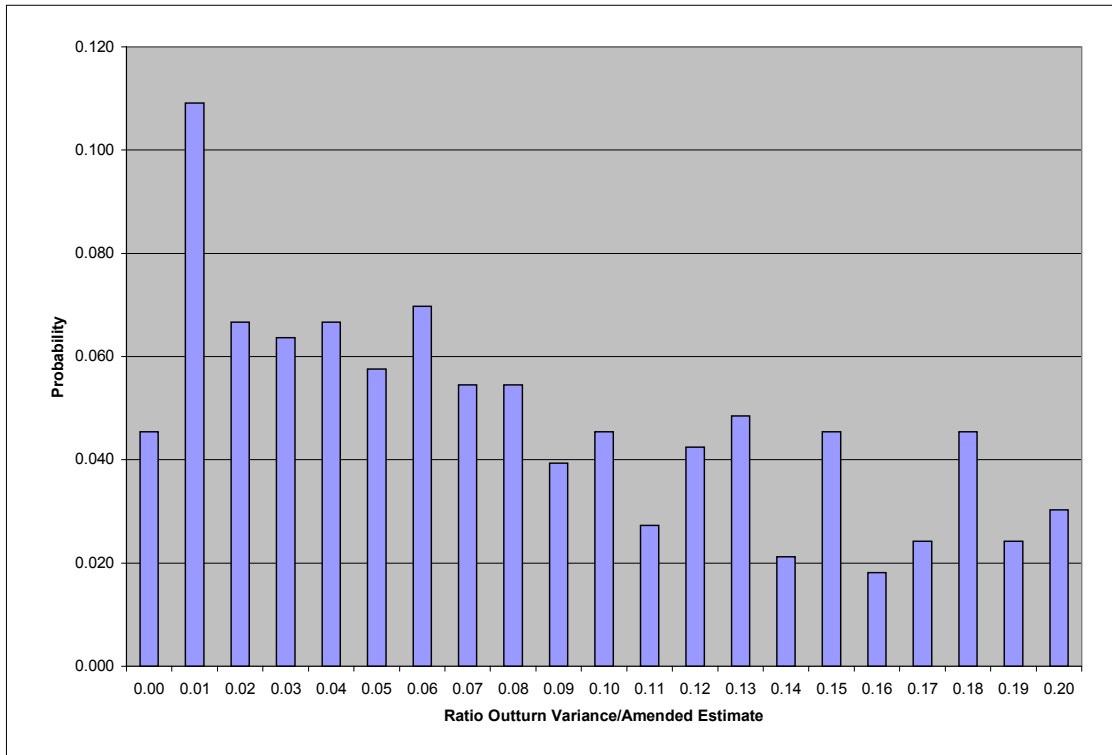


Figure 9-23 Probability histogram for the ration of Outturn Variance/Amended Estimate within the ratio range of 0-0.2, for the 1997-98 dataset.

The distribution fit for the ten probability distributions tested for this range are shown in Table 9-80.

Distribution	Chi-square	Kolmogorov-Smirnov	Anderson-Darling
Triangular	70.12 ($\theta = 0.000$)	0.0812	10.1851
Weibull	96.55 ($\theta = 0.000$)	0.1009	10.0689
Normal	102.93 ($\theta = 0.000$)	0.0992	6.3632
Beta	26.12 ($\theta = 0.0523$)	0.0455	8.1086
Logistic	130.48 ($\theta = 0.000$)	0.1192	5.8164
Extreme Value	116.67 ($\theta = 0.000$)	0.0725	4.4293
Exponential	71.94 ($\theta = 0.000$)	0.0862	13.9052
Gamma	269.03 ($\theta = 0.000$)	0.2892	56.6016
Lognormal	156.67 ($\theta = 0.000$)	0.1430	23.1930
Uniform	99.82 ($\theta = 0.000$)	0.1938	34.0381

Table 9-80 Distribution fit for probability curves against 'Outturn Variance/Amended Estimate' in the range $x = 0$ to 0.2 in the 1997-98 data set

The fit to the distribution curves is not good but the Beta distribution is the closest fit in terms of the Chi-square test and the Kolmogorov-Smirnov test. The fit to this distribution is shown in Figure 9-24.

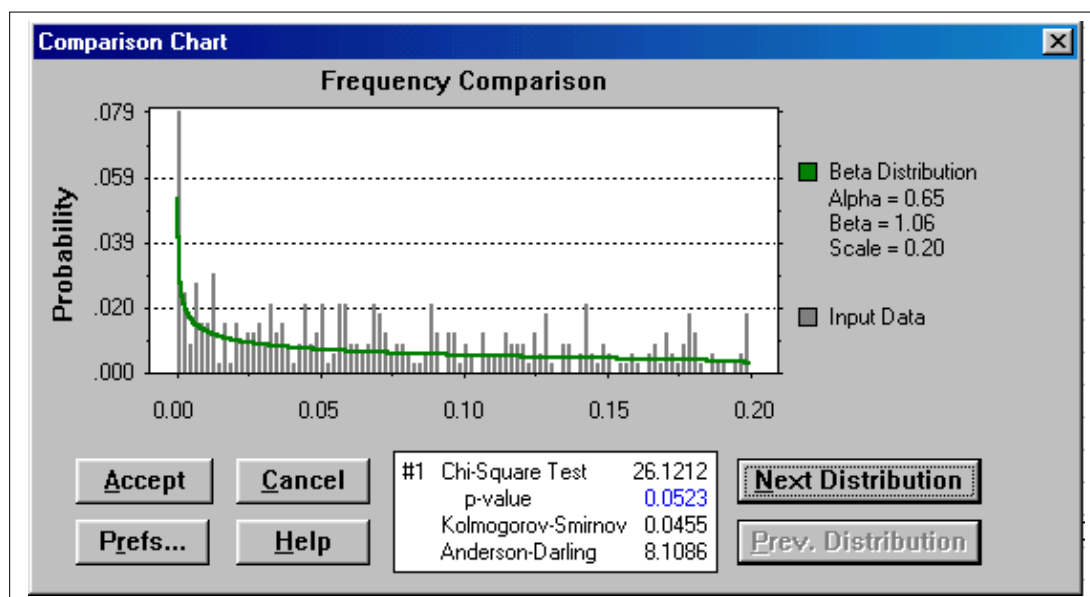


Figure 9-24 Showing the fit of to a Beta distribution for x-range of 0 to 0.2, 1997-98 data set.

This distribution is used in the stochastic analysis described in Section 9.4.

1998-99

This data is taken from the 'Annual Report of the Director of Accounting Services and the Accounts for the year ended 31 March 1999'¹⁷. Reference is also made to the forecast of this spending programme taken from the 'Estimates for the year ending 31 March 1999: Volume III – Fund Accounts, Memorandum Notes, and Payments and receipts'¹⁸.

The portfolio of Category A projects to be analyzed for this element of the research includes 1,082 mutually exclusive projects. The 'Original Estimate' of expenditure on these projects was HK\$ 18,844.6 million¹⁸. The 'Amended Estimate' expenditure on the same items was HK\$ 24,780.3 million but the audited expenditure was HK\$ 18,567.9 million¹⁷. The outcome was an under-expenditure of twenty-five percent of the funds approved for expenditure i.e., the 'Amended Estimate' less 'Actual' resulted in an 'outturn variance' of HK\$ 6,212.5 millions.

This portfolio of projects is the entire PWP for 1998-1999, except for the exclusion of items listed in the Head of Expenditure 'Land Acquisition (Head 701 PWP Items)' and 'Capital Subventions and Major Systems and Equipment (Head 708 PWP Items)'; and the 'omnibus' items defined in Section 2.9.1 of the Thesis. Table 9-81 states the statistical attributes of the data-set used in this analysis.

Expenditure	No Project	Statistics (<i>Units are HK \$ 000's</i>)					
		Low	High	Mode	Mean	Median	S.D.
Original est	1082	0	680,658	0	17,416	1,673	52,475
Amended est		0	818,299	10	22,902	2,684	63,302
Actual		-13,705	795,928	0	17,161	578	56,746
Outturn		0	140,509	10	5,742	1,046	14,663

Table 9-81 Statistical attributes of the portfolio of projects taken from the 1998-1999 Public Works Programme of projects.

The composition of the portfolio in terms of numbers of projects and the value of the 'Amended Estimate' by 'Heads of Expenditure' is displayed in Table 9-82. Heads of Expenditure 703 'Buildings' at thirty-two percent of the portfolio predominates in terms of size and total value compared to the sixteen percent or less contributed by each of the other Heads of Expenditure. In 1998-99, the new airport development is the second-highest value sub-portfolio of projects at sixteen percent of the planned expenditure for this portfolio of projects. However, this is not significant as it is close to other sub-portfolios.

Code	Head of Expenditure	By No. Projects		By 'Amended Estimate' Value	
		Nos	%	Value <i>HK\$000's</i>	%
702	Port & Airport Development	54	5%	3,915,846	16%
703	Buildings	387	36%	7,831,730	32%
704	Drainage	105	10%	2,619,843	11%
705	Civil Engineering	44	4%	1,632,133	7%
706	Highways	102	9%	2,220,006	9%
707	New Towns & Public Housing (exc HK Housing Authority)	271	25%	3,310,194	13%
709	Waterworks	79	7%	804,987	3%
711	Housing	40	4%	2,445,597	10%

Table 9-82 Composition of the 1998-99 data set in terms of 'Heads of Expenditure'.

The 1998-1999 PWP portfolio of one thousand and eighty-two projects to be analysed for this research contains forty-seven number out of seventy-eight categories of works. This is taken to indicate a fair degree of diversity (sixty percent) of types of infrastructure projects contained within the portfolio.

The twenty categories of public works that each comprise more than one percent in number of the portfolio are listed in Table 9-83. These projects comprise in total, eighty-eight percent by number and eighty-three percent by value of the data set to be analyzed.

Category of public works	ID	By Project No.		By Value (HK\$ 000's)	
		No	%	Amended Est Value	%
Civil engineering – land development	CL	178	17%	\$3,751,974	15%
Transport – roads	TH	140	13%	\$3,399,579	14%
Environmental engineering – sewerage and sewage treatment	DS	94	9%	\$2,214,761	9%
Education – secondary	ES	83	8%	\$1,063,782	4%
Education – primary	EP	69	6%	\$971,362	4%
Water supply – fresh water supplies	WF	66	6%	\$2,264,188	9%
Civil engineering – drainage and erosion protection	CD	37	3%	\$712,678	3%
Water supply – combined fresh/salt water supply projects	WC	35	3%	\$404,774	2%
Education – tertiary	ET	30	3%	\$763,838	3%
Recreation, culture and amenities – open spaces	RO	28	3%	\$15,861	<1%
Environmental engineering - refuse disposal	DR	27	3%	\$1,371,158	6%
Government offices –intra-Governmental services	KA	24	2%	\$1,202,035	5%
Health – hospitals	MH	22	2%	\$207,566	1%
Transport – footbridges and pedestrian tunnels	TB	22	2%	\$128,416	<1%
Housing – rural housing improvement	HH	20	2%	\$387,776	2%
Support – others	GK	17	2%	\$628,400	3%
Law and order – police	LP	17	2%	\$127,451	1%
Air and sea communications –port works	AP	14	1%	\$352,784	1%
Law and Order – correctional services	LC	13	1%	\$569,485	2%
Water supply – salt water supplies	WS	11	1%	\$126,431	<1%
Sub-totals			88%	\$20,664,299	83%

Table 9-83 Categories of work that are greater than one percent of the 1998-99 PWP data set.

The dominant categories of work in the data set in terms of planned expenditure in the 1998-99 financial year:

- CL ‘Civil engineering – land development’, 15% by value but 17% by projects;
- TH ‘Transport – roads’, 14% by value but 13% by number of projects; and
- DS ‘Environmental engineering – sewerage and sewage treatment’, 9% by value and 9% by number of projects.

Table 9-84 shows the statistical attributes of these sub-portfolios of projects. These indicate a reasonable amount of diversity in the dominant sub-portfolios of projects with the mode and the median values indicating that the majority of the project values are at the low-value end of the range of values.

Cat of Work	No Projects	Statistical attributes in terms of 'Amended Estimate' (HK\$ 000's)					
		Low	High	Mode	Mean	Median	SD
CL	178	1	280,000	10	21,079	2,780	42,253
TH	140	10	424,020	10	24,283	4,073	54,265
DS	94	1	437,000	5,000	23,561	5,000	58,706

Table 9-84 Statistical attributes of the dominant sub-portfolios in the 1998-99 dataset

Planned expenditure variable

The planned expenditure variable is 'Amended Estimate' in the data source. The statistical attributes of this variable within the data set for this analysis are stated in Table 9-81. These indicate that the values of 'Amended Estimate' expenditure within the data-set are predominantly at the low-value end of the range of values. Whereas, 'Table 9-85 Percentiles for 'Amended Estimate' variable in the 1998-99 data set', shows the distribution of the values of the variable 'Amended Estimate' of each project in the 1998-99 data set. Ninety-five percent of the number of projects contains forty-nine percent of the total value of the planned expenditure on the projects.

Percentile (No Projects)	Thresh-hold Value of 'Amended Estimate of a project (HK \$ 000's)	Cum Value (HK \$ 000's)	Cum Value (%)
5%	10	365	0.001%
10%	48	1,552	0.006%
15%	100	5,895	0.024%
20%	200	12,553	0.051%
25%	500	36,954	0.149%
30%	600	62,112	0.25%
35%	1,042	107,782	0.43%
40%	1,500	180,769	0.73%
45%	2,000	270,621	1.09%
50%	3,000	410,935	1.66%
55%	4,680	600,056	2.42%
60%	6,503	888,440	3.6%
65%	9,106	1,307,727	5.3%
70%	13,113	1,893,963	7.6%
75%	19,992	2,795,558	11.3%
80%	29,120	4,093,297	16.5%
85%	37,777	5,923,405	24%
90%	54,990	8,368,116	34%
95%	93,980	12,150,365	49%

Table 9-85 Percentiles for 'Amended Estimate' variable in the 1998-99 data set

‘Outturn variance’ variable

The statistical attributes of this variable within the data set for this analysis are also stated in Table 9-81 Statistical attributes of the portfolio of projects taken from the 1998-1999 Public Works Programme of projects. These indicate that the values of ‘Outturn’ expenditure within the data-set are predominantly at the low-value end of the range of values. Whereas, ‘Table 9-86 Percentiles for ‘Outturn variance’ variable in the 1998-99 dataset.’, shows the distribution of the values of the variable ‘Outturn variance’ of the projects in the 1998-99 data set. Ninety-five percent of the number of projects contains fifty percent of the total value of the variance between planned and actual expenditure on the projects.

Percentile (No Projects)	Thresh-hold Value of ‘Outturn variance’ for a project (HK \$ 000’s)	Cum Value (HK \$ 000’s)	Cum Value (%)
5%	5	79	0.001%
10%	18	650	0.01%
15%	50	2,545	0.04%
20%	100	6,536	0.1%
25%	151	12,745	0.2%
30%	271	23,762	0.4%
35%	412	41,837	0.7%
40%	567	68,282	1.1%
45%	786	103,670	1.7%
50%	1,046	153,606	2.5%
55%	1,435	220,139	3.5%
60%	1,885	310,329	5%
65%	2,419	426,481	6.7%
70%	3,407	578,871	9.3%
75%	4,463	786,628	12.7%
80%	6,517	1,072,392	17.3%
85%	9,167	1,482,523	24%
90%	14,119	2,101,639	34%
95%	26,763	3,128,235	50%

Table 9-86 Percentiles for ‘Outturn variance’ variable in the 1998-99 dataset.

Probability curve fitting in the 1998-99 data set

For the purpose of this analysis, the probability curve of the values of the ‘ratio of outturn variance’ for a project is required within the range of zero to 0.2. The two-step curve-fitting approach is described in the Thesis at Section 2.9.2. In the first step, the curve-fitting range corresponds to values of percent ‘Outturn Variance’ from zero to two hundred percent. There are 12 instances out of 1082 data pairs where this threshold is exceeded. These are unrepresentative outliers and are not included in the frequency distribution shown in Figure 9-22. The statistical attributes of the data sets for this frequency distribution are listed in Table 9-87.

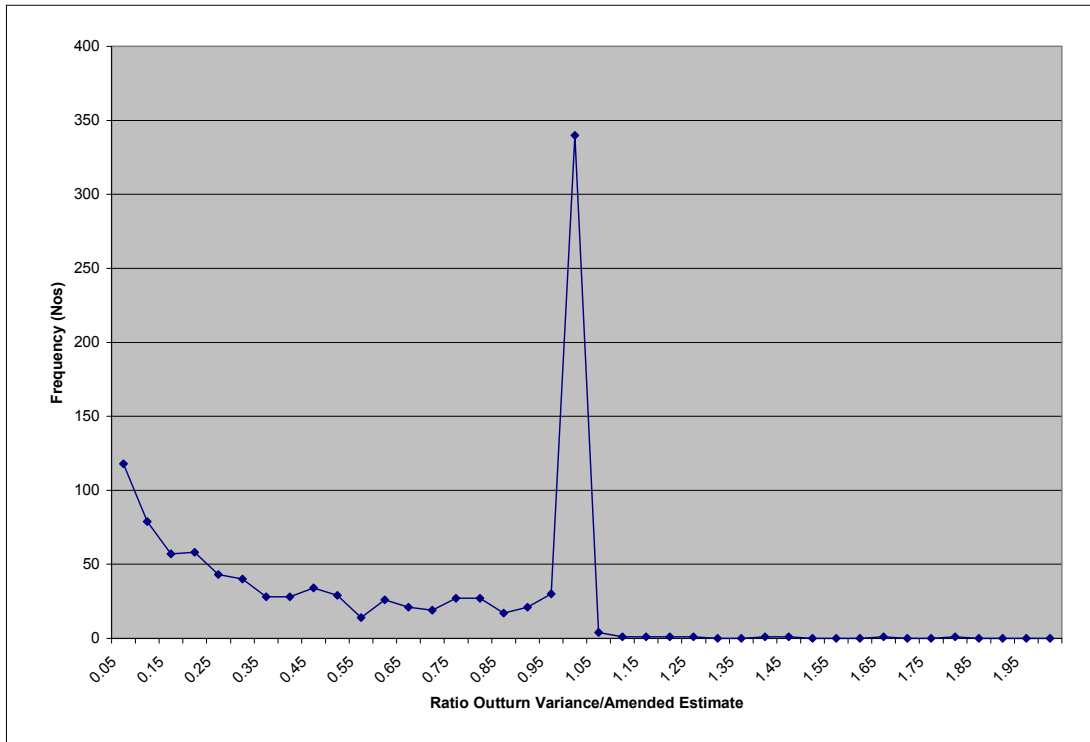


Figure 9-25 Frequency distribution of the ratio of 'Outturn Variance/Amended Estimate' for 1998-99 data set.

Attribute	Value
No data pairs	1068
Low Value	0.0000
High Value	1.756
Mode Value	1.0000
Mean Value	0.5586
Median Value	0.5670
Standard Deviation Value	0.3935

Table 9-87 Statistical attributes of frequency distribution of 'Outturn Variance' ratio, 1998-99 dataset

Using the distribution fitting methods within the Crystal Ball software, ten standard probability distributions are fitted to the data array of 'Outturn variance/Amended Estimate' with the statistical attributes stated in Table 9-87. The distribution fit for the probability distributions tested are shown in Table 9-88.

Distribution	Chi-square	Kolmogorov-Smirnov	Anderson-Darling
Triangular	3131.13 ($\theta = 0.000$)	0.1876	49.4931
Weibull	3436.75 ($\theta = 0.000$)	0.1834	88.7886
Normal	3477.74 ($\theta = 0.000$)	0.1761	59.2144
Beta	3365.86 ($\theta = 0.000$)	0.1544	55.9169
Logistic	3100.69 ($\theta = 0.000$)	0.1543	52.2008
Extreme Value	3579.79 ($\theta = 0.000$)	0.1649	59.3746
Exponential	3394.86 ($\theta = 0.000$)	0.1639	55.9204
Gamma	2865.78 ($\theta = 0.000$)	0.1837	98.1502
Lognormal	2894.43 ($\theta = 0.000$)	0.2020	69.1773
Uniform	3047.54 ($\theta = 0.000$)	0.4195	246.7790

Table 9-88 Distribution fit for probability curves against 'Outturn Variance/Amended Estimate' in 1998-99 data set

A good fit is not achieved with any of these ten probability distributions. The step-two curve fitting, within the x-axis range of zero to 0.2 therefore applies as described in Section 2.9.2 of the methodology. The analysis required for the purpose of this research will involve Monte Carlo analysis using a probability distribution constrained within x-axis ranges of zero to 0.2. If we constrain distribution fitting to the data pairs within the range of zero to 0.2 then the statistical attributes of the data pairs are as shown in Table 9-89 and the probability histogram for this range is shown in Figure 9-26.

Attribute	Value
No data pairs	312
Low Value	0
High Value	0.198
Mode Value	0.0
Mean Value	0.0797
Median Value	0.0701
Standard Deviation Value	0.0594

Table 9-89 Statistical attributes of frequency distribution of 'Outturn Variance' ratio for x-axis values of 0 to 0.2, 1998-99 dataset.

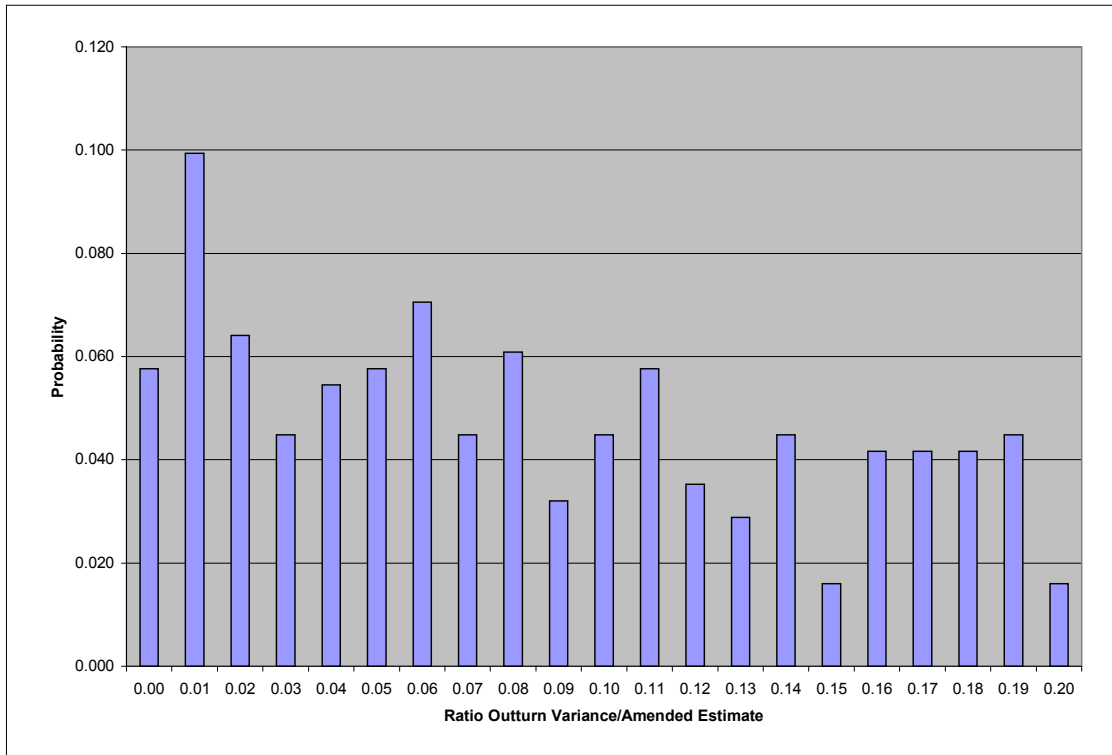


Figure 9-26 Probability histogram for the ratio of Outturn Variance/Amended Estimate within the ratio range of 0-0.2, for the 1998-99 dataset.

The distribution fit for the ten probability distributions tested for this range are shown in Table 9-90.

Distribution	Chi-square	Kolmogorov-Smirnov	Anderson-Darling
Triangular	95.16 ($\theta = 0.000$)	0.1128	14.9918
Weibull	129.38 ($\theta = 0.000$)	0.1077	11.3713
Normal	87.73 ($\theta = 0.000$)	0.0901	5.4349
Beta	23.42 ($\theta = 0.0756$)	0.0577	11.9751
Logistic	180.17 ($\theta = 0.000$)	0.1089	5.0792
Extreme Value	170.67 ($\theta = 0.000$)	0.0708	4.3021
Exponential	93.21 ($\theta = 0.000$)	0.0998	18.9964
Gamma	323.40 ($\theta = 0.000$)	0.3286	69.4347
Lognormal	179.56 ($\theta = 0.000$)	0.1453	28.0551
Uniform	91.63 ($\theta = 0.000$)	0.1586	22.6006

Table 9-90 Distribution fit for probability curves against 'Outturn Variance/Amended Estimate' in the range $x = 0$ to 0.2 in the 1998-99 data set

The fit to the distribution curves is not good but the Beta distribution is the closest fit in terms of the Chi-square test and the Kolmogorov-Smirnov test. The fit to this distribution is shown in Figure 9-27.

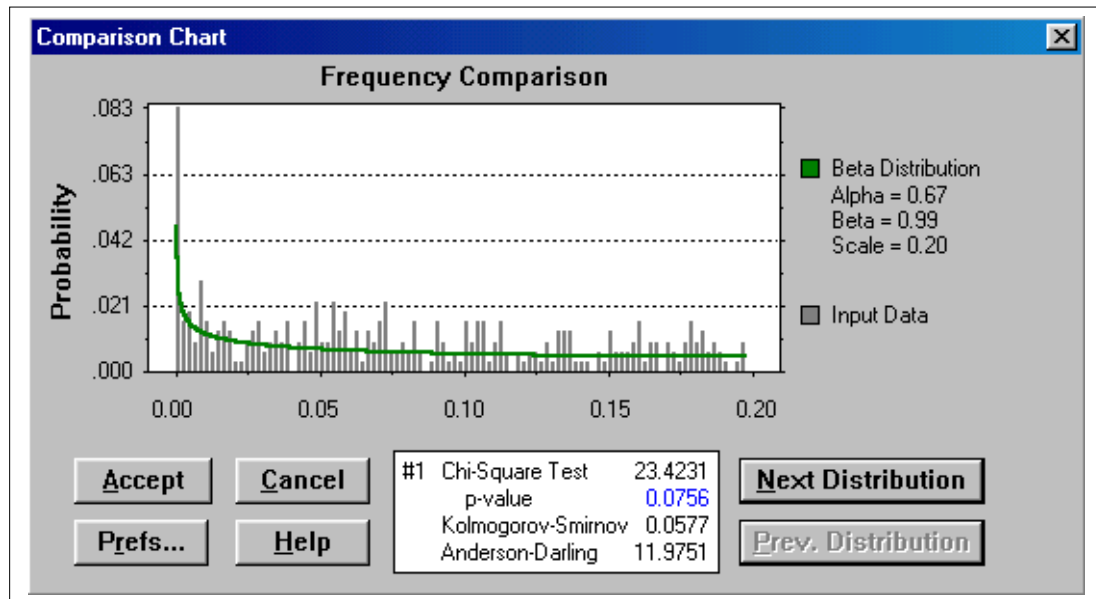


Figure 9-27 Showing the fit of to a Beta distribution for x-range of 0 to 0.2, 1998-99 data set.

This distribution is used in the stochastic analysis described in Section 9.4.

9.4 Modeling a significance approach

1989-90

Refer to the main Thesis, Chapter Nine Section 9.4.

1990-91

Mathematical analysis

The attributes of the 1990-91 data set used in this analysis are described in Section 9.3.

The outturn variance in the 1990-91 data set is an under-spend of HK\$ 6,119 million, or thirty-four percent of the planned expenditure. In this analysis, the effect on the outturn for the portfolio of projects as a whole is calculated as those projects with the more significant values of planned expenditure achieve a perfect outcome of zero outturn variance.

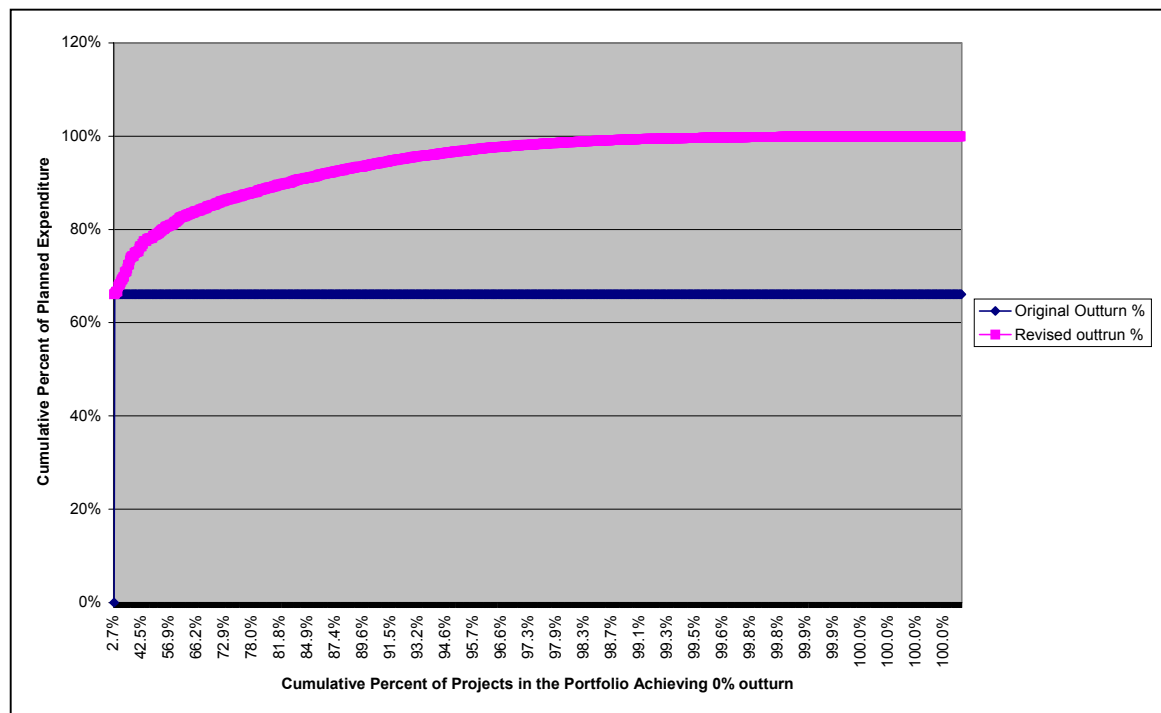


Figure 9-28 Improved outturn achieved in 1990-91 dataset as ideal outturn is achieved by significant projects

Figure 9-28 and Table 9-91, shows the rate of improvement as increasing percentiles of the significant projects in the portfolio achieve a perfect outcome. The greatest rate of improvement occurs within the 12.5 percentile.

Percentile (<i>Projects in dataset</i>)	Outturn Achieved	Diff to Actual Outturn
2.5%	75%	9%
5%	79%	13%
7.5%	82%	16%
10%	84%	18%
12.5%	86%	20%
15%	87%	21%
17.5%	89%	23%
20%	90%	24%
22.5%	91%	25%
25%	92%	26%
27.5%	93%	27%
30%	94%	28%
35%	95%	29%
40%	97%	31%
50%	98%	32%

Table 9-91 Improved outturn achievement for 1990-91 dataset

This analysis indicates that an ideal delivery for the significant value twenty percent of the projects in the data set will deliver an overall outturn for the portfolio that is ninety percent of the planned outcome – all other things being unchanged.

Stochastic analysis

In this analysis, the outcome for each significant project is based upon a probability distribution derived from the 1990-91 empirical data as described in Section 9.3 – ‘Probability curve fitting’. The probability distribution for this range of values is a Beta distribution with parameters of:

- Alpha value = 0.74
- Beta value = 0.89
- Scale value = 0.20

This probability curve is based upon the actual performance for this data set within the limits of x-values of 0 to 0.2, i.e., ratios of outturn performance that range from zero to a twenty percent under-spending of the planned expenditure. In this analysis Crystal Ball® software by Decisioneering Inc is used to perform Monte Carlo analysis on the variable ‘Outturn variance/Amended Estimate’ for each of the significant projects identified within the 1990-91 data set within ranges of one to twenty percent of the 1282 projects within the data set.

The Crystal Ball® analysis produced a frequency diagram for outturn for the data set in terms of total expenditure and also percent outturn. For example, Figure 9-29 shows the range of total expenditures for the data set whilst Figure 9-30 shows the corresponding outturn in terms of percent. For brevity in this thesis the frequency diagrams are not reproduced in all analyses, however the results corresponding to percentiles are tabulated here.

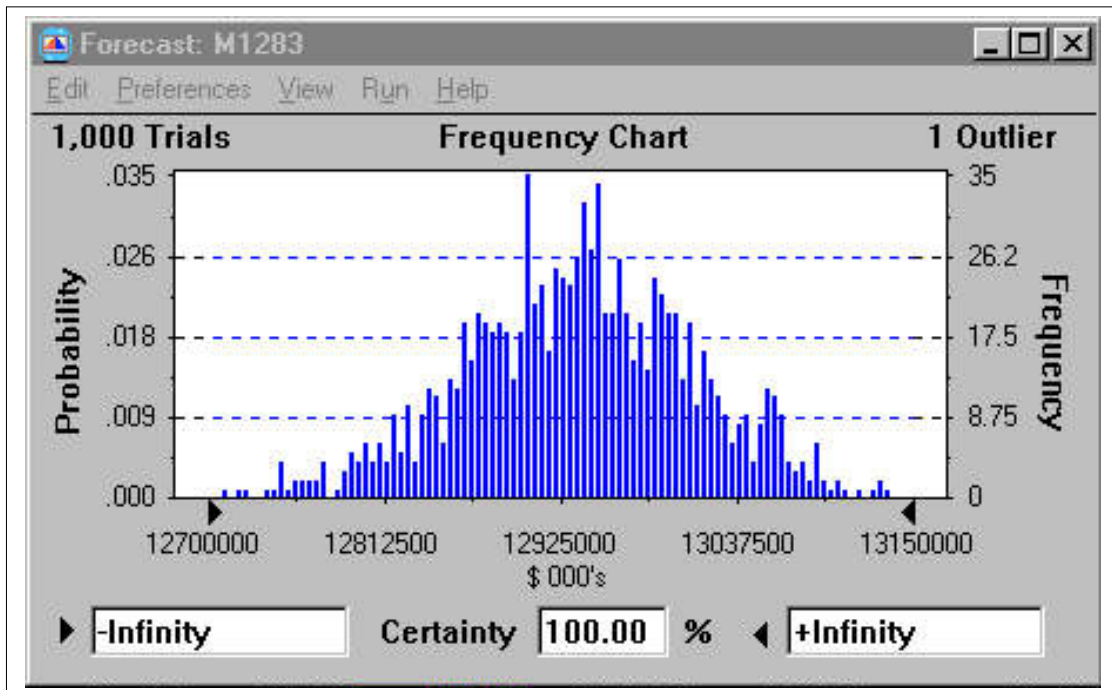


Figure 9-29 Frequency chart derived from Monte Carlo analysis of 1990-91 data set with one percent of significant projects subject to stochastic outturn

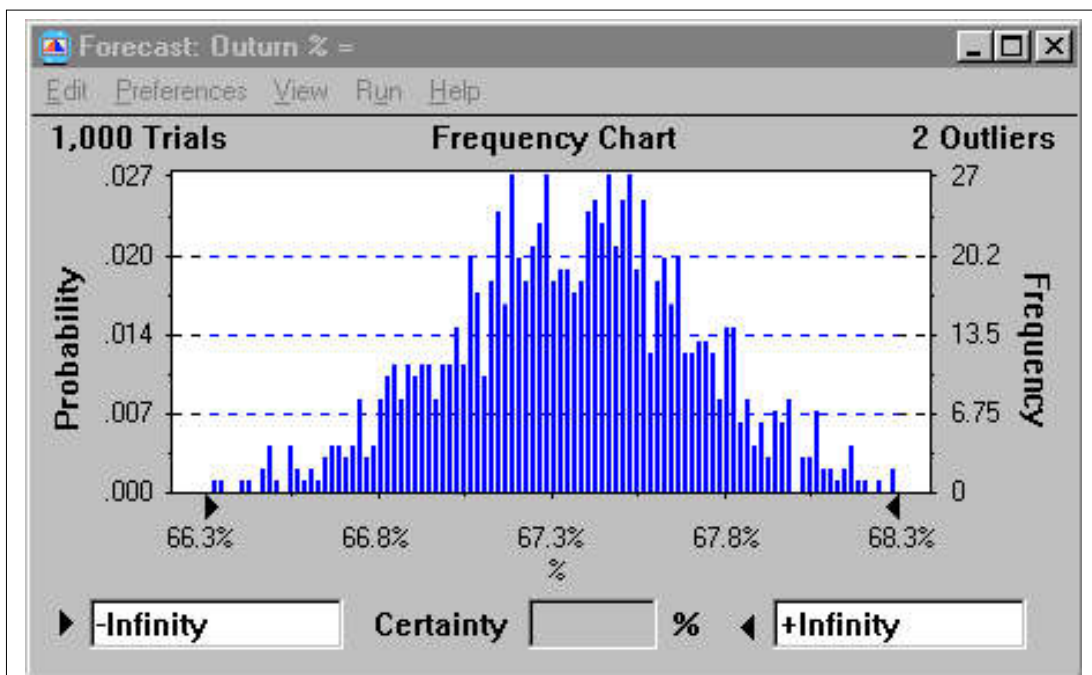


Figure 9-30 Frequency chart of outturn percent for 1990-91 data set when one percent of high impact projects are subject to stochastic analysis

The percentiles for Figure 9-30 shows the range of values for 'percent outturn', when one percent of the highest value projects in terms of planned expenditure (Amended Estimate) achieve an outturn governed by the Monte Carlo analysis. This one percent by number of projects, contains twenty percent of the total planned expenditure value of the data set.

Percentiles for 95%, 90%, 75%, and 50% are recorded for each frequency chart generated as shown in Table 9-92. It states the probable percent outturn when one percent to twenty percent of the highest value projects in the 1990-91 data set, in terms of planned expenditure (Amended Estimate), achieve an outturn governed by a Monte Carlo analysis based on the Beta probability distribution. The Beta distribution is constrained to produce an outturn variance that falls within zero to twenty percent.

% by Nos	% by \$	Percentiles results compared to 66.1 % actual outturn				
		100%	95%	90%	75%	50%
1%	20%	66.3 - 68.3	66.6 - 68.0	66.7 - 67.9	66.9 - 67.7	67.1 - 67.5
2%	30%	69.5 - 71.8	69.8 - 71.4	69.9 - 71.2	70.1 - 71.1	70.3 - 70.8
3%	40%	71.0 - 73.5	71.5 - 73.1	71.6 - 73.0	71.8 - 78.2	72.0 - 72.6
4%	46%	72.5 - 75.0	72.9 - 74.7	73.0 - 74.5	73.2 - 74.3	73.4 - 74.0
5%	51%	73.0 - 75.5	73.1 - 75.2	73.6 - 75.1	73.8 - 74.8	74.0 - 74.6
6%	55%	73.8 - 76.5	74.3 - 76.1	74.4 - 76.0	74.6 - 75.7	74.8 - 75.5
7%	58%	74.5 - 77.3	74.9 - 76.7	75.1 - 76.6	75.3 - 76.3	75.5 - 76.1
8%	61%	75.8 - 78.5	76.2 - 78.1	76.3 - 77.9	76.5 - 77.6	76.7 - 77.4
9%	64%	76.3 - 79.0	76.7 - 78.5	76.8 - 78.3	77.0 - 78.1	77.2 - 77.9
10%	66%	76.5 - 79.3	77.0 - 78.8	77.2 - 78.7	77.4 - 78.5	77.6 - 78.3
11%	69%	77.0 - 79.8	77.5 - 79.4	77.6 - 79.2	77.9 - 79.0	78.1 - 78.8
12%	71%	77.5 - 80.3	77.9 - 79.9	78.1 - 79.7	78.4 - 79.5	78.6 - 79.2
13%	73%	78.0 - 80.8	78.5 - 80.4	78.7 - 80.2	78.9 - 80.0	79.1 - 79.8
14%	74%	78.5 - 81.3	78.9 - 80.8	79.1 - 80.6	79.3 - 80.4	79.6 - 80.2
15%	76%	79.0 - 81.8	79.3 - 81.2	79.5 - 81.0	79.7 - 80.8	79.9 - 80.6
16%	77%	79.3 - 82.0	79.7 - 81.5	79.8 - 81.4	80.1 - 81.2	80.3 - 80.9
17%	79%	79.5 - 82.3	80.0 - 81.9	80.2 - 81.7	80.4 - 81.5	80.7 - 81.3
18%	80%	80.0 - 82.8	80.6 - 82.4	80.7 - 82.3	80.9 - 82.0	81.1 - 81.8
19%	81%	80.5 - 83.3	81.0 - 82.8	81.1 - 82.7	81.4 - 82.4	81.6 - 82.2
20%	82%	81.0 - 83.8	81.4 - 83.2	81.5 - 83.1	81.8 - 82.8	82.0 - 82.6

Table 9-92 Outturn for 1990-91 dataset when one to twenty percent of the significant projects are subject to an outturn based upon the Monte Carlo analysis.

Figure 9-31 shows these results graphically. The graph shows the relationship between the range of possible outturn when an increasing percent of the projects, in their order of greatest planned expenditure that financial year, achieve a high performance outcome. The performance is within an assumed range of eighty to one-hundred percent perfection and is based upon the Beta probability distribution for this range derived from the empirical data of the 1990-91 data set. All other project outcomes within the data set remain unchanged, i.e., remain at the outturn achieved in reality.

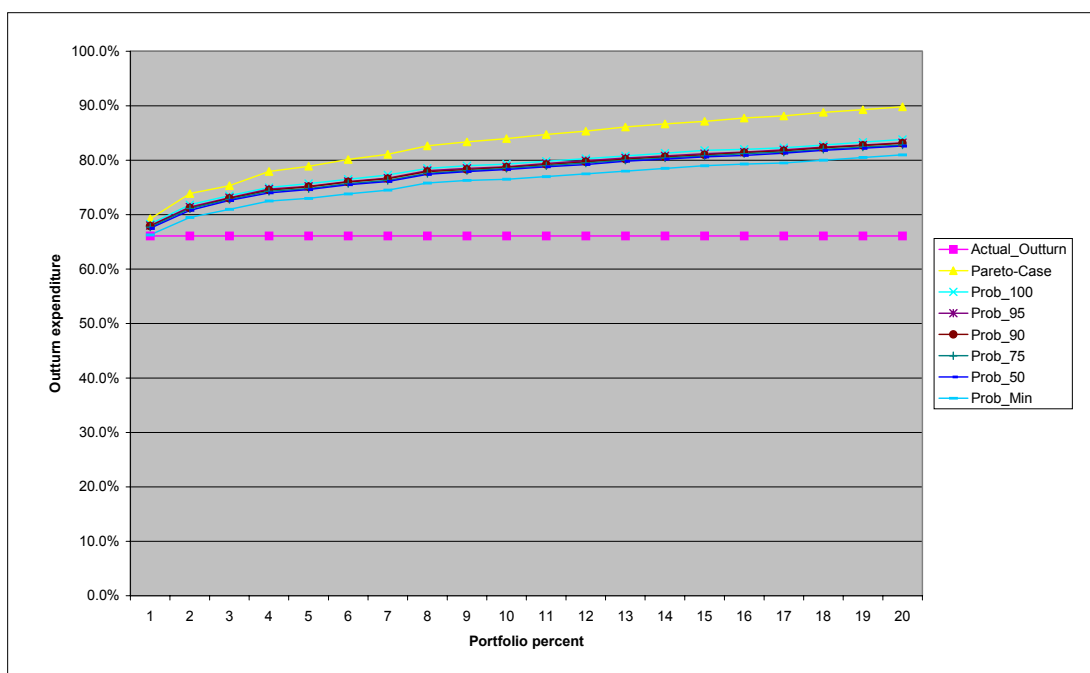


Figure 9-31 Variation in outturn expenditure 1990-91 dataset: comparison of actual outturn when significant projects achieve an ideal or probability-based ideal outcome

The percent improvement over the actual performance achieved in 1990-91 for this data set, that could theoretically be achieved, based on the assumptions in the Mathematical Analysis and in this stochastic analysis, are set out in Table 9-93.

Percent of data-set (i.e. portfolio)		Theoretical % improved outturn		
% by Nos. Sig Projects	% by Value of Planned Exp	assumed ideal	assumed Beta probability < Maximax	> Minimin
1%	20%	3.1%	2.2%	0.2%
2%	30%	7.8%	5.7%	3.4%
3%	40%	9.2%	7.4%	4.9%
4%	46%	11.8%	8.9%	6.4%
5%	51%	12.8%	9.6%	6.9%
6%	55%	14%	10.4%	7.7%
7%	58%	15%	11.2%	8.4%
8%	61%	16.5%	12.4%	9.7%
9%	64%	17.3%	12.9%	10.2%
10%	66%	17.9%	13.2%	10.4%
11%	69%	18.6%	13.7%	10.9%
12%	71%	19.2%	14.2%	11.4%
13%	73%	20%	14.7%	11.9%
14%	74%	20.6%	15.2%	12.4%
15%	76%	21.1%	15.7%	12.9%
16%	77%	21.6%	15.9%	13.2%
17%	79%	22%	16.2%	13.4%
18%	80%	22.7%	16.7%	13.9%
19%	81%	23.2%	17.2%	14.4%
20%	82%	23.7%	17.7%	14.9%

Table 9-93 Theoretical relative outturn improvement in the outturn performance for the 1990-91 data set

The numbers of projects subject to the stochastic analyses range from thirteen to two hundred and fifty-seven. The statistical attributes from each of analyses, in Table 9-94, shows the distribution of outcomes to be a consistent, normal distribution. This is reasonable as the Beta distribution used in the Monte Carlo analysis tends to a uniform distribution.

Prop dataset	Range	Kurtosis	Skew	Mean	Median	Mode	SD	Sensitivity > 0.5
1%	2.3%	2.93	-0.11	67.3%	67.3%	-	0.4%	No (-0.45)
2%	2.5%	2.99	-0.05	70.6%	70.6%	-	0.4%	No (-0.42)
3%	2.8%	3.01	0.01	72.3%	72.3%	-	0.4%	No (-0.35)
4%	2.8%	2.91	0.00	73.7%	73.7%	-	0.5%	No
5%	2.8%	3.07	0.03	74.3%	74.3%	-	0.5%	No
6%	2.9%	2.92	0.06	75.2%	75.2%	-	0.5%	No
7%	3.1%	2.94	0.02	75.8*	75.8%	-	0.5%	No
8%	3.2%	2.92	0.11	77.1%	77.0%	-	0.5%	No
9%	3.2%	2.97	-0.02	77.6%	77.6%	-	0.5%	No
10%	3.2%	3.00	-0.02	77.9%	77.9%	-	0.5%	No
11%	3.2%	3.01	-0.02	78.5%	78.5%	-	0.5%	No (-0.36)
12%	3.3%	3.04	0.0	78.9%	78.9%	-	0.5%	No (-0.32)
13%	3.3%	2.92	-0.13	79.9%	79.9%	-	0.5%	No (-0.42)
14%	3.3%	2.95	-0.13	79.9%	79.9%	-	0.5%	No (-0.31)
15%	3.3%	2.96	-0.07	80.2%	80.3%	-	0.5%	No (-0.33)
16%	3.3%	2.90	-0.04	80.6%	80.6%	-	0.5%	No (-0.36)
17%	3.3%	2.91	-0.11	81.0%	81.0%	-	0.5%	No (-0.31)
18%	3.3%	2.99	-0.03	81.5%	81.4%	-	0.5%	No (-0.31)
19%	3.3%	2.95	-0.08	81.9%	81.9%	-	0.5%	No (-0.36)
20%	3.3%	2.82	-0.08	82.3%	82.3%	-	0.5%	No (-0.33)

Table 9-94 Statistical attributes of the Monte Carlo analysis of the 1990-91 data set for cases 1% to 20% project significance

The range width is narrow: two to three percent in all cases. The kurtosis value are close to the value of 3.0 associated with a normal distribution. The values of skewness are close to zero showing the distribution to be highly symmetrical. The values of the 'mean' and the 'median' are coincident due to the symmetry. The Beta distribution is continuous and does not lend itself to producing mode values. The Standard Deviation is also uniform. For the purpose of this analysis, correlation coefficients less than +/- 0.5 is taken to indicate a lack of sensitivity between the individual variables and the outcome. This is found to be true in these analyses even when the number of variables is lowest and the potential for any one variable to affect the outcome is greatest. It is the effect of the significant group of projects that produces the outcome.

The Monte Carlo analysis generates the mean value for the percent outturn variance of each project out of the one thousand cases computed in the analysis. This ranges from zero to twenty percent according to the Beta probability distribution. Table 9-95 shows the statistical attributes for these mean values in each of the analysis scenarios: from one percent significant projects to twenty percent.

%Sig	Statistical Mean Values from 1000 Monte Carlo Trials						
	Nos	Low	High	Mode	Mean	Median	SD
1%	12	8.83%	9.33%	-	9.08%	9.12%	0.14%
2%	25	8.72%	9.33%	9.03%	9.09%	9.10%	0.15%
3%	39	8.78%	9.44%	9.22%	9.08%	9.07%	0.16%
4%	51	8.65%	9.67%	8.99%	9.07%	9.05%	0.20%
5%	64	8.61%	9.58%	9.02%	9.06%	9.05%	0.18%
6%	77	8.62%	9.43%	9.08%	9.07%	9.08%	0.17%
7%	90	8.52%	9.80%	8.98%	9.08%	9.09%	0.20%
8%	102	8.60%	9.80%	8.98%	9.09%	9.09%	0.22%
9%	115	8.63%	9.58%	9.09%	9.08%	9.09%	0.19%
10%	128	8.59%	9.88%	8.91%	9.08%	9.09%	0.22%
11%	141	8.59%	9.55%	9.22%	9.08%	9.08%	0.20%
12%	154	8.53%	9.93%	9.00%	9.08%	9.08%	0.21%
13%	166	8.58%	9.84%	9.18%	9.06%	9.08%	0.20%
14%	179	8.54%	9.99%	9.16%	9.08%	9.06%	0.22%
15%	192	8.60%	9.70%	9.05%	9.07%	9.05%	0.20%
16%	205	8.54%	9.80%	9.10%	9.08%	9.06%	0.21%
17%	218	8.48%	9.64%	9.05%	9.07%	9.05%	0.20%
18%	230	8.55%	9.64%	8.96%	9.07%	9.05%	0.20%
19%	243	8.52%	9.61%	8.93%	9.08%	9.07%	0.21%
20%	257	8.50%	9.66%	8.96%	9.08%	9.08%	0.20%

Table 9-95 Statistical attributes of mean values derived from Monte Carlo simulations of outturn performance for percents of project significance, 1990-91 portfolio

Results

Within the range of zero to twenty percent outturn variance used in the analysis the closest fit of a standard distribution is the Beta distribution ($\alpha = 0.74$, $\beta = 0.89$, $\text{scale} = 0.2$) in terms of the Chi-square test ($\theta = 0.0094$) and the Kolmogorov-Smirnov test (0.0682).

Table 9-96 lists the results of this analysis of the 1990-91 data set. The table contains 'ideal' case results taken from the 'mathematical' results and the results for percentiles of 95%, 90%, 75% and 50% probability derived from the Monte Carlo analyses. The 'Ave-mean' is the average of the mean values derived from the Monte Carlo analysis of each project in the analyses. The statistical attributes for the Monte Carlo values for each percent-significance are listed in Table 9-95. Each Monte Carlo analysis produced one thousand scenarios in which the percent outturn variance could fall within the range of zero to twenty percent according to the pre-selected Beta probability distribution. The mean of the 'Ave-mean outturn variance per significant project' is 9.08% compared to 0% in the 'ideal' mathematical case.

When deriving heuristics from this data, the 'evens' probability is used, i.e., the 50% percentile. This is because the difference between 95% and 50% percentiles values in the case of ten percent and twenty percent of significant projects is less than 0.5% and is not significant.

% No projects modified outturn	% Value	Outturn percent of target expenditure achieved						
		Actual %	Ideal %	Monte Carlo Percentiles				
				Ave-Mean outturn variance per project	95%	90%	75%	50%
1%	20%	66.1	69.7	9.08	68.0	67.9	67.7	67.5
2%	30%	66.1	73.9	9.09	71.4	71.2	71.1	70.8
3%	40%	66.1	75.3	9.08	73.1	73.0	72.8	72.6
4%	46%	66.1	77.9	9.07	74.7	74.5	74.3	74.0
5%	51%	66.1	78.9	9.06	75.2	75.1	74.8	74.6
6%	55%	66.1	80.1	9.07	76.1	76.0	75.7	75.5
7%	58%	66.1	81.1	9.08	76.7	76.6	76.3	76.1
8%	61%	66.1	82.6	9.09	78.1	77.9	77.6	77.4
9%	64%	66.1	83.4	9.08	78.5	78.3	78.1	77.9
10%	66%	66.1	84.0	9.08	78.8	78.7	78.5	78.3
11%	69%	66.1	84.7	9.08	79.4	79.2	79.0	78.8
12%	71%	66.1	85.3	9.08	79.9	79.7	79.5	79.2
13%	73%	66.1	86.2	9.06	80.4	80.2	80.0	79.8
14%	74%	66.1	86.7	9.08	80.8	80.6	80.4	80.2
15%	76%	66.1	87.2	9.07	81.2	81.0	80.8	80.6
16%	77%	66.1	87.7	9.08	81.5	81.4	81.2	80.9
17%	79%	66.1	88.1	9.07	81.9	81.7	81.5	81.3
18%	80%	66.1	88.8	9.07	82.4	82.3	82.0	81.8
19%	81%	66.1	89.3	9.08	82.8	82.7	82.4	82.2
20%	82%	66.1	89.8	9.08	83.2	83.1	82.8	82.6

Table 9-96 Comparison of the improved outturn for the 1990-91 portfolio due to the impact of the outturn-variance for 1% to 20% significant projects according to 'actual', 'ideal' and 'stochastic' scenarios.

Using the results shown in Table 9-96, three heuristics are proposed corresponding to the twenty-percent, the ten-percent and the five percent levels of significant projects in the portfolio.

- 80:20 rule case:

Twenty percent of the number of the projects in the 1990-91 portfolio, contain eighty-two percent of the 'planned expenditure' of the portfolio. There is an even probability of achieving an eighty-two percent spending performance for the portfolio overall *compared to the sixty-six percent outturn actually achieved*. This assumes that best endeavor management effort is applied to each of the twenty percent projects with greatest planned expenditure that year so that they each achieve a high performance outturn variance that is within the range of zero to twenty percent. Other projects remain at actual performance levels.

- 60:10 rule case

Ten percent of the number of the projects in the 1990-91 portfolio, contain sixty-six percent of the 'planned expenditure' of the portfolio. There is an even probability of achieving an seventy-eight percent spending performance for the portfolio overall *compared to the sixty-six percent outturn actually achieved*. This assumes that best endeavor management effort is applied to each of the ten percent projects with greatest planned expenditure that year so that they each achieve a high performance outturn variance that is within the range of zero to twenty percent. Other projects remain at actual performance levels.

- 50:5 rule case

Five percent of the number of the projects in the 1990-91 portfolio, contain fifty-one percent of the 'planned expenditure' of the portfolio. There is an even probability of achieving an seventy-five percent spending performance for the portfolio overall *compared to the sixty-six percent outturn actually achieved*. This assumes that best endeavor management effort is applied to each of the five percent projects with greatest planned expenditure that year so that they each achieve a high performance outturn variance that is within the range of zero to twenty percent. Other projects remain at current performance levels.

1991-92

Mathematical analysis

The attributes of the 1991-92 data set used in this analysis are described in Section 9.3.

The outturn variance in the 1991-92 data set is an under-spend of HK\$ 9,040 million, or forty-six percent of the planned expenditure. In this analysis, the effect on the outturn for the portfolio of projects as a whole is calculated as those projects with the more significant values of planned expenditure achieve a perfect outcome of zero outturn variance.

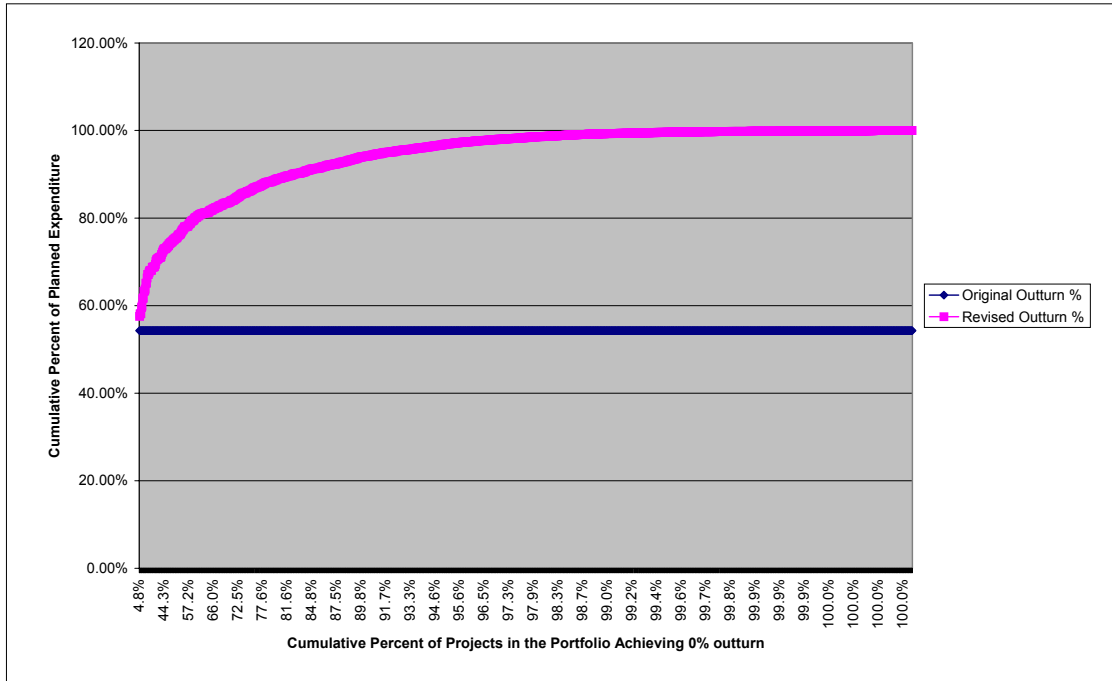


Figure 9-32 Improved outturn achieved in 1991-92 dataset as ideal outturn is achieved by significant projects

Figure 9-32 and Table 9-97, shows the rate of improvement as increasing percentiles of the significant projects in portfolio achieve a perfect outcome. The greatest rate of improvement occurs within the 12.5 percentile.

Percentile (<i>Projects in dataset</i>)	Outturn Achieved	Diff to Actual Outturn
2.5%	71%	17%
5%	76%	22%
7.5%	80%	26%
10%	82%	28%
12.5%	85%	30%
15%	87%	33%
17.5%	89%	34%
20%	90%	36%
22.5%	91%	37%
25%	92%	38%
27.5%	93%	39%
30%	94%	40%
35%	96%	41%
40%	97%	43%
50%	98%	44%

Table 9-97 Improved outturn achievement for 1991-92 dataset

This analysis indicates that an ideal delivery for the significant value twenty percent of the projects in the data set will deliver on overall outturn for the portfolio that is ninety percent of the planned outcome – all other things being unchanged.

Stochastic analysis

In this analysis, the outcome for each significant project is based upon a probability distribution derived from the 1991-92 empirical data as described in Section 9.3 – ‘Probability curve fitting’. The probability distribution for this range of values is a Beta distribution with parameters of:

- Alpha value = 0.68
- Beta value = 0.82
- Scale value = 0.20

This probability curve is based upon the actual performance for this data set within the limits of x-values of 0 to 0.2, i.e., ratios of outturn performance that range from zero to a twenty percent under-spending of the planned expenditure. Crystal Ball® software by Decisioneering Inc is used to perform Monte Carlo analysis on the variable ‘Outturn variance/Amended Estimate’ for each of the significant projects identified within the 1991-92 data set within ranges of one to twenty percent of the 1225 projects in the data set.

These analyses produced a frequency diagram for outturn for the data set in terms of total expenditure and also percent outturn. For example, Figure 9-33 shows the range of total expenditures for the data set whilst Figure 9-34 shows the corresponding outturn in terms of percent. For brevity in this thesis the frequency diagrams are not reproduced in all analyses, however the results corresponding to percentiles are tabulated here.

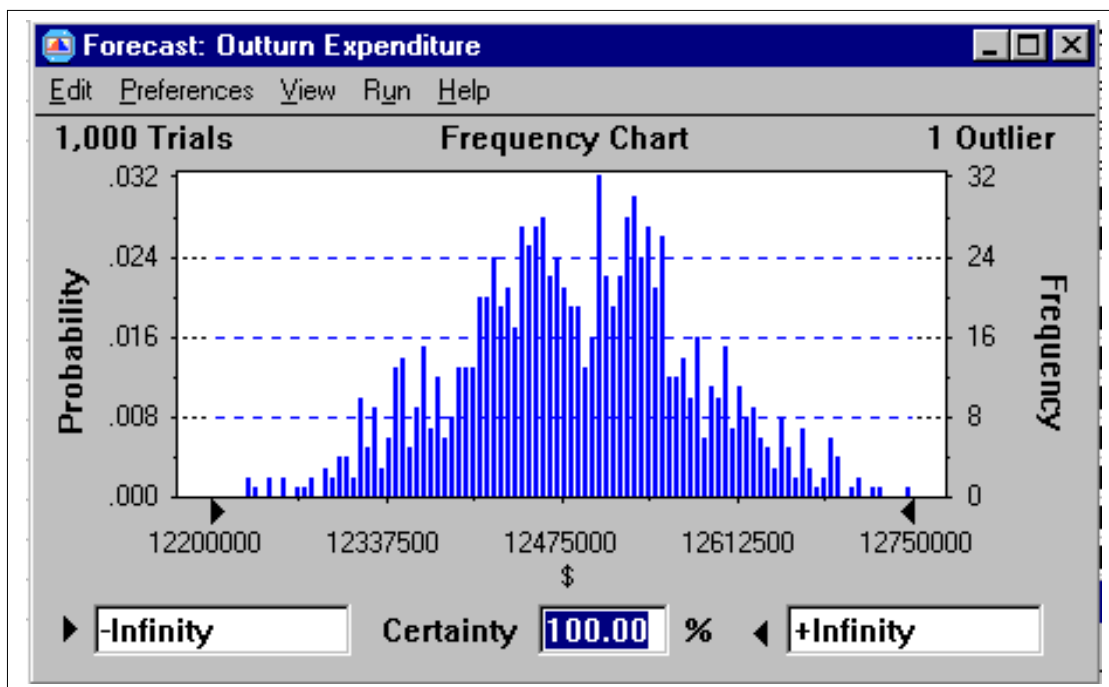


Figure 9-33 Frequency chart derived from Monte Carlo analysis of 1991-92 data set with one percent of significant projects subject to stochastic outturn

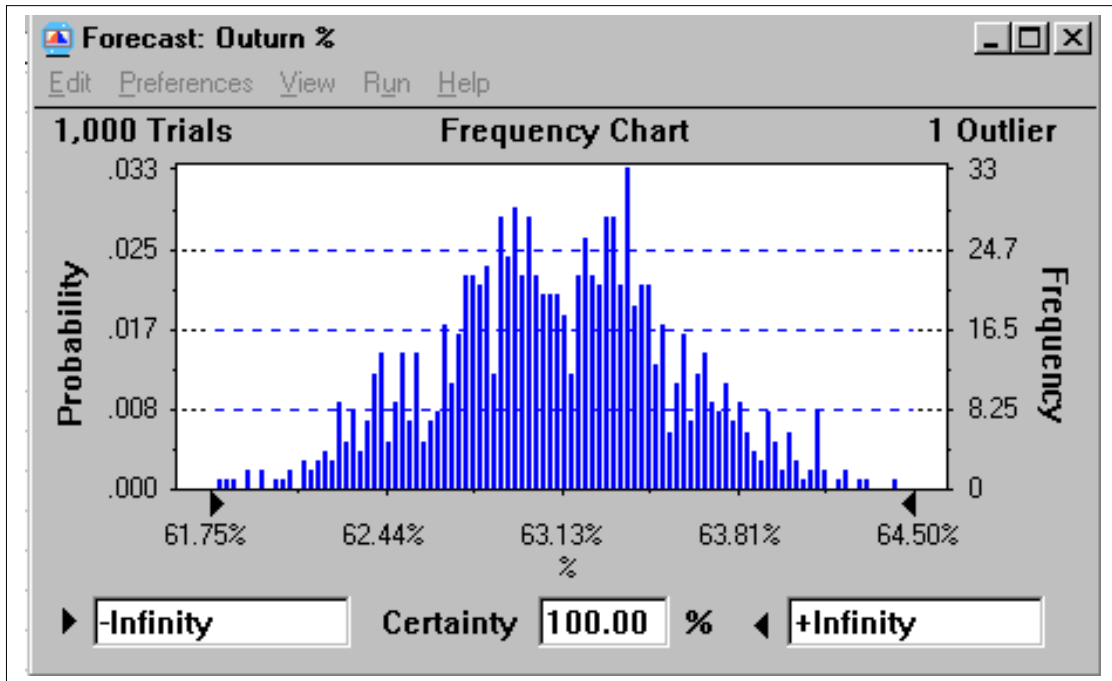


Figure 9-34 Frequency chart of outturn percent for 1991-92 data set when one percent of high impact projects are subject to stochastic analysis.

The percentiles for Figure 9-34 shows the range of values for 'percent outturn', when one percent of the highest value projects in terms of planned expenditure (Amended Estimate) achieve an outturn governed by the Monte Carlo analysis. This one percent by number of projects, contains twenty percent of the total planned expenditure value of the data set. Percentiles for 95%, 90%, 75%, and 50% are recorded for each frequency chart generated as shown in Table 9-98. It states the probable percent outturn when one percent to twenty percent of the highest value projects in the 1990-91 data set, in terms of planned expenditure (Amended Estimate), achieve an outturn governed by a Monte Carlo analysis based on the Beta probability distribution. The Beta distribution is constrained to produce an outturn variance that falls within zero to twenty percent.

Figure 9-35 shows these results graphically. The graph shows the relationship between the range of possible outturn when an increasing percent of the projects, in their order of greatest planned expenditure that financial year, achieve a high performance outcome within an assumed range of eighty to one hundred percent perfection. This is based upon the Beta probability distribution for this constrained range derived from the empirical data of the 1991-92 data set. All other project outcomes within the data set remain unchanged, i.e., remain at the outturn achieved in reality.

% by Nos	% by \$	Percentiles results compared to 54.3 % actual outturn				
		100%	95%	90%	75%	50%
1%	24.1%	61.75 – 64.50	62.24 – 64.02	62.33 – 63.88	62.56 – 63.65	62.80 – 63.41
2%	39.9%	64.25 – 67.25	64.63 – 66.67	64.82 – 66.56	65.12 – 66.34	65.38 – 66.11
3%	43.0%	66.50 – 70.00	67.32 – 69.44	67.52 – 69.25	67.76 – 69.01	67.99 – 68.72
4%	48.0%	68.50 – 71.50	68.91 – 71.02	69.04 – 70.90	69.25 – 70.60	69.58 – 70.32
5%	52.2%	69.75 – 72.75	69.92 – 72.07	70.19 – 71.99	70.55 – 71.79	70.78 – 71.52
6%	55.7%	71.50 – 74.50	71.99 – 74.10	72.15 – 73.96	72.36 – 73.69	72.66 – 73.42
7%	59.0%	72.75 – 75.75	73.05 – 75.19	73.23 – 75.07	73.56 – 74.84	73.84 – 74.61
8%	61.9%	73.50 – 77.00	74.23 – 76.48	74.41 – 76.33	74.73 – 76.07	75.03 – 75.82
9%	64.4%	74.00 – 77.50	74.46 – 76.70	74.64 – 76.53	74.92 – 76.23	75.21 – 75.98
10%	66.7%	74.50 – 78.00	75.18 – 77.42	75.40 – 77.31	75.69 – 77.05	76.01 – 76.76
11%	69.0%	75.50 – 79.00	76.17 – 78.32	76.30 – 78.16	76.55 – 77.91	76.81 – 77.57
12%	70.9%	76.25 – 79.25	76.64 – 78.81	76.78 – 78.58	77.05 – 78.31	77.34 – 78.07
13%	72.8%	77.00 – 80.50	77.38 – 79.61	77.62 – 79.46	77.91 – 79.21	78.18 – 78.94
14%	74.4%	77.50 – 81.00	78.20 – 80.43	78.35 – 80.27	78.61 – 79.97	78.91 – 79.71
15%	76.0%	78.50 – 82.00	78.59 – 81.00	78.95 – 80.89	79.31 – 80.62	79.62 – 80.38
16%	77.6%	79.25 – 82.25	79.65 – 81.77	79.82 – 81.60	80.08 – 81.36	80.34 – 81.10
17%	78.9%	79.75 – 82.75	80.01 – 82.24	80.22 – 82.10	80.53 – 81.86	80.81 – 81.62
18%	80.1%	80.00 – 83.50	80.88 – 83.00	80.90 – 82.79	81.17 – 82.47	81.46 – 82.21
19%	81.4%	80.50 – 84.00	80.50 – 83.17	81.12 – 83.03	81.47 – 82.82	81.76 – 82.59
20%	82.5%	81.00 – 84.50	81.47 – 83.70	81.66 – 83.59	81.93 – 83.35	82.22 – 83.05

Table 9-98 Outturn for 1991-92 dataset when one to twenty percent of the significant projects are subject to an outturn based upon the Monte Carlo analysis.

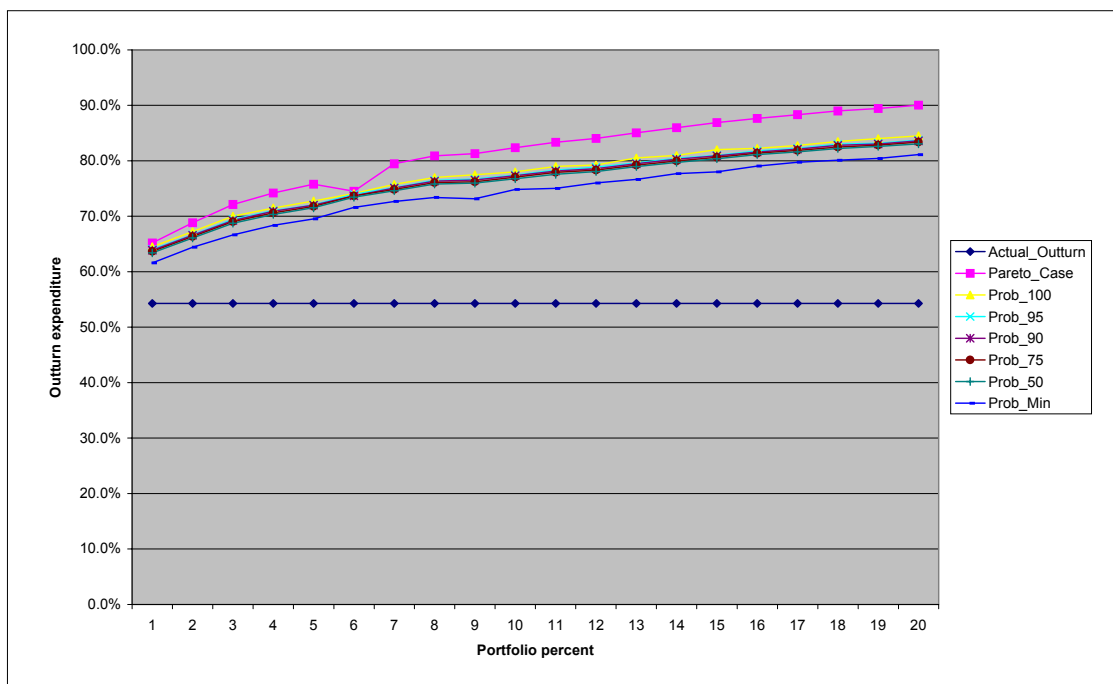


Figure 9-35 Variation in outturn expenditure 1991-92 dataset: comparison of actual outturn when significant projects achieve an ideal or probability-based ideal outcome

The percent improvement over the actual performance achieved in 1991-92 for this data set, that could theoretically be achieved, based on the assumptions in the mathematical analysis and this stochastic analysis, are set out in Table 9-99.

Percent of data-set (i.e. portfolio)		Theoretical % improved outturn		
% by Nos. Sig Projects	% by Value of Planned Exp	Assumed ideal	assumed Beta probability	
			< Maximax	> Minimin
1%	24%	10.9%	10.2%	7.3%
2%	35%	14.5%	13.0%	10.1%
3%	43%	17.8%	15.7%	12.3%
4%	48%	19.9%	17.2%	14.1%
5%	52%	21.5%	18.5%	15.2%
6%	56%	20.2%	19.8%	17.3%
7%	59%	25.2%	21.5%	18.4%
8%	62%	26.6%	22.7%	19.1%
9%	64%	27.0%	23.2%	18.8%
10%	67%	28.1%	23.7%	20.5%
11%	69%	29.0%	24.7%	20.7%
12%	71%	29.7%	25.0%	21.7%
13%	73%	30.7%	26.2%	22.3%
14%	74%	31.7%	26.7%	23.4%
15%	76%	32.6%	27.7%	23.7%
16%	78%	33.4%	28.0%	24.7%
17%	79%	34.0%	28.5%	25.5%
18%	80%	34.7%	29.2%	25.8%
19%	81%	35.1%	29.7%	26.1%
20%	83%	35.7%	30.2%	26.8%

Table 9-99 Theoretical relative outturn improvement in the outturn performance for the 1991-92 data set

The numbers of projects subject to the stochastic analyses, range from thirteen to two hundred and forty-five. The statistical attributes from each of analyses, shown in Table 9-100, shows the distribution of outcomes to be a consistent, normal distribution. This is reasonable as the Beta distribution used in the Monte Carlo analysis tends to a uniform distribution. The range width is narrow: three to four percent in all cases. The kurtosis value are close to the value of 3.0 associated with a normal distribution. The values of skewness are close to zero showing the distribution to be highly symmetrical. The values of the 'mean' and the 'median' are coincident due to the symmetry. The Beta distribution is continuous and does not lend itself to producing mode values. The Standard Deviation is also uniform.

For the purpose of this analysis, correlation coefficients less than +/- 0.5 is taken to indicate a lack of sensitivity between the individual variables and the outcome. The largest variable exceeds the borderline value of -0.5 for all of the one-twenty percent cases of project significance examined but it does not exceed a sensitivity of -0.6. All other variables are below the 0.5 threshold. The significance of this one project is not marked. Overall, it is the effect of the significant group of projects that produces the outcome.

Prop dataset	Range	Kurtosis	Skew	Mean	Median	Mode	SD	Sensitivity > 0.5
1%	2.8%	2.84	-0.05	63.1%	63.1%	-	0.5%	Yes (-0.61)
2%	2.9%	2.63	-0.06	65.8%	65.8%	-	0.52	Yes (-0.60)
3%	3.2%	2.80	-0.03	68.4%	68.4%	-	0.02	Yes (-0.56)
4%	3.1%	2.69	0.00	70.0%	69.9%	-	0.55	Yes (-0.53)
5%	3.3%	2.93	-0.09	71.2%	71.2%	-	0.54	Yes (-0.54)
6%	3.1%	2.62	0.04	73.1%	73.1%	-	0.55	Yes (-0.52)
7%	3.4%	2.77	-0.07	74.2%	74.2%	-	0.55	Yes (-0.54)
8%	3.7%	2.99	-0.17	75.4%	75.4%	-	0.58	Yes (-0.54)
9%	4.4%	3.10	-0.10	75.6%	75.6%	-	0.58	Yes (-0.56)
10%	3.2%	2.73	-0.02	76.4%	76.4%	-	0.57	Yes (-0.58)
11%	3.8%	2.91	0.01	77.2%	77.2%	-	0.56	Yes (-0.54)
12%	3.4%	2.91	-0.02	77.7%	77.7%	-	0.55	No (-0.50)
13%	3.6%	2.96	-0.03	78.6%	78.6%	-	0.57	Yes (-0.55)
14%	3.2%	2.68	0.02	79.3%	79.3%	-	0.58	Yes (-0.56)
15%	4.2%	3.05	-0.05	80.1%	80.1%	-	0.56	Yes (-0.52)
16%	3.4%	2.76	0.00	80.7%	80.7%	-	0.55	Yes (-0.52)
17%	3.2%	2.71	0.02	81.2%	81.2%	-	0.57	Yes (-0.52)
18%	3.6%	2.95	0.02	81.8%	81.8%	-	0.57	Yes (-0.54)
19%	3.6%	2.71	-0.15	82.2%	82.2%	-	0.58	Yes (-0.57)
20%	3.0%	2.52	-0.02	82.6%	82.6%	-	0.58	Yes (-0.55)

Table 9-100 Statistical attributes of the Monte Carlo analysis of the 1991-92 data set for cases 1% to 20% project significance

The Monte Carlo analysis generates the mean value for the percent outturn variance of each project out of the one thousand cases computed in the analysis. This ranges from zero to twenty percent according to the Beta probability distribution. Table 9-101 shows the statistical attributes for these mean values in each of the analysis scenarios: from one percent significant projects to twenty percent.

%Sig	Statistical Mean Values from 1000 Monte Carlo Trials						
	Nos	Low	High	Mode	Mean	Median	SD
1%	12	8.76%	9.35%	8.93%	9.06%	9.075	0.16%
2%	24	8.79%	9.47%	9.25%	9.12%	9.14%	0.18%
3%	37	8.69%	9.49%	9.24%	9.11%	9.11%	0.19%
4%	49	8.65%	9.77%	9.10%	9.11%	9.11%	0.21%
5%	61	8.56%	9.51%	9.10%	9.03%	9.08%	0.18%
6%	73	8.08%	9.70%	9.19%	9.09%	9.11%	0.21%
7%	86	8.61%	9.46%	9.08%	9.06%	9.08%	0.20%
8%	98	8.61%	9.46%	9.08%	9.06%	9.08%	0.20%
9%	110	8.35%	9.62%	9.08%	9.07%	9.07%	0.20%
10%	122	8.45%	9.56%	8.92%	9.07%	9.07%	0.21%
11%	135	8.60%	9.62%	9.13%	9.07%	9.07%	0.18%
12%	147	8.55%	9.61%	9.25%	9.07%	9.05%	0.22%
13%	159	8.56%	9.59%	9.31%	9.08%	9.09%	0.19%
14%	171	8.59%	9.60%	8.97%	9.07%	9.06%	0.20%
15%	183	8.55%	9.61%	9.10%	9.06%	9.06%	0.19%
16%	196	8.53%	9.55%	8.98%	9.05%	9.04%	0.19%
17%	208	8.48%	9.59%	9.15%	9.09%	9.10%	0.21%
18%	220	8.56%	9.69%	9.08%	9.06%	9.07%	0.20%
19%	232	8.54%	9.64%	9.11%	9.07%	9.10%	0.19%
20%	245	8.60%	9.73%	9.12%	9.08%	9.09%	0.19%

Table 9-101 Statistical attributes of mean values derived from Monte Carlo simulations of outturn performance for percents of project significance, 1991-92 portfolio

Results

Within the range of zero to twenty percent outturn variance used in the analysis the closest fit of a standard distribution is the Beta distribution ($\alpha = 0.68$, $\beta = 0.82$, $\text{scale} = 0.2$) in terms of the Chi-square test ($\theta = 0.0133$) and the Kolmogorov-Smirnov test (0.0861).

Table 9-102 lists the results of this analysis of the 1991-92 data set. The table contains 'ideal' case results taken from the 'mathematical' and the 'stochastic' results for percentiles of 95%, 90%, 75% and 50% probability taken from the Monte Carlo analyses. The 'Ave-mean' is the average of the mean values derived from the Monte Carlo analysis of each project in the analyses. The statistical attributes for the Monte Carlo values for each percent-significance are listed in Table 9-101. Each Monte Carlo analysis produced one thousand scenarios in which the percent outturn variance could fall within the range of zero to twenty percent according to the pre-selected Beta probability distribution. The mean of the 'Ave-mean outturn variance per project' is 9.08%.

When deriving heuristics from this data, the 'evens' probability is used, i.e., the 50% percentile. This is because the difference between 95% and 50% percentiles values in the case of ten percent and twenty percent of significant projects is less than 0.5% and is not significant.

% No projects modified outturn	% Value	Outturn percent of target expenditure achieved						
		Actual %	Ideal %	Monte Carlo Percentiles				
				Ave-Mean outturn variance per project	95%	90%	75%	50%
1%	24%	54.3	65.2	9.06%	64.0	63.9	63.7	63.4
2%	40%	54.3	68.8	9.12%	66.7	66.6	66.3	66.1
3%	43%	54.3	72.1	9.11%	69.4	69.3	69.0	68.7
4%	48%	54.3	74.2	9.11%	71.0	70.9	70.6	70.3
5%	52%	54.3	75.8	9.03%	72.1	72.0	71.8	71.5
6%	56%	54.3	78.0	9.09%	74.1	74.0	73.7	73.4
7%	59%	54.3	79.5	9.08%	75.2	75.1	74.8	74.6
8%	62%	54.3	80.9	9.06%	76.5	76.3	76.1	75.8
9%	64%	54.3	81.3	9.07%	76.7	76.5	76.3	76.0
10%	67%	54.3	82.4	9.07%	77.4	77.3	77.1	76.8
11%	69%	54.3	85.3	9.07%	78.3	78.2	77.9	77.6
12%	71%	54.3	84.0	9.07%	78.8	78.6	78.3	78.1
13%	73%	54.3	85.0	9.08%	79.6	79.5	79.2	78.9
14%	75%	54.3	86.0	9.06%	80.4	80.3	80.0	79.7
15%	76%	54.3	87.2	9.06%	81.0	80.9	80.6	80.4
16%	78%	54.3	87.7	9.05%	81.8	81.6	81.4	81.1
17%	79%	54.3	88.3	9.09%	82.2	82.1	81.9	81.6
18%	80%	54.3	89.0	9.06%	83.0	82.8	82.5	82.2
19%	81%	54.3	89.5	9.07%	83.2	83.0	82.8	82.6
20%	83%	54.3	90.0	9.08%	83.7	83.6	83.4	83.1

Table 9-102 Comparison of the improved outturn for the 1991-92 portfolio due to the impact of the outturn-variance for 1% to 20% significant projects according to 'actual', 'ideal' and 'stochastic' scenarios.

Using the results shown in Table 9-102, three heuristics are proposed corresponding to the twenty-percent, the ten-percent and the five percent levels of significant projects in the portfolio.

- 80:20 rule case:

Twenty percent of the number of the projects in the 1991-92 portfolio contain eighty-three percent of the 'planned expenditure' of the portfolio. There is an evens probability of achieving an eighty-three percent spending performance for the portfolio overall *compared to the sixty-six percent outturn actually achieved*. This assumes that best endeavor management effort is applied to each of the twenty percent projects with greatest planned expenditure that year so that they each achieve a high performance outturn variance that is within the range of zero to twenty percent. Other projects remain at current performance levels.

- 60:10 rule case

Ten percent of the number of the projects in the 1991-92 portfolio contain sixty-seven percent of the 'planned expenditure' of the portfolio. There is an evens probability of achieving an seventy-seven percent spending performance for the portfolio overall *compared to the sixty-six percent outturn actually achieved*. This assumes that best endeavor management effort is applied to each of the ten percent projects with greatest planned expenditure that year so that they each achieve a high performance outturn variance that is within the range of zero to twenty percent. Other projects remain at current performance levels.

- 50:5 rule case

Five percent of the number of the projects in the 1991-92 portfolio contain fifty-two percent of the 'planned expenditure' of the portfolio. There is an evens probability of achieving an seventy-two percent spending performance for the portfolio overall *compared to the sixty-six percent outturn actually achieved*. This assumes that best endeavor management effort is applied to each of the five percent projects with greatest planned expenditure that year so that they each achieve a high performance outturn variance that is within the range of zero to twenty percent. Other projects remain at current performance levels.

1992-93

Mathematical analysis

The attributes of the 1992-93 data set used in this analysis are described in Section 9.3.

The outturn variance in the 1992-93 data set is an under-spend of HK\$ 7,309 million, or thirty-five percent of the planned expenditure. In this analysis, the effect on the outturn for the portfolio of projects as a whole is calculated as the projects with the more significant values of planned expenditure achieve a perfect outcome of zero outturn variance.

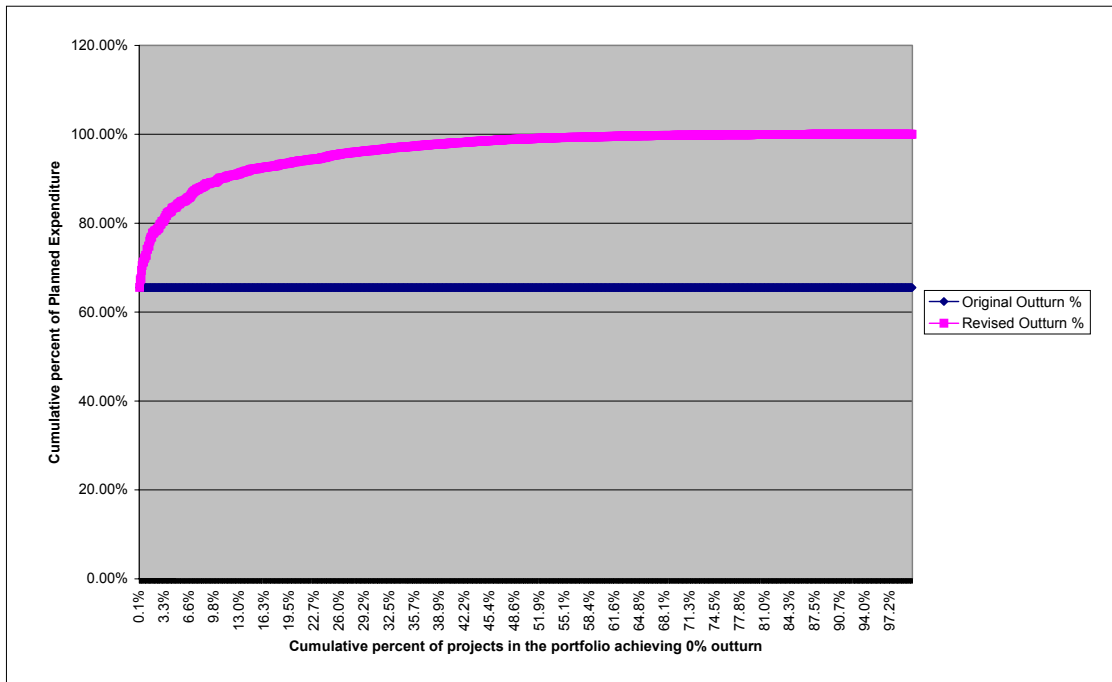


Figure 9-36 Improved outturn achieved in 1992-93 dataset as ideal outturn is achieved by significant projects

Figure 9-36 and Table 9-103, shows the rate of improvement as increasing percentiles of the significant projects in portfolio achieve a perfect outcome. The greatest rate of improvement occurs within the 12.5 percentile.

Percentile (Projects in dataset)	Outturn Achieved	Diff to Actual Outturn
2.5%	79%	13%
5%	84%	19%
7.5%	88%	22%
10%	89%	24%
12.5%	91%	25%
15%	92%	27%
17.5%	93%	27%
20%	94%	28%
22.5%	94%	29%
25%	95%	30%
27.5%	96%	30%
30%	96%	31%
35%	97%	32%
40%	98%	32%
50%	99%	33%

Table 9-103 Improved outturn achievement for 1992-93 dataset

This analysis indicates that an ideal delivery for the significant value twenty percent of the projects in the data set will deliver on overall outturn for the portfolio that is ninety-four percent of the planned outcome – all other things being unchanged.

Stochastic analysis

The stochastic validation is the same as Mathematical Analysis except for a change to the earlier assumption that increasing numbers of significant value project will achieve a perfect outcome. As in the stochastic analyses before, this assumption is replaced by outcome for each significant project that are based upon a probability distribution derived from the 1992-93 empirical data as described in Section 9.3. This probability curve is based upon the actual performance for this data set within the limits of x-values of 0 to 0.2, i.e., ratios of outturn performance that range from zero to a twenty percent under-spending of the planned expenditure. The probability distribution for this range of values is a Beta distribution with parameters of:

- Alpha value = 0.61
- Beta value = 1.06
- Scale value = 0.20

Crystal Ball® software by Decisioneering Inc is used to perform Monte Carlo analysis on the variable 'Outturn variance/Amended Estimate' for each of the significant projects identified within the 1992-93 data set within ranges of one to twenty percent of the 1,143 projects in the data set.

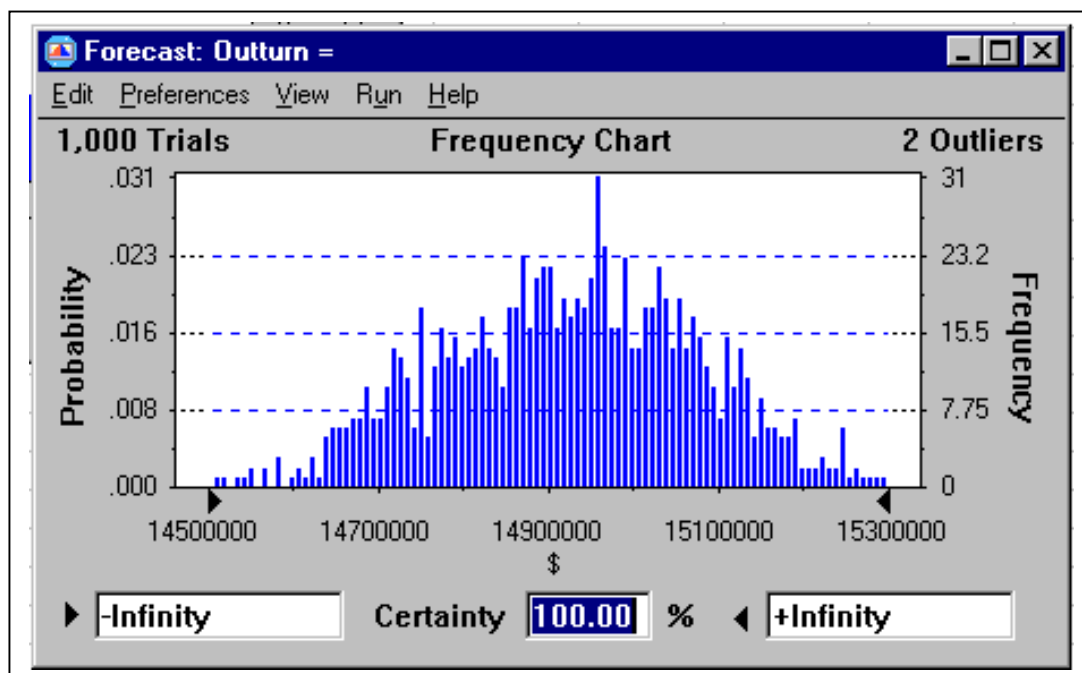


Figure 9-37 Frequency chart derived from Monte Carlo analysis of 1992-93 data set with one percent of significant projects subject to stochastic outturn

The Crystal Ball® analysis produced a frequency diagram for outturn for the data set in terms of total expenditure and also percent outturn. For example, Figure 9-37 shows the range of total expenditures for the data set whilst Figure 9-38 shows the corresponding outturn in terms of percent. For brevity in this thesis the frequency diagrams are not reproduced in all analyses, however the results corresponding to percentiles are tabulated here.

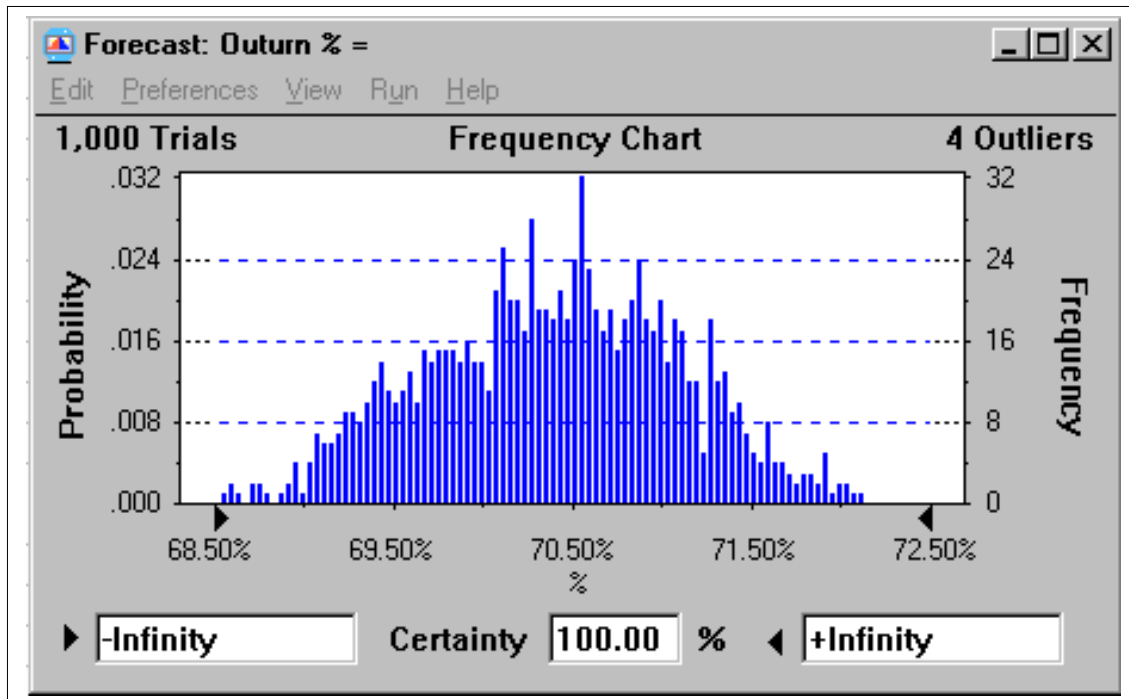


Figure 9-38 Frequency chart of outturn percent for 1992-93 data set when one percent of high impact projects are subject to stochastic analysis

The percentiles for Figure 9-37 shows the range of values for 'percent outturn', when one percent of the highest value projects in terms of planned expenditure (Amended Estimate) achieve an outturn governed by the Monte Carlo analysis. This one percent by number of projects, contains twenty percent of the total planned expenditure value of the data set. Percentiles for 95%, 90%, 75%, and 50% are recorded for each frequency chart generated as shown in Table 9-104. It states the probable percent outturn when one percent to twenty percent of the highest value projects in the 1992-93 data set, in terms of planned expenditure (Amended Estimate), achieve an outturn governed by a Monte Carlo analysis based on the Beta probability distribution. The Beta distribution is constrained to produce an outturn variance that falls within zero to twenty percent.

% by Nos	% by \$	Percentiles results compared to 65.52 % actual outturn				
		100%	95%	90%	75%	50%
1%	33.1%	68.50 – 72.50	68.78 – 71.59	69.13 – 71.44	69.46 – 71.17	69.85 – 70.88
2%	45.5%	73.00 – 77.00	73.39 – 76.06	73.65 – 75.91	73.96 – 75.61	74.31 – 75.29
3%	52.4%	74.50 – 79.00	74.78 – 77.86	75.24 – 77.69	75.62 – 77.40	76.03 – 77.03
4%	57.9%	76.00 – 80.50	76.77 – 79.75	77.13 – 79.54	77.48 – 79.25	77.88 – 78.93
5%	62.2%	77.50 – 81.50	77.78 – 80.76	78.22 – 80.60	78.61 – 80.33	79.00 – 80.04
6%	66.0%	78.50 – 82.50	78.86 – 81.69	79.14 – 81.54	79.53 – 81.25	79.92 – 80.94
7%	69.0%	79.50 – 84.00	79.80 – 83.09	80.34 – 82.96	80.85 – 82.64	81.26 – 82.33
8%	71.6%	80.50 – 85.00	80.54 – 83.98	81.33 – 83.37	81.82 – 83.60	82.25 – 83.27
9%	74.1%	81.50 – 85.50	81.87 – 84.83	82.19 – 84.64	82.58 – 84.30	82.93 – 83.98
10%	76.2%	81.50 – 86.00	82.20 – 85.06	82.51 – 84.92	82.86 – 84.62	83.24 – 84.24
11%	78.1%	82.00 – 87.00	82.93 – 85.98	83.15 – 85.75	83.52 – 85.42	83.90 – 85.04
12%	79.6%	82.50 – 87.00	83.43 – 86.41	83.66 – 86.13	84.09 – 85.83	84.40 – 85.41
13%	81.0%	83.00 – 87.50	83.44 – 86.51	83.83 – 86.37	84.28 – 86.09	84.73 – 85.73
14%	82.3%	83.50 – 88.00	84.09 – 87.06	84.35 – 86.87	84.79 – 86.55	85.22 – 86.21
15%	83.4%	84.00 – 88.50	84.66 – 87.49	84.83 – 87.30	85.24 – 87.01	85.58 – 86.70
16%	84.5%	84.00 – 88.50	84.33 – 87.69	84.88 – 87.47	85.33 – 87.16	85.77 – 86.55
17%	85.4%	84.50 – 88.50	84.69 – 87.77	85.16 – 87.61	85.58 – 87.32	85.98 – 87.03
18%	86.4%	84.50 – 89.00	84.93 – 87.94	85.31 – 87.79	85.78 – 87.53	86.18 – 87.21
19%	87.2%	85.00 – 89.00	85.08 – 88.33	85.56 – 88.16	86.04 – 87.85	86.48 – 87.53
20%	88.1%	85.00 – 89.50	85.63 – 88.66	85.98 – 88.47	86.50 – 88.18	86.90 – 87.92

Table 9-104 Outturn for 1992-93 dataset when one to twenty percent of the significant projects are subject to an outturn based upon the Monte Carlo analysis.

Figure 9-39 shows these results graphically. The graph shows the relationship between the range of possible outturn when an increasing percent of the projects, in their order of greatest planned expenditure that financial year, achieve a high performance outcome within an assumed range of eighty to one hundred percent perfection. Based upon the Beta probability distribution for this constrained range, derived from the empirical data of the 1992-93 data set. All other outcomes within the data set remain unchanged, i.e., remain at the outturn achieved in reality.

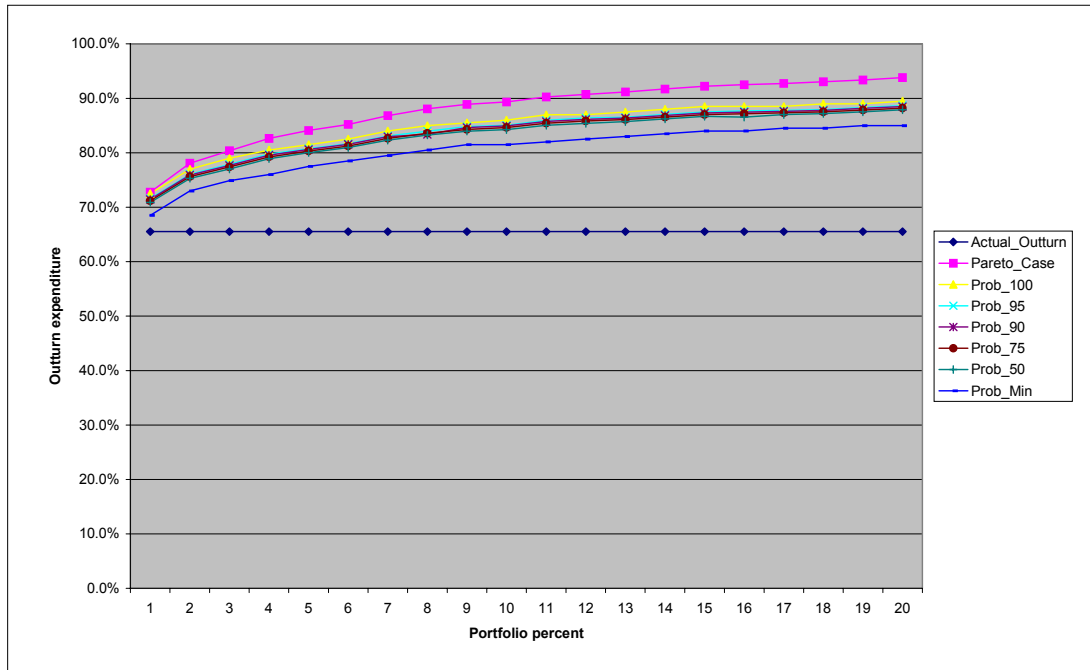


Figure 9-39 Variation in outturn expenditure 1992-93 dataset: comparison of actual outturn when significant projects achieve an ideal or probability-based ideal outcome

The percent improvement over the actual performance achieved in 1992-93 for this data set, that could theoretically be achieved, based on the assumptions in the Mathematical Analysis and this stochastic analysis, are set out in Table 9-105.

Percent of data-set (i.e. portfolio)		Theoretical % improved outturn		
% by Nos. Sig Projects	% by Value of Planned Exp	Assumed ideal	assumed Beta probability < Maximax	> Minimin
1%	33%	7.3%	7.0%	3.0%
2%	45%	12.6%	11.5%	7.5%
3%	52%	14.9%	13.5%	9.4%
4%	58%	17.1%	15.0%	10.5%
5%	62%	18.6%	16.0%	12.0%
6%	66%	19.7%	17.0%	13.0%
7%	69%	21.3%	18.5%	14.0%
8%	72%	22.5%	19.5%	15.0%
9%	74%	23.4%	20.0%	16.0%
10%	76%	23.8%	20.5%	16.0%
11%	78%	24.7%	21.5%	16.5%
12%	80%	25.2%	21.5%	17.0%
13%	81%	25.7%	22.0%	17.5%
14%	82%	26.2%	22.5%	18.0%
15%	83%	26.7%	23.0%	18.5%
16%	85%	27.0%	23.0%	18.5%
17%	85%	27.2%	23.0%	19.0%
18%	86%	27.5%	23.5%	19.0%
19%	87%	27.9%	23.5%	19.5%
20%	88%	28.3%	24.0%	19.5%

Table 9-105 Theoretical relative outturn improvement in the outturn performance for the 1992-93 data set

The numbers of projects subject to the stochastic analysis ranges from thirteen to two hundred and forty-five. The statistical attributes from each of the analyses, stated in Table 9-106, shows the distribution of outcomes to be a consistent, normal distribution. This is reasonable as the Beta distribution used in the Monte Carlo analysis tends to a uniform distribution. The range width is narrow: four to five percent in all cases. The kurtosis values are close to the value of 3.0 associated with a normal distribution. The values of skewness are close to zero showing the distribution to be highly symmetrical. The values of the 'mean' and the 'median' are coincident due to the symmetry. The Beta distribution is continuous and does not lend itself to producing mode values. The Standard Deviation is also uniform.

For the purpose of this analysis, correlation coefficients less than +/- 0.5 is taken to indicate a lack of sensitivity between the individual variables and the outcome. The largest variable exceeds the borderline value of -0.5 for most of the one-twenty percent cases of project significance examined but it does not exceed a sensitivity of -0.6. All other variables are below the 0.5 threshold. The significance of this one project is not marked. Overall, it is the effect of the significant group of projects that produces the outcome.

Prop dataset	Range	Kurtosis	Skew	Mean	Median	Mode	SD	Sensitivity > 0.5
1%	3.9%	2.61	-0.14	70.4%	70.4%	-	0.7%	Yes (-0.63)
2%	3.9%	2.66	-0.08	74.8%	74.8%	-	0.7%	Yes (-0.54)
3%	4.5%	2.74	-0.07	76.6%	76.6%	-	0.8%	Yes (-0.50)
4%	4.7%	2.92	-0.21	78.4%	78.4%	-	0.8%	Yes (-0.53)
5%	4.3%	2.76	-0.14	79.5%	79.6%	-	0.7%	No (-0.50)
6%	4.3%	2.84	-0.14	80.4%	80.4%	-	0.7%	Yes (-0.56)
7%	4.8%	2.84	-0.17	81.8%	81.9%	-	0.8%	Yes (-0.52)
8%	4.7%	3.06	-0.29	82.8%	82.8%	-	0.8%	Yes (-0.50)
9%	4.3%	2.73	-0.14	83.5%	83.5%	-	0.7%	Yes (-0.56)
10%	4.8%	2.85	-0.13	83.8%	83.8%	-	0.7%	Yes (-0.58)
11%	4.3%	2.53	0.00	84.5%	84.5%	-	0.8%	Yes (-0.56)
12%	4.8%	2.93	-0.06	84.9%	84.9%	-	0.8%	Yes (-0.54)
13%	4.5%	2.72	-0.15	85.3%	85.3%	-	0.7%	No (-0.48)
14%	4.8%	2.95	-0.17	85.7%	85.7%	-	0.8%	Yes (-0.54)
15%	4.5%	2.60	-0.06	86.1%	86.1%	-	0.8%	Yes (-0.58)
16%	4.8%	2.86	-0.23	86.3%	86.3%	-	0.8%	Yes (-0.57)
17%	4.8%	2.78	-0.18	86.5%	86.5%	-	0.7%	
18%	4.7%	2.92	-0.20	86.7%	86.7%	-	0.7%	
19%	4.2%	2.79	-0.25	87.0%	87.0%	-	0.8%	
20%	5.1%	3.26	-0.28	87.4%	87.4%	-	0.8%	

Table 9-106 Statistical attributes of the Monte Carlo analysis of the 1992-93 data set for cases 1% to 20% project significance

The Monte Carlo analysis generates the mean value for the percent outturn variance of each project out of the one thousand cases computed in the analysis. This ranges from zero to twenty percent according to the Beta probability distribution. Table 9-107 shows the statistical attributes for these mean values in each of the analysis scenarios: from one percent significant projects to twenty percent. The average of the mean values is 7.3% compared with 0% assumed in the mathematical analyses.

%Sig	Statistical Mean Values from 1000 Monte Carlo Trials						
	Nos	Low	High	Mode	Mean	Median	SD
1%	11	6.99%	7.54%	7.10%	7.25%	7.29%	0.18%
2%	23	6.92%	7.70%	7.27%	7.26%	7.27%	0.18%
3%	34	6.84%	7.61%	7.28%	7.29%	7.29%	0.17%
4%	46	6.88%	7.67%	7.43%	7.30%	7.30%	0.19%
5%	57	6.88%	7.80%	7.25%	7.37%	7.39%	0.20%
6%	69	6.86%	7.76%	7.20%	7.28%	7.24%	0.20%
7%	80	6.96%	7.83%	7.28%	7.28%	7.27%	0.17%
8%	91	6.91%	7.75%	7.35%	7.33%	7.32%	0.15%
9%	103	6.81%	7.83%	7.35%	7.30%	7.32%	0.19%
10%	114	6.97%	7.66%	7.19%	7.29%	7.26%	0.17%
11%	126	6.88%	7.78%	7.50%	7.33%	7.34%	0.18%
12%	137	6.74%	7.75%	7.40%	7.31%	7.31%	0.18%
13%	149	6.77%	7.72%	7.30%	7.33%	7.32%	0.18%
14%	160	6.86%	7.80%	7.35%	7.31%	7.32%	0.18%
15%	171	6.88%	7.70%	7.28%	7.30%	7.29%	0.17%
16%	183	6.77%	7.72%	7.43%	7.31%	7.32%	0.18%
17%	194	6.87%	7.88%	7.35%	7.31%	7.30%	0.19%
18%	206	6.89%	7.88%	7.35%	7.33%	7.34%	0.18%
19%	217	6.74%	7.86%	7.45%	7.32%	7.32%	0.19%
20%	229	6.72%	7.72%	7.33%	7.30%	7.31%	0.17%

Table 9-107 Statistical attributes of mean values derived from Monte Carlo simulations of outturn performance for percents of project significance, 1992-93 portfolio

Results

Within the range of zero to twenty percent outturn variance used in the analysis the closest fit of a standard distribution is the Beta distribution ($\alpha = 0.61$, $\beta = 1.06$, $\text{scale} = 0.2$) in terms of the Chi-square test ($\theta = 0.007$) and the Kolmogorov-Smirnov test (0.0772).

Table 9-108 lists the results of this analysis of the 1992-93 data set. The table contains 'ideal' case results taken from the mathematical validation and the 'stochastic' results for percentiles of 95%, 90%, 75% and 50% probability taken from the Monte Carlo analyses. The 'Ave-mean' is the average of the mean values derived from the Monte Carlo analysis of each project in the analyses. The statistical attributes for the Monte Carlo values for each percent-significance are listed in Table 9-107. Each Monte Carlo analysis produced one thousand scenarios in which the percent outturn variance could fall within the range of zero to twenty percent according to the pre-selected Beta probability distribution. The mean of the 'Ave-mean outturn variance per project' is 7.3%.

When deriving heuristics from this data, the 'evens' probability is used, i.e., the 50% percentile. This is because the difference between 95% and 50% percentiles values in the case of ten percent and twenty percent of significant projects is less than 1.0% and is not significant.

% No projects modified outturn	% Value	Outturn percent of target expenditure achieved						
		Actual %	Ideal %	Monte Carlo Percentiles				
				Ave-Mean outturn variance per project	95%	90%	75%	50%
1%	33%	65.6	72.8	7.25%	71.6	71.4	71.2	70.9
2%	46%	65.6	78.1	7.26%	76.1	75.9	75.6	75.3
3%	52%	65.6	80.4	7.29%	77.9	77.7	77.4	77.0
4%	58%	65.6	82.6	7.30%	79.8	79.5	79.3	78.9
5%	62%	65.6	84.1	7.37%	80.8	80.6	80.3	80.0
6%	66%	65.6	85.2	7.28%	81.7	81.5	81.3	80.9
7%	69%	65.6	86.8	7.28%	83.1	83.0	82.6	82.3
8%	72%	65.6	88.1	7.33%	84.0	83.4	83.6	82.3
9%	74%	65.6	88.9	7.30%	84.8	84.6	84.3	84.0
10%	76%	65.6	89.3	7.29%	85.1	84.9	84.6	84.2
11%	78%	65.6	90.2	7.33%	86.0	85.8	85.4	85.0
12%	80%	65.6	90.7	7.31%	86.4	86.1	85.8	85.4
13%	73%	65.6	91.2	7.33%	86.5	86.4	86.1	85.7
14%	82%	65.6	91.7	7.31%	87.1	86.9	86.6	86.2
15%	83%	65.6	92.2	7.30%	87.7	87.3	87.0	86.7
16%	84%	65.6	92.5	7.31%	87.8	87.5	87.2	86.6
17%	85%	65.6	92.7	7.31%	87.9	87.6	87.3	87.0
18%	86%	65.6	93.1	7.33%	87.9	87.8	87.5	87.2
19%	87%	65.6	93.4	7.32%	88.3	88.2	87.9	87.5
20%	88%	65.6	93.8	7.30%	88.7	88.5	88.2	87.9

Table 9-108 Comparison of the improved outturn for the 1992-93 portfolio due to the impact of the outturn-variance for 1% to 20% significant projects according to 'actual', 'ideal' and 'stochastic' scenarios.

Using the results shown in Table 9-108, three heuristics are proposed corresponding to the twenty-percent, the ten-percent and the five percent levels of significant projects in the portfolio.

- 80:20 rule case:

Twenty percent of the number of the projects in the 1992-93 portfolio contain eighty-eight percent of the 'planned expenditure' of the portfolio. There is an evens probability of achieving an eighty-eight percent spending performance for the portfolio overall *compared to the sixty-six percent outturn actually achieved*. This assumes that best endeavor management effort is applied to each of the twenty percent projects with greatest planned expenditure that year so that they each achieve a high performance outturn variance that is within the range of zero to twenty percent. Other projects remain at current performance levels.

- 60:10 rule case

Ten percent of the number of the projects in the 1992-93 portfolio contain seventy-six percent of the 'planned expenditure' of the portfolio. There is an evens probability of achieving an eighty-four percent spending performance for the portfolio overall *compared to the sixty-six percent outturn actually achieved*. This assumes that best endeavor management effort is applied to each of the ten percent projects with greatest planned expenditure that year so that they each achieve a high performance outturn variance that is within the range of zero to twenty percent. Other projects remain at current performance levels.

50:5 rule case

Five percent of the number of the projects in the 1992-93 portfolio contain fifty-two percent of the 'planned expenditure' of the portfolio. There is an evens probability of achieving an eighty percent spending performance for the portfolio overall *compared to the sixty-six percent outturn actually achieved*. This assumes that best endeavor management effort is applied to each of the five percent projects with greatest planned expenditure that year so that they each achieve a high performance outturn variance that is within the range of zero to twenty percent. Other projects remain at current performance levels.

1993-94

Mathematical analysis

The attributes of the 1993-94 data set used in this analysis are described in Section 9.3.

The outturn variance in the 1993-94 data set is an under-spend of HK\$ 6,764 million, or twenty-four percent of the planned expenditure. In this analysis, the effect on the outturn for the portfolio of projects as a whole is calculated as those projects with the more significant values of planned expenditure achieve a perfect outcome of zero outturn variance.

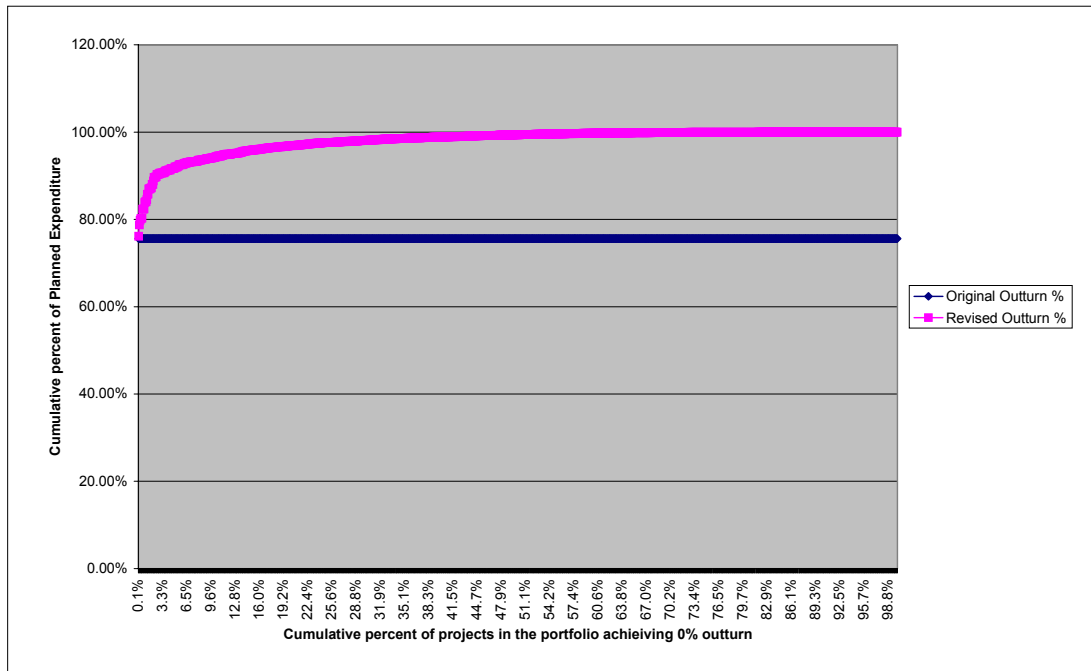


Figure 9-40 Improved outturn achieved in 1993-94 dataset as ideal outturn is achieved by significant projects

Figure 9-40 and Table 9-109, shows the rate of improvement as increasing percentiles of the significant projects in portfolio achieve a perfect outcome. The greatest rate of improvement occurs within the 5% percentile.

Percentile (Projects in dataset)	Outturn Achieved	Diff to Actual Outturn
2.5%	90%	15%
5%	92%	16%
7.5%	93%	18%
10%	94%	19%
12.5%	95%	20%
15%	96%	21%
17.5%	96%	21%
20%	97%	21%
22.5%	97%	22%
25%	98%	22%
27.5%	98%	22%
30%	98%	23%
35%	99%	23%
40%	99%	23%
50%	99%	24%

Table 9-109 Improved outturn achievement for 1993-94 dataset

This analysis indicates that an ideal delivery for the significant value twenty percent of the projects in the data set will deliver on overall outturn for the portfolio that is ninety-four percent of the planned outcome – all other things being unchanged.

Stochastic analysis

The stochastic validation is the same as mathematical analyses except for a change to the earlier assumption that increasing numbers of significant value project will achieve a perfect outcome. As in the stochastic analyses before, this assumption is replaced by outcome for each significant project that are based upon a probability distribution derived from the 1993-94 empirical data as described in Section 9.3. This probability curve is based upon the actual performance for this data set within the limits of x-values of 0 to 0.2, i.e., ratios of outturn performance that range from zero to a twenty percent under-spending of the planned expenditure. The probability distribution for this range of values is a Beta distribution with parameters of:

- Alpha value = 0.54
- Beta value = 0.92
- Scale value = 0.20

Crystal Ball® software by Decisioneering Inc is used to perform Monte Carlo analysis on the variable 'Outturn variance/Amended Estimate' for each of the significant projects identified within the 1993-94 data set within ranges of one to twenty percent of the 1,130 projects in the data set.

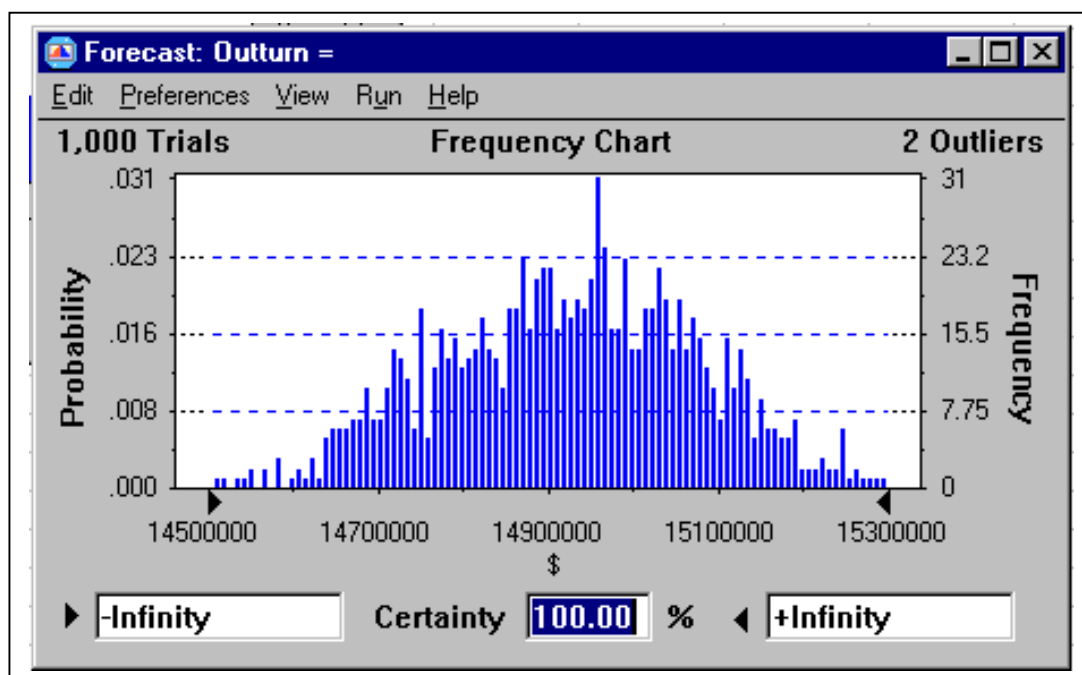


Figure 9-41 Frequency chart derived from Monte Carlo analysis of 1993-94 data set with one percent of significant projects subject to stochastic outturn

The Crystal Ball® analysis produced a frequency diagram for outturn for the data set in terms of total expenditure and also percent outturn. For example, Figure 9-37 shows the range of total expenditures for the data set whilst Figure 9-38 shows the corresponding outturn in terms of percent. For brevity in this thesis the frequency diagrams are not reproduced in all analyses, however the results corresponding to percentiles are tabulated here.

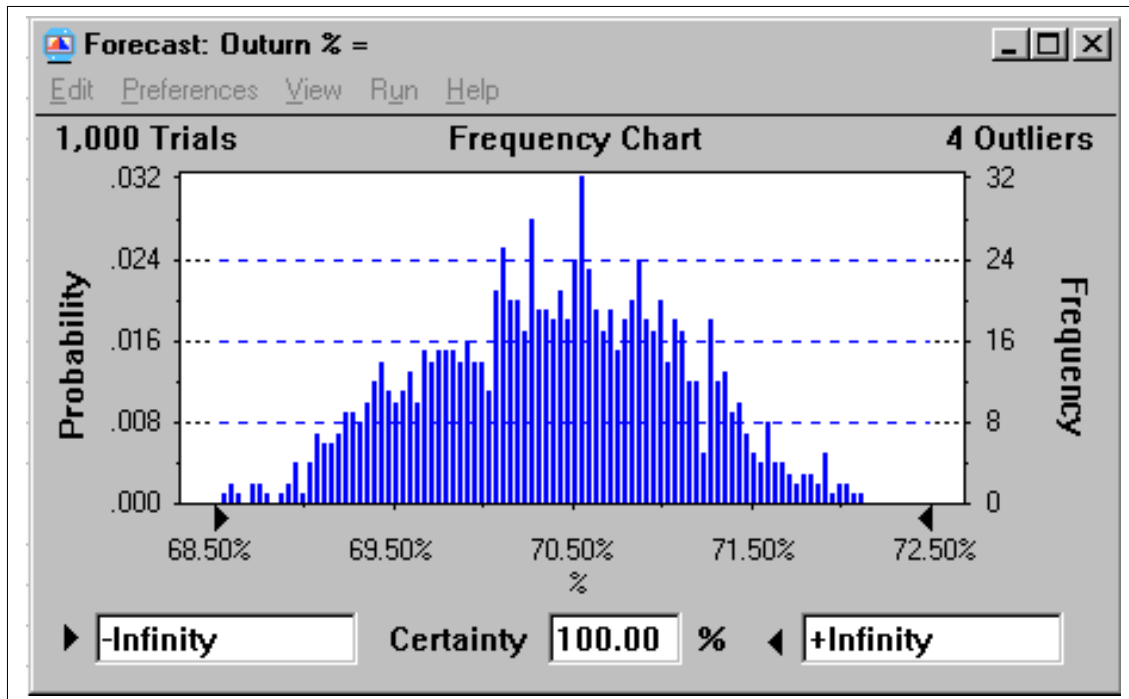


Figure 9-42 Frequency chart of outturn percent for 1992-93 data set when one percent of high impact projects are subject to stochastic analysis

The percentiles for Figure 9-37 shows the range of values for 'percent outturn', when one percent of the highest value projects in terms of planned expenditure (Amended Estimate) achieve an outturn governed by the Monte Carlo analysis. This one percent by number of projects, contains twenty percent of the total planned expenditure value of the data set. Percentiles for 95%, 90%, 75%, and 50% are recorded for each frequency chart generated as shown in Table 9-110. It states the probable percent outturn when one percent to twenty percent of the highest value projects in the 1993-94 data set, in terms of planned expenditure (Amended Estimate), achieve an outturn governed by a Monte Carlo analysis based on the Beta probability distribution. The Beta distribution is constrained to produce an outturn variance that falls within zero to twenty percent.

% by Nos	% by \$	Percentiles results compared to 75.6 % actual outturn				
		100%	95%	90%	75%	50%
1%	48.4%	77.50 – 83.50	77.86 – 82.21	78.39 – 82.04	79.01 – 81.68	79.68 – 81.19
2%	61.7%	81.00 – 88.00	82.22 – 86.33	82.50 – 86.06	83.04 – 85.57	83.54 – 85.13
3%	68.6%	82.00 – 89.00	82.45 – 87.26	83.41 – 87.06	84.10 – 86.68	84.70 – 86.28
4%	73.3%	83.00 – 89.00	82.50 – 87.63	83.71 – 87.43	84.39 – 87.10	85.01 – 86.68
5%	76.2%	83.00 – 90.00	83.21 – 88.12	84.09 – 87.93	84.97 – 87.54	85.61 – 87.19
6%	78.7%	84.00 – 90.00	84.39 – 88.73	84.85 – 88.53	85.55 – 88.14	86.16 – 87.62
7%	80.6%	84.00 – 90.00	84.85 – 89.17	85.32 – 88.99	85.90 – 88.44	86.42 – 88.00
8%	82.2%	84.50 – 90.50	84.94 – 89.42	85.45 – 89.15	86.13 – 88.64	86.67 – 88.18
9%	83.9%	84.00 – 91.00	85.08 – 89.46	85.62 – 89.31	86.32 – 88.99	86.90 – 88.46
10%	85.3%	84.00 – 91.00	85.07 – 89.76	85.73 – 89.48	86.47 – 89.07	87.04 – 88.61
11%	86.5%	85.00 – 92.00	86.28 – 90.51	86.56 – 90.17	87.00 – 89.63	87.57 – 89.08
12%	87.6%	85.50 – 91.50	85.59 – 90.39	86.37 – 90.08	87.14 – 89.61	87.70 – 89.19
13%	88.5%	85.50 – 91.50	86.09 – 90.42	86.55 – 90.24	87.21 – 89.84	87.75 – 89.28
14%	89.3%	85.00 – 92.00	86.66 – 90.97	86.98 – 90.75	87.51 – 90.25	88.05 – 89.65
15%	90.0%	86.00 – 93.00	86.81 – 91.25	87.12 – 91.00	87.79 – 90.42	88.37 – 89.96
16%	90.7%	86.00 – 93.00	86.83 – 91.28	87.34 – 91.10	87.96 – 90.67	88.54 – 90.15
17%	91.3%	86.00 – 93.00	87.22 – 91.51	87.50 – 91.26	88.10 – 90.80	88.77 – 90.28
18%	91.9%	86.00 – 93.00	86.64 – 91.46	87.48 – 91.25	88.18 – 90.87	88.79 – 90.36
19%	92.5%	87.00 – 92.50	87.00 – 91.46	87.56 – 91.34	88.28 – 90.89	88.98 – 90.49
20%	92.9%	86.00 – 93.00	87.32 – 91.72	87.73 – 91.48	88.55 – 91.16	89.05 – 90.68

Table 9-110 Outturn for 1993-94 dataset when one to twenty percent of the significant projects are subject to an outturn based upon the Monte Carlo analysis.

Figure 9-43 shows graphically these results. The graph shows the relationship between the range of possible outturn when an increasing percent of the projects, in their order of greatest planned expenditure that financial year, achieve a high performance outcome within an assumed range of eighty to one hundred percent perfection. Based upon the Beta probability distribution for this constrained range, derived from the empirical data of the 1993-94 data set. All other project outcomes within the data set remain unchanged, i.e., remain at the outturn achieved in reality.

The percent improvement over the actual performance achieved in 1993-94 for this data set, that could theoretically be achieved, based on the assumptions in the mathematical analysis and this stochastic analysis, are set out in Table 9-111.

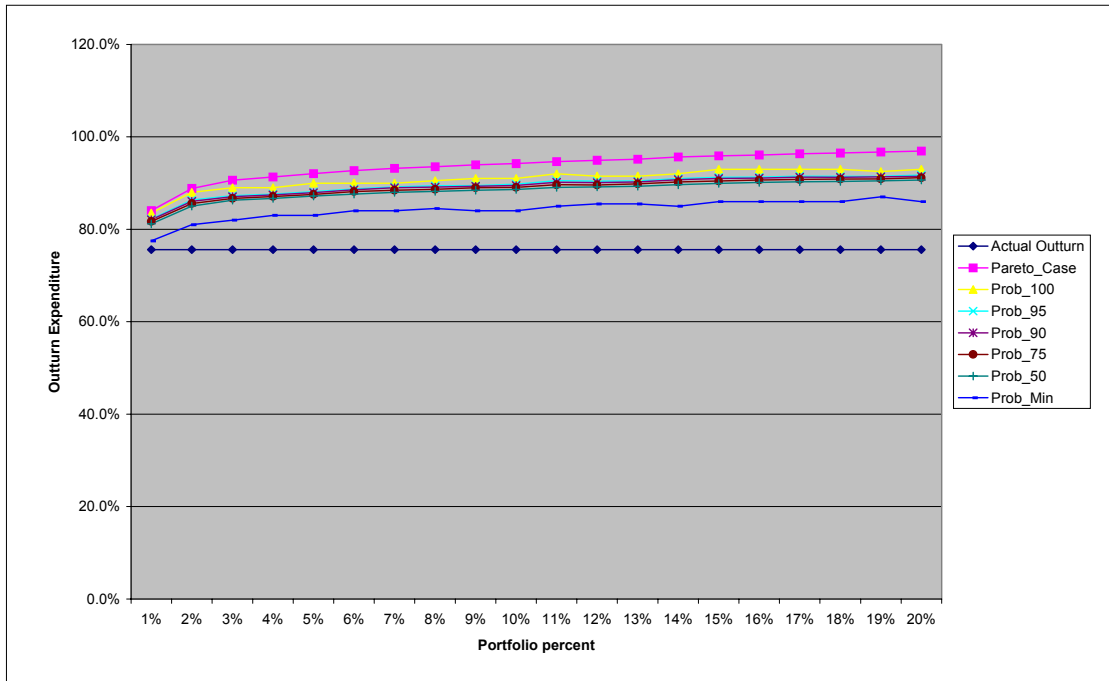


Figure 9-43 Variation in outturn expenditure 1993-94 dataset: comparison of actual outturn when significant projects achieve an ideal or probability-based ideal outcome

Percent of data-set (i.e. portfolio)		Theoretical % improved outturn		
% by Nos. Sig Projects	% by Value of Planned Exp	Assumed ideal	assumed Beta probability < Maximax	> Minimin
1%	48.4%	8.5%	7.9%	1.9%
2%	61.7%	13.2%	12.4%	5.4%
3%	68.6%	15.0%	13.4%	6.4%
4%	73.3%	15.7%	13.4%	7.4%
5%	76.2%	16.5%	14.4%	7.4%
6%	78.7%	17.1%	14.4%	7.4%
7%	80.6%	17.6%	14.4%	8.4%
8%	82.2%	17.9%	14.9%	8.9%
9%	83.9%	18.4%	15.4%	8.4%
10%	85.3%	18.6%	15.4%	8.4%
11%	86.5%	19.0%	16.4%	9.4%
12%	87.6%	19.3%	15.9%	9.9%
13%	88.5%	19.6%	15.9%	9.9%
14%	89.3%	20.0%	16.4%	9.4%
15%	90.0%	20.3%	17.4%	10.4%
16%	90.7%	20.5%	17.4%	10.4%
17%	91.3%	20.7%	17.4%	10.4%
18%	91.9%	20.9%	17.4%	10.4%
19%	92.5%	21.1%	16.9%	11.4%
20%	92.9%	21.3%	17.4%	10.4%

Table 9-111 Theoretical relative outturn improvement in the outturn performance for the 1993-94 data set

The numbers of projects subject to the stochastic analysis ranges from thirteen to two hundred and twenty-six. The statistical attributes from each of the analyses, stated in

Table 9-112, shows the distribution of outcomes to be a consistent, normal distribution. This is reasonable as the Beta distribution used in the Monte Carlo analysis tends to a uniform distribution.

Prop dataset	Range	Kurtosis	Skew	Mean	Median	Mode	SD	Sensitivity > 0.5
1%	5.8%	2.65	-0.27	80.5%	80.6%	-	1.1%	Yes (-0.52)
2%	6.5%	2.72	-0.06	84.3%	84.35	-	1.1%	Yes (-0.53)
3%	6.9%	2.89	-0.24	85.5%	85.6%	-	1.1%	No (-0.50)
4%	6.7%	2.60	-0.19	85.9%	85.9%	-	1.1%	No (-0.50)
5%	6.9%	2.91	-0.30	86.4%	86.4%	-	1.1%	Yes (-0.51)
6%	6.28%	2.85	-0.22	86.9%	86.9%	-	1.1%	Yes (-0.51)
7%	6.09%	2.75	-0.20	87.2%	87.2%	-	1.1%	No (-0.50)
8%	6.25%	2.84	-0.15	87.4%	87.4%	-	1.1%	Yes (-0.53)
9%	7.00%	2.89	-0.20	87.2%	87.2%	-	1.1%	Yes (-0.53)
10%	6.82%	2.78	-0.17	87.9%	87.9%	-	1.1%	No (-0.50)
11%	6.71%	2.80	-0.12	88.3%	88.3%	-	1.1%	Yes (-0.52)
12%	7.08%	3.28	-0.33	88.5%	88.5%	-	1.1%	No (-0.48)
13%	6.64%	2.71	-0.14	88.6%	88.6%	-	1.1%	Yes (-0.51)
14%	6.54%	2.69	-0.03	88.9%	88.9%	-	1.1%	Yes (-0.52)
15%	7.50%	2.91	-0.13	89.2%	89.2%	-	1.2%	Yes (-0.52)
16%	6.07%	2.65	-0.10	89.4%	89.4%	-	1.1%	Yes (-0.52)
17%	7.08%	2.73	-0.15	89.5%	89.6%	-	1.1%	Yes (-0.51)
18%	6.76%	2.71	-0.17	89.6%	89.7%	-	1.1%	No (-0.50)
19%	6.83%	3.01	-0.32	89.9%	89.9%	-	1.1%	No (-0.50)
20%	6.67%	2.81	-0.20	89.9%	89.9%	-	1.1%	Yes (-0.53)

Table 9-112 Statistical attributes of the Monte Carlo analysis of the 1993-94 data set for cases 1% to 20% project significance

The range width is narrow: five to seven percent in all cases. The kurtosis values are close to the value of 3.0 associated with a normal distribution. The values of skewness are close to zero showing the distribution to be highly symmetrical. The values of the 'mean' and the 'median' are coincident due to the symmetry. The Beta distribution is continuous and does not lend itself to producing mode values. The Standard Deviation is also uniform.

For the purpose of this analysis, correlation coefficients less than +/- 0.5 is taken to indicate a lack of sensitivity between the individual variables and the outcome. The largest variable exceeds the borderline value of -0.5 for most of the one-twenty percent cases of project significance examined but it does not exceed a sensitivity of -0.6. All other variables are below the 0.5 threshold. The significance of this one project is not marked. Overall, it is the effect of the significant group of projects that produces the outcome.

The Monte Carlo analysis generates the mean value for the percent outturn variance of each project out of the one thousand cases computed in the analysis. This ranges from zero to twenty percent according to the Beta probability distribution. Table 9-113 shows the statistical attributes for these mean values in each of the analysis scenarios: from one percent significant projects to twenty percent.

%Sig	Statistical Mean Values from 1000 Monte Carlo Trials						
	Nos	Low	High	Mode	Mean	Median	SD
1%	11	7.06%	7.60%	7.21%	7.34%	7.39%	0.14%
2%	23	6.99%	7.79%	7.53%	7.37%	7.37%	0.23%
3%	34	7.15%	7.78%	7.40%	7.44%	7.41%	0.16%
4%	45	6.95%	7.83%	7.28%	7.38%	7.37%	0.18%
5%	56	7.00%	7.80%	7.30%	7.41%	7.39%	0.20%
6%	68	7.09%	7.72%	7.35%	7.41%	7.41%	0.16%
7%	79	6.99%	7.86%	7.42%	7.41%	7.42%	0.18%
8%	90	6.88%	7.81%	7.40%	7.38%	7.38%	0.17%
9%	102	6.94%	8.09%	7.26%	7.40%	7.38%	0.21%
10%	113	6.88%	7.77%	7.44%	7.37%	7.40%	0.19%
11%	124	6.90%	7.84%	7.48%	7.40%	7.41%	0.19%
12%	136	6.87%	7.89%	7.49%	7.37%	7.36%	0.20%
13%	147	7.05%	7.89%	7.46%	7.43%	7.44%	0.17%
14%	158	6.92%	7.85%	7.42%	7.39%	7.41%	0.20%
15%	169	6.76%	7.90%	7.64%	7.39%	7.40%	0.22%
16%	181	6.93%	7.94%	7.29%	7.39%	7.39%	0.20%
17%	192	6.96%	7.83%	7.40%	7.40%	7.40%	0.20%
18%	202	6.73%	7.96%	7.48%	7.39%	7.39%	0.21%
19%	215	6.92%	7.98%	7.42%	7.40%	7.41%	0.19%
20%	226	6.77%	7.92%	7.44%	7.40%	7.40%	0.20%

Table 9-113 Statistical attributes of mean values derived from Monte Carlo simulations of outturn performance for percents of project significance, 1993-94 portfolio

Results

Within the range of zero to twenty percent outturn variance used in the analysis the closest fit of a standard distribution is the Beta distribution ($\alpha = 0.54$, $\beta = 0.92$ scale = 0.2) in terms of the Chi-square test (23.87, $\theta = 0.0924$) and the Kolmogorov-Smirnov test (0.0616).

Table 9-114 lists the results of this analysis of the 1993-94 data set. The table contains 'ideal' case results taken from the mathematical validation and the 'stochastic' results for percentiles of 95%, 90%, 75% and 50% probability taken from the Monte Carlo analyses. The 'Ave-mean' is the average of the mean values derived from the Monte Carlo analysis of each project in the analyses. The statistical attributes for the Monte Carlo values for each percent-significance are listed in Table 9-113. Each Monte Carlo analysis produced one thousand scenarios in which the percent outturn variance could fall within the range of zero to twenty percent according to the pre-selected Beta probability distribution. The mean of the 'Ave-mean outturn variance per project' is 7.39%.

When deriving heuristics from this data, the 'evens' probability is used, i.e., the 50% percentile. This is because the difference between 95% and 50% percentiles values in

the case of ten percent and twenty percent of significant projects is less than 1.0% and is not significant.

% No projects modified outturn	% Value	Outturn percent of target expenditure achieved						
		Actual %	Ideal %	Monte Carlo Percentiles				50%
				Ave-Mean outturn variance per project	95%	90%	75%	
1%	48.4	75.6	84.1	7.34%	82.2	82.0	81.7	81.2
2%	61.7	75.6	88.8	7.37%	86.3	86.1	85.6	85.1
3%	68.6	75.6	90.6	7.44%	87.3	87.1	86.7	86.3
4%	73.3	75.6	91.3	7.38%	87.6	87.4	87.1	86.7
5%	76.2	75.6	92.0	7.41%	88.1	87.9	87.5	87.2
6%	78.7	75.6	92.7	7.41%	88.7	88.5	88.1	87.6
7%	80.6	75.6	93.2	7.41%	89.2	89.0	88.4	88.0
8%	82.2	75.6	93.5	7.38%	89.4	89.2	88.6	88.2
9%	83.9	75.6	93.9	7.40%	89.5	89.3	89.0	88.5
10%	85.3	75.6	94.1	7.37%	89.8	89.5	89.1	88.6
11%	86.5	75.6	94.6	7.43%	90.5	90.2	89.6	89.1
12%	87.6	75.6	94.9	7.37%	90.4	90.1	89.6	89.2
13%	88.5	75.6	95.2	7.43%	90.4	90.2	89.8	89.3
14%	89.3	75.6	95.6	7.39%	91.0	90.8	90.3	89.7
15%	90.0	75.6	95.9	7.39%	91.4	91.0	90.4	90.0
16%	90.7	75.6	96.1	7.39%	91.3	91.1	90.7	90.2
17%	91.3	75.6	96.3	7.40%	91.5	91.3	90.8	90.3
18%	91.9	75.6	96.5	7.39%	91.5	91.3	90.9	90.4
19%	92.5	75.6	96.7	7.40%	91.5	91.3	90.9	90.5
20%	92.9	75.6	96.9	7.40%	91.7	91.5	91.2	90.7

Table 9-114 Comparison of the improved outturn for the 1993-94 portfolio due to the impact of the outturn-variance for 1% to 20% significant projects according to 'actual', 'ideal' and 'stochastic' scenarios.

Using the results shown in Table 9-114, three heuristics are proposed corresponding to the twenty-percent, the ten-percent and the five percent levels of significant projects in the portfolio.

- 80:20 rule case:

Twenty percent of the number of the projects in the 1993-94 portfolio contain ninety-three percent of the 'planned expenditure' of the portfolio. There is an evens probability of achieving an ninety-one percent spending performance for the portfolio overall *compared to the seventy-five percent outturn actually achieved*. This assumes that best endeavor management effort is applied to each of the twenty percent projects with greatest planned expenditure that year so that they each achieve a high performance outturn variance that is within the range of zero to twenty percent. Other projects remain at current performance levels.

- 60:10 rule case

Ten percent of the number of the projects in the 1993-94 portfolio contain eighty-five percent of the 'planned expenditure' of the portfolio. There is an evens probability of achieving an eighty-nine percent spending performance for the portfolio overall *compared to the seventy-five percent outturn actually achieved*. This assumes that best endeavor management effort is applied to each of the ten percent projects with greatest planned expenditure that year so that they each achieve a high performance outturn variance that is within the range of zero to twenty percent. Other projects remain at current performance levels.

- 50:5 rule case

Five percent of the number of the projects in the 1993-94 portfolio contain seventy-six percent of the 'planned expenditure' of the portfolio. There is an evens probability of achieving an eighty-seven percent spending performance for the portfolio overall *compared to the seventy-five percent outturn actually achieved*. This assumes that best endeavor management effort is applied to each of the five percent projects with greatest planned expenditure that year so that they each achieve a high performance outturn variance that is within the range of zero to twenty percent. Other projects remain at current performance levels.

1994-95

Mathematical analysis

The attributes of the 1994-95 data set used in this analysis are described in Section 9.3.

The outturn variance in the 1994-95 data set is an under-spend of HK\$ 6,083 million, or twenty-three percent of the planned expenditure. In this analysis, the effect on the outturn for the portfolio of projects as a whole is calculated as those projects with the more significant values of planned expenditure achieve a perfect outcome of zero outturn variance.

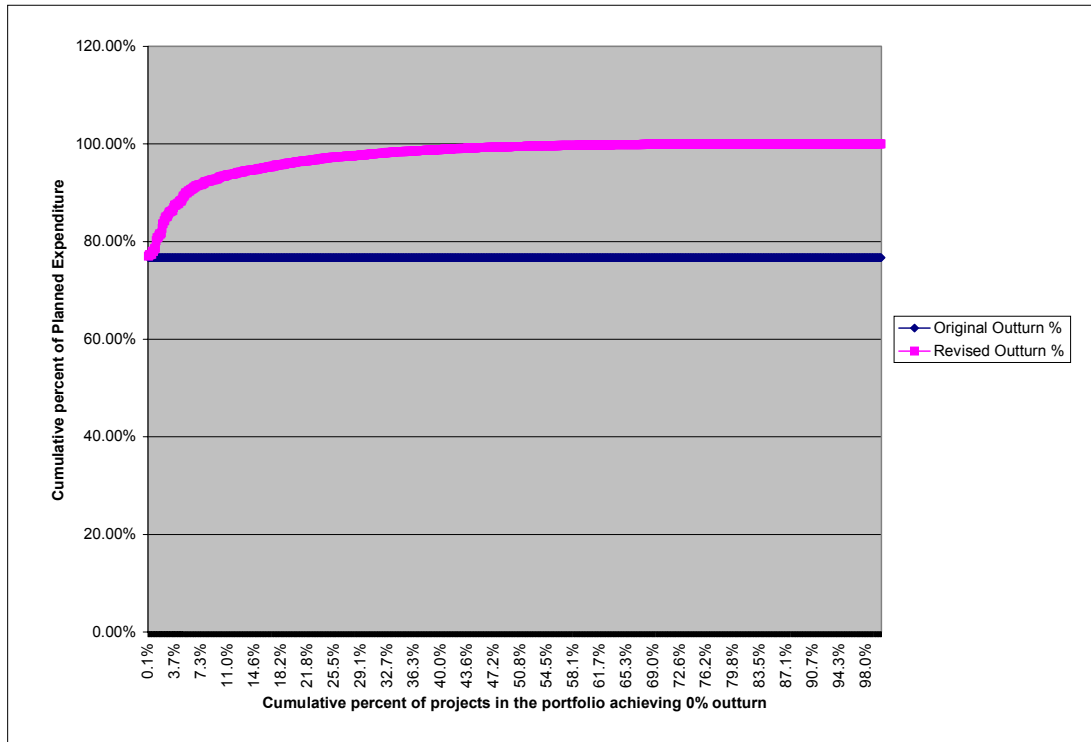


Figure 9-44 Improved outturn achieved in 1994-95 dataset as ideal outturn is achieved by significant projects

Figure 9-44 and Table 9-115, shows the rate of improvement as increasing percentiles of the significant projects in portfolio achieve a perfect outcome. The greatest rate of improvement occurs within the 5% percentile.

Percentile (<i>Projects in dataset</i>)	Outturn Achieved	Diff to Actual Outturn
2.5%	85%	8%
5%	90%	13%
7.5%	92%	15%
10%	93%	17%
12.5%	94%	18%
15%	95%	18%
17.5%	96%	19%
20%	96%	20%
22.5%	97%	20%
25%	97%	21%
27.5%	98%	21%
30%	98%	21%
35%	98%	22%
40%	99%	22%
50%	99%	23%

Table 9-115 Improved outturn achievement for 1994-95 dataset

This analysis indicates that an ideal delivery for the significant value twenty percent of the projects in the data set will deliver on overall outturn for the portfolio that is ninety-six percent of the planned outcome – all other things being unchanged.

Stochastic analysis

The stochastic validation is the same as mathematical validation except for a change to the earlier assumption that increasing numbers of significant value project will achieve a perfect outcome. As in the stochastic analyses before, this assumption is replaced by outcome for each significant project that are based upon a probability distribution derived from the 1994-95 empirical data as described in Section 9.3.

This probability curve is based upon the actual performance for this data set within the limits of x-values of 0 to 0.2, i.e., ratios of outturn performance that range from zero to a twenty percent under-spending of the planned expenditure. The probability distribution for this range of values is a Beta distribution with parameters of:

- Alpha value = 0.64
- Beta value = 0.97
- Scale value = 0.20

Crystal Ball® software by Decisioneering Inc is used to perform Monte Carlo analysis on the variable 'Outturn variance/Amended Estimate' for each of the significant projects identified within the 1994-95 data set within ranges of one to twenty percent of the 1,131 projects in the data set.

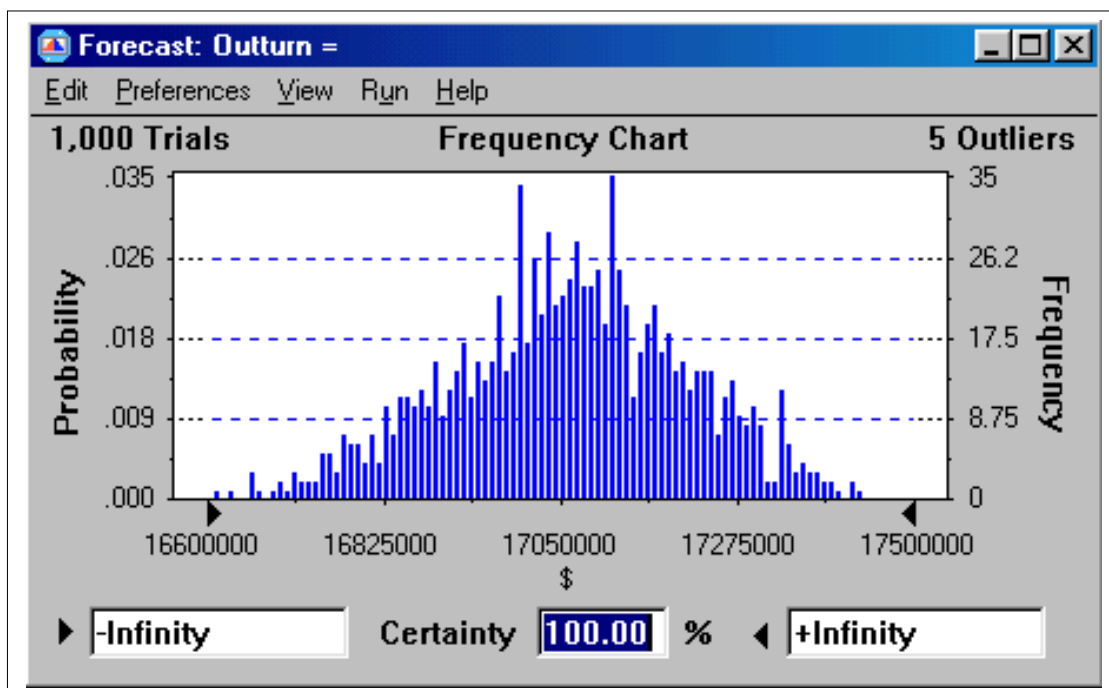


Figure 9-45 Frequency chart derived from Monte Carlo analysis of 1994-95 data set with one percent of significant projects subject to stochastic outturn

The Crystal Ball® analysis produced a frequency diagram for outturn for the data set in terms of total expenditure and also percent outturn. For example, Figure 9-45 shows the range of total expenditures for the data set whilst Figure 9-46 shows the corresponding outturn in terms of percent. For brevity in this thesis the frequency diagrams are not reproduced in all analyses, however the results corresponding to percentiles are tabulated here.

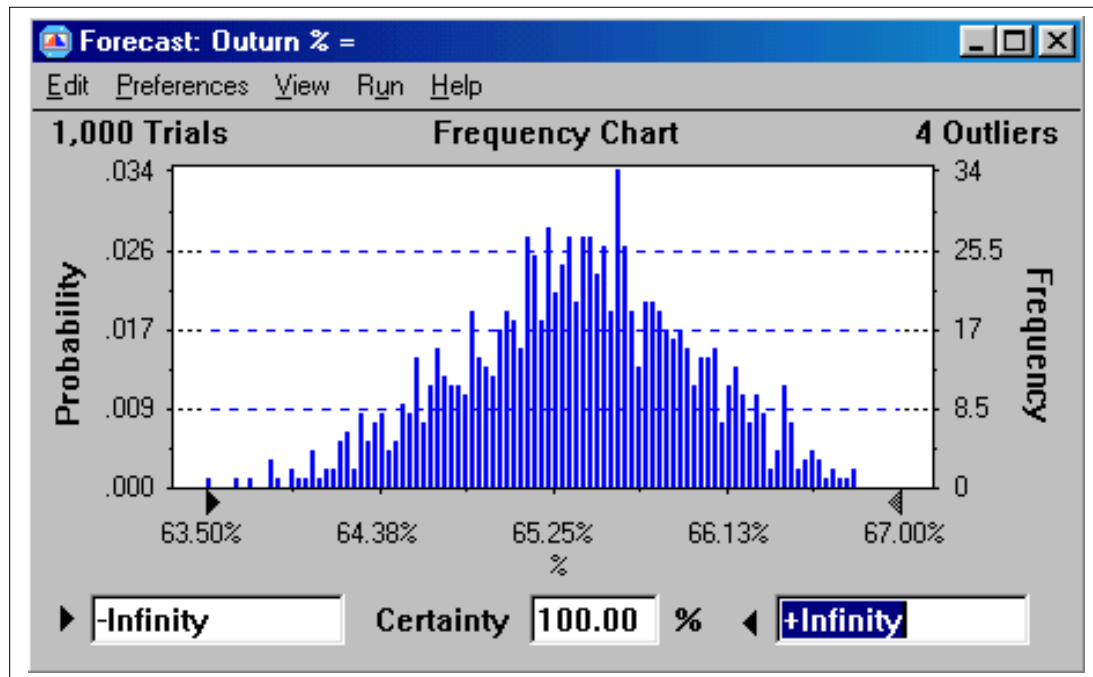


Figure 9-46 Frequency chart of outturn percent for 1994-95 data set when one percent of high impact projects are subject to stochastic analysis

The percentiles for Figure 9-46 shows the range of values for 'percent outturn', when one percent of the highest value projects in terms of planned expenditure (Amended Estimate) achieve an outturn governed by the Monte Carlo analysis. This one percent by number of projects, contains twenty percent of the total planned expenditure value of the data set.

Percentiles for 95%, 90%, 75%, and 50% are recorded for each frequency chart generated as shown in Table 9-110. It states the probable percent outturn when one percent to twenty percent of the highest value projects in the 1993-94 data set, in terms of planned expenditure (Amended Estimate), achieve an outturn governed by a Monte Carlo analysis based on the Beta probability distribution. The Beta distribution is constrained to produce an outturn variance that falls within zero to twenty percent.

Figure 9-47 shows graphically these results. The graph shows the relationship between the range of possible outturn when an increasing percent of the projects, in their order of greatest planned expenditure that financial year, achieve a high performance outcome within an assumed range of eighty to one hundred percent perfection. Based upon the Beta probability distribution for this constrained range, derived from the empirical data of the 1994-95 data set. All other outcomes within the data set remain unchanged, i.e., remain at the outturn achieved in reality.

% by Nos	% by \$	Percentiles results compared to 76.7 % actual outturn				
		100%	95%	90%	75%	50%
1%	40.0%	63.50 – 67.00	64.38 – 66.13	64.28 – 66.27	64.62 – 66.02	64.97 – 65.76
2%	53.9%	67.50 – 71.50	67.67 – 70.48	68.11 – 70.33	68.56 – 70.02	68.86 – 69.76
3%	61.6%	69.00 – 73.00	69.80 – 72.45	70.00 – 72.28	70.37 – 71.95	70.71 – 71.62
4%	67.3%	70.50 – 74.50	70.89 – 73.56	71.16 – 73.47	71.56 – 73.17	71.90 – 72.88
5%	71.4%	71.50 – 75.50	72.03 – 74.86	72.42 – 74.70	72.84 – 74.41	73.15 – 74.11
6%	74.9%	73.00 – 77.00	73.17 – 76.04	73.52 – 75.83	73.97 – 75.49	74.33 – 75.23
7%	77.5%	73.50 – 77.50	73.96 – 76.72	74.20 – 76.59	74.65 – 76.23	74.95 – 75.90
8%	79.7%	74.00 – 78.00	74.18 – 77.01	74.61 – 76.86	75.08 – 76.62	75.45 – 76.38
9%	81.6%	74.00 – 78.50	74.80 – 77.50	75.05 – 77.34	75.39 – 77.00	75.77 – 77.68
10%	83.1%	74.50 – 79.00	75.20 – 77.98	75.45 – 77.82	75.87 – 77.45	76.21 – 77.18
11%	84.5%	75.00 – 79.00	75.75 – 78.36	75.91 – 78.09	76.20 – 77.79	76.52 – 77.46
12%	85.8%	75.00 – 79.00	76.67 – 78.39	75.89 – 78.26	76.31 – 77.93	76.58 – 77.62
13%	86.9%	75.50 – 79.50	76.09 – 78.69	76.28 – 78.46	76.58 – 78.19	76.95 – 77.89
14%	87.9%	75.50 – 79.50	75.50 – 78.79	76.34 – 78.68	76.72 – 78.36	77.10 – 78.05
15%	88.9%	76.00 – 80.00	76.37 – 79.05	76.58 – 78.93	76.99 – 78.60	77.34 – 78.27
16%	89.8%	76.00 – 80.00	76.35 – 79.13	76.71 – 78.98	77.15 – 78.27	77.51 – 78.40
17%	90.5%	76.00 – 80.00	76.70 – 79.35	77.01 – 79.22	77.41 – 78.97	77.73 – 78.67
18%	91.2%	76.50 – 80.50	76.61 – 79.61	77.10 – 79.48	77.56 – 79.22	77.90 – 78.90
19%	91.8%	76.50 – 80.50	77.26 – 79.92	77.53 – 79.72	77.85 – 79.46	78.22 – 79.17
20%	92.3%	77.00 – 81.00	77.46 – 80.14	77.69 – 80.01	78.09 – 79.69	78.42 – 79.37

Table 9-116 Outturn for 1994-95 dataset when one to twenty percent of the significant projects are subject to an outturn based upon the Monte Carlo analysis.

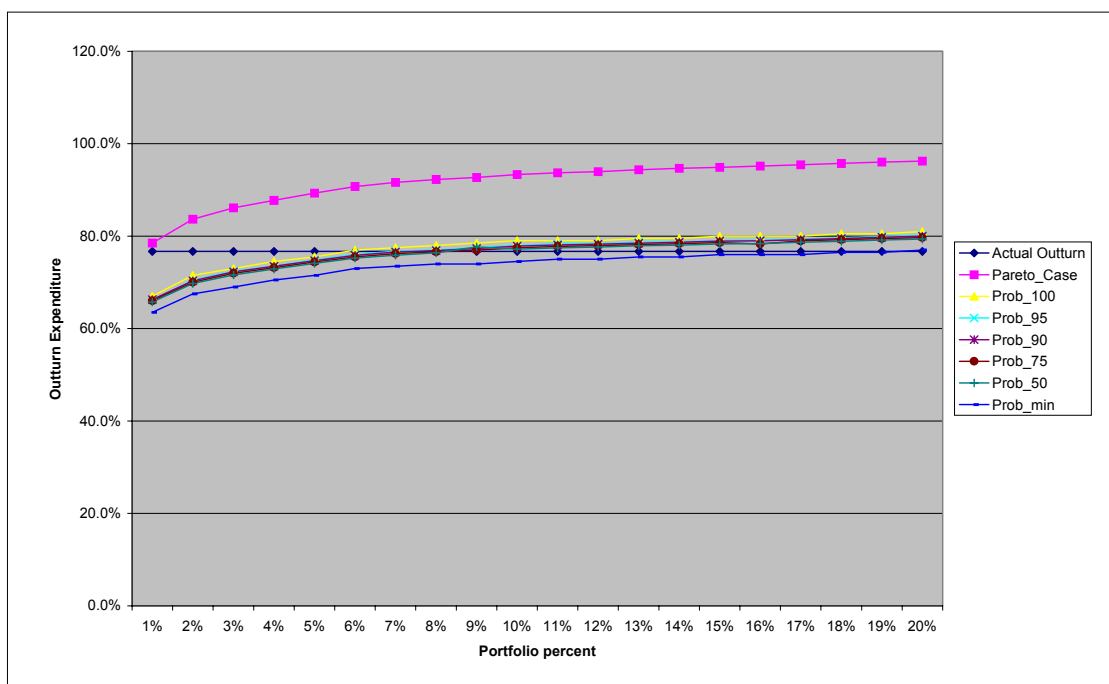


Figure 9-47 Variation in outturn expenditure 1994-95 dataset: comparison of actual outturn when significant projects achieve an ideal or probability-based ideal outcome

The percent improvement over the actual performance achieved in 1994-95 for this data set, that could theoretically be achieved, based on the assumptions in the mathematical analysis and these stochastic analyses are set out in Table 9-117.

Percent of data-set (i.e. portfolio)		Theoretical % improved outturn		
% by Nos. Sig Projects	% by Value of Planned Exp	Assumed ideal	assumed Beta probability	
			< Maximax	> Minimin
1%	40.0%	1.8%	-9.7%	-13.2%
2%	53.9%	7.0%	-5.2%	-9.2%
3%	61.6%	9.4%	-3.7%	-7.7%
4%	67.3%	11.0%	-2.2%	-6.2%
5%	71.4%	12.6%	-1.2%	-5.2%
6%	74.9%	14.1%	0.3%	-3.7%
7%	77.5%	14.9%	0.8%	-3.2%
8%	79.7%	15.6%	1.3%	-2.7%
9%	81.6%	16.0%	1.8%	-2.7%
10%	83.1%	16.6%	2.3%	-1.7%
11%	84.5%	17.0%	2.3%	-1.7%
12%	85.8%	17.3%	2.3%	-1.7%
13%	86.9%	17.7%	2.8%	-1.2%
14%	87.9%	18.0%	2.8%	-1.2%
15%	88.9%	18.2%	3.3%	-0.7%
16%	89.8%	18.5%	3.3%	-0.7%
17%	90.5%	18.7%	3.3%	-0.7%
18%	91.2%	19.0%	3.8%	-0.2%
19%	91.8%	19.3%	3.8%	-0.2%
20%	92.3%	19.5%	4.3%	0.3%

Table 9-117 Theoretical relative outturn improvement in the outturn performance for the 1994-95 data set

The numbers of projects subject to the stochastic analysis ranges from eleven to two hundred and twenty-six. The statistical attributes from each of the analyses, stated in Table 9-118, shows the distribution of outcomes to be a consistent, normal distribution. This is reasonable as the Beta distribution used in the Monte Carlo analysis tends to a uniform distribution.

The range width is narrow: three to five percent in all cases. The kurtosis values are close to the value of 3.0 associated with a normal distribution (Sargeant, Wainwright, 1996). The values of skewness are close to zero showing the distribution to be highly symmetrical. The values of the 'mean' and the 'median' are coincident due to the symmetry. The Beta distribution is continuous and does not lend itself to producing mode values. The Standard Deviation is also uniform.

For the purpose of this analysis, correlation coefficients less than +/- 0.5 is taken to indicate a lack of sensitivity between the individual variables and the outcome. All variables are below the 0.5 threshold.

The Monte Carlo analysis generates the mean value for the percent outturn variance of each project out of the one thousand cases computed in the analysis. This ranges from zero to twenty percent according to the Beta probability distribution. Table 9-119 shows the statistical attributes for these mean values in each of the analysis scenarios: from one percent significant projects to twenty percent. The average of the mean values is 7.95% for the outturn variance for the significant projects compared to 0% assumed in the mathematical analysis.

Prop dataset	Range	Kurtosis	Skew	Mean	Median	Mode	SD	Sensitivity > 0.5
1%	3.6%	2.90	-0.15	65.4%	65.4%	-	0.6%	No (-0.49)
2%	3.9%	2.9	-0.08	69.4%	69.4%	-	0.7%	No (-0.48)
3%	4.2%	2.81	0.03	71.2%	71.2%	-	0.7%	No (-0.48)
4%	4.7%	2.75	-0.11	72.4%	72.4%	-	0.7%	No (-0.44)
5%	4.4%	2.95	-0.16	73.6%	73.6%	-	0.7%	No (-0.46)
6%	4.1%	3.02	-0.11	74.8%	74.8%	-	0.7%	No (-0.46)
7%	4.1%	2.85	-0.06	75.5%	75.5%	-	0.7%	No (-0.47)
8%	4.3%	2.93	-0.16	76.0%	76.0%	-	0.7%	No (-0.47)
9%	4.1%	2.87	-0.03	76.2%	76.2%	-	0.7%	No (-0.44)
10%	4.1%	2.85	-0.09	76.7%	76.7%	-	0.7%	No (-0.46)
11%	4.5%	2.90	-0.03	77.0%	77.0%	-	0.7%	No (-0.46)
12%	4.1%	2.72	-0.09	77.1%	77.1%	-	0.7%	No (-0.47)
13%	4.0%	2.77	0.00	77.4%	77.4%	-	0.7%	No (-0.44)
14%	4.7%	2.92	-0.07	77.6%	77.7%	-	0.7%	No (-0.44)
15%	4.5%	2.83	-0.11	77.8%	77.8%	-	0.7%	No (-0.46)
16%	3.7%	2.82	-0.10	78.0%	78.0%	-	0.7%	No (-0.46)
17%	4.3%	2.85	-0.06	78.2%	78.2%	-	0.7%	No (-0.46)
18%	4.5%	2.85	-0.14	78.4%	78.5%	-	0.7%	No (-0.46)
19%	4.2%	2.89	-0.15	78.7%	78.7%	-	0.7%	No (-0.43)
20%	3.7%	2.72	-0.12	78.9%	78.9%	-	0.7%	No (-0.48)

Table 9-118 Statistical attributes of the Monte Carlo analysis of the 1994-95 data set for cases 1% to 20% project significance

%Sig	Statistical Mean Values from 1000 Monte Carlo Trials						
	Nos	Low	High	Mode	Mean	Median	SD
1%	11	7.67%	8.05%	-	7.88%	7.88%	0.11%
2%	23	7.60%	8.47%	8.03%	8.00%	8.03%	0.23%
3%	34	7.21%	8.26%	8.05%	7.90%	7.97%	0.21%
4%	45	7.44%	8.28%	8.04%	7.91%	7.95%	0.17%
5%	56	7.50%	8.20%	8.00%	7.92%	7.93%	0.15%
6%	63	7.44%	8.50%	7.90%	7.96%	7.97%	0.20%
7%	79	7.56%	8.57%	7.92%	7.97%	7.97%	0.19%
8%	90	7.47%	8.38%	8.03%	7.95%	7.96%	0.19%
9%	101	7.42%	8.61%	7.84%	7.93%	7.92%	0.21%
10%	113	7.41%	8.39%	7.93%	7.94%	7.96%	0.20%
11%	124	7.39%	8.41%	7.94%	7.93%	7.93%	0.19%
12%	136	7.48%	8.39%	8.00%	7.94%	7.94%	0.20%
13%	145	7.49%	8.46%	7.92%	7.97%	7.96%	0.19%
14%	158	7.44%	8.46%	8.04%	7.97%	7.96%	0.18%
15%	170	7.24%	8.42%	7.93%	7.93%	7.93%	0.20%
16%	181	7.47%	8.46%	8.07%	7.95%	7.96%	0.19%
17%	192	7.33%	8.59%	7.97%	7.97%	7.96%	0.19%
18%	204	7.36%	8.95%	7.93%	7.98%	7.98%	0.21%
19%	215	7.43%	8.42%	7.89%	7.96%	7.96%	0.18%
20%	226	7.43%	8.48%	7.96%	7.96%	7.96%	0.20%

Table 9-119 Statistical attributes of mean values derived from Monte Carlo simulations of outturn performance for percents of project significance, 1994-95 portfolio

Results

Within the range of zero to twenty percent outturn variance used in the analysis the closest fit of a standard distribution is the Beta distribution ($\alpha = 0.64$, $\beta = 0.97$ scale = 0.2) in terms of the Chi-square test (15.18, $\theta = 0.4388$) and the Kolmogorov-Smirnov test (0.0611).

Table 9-120 lists the results of this analysis of the 1994-95 data set. The table contains 'ideal' case results taken from the mathematical analysis and the 'stochastic' results for percentiles of 95%, 90%, 75% and 50% probability taken from the Monte Carlo analyses. The 'Ave-mean' is the average of the mean values derived from the Monte Carlo analysis of each project in the analyses. The statistical attributes for the Monte Carlo values for each percent-significance are listed in Table 9-119. Each Monte Carlo analysis produced one thousand scenarios in which the percent outturn variance could fall within the range of zero to twenty percent according to the pre-selected Beta probability distribution. The mean of the 'Ave-mean outturn variance per project' is 7.95%. When deriving heuristics from this data, the 'evens' probability is used, i.e., the 50% percentile. This is because the difference between 95% and 50% percentiles values in the case of ten percent and twenty percent of significant projects is less than 1.0% and is not significant.

% No projects modified outturn	% Value	Outturn percent of target expenditure achieved						
		Actual %	Ideal %	Ave-Mean outturn variance per project	95%	90%	75%	50%
1%	40.0	76.7	78.6	7.88%	66.1	66.3	66.0	65.8
2%	53.9	76.7	83.7	8.00%	70.5	70.3	70.0	69.8
3%	61.6	76.7	86.1	7.90%	72.5	72.3	72.0	71.6
4%	67.3	76.7	87.7	7.91%	73.6	73.5	73.2	72.9
5%	71.4	76.7	89.6	7.92%	74.9	74.7	74.4	74.1
6%	74.9	76.7	90.8	7.96%	76.0	75.8	75.5	75.2
7%	77.5	76.7	91.6	7.92%	76.7	76.6	76.2	75.9
8%	79.7	76.7	92.3	7.95%	77.0	76.9	76.6	76.4
9%	81.6	76.7	92.7	7.93%	77.5	77.3	77.0	77.7
10%	83.1	76.7	93.3	7.94%	78.0	77.8	77.5	77.2
11%	84.5	76.7	93.7	7.93%	78.4	78.1	77.8	77.5
12%	85.8	76.7	94.0	7.94%	78.4	78.3	77.9	77.6
13%	86.9	76.7	94.4	7.97%	78.7	78.5	78.2	77.9
14%	87.9	76.7	94.7	7.97%	78.8	78.7	78.4	78.1
15%	88.9	76.7	94.9	7.93%	79.1	78.9	78.6	78.3
16%	89.8	76.7	95.2	8.07%	79.1	79.0	78.3	78.4
17%	90.5	76.7	95.4	7.97%	79.4	79.2	79.0	78.7
18%	91.2	76.7	95.7	7.93%	79.6	79.5	79.2	78.9
19%	91.8	76.7	96.0	7.89%	79.9	79.7	79.5	79.2
20%	92.3	76.7	96.2	7.96%	80.1	80.0	79.7	79.4

Table 9-120 Comparison of the improved outturn for the 1994-95 portfolio due to the impact of the outturn-variance for 1% to 20% significant projects according to 'actual', 'ideal' and 'stochastic' scenarios.

Using the results shown in Table 9-120, three heuristics are proposed corresponding to the twenty-percent, the ten-percent and the five percent levels of significant projects in the portfolio.

- 80:20 rule case:

Twenty percent of the number of the projects in the 1994-95 portfolio contain ninety-two percent of the 'planned expenditure' of the portfolio. There is an evens probability of achieving an seventy-nine percent spending performance for the portfolio overall *compared to the seventy-seven percent outturn actually achieved.*) This assumes that best endeavor management effort is applied to each of the twenty percent projects with greatest planned expenditure that year so that they each achieve a high performance outturn variance that is within the range of zero to twenty percent. Other projects remain at current performance levels.

- 60:10 rule case

Ten percent of the number of the projects in the 1994-95 portfolio contain eighty-three percent of the 'planned expenditure' of the portfolio. There is an evens probability of achieving an seventy-seven percent spending performance for the portfolio overall *compared to the seventy-seven percent outturn actually achieved.* This assumes that best endeavor management effort is applied to each of the ten percent projects with greatest planned expenditure that year so that they each achieve a high performance outturn variance that is within the range of zero to twenty percent. Other projects remain at current performance levels.

- 50:5 rule case

Five percent of the number of the projects in the 1994-95 portfolio contain seventy-four percent of the 'planned expenditure' of the portfolio. There is an evens probability of achieving an seventy-four percent spending performance for the portfolio overall *compared to the seventy-seven percent outturn actually achieved.* This assumes that best endeavor management effort is applied to each of the five percent projects with greatest planned expenditure that year so that they each achieve a high performance outturn variance that is within the range of zero to twenty percent. Other projects remain at current performance levels.

1995-96

Mathematical analysis

The attributes of the 1995-96 data set used in this analysis are described in Section 9.3.

The outturn variance in the 1995-96 data set is an under-spend of HK\$ 8,462 million, or twenty-seven percent of the planned expenditure. In this analysis, the effect on the outturn for the portfolio of projects as a whole is calculated as those projects with the more significant values of planned expenditure achieve a perfect outcome of zero outturn variance.

Figure 9-48 and Table 9-121, shows the rate of improvement as increasing percentiles of the significant projects in portfolio achieve a perfect outcome. The greatest rate of improvement occurs within the 5% percentile.

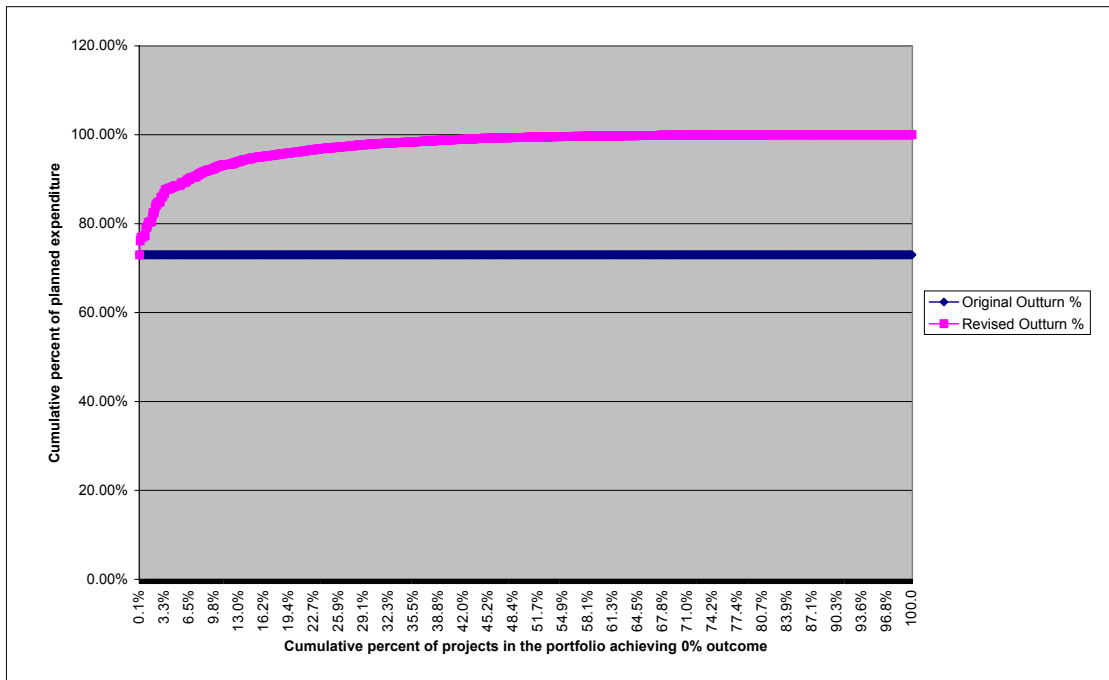


Figure 9-48 Improved outturn achieved in 1995-96 dataset as ideal outturn is achieved by significant projects

Percentile (<i>Projects in dataset</i>)	Outturn Achieved	Diff to Actual Outturn
2.5%	85%	12%
5%	89%	16%
7.5%	91%	18%
10%	93%	20%
12.5%	94%	21%
15%	95%	22%
17.5%	95%	22%
20%	96%	23%
22.5%	97%	24%
25%	97%	24%
27.5%	98%	25%
30%	98%	25%
35%	98%	25%
40%	99%	26%
50%	99%	26%

Table 9-121 Improved outturn achievement for 1995-96 dataset

This analysis indicates that an ideal delivery for the significant value twenty percent of the projects in the data set will deliver on overall outturn for the portfolio that is ninety-six percent of the planned outcome – all other things being unchanged.

Stochastic analysis

The calculation in the stochastic validation is the same as the mathematical validation except for a change to the earlier assumption that increasing numbers of significant value project will achieve a perfect outcome. As in the stochastic analyses before, this assumption is replaced by outcome for each significant project that are based upon a probability distribution derived from the 1995-96 empirical data as described in Section 9.3.

This probability curve is based upon the actual performance for this data set within the limits of x-values of 0 to 0.2, i.e., ratios of outturn performance that range from zero to a twenty percent under-spending of the planned expenditure. The probability distribution for this range of values is a Beta distribution with parameters of:

- Alpha value = 0.65
- Beta value = 0.91
- Scale value = 0.20

Crystal Ball® software by Decisioneering Inc is used to perform Monte Carlo analysis on the variable 'Outturn variance/Amended Estimate' for each of the significant projects identified within the 1995-96 data set within ranges of one to twenty percent of the 1,086 projects in the data set.

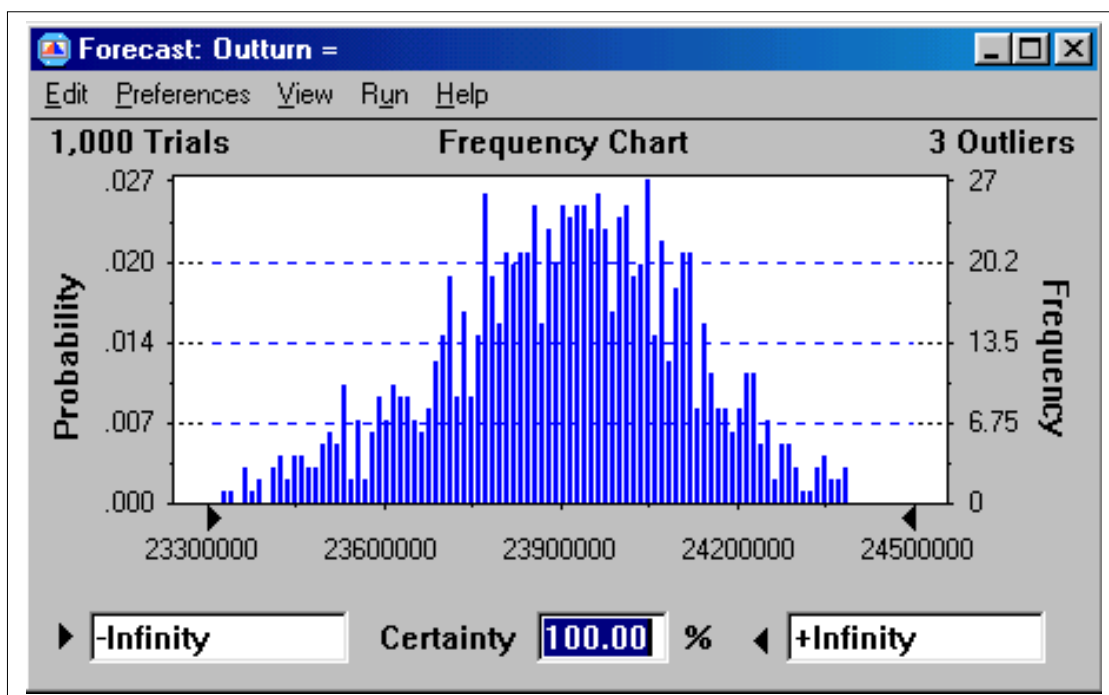


Figure 9-49 Frequency chart derived from Monte Carlo analysis of 1995-96 data set with one percent of significant projects subject to stochastic outturn

The Crystal Ball® analysis produced a frequency diagram for outturn for the data set in terms of total expenditure and also percent outturn. For example, Figure 9-49 shows the range of total expenditures for the data set whilst Figure 9-50 Frequency chart of outturn percent for 1995-96 data set when one percent of high impact projects are subject to stochastic analysis

shows the corresponding outturn in terms of percent. For brevity in this thesis the frequency diagrams are not reproduced in all analyses, however the results corresponding to percentiles are tabulated here.

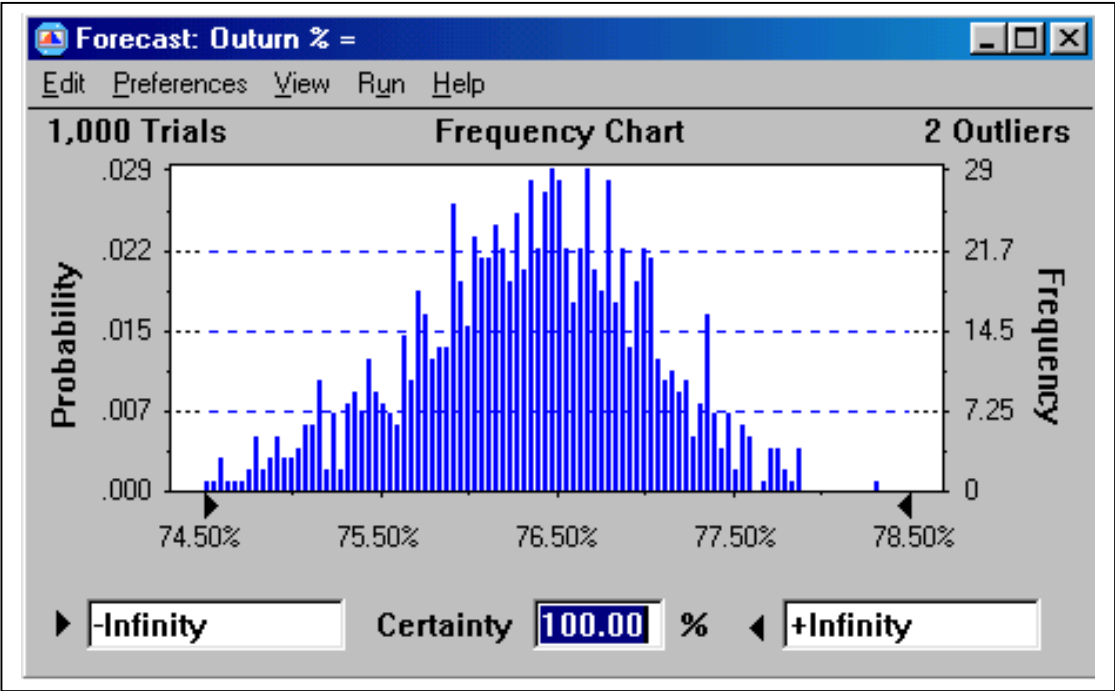


Figure 9-50 Frequency chart of outturn percent for 1995-96 data set when one percent of high impact projects are subject to stochastic analysis

The percentiles for Figure 9-49 shows the range of values for ‘percent outturn’, when one percent of the highest value projects in terms of planned expenditure (Amended Estimate) achieve an outturn governed by the Monte Carlo analysis. This one percent by number of projects, contains twenty percent of the total planned expenditure value of the data set.

Percentiles for 95%, 90%, 75%, and 50% are recorded for each frequency chart generated as shown in Table 9-122. It states the probable percent outturn when one percent to twenty percent of the highest value projects in the 1995-96 data set, in terms of planned expenditure (Amended Estimate), achieve an outturn governed by a Monte Carlo analysis based on the Beta probability distribution. The Beta distribution is constrained to produce an outturn variance that falls within zero to twenty percent.

% by Nos	% by \$	Percentiles results compared to 72.98 % actual outturn				
		100%	95%	90%	75%	50%
1%	31.6%	74.50 – 78.50	74.50 – 77.37	74.91 – 77.27	75.44 – 77.02	75.88 – 76.76
2%	48.8%	76.50 – 80.50	76.91 – 79.89	77.16 – 79.69	77.60 – 79.34	79.98 – 79.01
3%	59.3%	79.00 – 83.50	79.52 – 82.47	79.76 – 82.28	80.17 – 81.93	80.56 – 81.56
4%	67.3%	80.50 – 84.50	80.85 – 83.88	81.22 – 83.67	81.57 – 83.36	81.93 – 83.00
5%	71.4%	80.50 – 85.00	80.46 – 83.94	81.10 – 83.80	81.66 – 83.47	82.06 – 83.11
6%	74.9%	81.00 – 85.50	81.56 – 84.62	81.84 – 84.40	82.24 – 84.01	82.64 – 83.69
7%	77.5%	81.50 – 86.50	82.41 – 85.65	82.67 – 85.32	83.11 – 84.92	83.44 – 84.53
8%	79.7%	82.50 – 87.00	83.29 – 86.30	83.54 – 86.06	83.93 – 85.67	84.28 – 85.33
9%	81.6%	83.00 – 87.50	83.80 – 86.76	84.00 – 86.49	84.36 – 86.20	84.75 – 85.84
10%	83.1%	83.50 – 88.00	84.24 – 87.32	84.44 – 87.10	84.93 – 86.79	85.34 – 86.41
11%	84.5%	84.00 – 88.50	83.97 – 87.50	84.65 – 87.33	85.23 – 87.04	85.66 – 86.72
12%	85.8%	84.00 – 88.50	85.48 – 87.73	84.96 – 87.52	85.40 – 87.22	85.76 – 86.84
13%	86.9%	84.50 – 89.00	85.20 – 88.25	85.51 – 88.10	85.92 – 87.74	86.33 – 87.41
14%	87.9%	85.00 – 89.50	85.42 – 88.69	85.73 – 88.55	86.22 – 88.10	86.65 – 87.10
15%	88.9%	85.50 – 90.00	85.87 – 88.99	86.14 – 88.79	86.63 – 88.49	87.02 – 88.09
16%	89.8%	85.50 – 90.00	85.89 – 89.03	86.26 – 88.87	86.78 – 88.56	87.16 – 88.22
17%	90.5%	85.50 – 90.00	85.50 – 89.03	86.08 – 88.90	86.73 – 88.63	87.21 – 88.31
18%	91.2%	86.00 – 90.50	86.23 – 89.49	86.66 – 89.27	87.12 – 88.90	87.53 – 88.55
19%	91.8%	86.00 – 90.50	86.49 – 89.64	86.67 – 89.39	87.26 – 89.13	87.65 – 88.79
20%	92.3%	86.00 – 90.50	86.94 – 89.98	87.07 – 89.79	87.47 – 89.40	87.87 – 88.99

Table 9-122 Outturn for 1995-96 dataset when one to twenty percent of the significant projects are subject to an outturn based upon the Monte Carlo analysis.

Figure 9-51 shows graphically these results. The graph shows the relationship between the range of possible outturn when an increasing percent of the projects, in their order of greatest planned expenditure that financial year, achieve a high performance outcome within an assumed range of eighty to one hundred percent perfection. Based upon the Beta probability distribution for this constrained range, derived from the empirical data of the 1995-96 data set. All other outcomes within the data set remain unchanged, i.e., remain at the outturn achieved in reality.

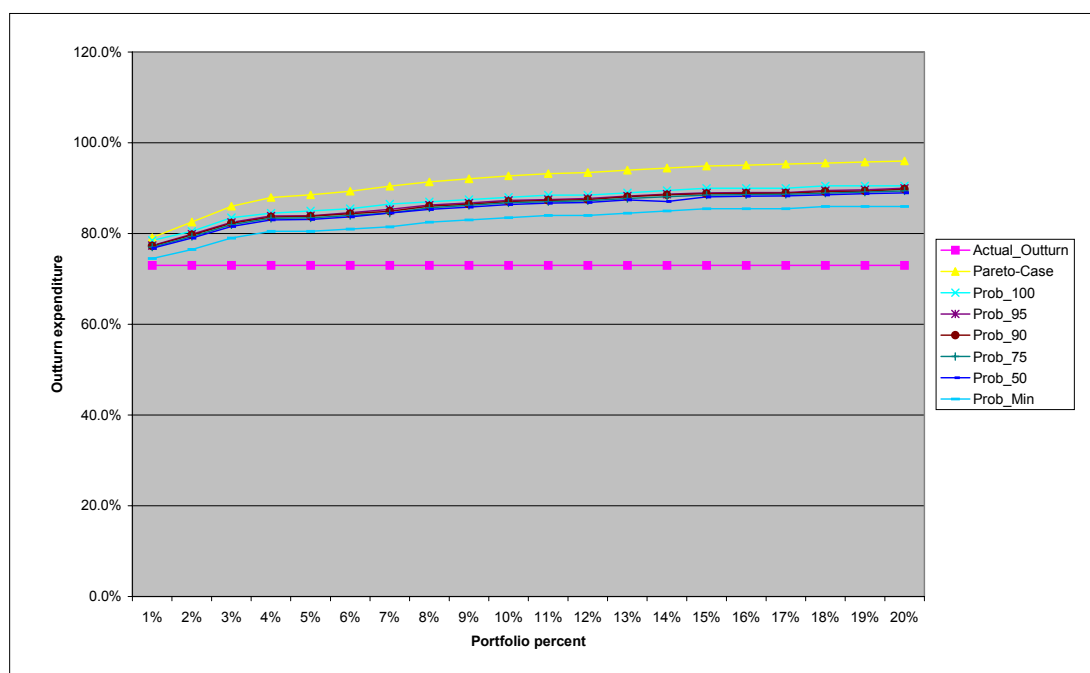


Figure 9-51 Variation in outturn expenditure 1995-96 dataset: comparison of actual outturn when significant projects achieve an ideal or probability-based ideal outcome

The percent improvement over the actual performance achieved in 1995-96 for this data set, that could theoretically be achieved, based on the assumptions in the mathematical analysis and this stochastic analysis, are set out in Table 9-123.

Percent of data-set (i.e. portfolio)		Theoretical % improved outturn		
% by Nos. Sig Projects	% by Value of Planned Exp	Assumed ideal	assumed Beta probability < Maximax	> Minimin
1%	31.6%	6.1%	5.5%	1.5%
2%	48.8%	9.6%	7.5%	3.5%
3%	59.3%	13.0%	10.5%	6.0%
4%	67.3%	15.0%	11.5%	7.5%
5%	71.4%	15.6%	12.0%	7.5%
6%	74.9%	16.3%	12.5%	8.0%
7%	77.5%	17.4%	13.5%	8.5%
8%	79.7%	18.4%	14.0%	9.5%
9%	81.6%	19.1%	14.5%	10.0%
10%	83.1%	19.8%	15.0%	10.5%
11%	84.5%	20.2%	15.5%	11.0%
12%	85.8%	20.5%	15.5%	11.0%
13%	86.9%	21.0%	16.0%	11.5%
14%	87.9%	21.5%	16.5%	12.0%
15%	88.9%	21.9%	17.0%	12.5%
16%	89.8%	22.1%	17.0%	12.5%
17%	90.5%	22.3%	17.0%	12.5%
18%	91.2%	22.6%	17.5%	13.0%
19%	91.8%	22.8%	17.5%	13.0%
20%	92.3%	23.0%	17.5%	13.0%

Table 9-123 Theoretical relative outturn improvement in the outturn performance for the 1995-96 data set

The numbers of projects subject to the stochastic analysis ranges from eleven to two hundred and seventeen. The statistical attributes from each of the analyses, stated in Table 9-124, shows the distribution of outcomes to be a consistent, normal distribution. This is reasonable as the Beta distribution used in the Monte Carlo analysis tends to a uniform distribution.

The range width is narrow: four to six percent in all cases. The kurtosis values are close to the value of 3.0 associated with a normal distribution (Sargeant, Wainwright, 1996). The values of skewness are close to zero showing the distribution to be highly symmetrical. The values of the 'mean' and the 'median' are coincident due to the symmetry. The Beta distribution is itself continuous and does not lend itself to producing mode values. The Standard Deviation is also uniform.

For the purpose of this analysis, correlation coefficients less than +/- 0.5 is taken to indicate a lack of sensitivity between the individual variables and the outcome. All variables bar three are below the 0.5 threshold. The exceptions are moderate and not significant overall.

Prop dataset	Range	Kurtosis	Skew	Mean	Median	Mode	SD	Sensitivity > 0.5
1%	3.9%	2.86	-0.27	76.4%	76.4%	-	0.7%	Yes (-0.55)
2%	4.0%	2.69	-0.06	78.5%	78.5%	-	0.7%	No (-0.48)
3%	4.6%	2.81	-0.09	81.1%	81.1%	-	0.8%	No (-0.46)
4%	5.0%	2.95	-0.15	82.5%	82.5%	-	0.8%	No (-0.46)
5%	4.6%	2.88	-0.12	82.6%	82.6%	-	0.8%	No (-0.5)
6%	5.2%	2.96	-0.03	83.2%	83.2%	-	0.8%	No (-0.48)
7%	5.1%	3.02	-0.04	84.0%	84.0%	-	0.8%	No (-0.49)
8%	4.7%	2.87	-0.06	84.8%	84.85	-	0.8%	No (-0.47)
9%	5.1%	2.92	-0.02	85.3%	85.3%	-	0.8%	No (-0.46)
10%	5.0%	2.80	-0.12	85.9%	85.9%	-	0.8%	No (-0.47)
11%	5.1%	3.16	-0.15	86.2%	86.2%	-	0.8%	Yes (-0.52)
12%	5.6%	3.03	-0.15	86.3%	86.4%	-	0.8%	Yes (-0.52)
13%	5.2%	2.96	-0.11	86.9%	86.9%	-	0.8%	No (-0.47)
14%	4.2%	2.69	-0.05	87.2%	87.2%	-	0.8%	No (-0.50)
15%	4.9%	2.94	-0.17	87.6%	87.6%	-	0.8%	No (-0.49)
16%	4.5%	2.80	-0.12	87.7%	87.7%	-	0.8%	No (-0.47)
17%	4.8%	2.86	-0.22	87.8%	87.9%	-	0.8%	No (-0.50)
18%	4.5%	2.96	-0.08	88.1%	88.1%	-	0.8%	No (-0.47)
19%	4.9%	2.79	-0.16	88.2%	88.3%	-	0.8%	No (-0.50)
20%	4.6%	2.56	-0.02	88.4%	88.4%	-	0.8%	No (0.48)

Table 9-124 Statistical attributes of the Monte Carlo analysis of the 1995-96 data set for cases 1% to 20% project significance

The Monte Carlo analysis generates the mean value for the percent outturn variance of each project out of the one thousand cases computed in the analysis. This ranges from zero to twenty percent according to the Beta probability distribution. Table 9-125 shows the statistical attributes for these mean values in each of the analysis scenarios: from one percent significant projects to twenty percent.

%Sig	Statistical Mean Values from 1000 Monte Carlo Trials						
	Nos	Low	High	Mode	Mean	Median	SD
1%	11	7.98%	8.57%	8.32%	8.33%	8.32%	0.17%
2%	22	8.01%	8.51%	8.31%	8.30%	8.30%	0.13%
3%	33	7.65%	8.67%	8.37%	8.30%	8.34%	0.19%
4%	43	7.91%	8.72%	8.28%	8.33%	8.29%	0.19%
5%	54	7.99%	8.81%	8.49%	8.35%	8.39%	0.19%
6%	65	7.87%	8.84%	8.43%	8.34%	8.32%	0.22%
7%	76	7.88%	8.80%	8.29%	8.35%	8.32%	0.20%
8%	87	7.88%	8.83%	8.26%	8.36%	8.33%	0.19%
9%	98	7.88%	8.86%	8.57%	8.38%	8.36%	0.22%
10%	109	7.91%	8.85%	8.35%	8.36%	8.35%	0.19%
11%	120	7.83%	8.78%	8.43%	8.35%	8.34%	0.19%
12%	130	7.83%	8.83%	8.39%	8.33%	8.34%	0.19%
13%	141	7.71%	8.97%	8.35%	8.32%	8.31%	0.22%
14%	152	7.71%	8.78%	8.32%	8.34%	8.35%	0.21%
15%	163	7.80%	8.79%	8.62%	8.33%	8.34%	0.21%
16%	174	7.80%	8.88%	8.44%	8.35%	8.37%	0.19%
17%	185	7.84%	8.78%	8.30%	8.37%	8.38%	0.19%
18%	195	7.83%	8.78%	8.37%	8.33%	8.34%	0.20%
19%	206	7.84%	8.78%	8.38%	8.32%	8.30%	0.20%
20%	217	7.87%	8.80%	8.33%	8.31%	8.31%	0.18%

Table 9-125 Statistical attributes of mean values derived from Monte Carlo simulations of outturn performance for percents of project significance, 1995-96 portfolio

Results

Within the range of zero to twenty percent outturn variance used in the analysis the closest fit of a standard distribution is the Beta distribution ($\alpha = 0.65$, $\beta = 0.91$ scale = 0.2) in terms of the Chi-square test (14.29, $\theta = 0.5769$) and the Kolmogorov-Smirnov test (0.0379).

Table 9-126 lists the results of this analysis of the 1995-96 data set. The table contains 'ideal' case results taken from the mathematical analysis and the 'stochastic' results for percentiles of 95%, 90%, 75% and 50% probability taken from the Monte Carlo analyses. The 'Ave-mean' is the average of the mean values derived from the Monte Carlo analysis of each project in the analyses. The statistical attributes for the Monte Carlo values for each percent-significance are listed in Table 9-124. Each Monte Carlo analysis produced one thousand scenarios in which the percent outturn variance could fall within the range of zero to twenty percent according to the pre-selected Beta probability distribution. The mean of the 'Ave-mean outturn variance per project' is 8.34%.

When deriving heuristics from this data, the 'evens' probability is used, i.e., the 50% percentile. This is because the difference between 95% and 50% percentiles values in the case of ten percent and twenty percent of significant projects is less than 1.0% and is not significant.

% No projects modified outturn	% Value	Outturn percent of target expenditure achieved						
		Actual %	Ideal %	Monte Carlo Percentiles				
				Ave-Mean outturn variance per project	95%	90%	75%	50%
1%	33.3	73.0	79.1	8.33%	77.4	77.3	77.0	76.8
2%	48.8	73.0	82.6	8.30%	79.9	79.7	79.3	79.0
3%	59.3	73.0	86.0	8.30%	82.5	82.3	81.9	81.6
4%	65.9	73.0	88.0	8.33%	83.9	83.8	83.5	83.1
5%	70.6	73.0	88.6	8.35%	83.9	83.8	83.5	83.1
6%	74.1	73.0	89.3	8.43%	84.6	84.4	84.0	83.7
7%	76.9	73.0	90.4	8.39%	85.7	85.3	84.9	84.5
8%	79.1	73.0	91.4	8.26%	86.3	86.1	85.7	85.3
9%	80.8	73.0	92.1	8.57%	86.8	86.5	86.2	85.8
10%	82.4	73.0	92.7	8.35%	87.3	87.1	86.8	86.4
11%	83.7	73.0	93.2	8.43%	87.5	87.3	87.0	86.7
12%	84.9	73.0	93.4	8.39%	87.7	87.5	87.2	86.8
13%	86.0	73.0	94.0	8.35%	88.3	88.1	87.7	87.4
14%	87.0	73.0	94.4	8.32%	88.7	88.6	88.1	87.1
15%	87.9	73.0	94.9	8.62%	89.0	88.8	88.5	88.1
16%	88.7	73.0	95.1	8.44%	89.0	88.9	88.6	88.2
17%	89.5	73.0	95.3	8.30%	89.0	88.9	88.6	88.3
18%	90.1	73.0	95.6	8.37%	89.5	89.3	88.9	88.6
19%	90.7	73.0	95.8	8.38%	89.6	89.4	89.1	88.8
20%	91.3	73.0	96.01	8.33%	90.0	89.8	89.4	89.0

Table 9-126 Comparison of the improved outturn for the 1995-96 portfolio due to the impact of the outturn-variance for 1% to 20% significant projects according to 'actual', 'ideal' and 'stochastic' scenarios.

Using the results shown in Table 9-126, three heuristics are proposed corresponding to the twenty-percent, the ten-percent and the five percent levels of significant projects in the portfolio.

- 80:20 rule case:

Twenty percent of the number of the projects in the 1995-96 portfolio contain ninety-two percent of the 'planned expenditure' of the portfolio. There is an evens probability of achieving an eighty-nine percent spending performance for the portfolio overall *compared to the seventy-three percent outturn actually achieved*. This assumes that best endeavor management effort is applied to each of the twenty percent projects with greatest planned expenditure that year so that they each achieve a high performance outturn variance that is within the range of zero to twenty percent. Other projects remain at current performance levels.

- 60:10 rule case

Ten percent of the number of the projects in the 1995-96 portfolio contain eighty-two percent of the 'planned expenditure' of the portfolio. There is an evens probability of achieving an eighty-six percent spending performance for the portfolio overall *compared to the seventy-three percent outturn actually achieved*. This assumes that best endeavor management effort is applied to each of the ten percent projects with greatest planned expenditure that year so that they each achieve a high performance outturn variance that is within the range of zero to twenty percent. Other projects remain at current performance levels.

- 50:5 rule case

Five percent of the number of the projects in the 1995-96 portfolio contain seventy-one percent of the 'planned expenditure' of the portfolio. There is an evens probability of achieving an eighty-three percent spending performance for the portfolio overall *compared to the seventy-three percent outturn actually achieved*. This assumes that best endeavor management effort is applied to each of the five percent projects with greatest planned expenditure that year so that they each achieve a high performance outturn variance that is within the range of zero to twenty percent. Other projects remain at current performance levels

1996-97

Mathematical analysis

The attributes of the 1996-97 data set used in this analysis are described in Section 9.3.

The outturn variance in the 1996-97 data set is an under-spend of HK\$ 7,541 million, or twenty-six percent of the planned expenditure. In this analysis, the effect on the outturn for the portfolio of projects as a whole is calculated as those projects with the more significant values of planned expenditure achieve a perfect outcome of zero outturn variance.

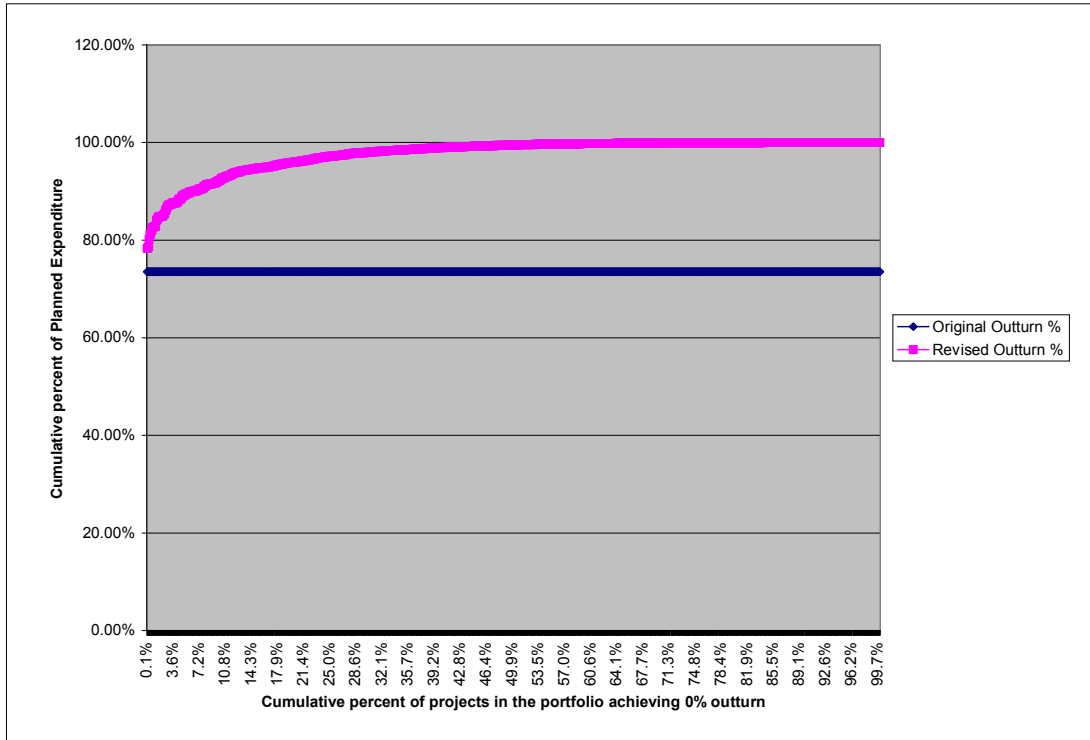


Figure 9-52 Improved outturn achieved in 1996-97 dataset as ideal outturn is achieved by significant projects

Figure 9-52 and Table 9-127, shows the rate of improvement as increasing percentiles of the significant projects in portfolio achieve a perfect outcome. The greatest rate of improvement occurs within the 5% percentile.

Percentile (<i>Projects in dataset</i>)	Outturn Achieved	Diff to Actual Outturn
2.5%	86%	13%
5%	89%	16%
7.5%	91%	17%
10%	92%	19%
12.5%	94%	20%
15%	95%	21%
17.5%	95%	22%
20%	96%	22%
22.5%	97%	23%
25%	97%	24%
27.5%	98%	24%
30%	98%	24%
35%	98%	25%
40%	99%	25%
50%	100%	26%

Table 9-127 Improved outturn achievement for 1996-97 dataset

This analysis indicates that an ideal delivery for the significant value twenty percent of the projects in the data set will deliver on overall outturn for the portfolio that is ninety-six percent of the planned outcome – all other things being unchanged.

Stochastic analysis

The stochastic validation is the same as the mathematical validation except for a change to the earlier assumption that increasing numbers of significant value project will achieve a perfect outcome. As in the stochastic analyses before, this assumption is replaced by outcome for each significant project that are based upon a probability distribution derived from the 1996-97 empirical data as described in Section 9.3.

This probability curve is based upon the actual performance for this data set within the limits of x-values of 0 to 0.2, i.e., ratios of outturn performance that range from zero to a twenty percent under-spending of the planned expenditure. The probability distribution for this range of values is a Beta distribution with parameters of:

- Alpha value = 0.61
- Beta value = 1.02
- Scale value = 0.20

Crystal Ball® software by Decisioneering Inc is used to perform Monte Carlo analysis on the variable 'Outturn variance/Amended Estimate' for each of the significant projects identified within the 1996-97 data set within ranges of one to twenty percent of the 1,096 projects in the data set.

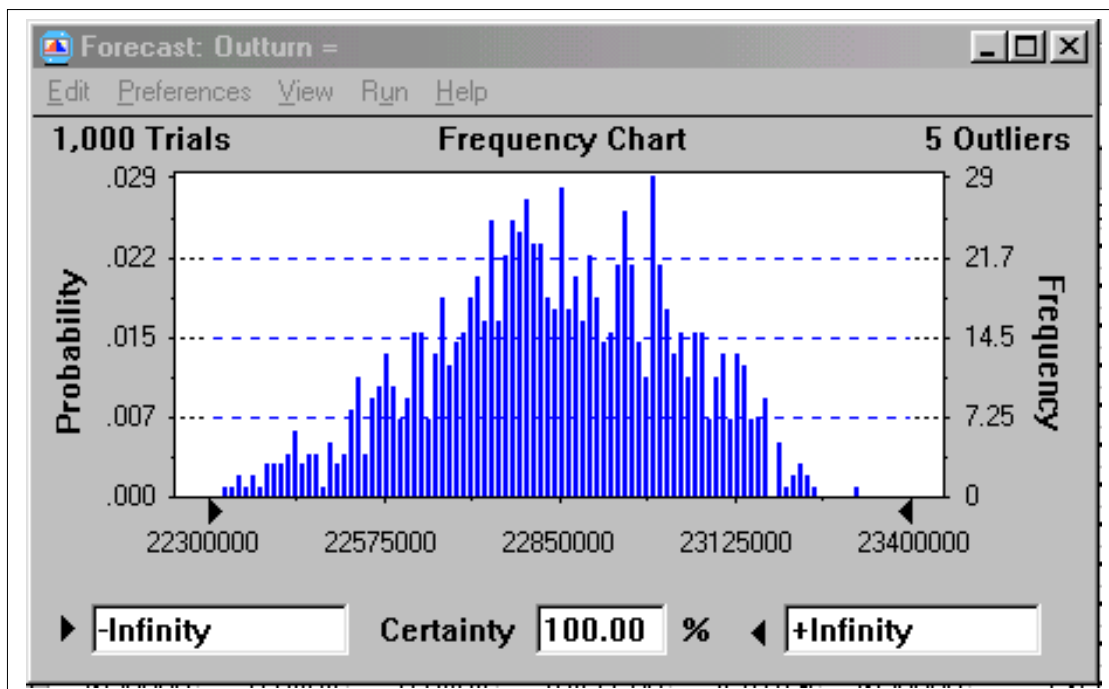


Figure 9-53 Frequency chart derived from Monte Carlo analysis of 1996-97 data set with one percent of significant projects subject to stochastic outturn

The Crystal Ball® analysis produced a frequency diagram for outturn for the data set in terms of total expenditure and also percent outturn. For example, Figure 9-53 shows the range of total expenditures for the data set whilst Figure 9-54 shows the corresponding outturn in terms of percent. For brevity in this thesis the frequency diagrams are not reproduced in all analyses, however the results corresponding to percentiles are tabulated here.

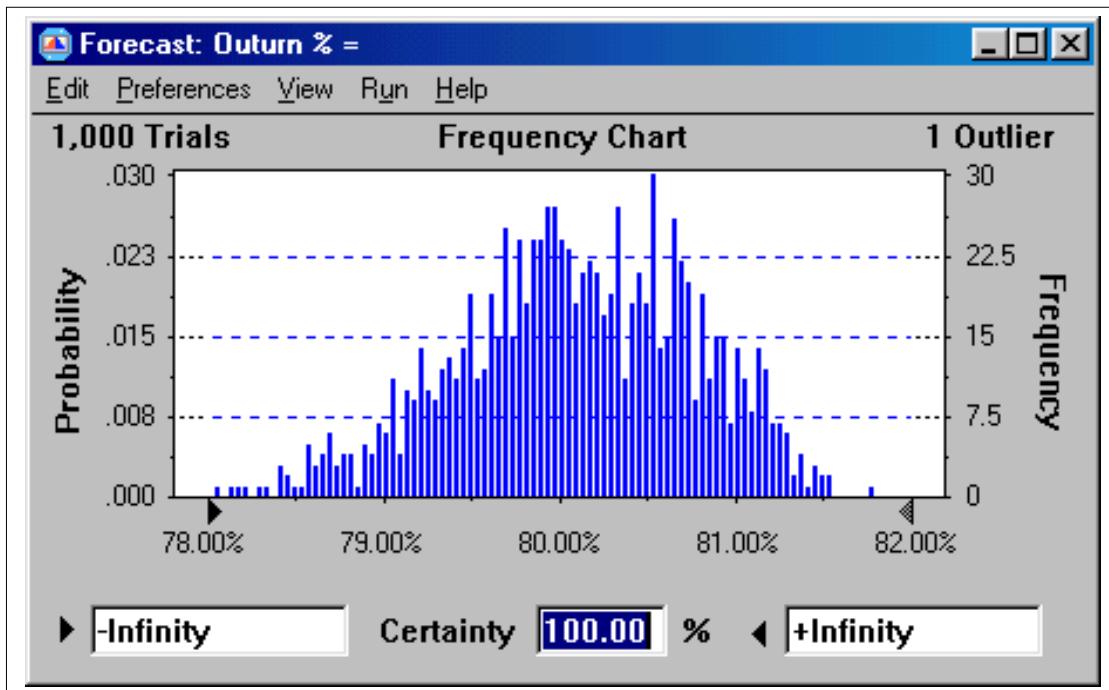


Figure 9-54 Frequency chart of outturn percent for 1996-97 data set when one percent of high impact projects are subject to stochastic analysis

The percentiles for Figure 9-54 shows the range of values for 'percent outturn', when one percent of the highest value projects in terms of planned expenditure (Amended Estimate) achieve an outturn governed by the Monte Carlo analysis. This one percent by number of projects, contains twenty percent of the total planned expenditure value of the data set.

Percentiles for 95%, 90%, 75%, and 50% are recorded for each frequency chart generated as shown in Table 9-128. It states the probable percent outturn when one percent to twenty percent of the highest value projects in the 1996-97 data set, in terms of planned expenditure (Amended Estimate), achieve an outturn governed by a Monte Carlo analysis based on the Beta probability distribution. The Beta distribution is constrained to produce an outturn variance that falls within zero to twenty percent.

% by Nos	% by \$	Percentiles results compared to 73.55 % actual outturn				
		100%	95%	90%	75%	50%
1%	35.3%	78.00 – 82.00	78.65 – 81.25	78.90 – 81.15	79.27 – 80.89	79.65 – 80.60
2%	47.9%	79.00 – 83.50	79.31 – 82.57	79.77 – 82.41	80.34 – 82.11	80.76 – 81.79
3%	56.4%	80.50 – 85.00	81.11 – 84.25	81.39 – 84.01	81.88 – 83.72	82.34 – 83.42
4%	62.5%	80.50 – 85.50	81.00 – 84.30	81.54 – 84.14	82.01 – 83.35	82.43 – 83.53
5%	66.9%	82.00 – 86.50	82.23 – 85.51	82.72 – 85.35	83.22 – 85.07	83.65 – 84.72
6%	70.5%	82.50 – 87.00	82.71 – 85.95	83.22 – 85.73	83.65 – 85.42	84.07 – 85.10
7%	73.5%	82.50 – 87.00	83.24 – 86.23	83.60 – 85.97	83.91 – 85.67	84.33 – 85.33
8%	76.0%	83.00 – 87.50	83.95 – 86.86	84.15 – 86.64	84.49 – 86.29	84.89 – 85.91
9%	78.1%	83.50 – 88.00	83.50 – 86.91	84.26 – 86.82	84.79 – 86.51	85.20 – 86.23
10%	80.0%	84.00 – 88.50	84.71 – 87.71	84.99 – 87.56	85.34 – 87.21	85.75 – 86.83
11%	81.7%	84.50 – 89.00	85.20 – 88.36	85.55 – 88.15	85.98 – 87.81	86.41 – 87.49
12%	83.2%	85.50 – 90.00	85.66 – 88.79	86.07 – 88.68	86.60 – 88.36	87.00 – 88.02
13%	84.4%	85.50 – 90.00	86.38 – 89.38	86.64 – 89.19	87.06 – 88.88	87.43 – 88.51
14%	85.6%	86.00 – 90.50	86.11 – 89.35	86.56 – 89.20	87.01 – 88.88	87.49 – 88.56
15%	86.7%	86.00 – 90.50	86.00 – 89.52	86.71 – 89.34	87.25 – 89.10	87.66 – 88.76
16%	87.7%	86.00 – 90.50	86.74 – 89.85	87.01 – 89.63	87.48 – 89.24	87.84 – 88.89
17%	88.7%	86.00 – 90.50	86.42 – 89.75	86.93 – 89.59	87.45 – 89.29	87.88 – 88.88
18%	89.5%	86.50 – 91.00	87.01 – 90.21	87.35 – 90.01	87.93 – 89.70	88.29 – 89.38
19%	90.3%	86.50 – 91.50	87.26 – 90.38	87.54 – 90.18	88.04 – 89.88	88.39 – 89.53
20%	91.0%	87.00 – 91.50	87.40 – 90.51	87.73 – 90.33	88.21 – 90.03	88.60 – 89.66

Table 9-128 Outturn for 1996-97 dataset when one to twenty percent of the significant projects are subject to an outturn based upon the Monte Carlo analysis.

Figure 9-55 shows graphically these results. The graph shows the relationship between the range of possible outturn when an increasing percent of the projects, in their order of greatest planned expenditure that financial year, achieve a high performance outcome within an assumed range of eighty to one hundred percent perfection. Based upon the Beta probability distribution for this constrained range, derived from the empirical data of the 1996-97 data set. All other outcomes within the data set remain unchanged, i.e., remain at the outturn achieved in reality.

The percent improvement over the actual performance achieved in 1996-97 for this data set, that could theoretically be achieved, based on the assumptions in the mathematical analysis and this stochastic analysis, are set out in Table 9-129.

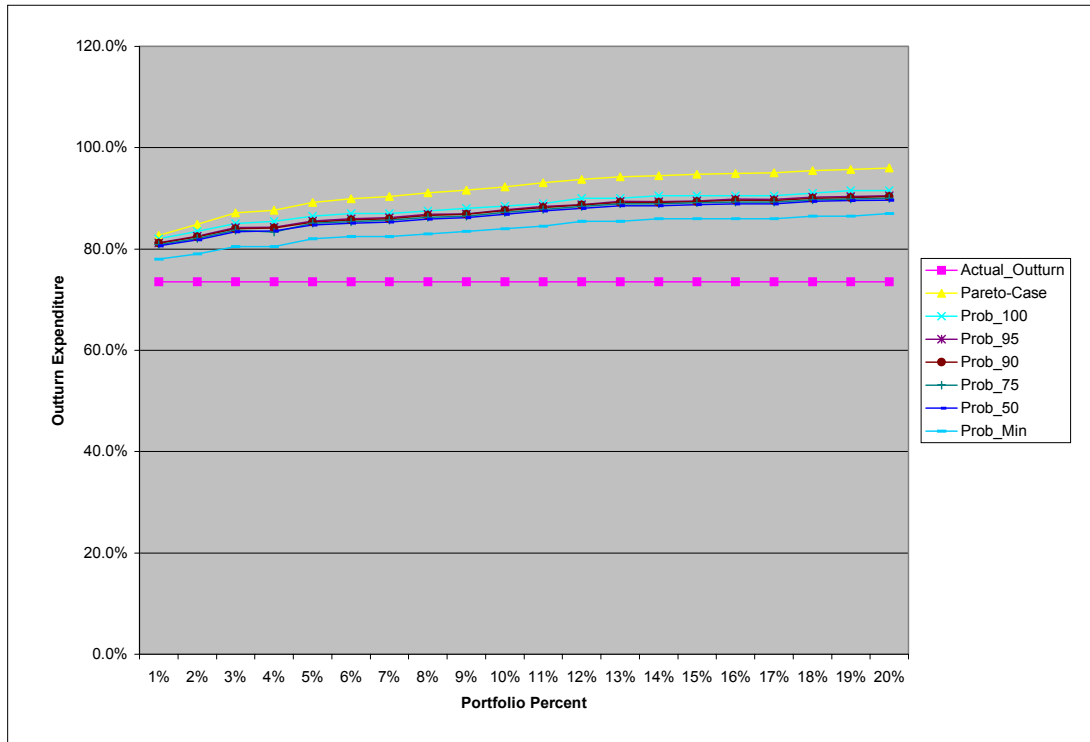


Figure 9-55 Variation in outturn expenditure 1996-97 dataset: comparison of actual outturn when significant projects achieve an ideal or probability-based ideal outcome

Percent of data-set (i.e. portfolio)		Theoretical % improved outturn		
% by Nos. Sig Projects	% by Value of Planned Exp	Assumed ideal	assumed Beta probability < Maximax	> Minimin
1%	35.3%	9.2%	8.4%	4.5%
2%	47.9%	11.3%	9.9%	5.5%
3%	56.4%	13.6%	11.5%	7.0%
4%	62.5%	14.1%	12.0%	7.0%
5%	66.9%	15.7%	13.0%	8.4%
6%	70.5%	16.4%	13.5%	8.9%
7%	73.5%	16.8%	13.5%	8.9%
8%	76.0%	17.5%	14.0%	9.4%
9%	78.1%	18.1%	14.5%	9.9%
10%	80.0%	18.7%	15.0%	10.5%
11%	81.7%	19.5%	15.5%	11.0%
12%	83.2%	20.2%	16.5%	12.0%
13%	84.4%	20.7%	16.5%	12.0%
14%	85.6%	20.9%	17.0%	12.5%
15%	86.7%	21.2%	17.0%	12.5%
16%	87.7%	21.4%	17.0%	12.5%
17%	88.7%	21.5%	17.0%	12.5%
18%	89.5%	21.9%	17.5%	13.0%
19%	90.3%	22.2%	18.0%	13.0%
20%	91.0%	22.4%	18.0%	13.5%

Table 9-129 Theoretical relative outturn improvement in the outturn performance for the 1996-97 data set

The numbers of projects subject to the stochastic analysis ranges from eleven to two hundred and nineteen. The statistical attributes from each of the analyses, stated in Table 9-130, shows the distribution of outcomes to be a consistent, normal distribution. This is reasonable as the Beta distribution used in the Monte Carlo analysis tends to a uniform distribution. The range width is narrow: four to six percent in all cases. The kurtosis values are close to the value of 3.0 associated with a normal distribution (Sargeant, Wainwright, 1996). The values of skewness are close to zero showing the distribution to be highly symmetrical. The values of the 'mean' and the 'median' are coincident due to the symmetry. The Beta distribution is itself continuous and does not lend itself to producing mode values. The Standard Deviation is also uniform.

For the purpose of this analysis, correlation coefficients less than +/- 0.5 is taken to indicate a lack of sensitivity between the individual variables and the outcome. All variables bar two are below the 0.5 threshold. The exceptions are moderate and not significant overall.

Prop dataset	Range	Kurtosis	Skew	Mean	Median	Mode	SD	Sensitivity > 0.5
1%	4.1%	2.68	-0.23	80.1%	80.1%	-	0.7%	Yes (-0.51)
2%	4.3%	2.91	-0.22	81.3%	81.3%	-	0.8%	No (0.48)
3%	4.6%	2.92	-0.24	82.9%	82.9%	-	0.8%	Yes (-0.52)
4%	4.6%	2.82	-0.20	83.0%	83.0%	-	0.8%	No (0.48)
5%	4.5%	2.78	-0.21	84.2%	84.2%	-	0.8%	No (0.48)
6%	4.3%	2.90	-0.10	84.6%	84.6%	-	0.8%	No (0.47)
7%	4.5%	2.91	-0.14	84.8%	84.8%	-	0.7%	No (0.42)
8%	4.7%	2.90	-0.12	85.4%	85.4%	-	0.8%	No (0.47)
9%	4.8%	3.13	-0.27	85.8%	85.8%	-	0.8%	No (0.47)
10%	4.8%	2.78	-0.12	86.3%	86.3%	-	0.8%	No (0.47)
11%	5.4%	2.93	-0.16	87.0%	87.0%	-	0.8%	No (0.48)
12%	4.8%	2.96	-0.20	87.5%	87.5%	-	0.8%	No (0.49)
13%	4.6%	2.75	-0.11	88.0%	88.0%	-	0.8%	No (0.46)
14%	5.0%	2.88	-0.04	88.1%	88.1%	-	0.8%	No (0.50)
15%	4.8%	2.70	-0.17	88.3%	88.3%	-	0.8%	No (0.46)
16%	5.2%	3.19	-0.20	88.4%	88.4%	-	0.8%	No (0.44)
17%	4.7%	2.87	-0.15	88.4%	88.5%	-	0.8%	No (0.44)
18%	4.5%	2.82	-0.14	88.8%	88.8%	-	0.8%	No (0.48)
19%	5.2%	2.76	-0.12	89.0%	89.0%	-	0.8%	No (0.48)
20%	5.3%	3.03	-0.17	89.2%	89.2%	-	0.8%	No (0.44)

Table 9-130 Statistical attributes of the Monte Carlo analysis of the 1996-97 data set for cases 1% to 20% project significance

The Monte Carlo analysis generates the mean value for the percent outturn variance of each project out of the one thousand cases computed in the analysis. This ranges from zero to twenty percent according to the Beta probability distribution. Table 9-131 shows the statistical attributes for these mean values in each of the analysis scenarios: from one percent significant projects to twenty percent.

%Sig	Statistical Mean Values from 1000 Monte Carlo Trials						
	Nos	Low	High	Mode	Mean	Median	SD
1%	11	7.20%	7.71%	7.50%	7.44%	7.44%	0.14%
2%	22	7.10%	7.78%	7.62%	7.49%	7.53%	0.17%
3%	33	7.15%	7.86%	7.53%	7.52%	7.53%	0.16%
4%	44	7.00%	7.91%	7.46%	7.48%	7.47%	0.19%
5%	55	6.90%	7.98%	7.51%	7.52%	7.54%	0.22%
6%	66	6.64%	8.09%	7.54%	7.47%	7.50%	0.23%
7%	77	6.64%	8.03%	7.48%	7.49%	7.49%	0.19%
8%	88	6.41%	8.02%	7.46%	7.48%	7.49%	0.21%
9%	99	6.09%	8.01%	7.29%	7.49%	7.49%	0.19%
10%	110	6.55%	7.88%	7.49%	7.47%	7.48%	0.21%
11%	121	6.66%	7.92%	7.50%	7.48%	7.50%	0.19%
12%	131	6.83%	7.91%	7.68%	7.46%	7.49%	0.20%
13%	142	6.52%	8.01%	7.48%	7.48%	7.48%	0.20%
14%	153	6.48%	7.94%	7.42%	7.45%	7.45%	0.20%
15%	164	6.42%	8.04%	7.48%	7.47%	7.49%	0.21%
16%	175	6.73%	8.08%	7.64%	7.49%	7.49%	0.20%
17%	186	6.44%	8.00%	7.32%	7.50%	7.51%	0.21%
18%	197	6.63%	7.89%	7.49%	7.45%	7.45%	0.19%
19%	208	6.57%	7.91%	7.54%	7.49%	7.51%	0.19%
20%	219	6.91%	8.09%	7.47%	7.50%	7.50%	0.21%

Table 9-131 Statistical attributes of mean values derived from Monte Carlo simulations of outturn performance for percents of project significance, 1996-97 portfolio

Results

Within the range of zero to twenty percent outturn variance used in the analysis the closest fit of a standard distribution is the Beta distribution ($\alpha = 0.61$, $\beta = 1.02$ scale = 0.2) in terms of the Chi-square test (14.23, $\theta = 0.5159$) and the Kolmogorov-Smirnov test (0.0543).

Table 9-132 lists the results of this analysis of the 1996-97 data set. The table contains 'ideal' case results taken from the mathematical analysis and the 'stochastic' results for percentiles of 95%, 90%, 75% and 50% probability taken from the Monte Carlo analyses. The 'Ave-mean' is the average of the mean values derived from the Monte Carlo analysis of each project in the analyses. The statistical attributes for the Monte Carlo values for each percent-significance are listed in Table 9-130. Each Monte Carlo analysis produced one thousand scenarios in which the percent outturn variance could fall within the range of zero to twenty percent according to the pre-selected Beta probability distribution. The mean of the 'Ave-mean outturn variance per project' is 7.48%.

When deriving heuristics from this data, the 'evens' probability is used, i.e., the 50% percentile. This is because the difference between 95% and 50% percentiles values in the case of ten percent and twenty percent of significant projects is less than 1.0% and is not significant.

% No projects modified outturn	% Value	Outturn percent of target expenditure achieved						
		Actual %	Ideal %	Monte Carlo Percentiles				50%
				Ave-Mean outturn variance per project	95%	90%	75%	
1%	35.3	73.6	82.7	7.44%	81.25	81.15	80.89	80.60
2%	47.9	73.6	84.9	7.49%	82.57	82.41	82.11	81.79
3%	56.4	73.6	87.1	7.52%	84.25	84.01	83.72	83.42
4%	62.5	73.6	87.7	7.48%	84.30	84.14	83.35	83.53
5%	66.9	73.6	89.2	7.52%	85.51	85.35	85.07	84.72
6%	70.5	73.6	89.9	7.47%	85.95	85.73	85.42	85.10
7%	73.5	73.6	90.3	7.49%	86.23	85.97	85.67	85.33
8%	76.0	73.6	91.1	7.48%	86.86	86.64	86.29	85.91
9%	78.1	73.6	91.6	7.49%	86.91	86.82	86.51	86.23
10%	80.0	73.6	92.2	7.47%	87.71	87.56	87.21	86.83
11%	81.7	73.6	93.1	7.48%	88.36	88.15	87.81	87.49
12%	83.2	73.6	93.7	7.46%	88.79	88.68	88.36	88.02
13%	84.4	73.6	94.2	7.48%	89.38	89.19	88.88	88.51
14%	85.6	73.6	94.5	7.45%	89.35	89.20	88.88	88.56
15%	86.7	73.6	94.7	7.47%	89.52	89.34	89.10	88.76
16%	87.7	73.6	94.9	7.49%	89.85	89.63	89.24	88.89
17%	88.7	73.6	95.1	7.50%	89.75	89.59	89.29	88.88
18%	89.5	73.6	95.5	7.45%	90.21	90.01	89.70	89.38
19%	90.3	73.6	95.7	7.49%	90.38	90.18	89.88	89.53
20%	91.0	73.6	96.0	7.50%	90.51	90.33	90.03	89.66

Table 9-132 Comparison of the improved outturn for the 1996-97 portfolio due to the impact of the outturn-variance for 1% to 20% significant projects according to 'actual', 'ideal' and 'stochastic' scenarios.

Using the results shown in Table 9-132, three heuristics are proposed corresponding to the twenty-percent, the ten-percent and the five percent levels of significant projects in the portfolio.

- 80:20 rule case:

Twenty percent of the number of the projects in the 1996-97 portfolio contain ninety-one percent of the 'planned expenditure' of the portfolio. There is an evens probability of achieving an ninety percent spending performance for the portfolio overall *compared to the seventy-four percent outturn actually achieved*. This assumes that best endeavor management effort is applied to each of the twenty percent projects with greatest planned expenditure that year so that they each achieve a high performance outturn variance that is within the range of zero to twenty percent. Other projects remain at current performance levels.

- 60:10 rule case

Ten percent of the number of the projects in the 1996-97 portfolio contain eighty percent of the 'planned expenditure' of the portfolio. There is an evens probability of achieving an eighty seven percent spending performance for the portfolio overall *compared to the seventy-four percent outturn actually achieved*. This assumes that best endeavor management effort is applied to each of the ten percent projects with greatest planned expenditure that year so that they each achieve a high performance outturn variance that is within the range of zero to twenty percent. Other projects remain at current performance levels.

- 50:5 rule case

Five percent of the number of the projects in the 1996-97 portfolio contain sixty-seven percent of the 'planned expenditure' of the portfolio. There is an evens probability of achieving an eighty five percent spending performance for the portfolio overall *compared to the seventy-four percent outturn actually achieved*. This assumes that best endeavor management effort is applied to each of the five percent projects with greatest planned expenditure that year so that they each achieve a high performance outturn variance that is within the range of zero to twenty percent. Other projects remain at current performance levels.

1997-98

Mathematical analysis

The attributes of the 1997-98 data set used in this analysis are described in Section 9.3.

The outturn variance in the 1997-98 data set is an under-spend of HK\$ 5,313 millions, or twenty-two percent of the planned expenditure. In this analysis, the effect on the outturn for the portfolio of projects as a whole is calculated as those projects with the more significant values of planned expenditure achieve a perfect outcome of zero outturn variance.

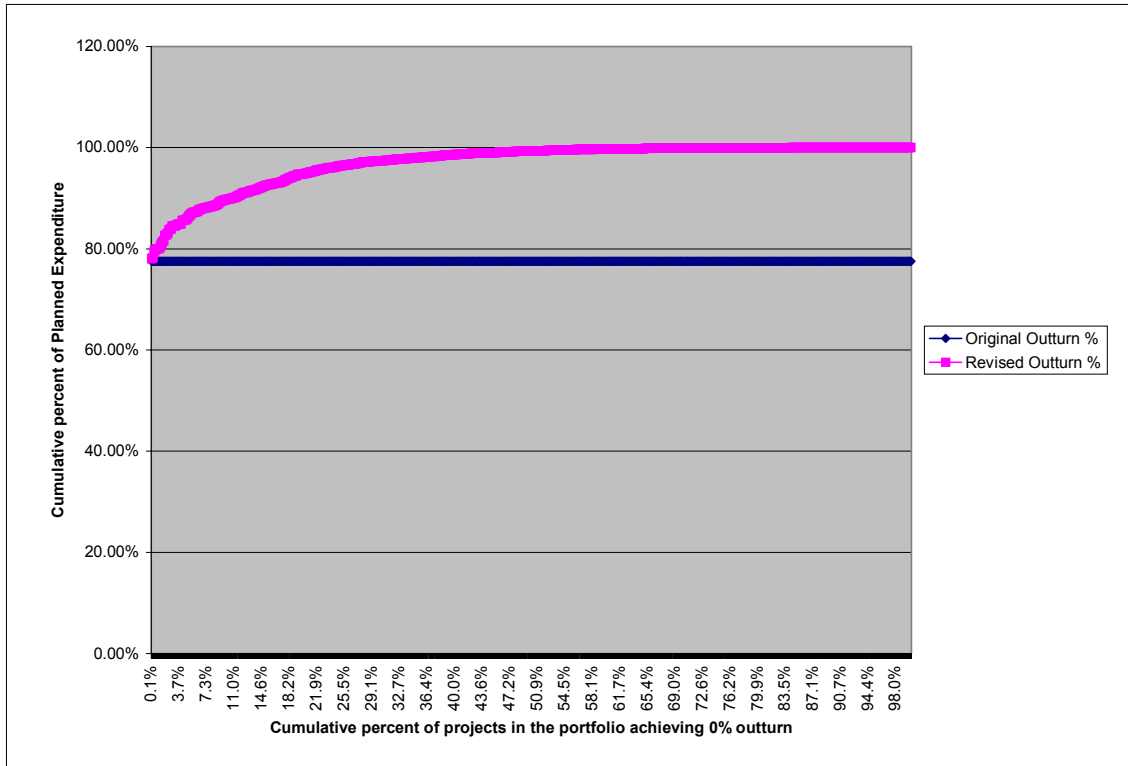


Figure 9-56 Improved outturn achieved in 1997-98 dataset as ideal outturn is achieved by significant projects

Figure 9-56 and Table 9-133, shows the rate of improvement as increasing percentiles of the significant projects in portfolio achieve a perfect outcome. The greatest rate of improvement occurs within the 5% percentile.

Percentile (<i>Projects in dataset</i>)	Outturn Achieved	Diff to Actual Outturn
2.5%	84%	6%
5%	87%	9%
7.5%	88%	11%
10%	90%	12%
12.5%	91%	14%
15%	93%	15%
17.5%	94%	16%
20%	95%	17%
22.5%	96%	18%
25%	96%	19%
27.5%	97%	19%
30%	97%	20%
35%	98%	21%
40%	99%	21%
50%	99%	22%

Table 9-133 Improved outturn achievement for 1997-98 dataset

This analysis indicates that an ideal delivery for the significant value twenty percent of the projects in the data set will deliver on overall outturn for the portfolio that is ninety-five percent of the planned outcome – all other things being unchanged.

Stochastic Analysis

The stochastic validation is the same as the Mathematical Analysis except for a change to the earlier assumption that increasing numbers of significant value project will achieve a perfect outcome. As in the stochastic analyses before, this assumption is replaced by outcome for each significant project that are based upon a probability distribution derived from the 1997-98 empirical data as described in Section 9.3.

This probability curve is based upon the actual performance for this data set within the limits of x-values of 0 to 0.2, i.e., ratios of outturn performance that range from zero to a twenty percent under-spending of the planned expenditure. The probability distribution for this range of values is a Beta distribution with parameters of:

- Alpha value = 0.65
- Beta value = 1.06
- Scale value = 0.20

Crystal Ball® software by Decisioneering Inc is used to perform Monte Carlo analysis on the variable ‘Outturn variance/Amended Estimate’ for each of the significant projects identified within the 1997-98 data set within ranges of one to twenty percent of the 1,049 projects in the data set.

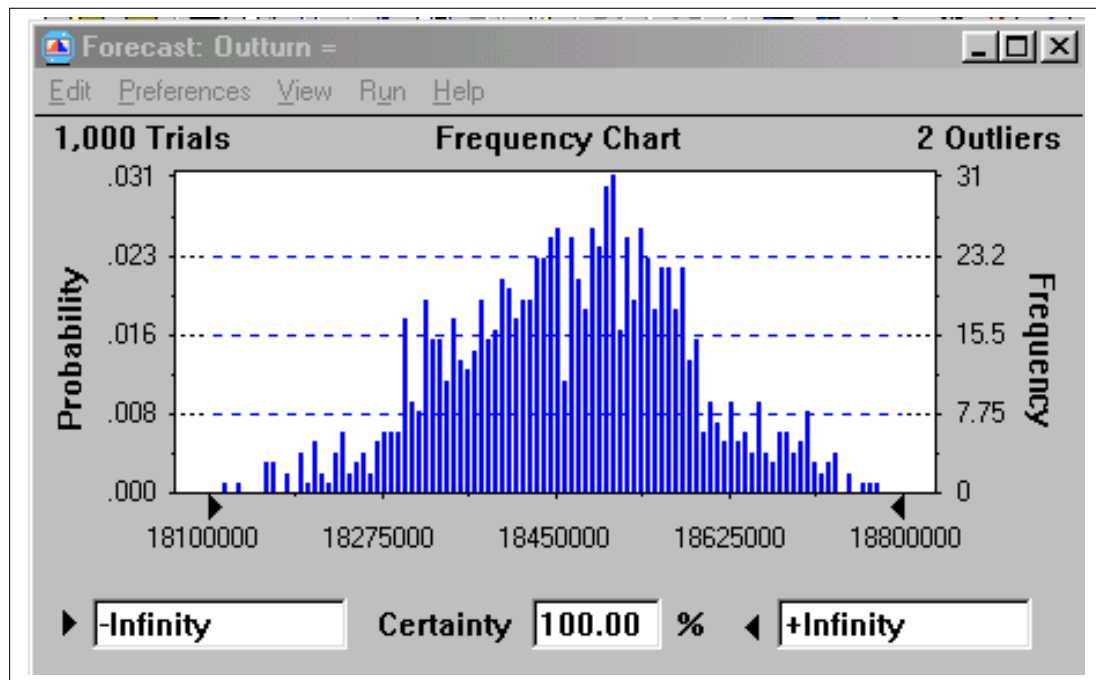


Figure 9-57 Frequency chart derived from Monte Carlo analysis of 1997-98 data set with one percent of significant projects subject to stochastic outturn

The Crystal Ball® analysis produced a frequency diagram for outturn for the data set in terms of total expenditure and also percent outturn. For example, Figure 9-57 shows the range of total expenditures for the data set whilst shows the corresponding outturn in terms of percent. For brevity in this thesis the frequency diagrams are not reproduced in all analyses, however the results corresponding to percentiles are tabulated here.

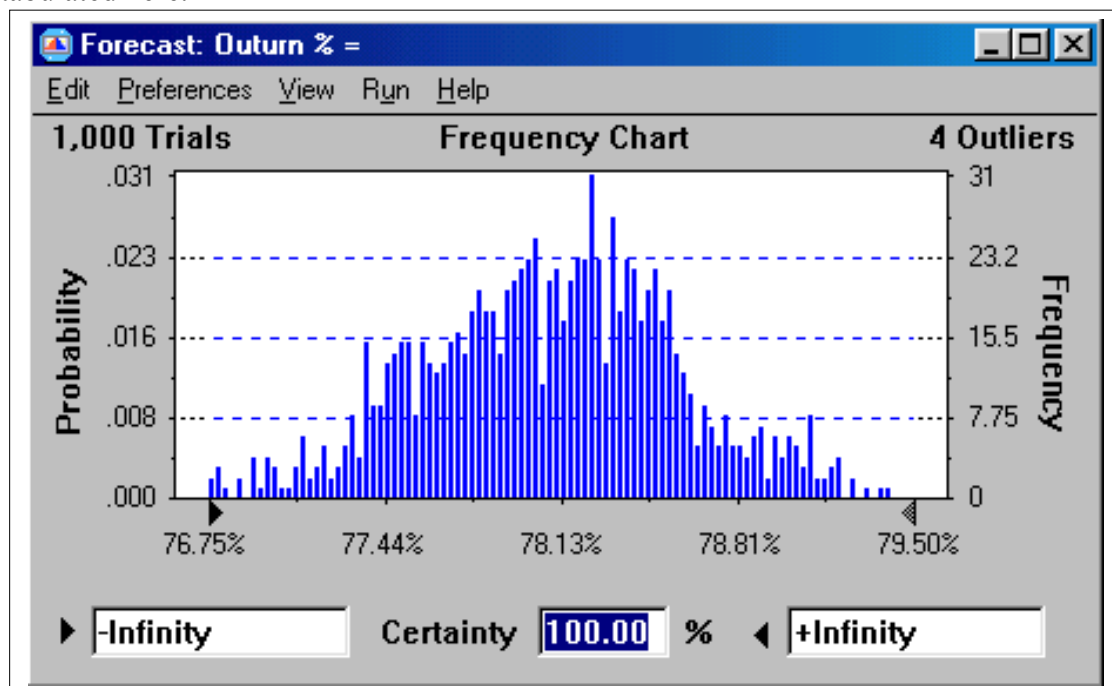


Figure 9-58 Frequency chart of outturn percent for 1997-98 data set when one percent of high impact projects are subject to stochastic analysis

The percentiles for shows the range of values for ‘percent outturn’, when one percent of the highest value projects in terms of planned expenditure (Amended Estimate) achieve an outturn governed by the Monte Carlo analysis. This one percent by number of projects, contains twenty percent of the total planned expenditure value of the data set.

Percentiles for 95%, 90%, 75%, and 50% are recorded for each frequency chart generated as shown in Table 9-134. It states the probable percent outturn when one percent to twenty percent of the highest value projects in the 1997-98 data set, in terms of planned expenditure (Amended Estimate), achieve an outturn governed by a Monte Carlo analysis based on the Beta probability distribution. The Beta distribution is constrained to produce an outturn variance that falls within zero to twenty percent.

% by Nos	% by \$	Percentiles results compared to 73.55 % actual outturn				
		100%	95%	90%	75%	50%
1%	26.4%	76.75 – 79.50	76.62 – 78.95	77.09 – 78.81	77.45 – 78.56	77.71 – 78.39
2%	39.0%	78.25 – 81.25	78.76 – 80.87	78.91 – 80.69	79.17 – 80.44	79.41 – 80.18
3%	46.7%	79.50 – 82.50	79.78 – 82.00	80.05 – 81.88	80.34 – 81.63	80.60 – 81.38
4%	53.5%	79.00 – 83.00	79.69 – 82.00	79.96 – 81.89	80.25 – 81.66	80.59 – 81.41
5%	58.1%	80.00 – 84.00	80.89 – 83.27	81.01 – 83.06	81.27 – 82.70	81.58 – 82.40
6%	62.1%	81.00 – 84.50	81.46 – 83.72	81.65 – 83.60	81.95 – 83.34	82.23 – 83.08
7%	65.1%	81.50 – 85.00	82.04 – 84.38	82.19 – 84.10	82.45 – 83.78	82.70 – 83.51
8%	68.1%	81.50 – 85.00	82.18 – 84.50	82.39 – 84.33	82.70 – 83.99	82.95 – 83.70
9%	70.4%	82.00 – 85.50	82.67 – 85.12	82.80 – 84.91	83.14 – 84.61	83.48 – 84.29
10%	72.6%	82.50 – 86.00	82.83 – 85.30	83.10 – 85.15	83.49 – 84.90	83.80 – 84.66
11%	74.5%	82.50 – 86.50	83.37 – 85.57	83.53 – 85.47	83.79 – 85.17	84.09 – 84.89
12%	76.4%	83.50 – 87.00	83.91 – 86.34	84.10 – 86.18	84.43 – 85.86	84.72 – 85.58
13%	78.0%	83.50 – 87.50	83.68 – 86.47	84.25 – 86.34	84.72 – 86.10	85.08 – 85.85
14%	79.7%	84.00 – 87.50	84.54 – 86.93	84.79 – 86.76	85.12 – 86.53	85.44 – 86.21
15%	81.1%	84.50 – 88.00	85.21 – 87.46	85.38 – 87.34	85.69 – 87.03	85.99 – 86.79
16%	82.5%	85.00 – 88.50	85.13 – 87.66	85.47 – 87.56	85.85 – 87.30	86.18 – 87.01
17%	83.8%	85.00 – 88.50	85.22 – 87.80	85.62 – 87.69	85.96 – 87.45	86.33 – 87.19
18%	85.0%	85.50 – 89.50	86.14 – 88.54	86.40 – 88.41	86.74 – 88.11	87.04 – 87.90
19%	86.2%	86.00 – 89.50	86.85 – 88.84	86.85 – 88.84	87.14 – 88.58	87.45 – 88.35
20%	87.3%	86.50 – 90.00	87.04 – 89.42	87.22 – 89.23	87.52 – 88.94	87.84 – 88.65

Table 9-134 Outturn for 1997-98 dataset when one to twenty percent of the significant projects are subject to an outturn based upon the Monte Carlo analysis.

Figure 9-59 shows these results graphically. The graph shows the relationship between the range of possible outturn when an increasing percent of the projects, in their order of greatest planned expenditure that financial year, achieve a high performance outcome within an assumed range of eighty to one hundred percent perfection. Based upon the Beta probability distribution for this constrained range, derived from the empirical data of the 1997-98 data set. All other outcomes within the data set remain unchanged, i.e., remain at the outturn achieved in reality.

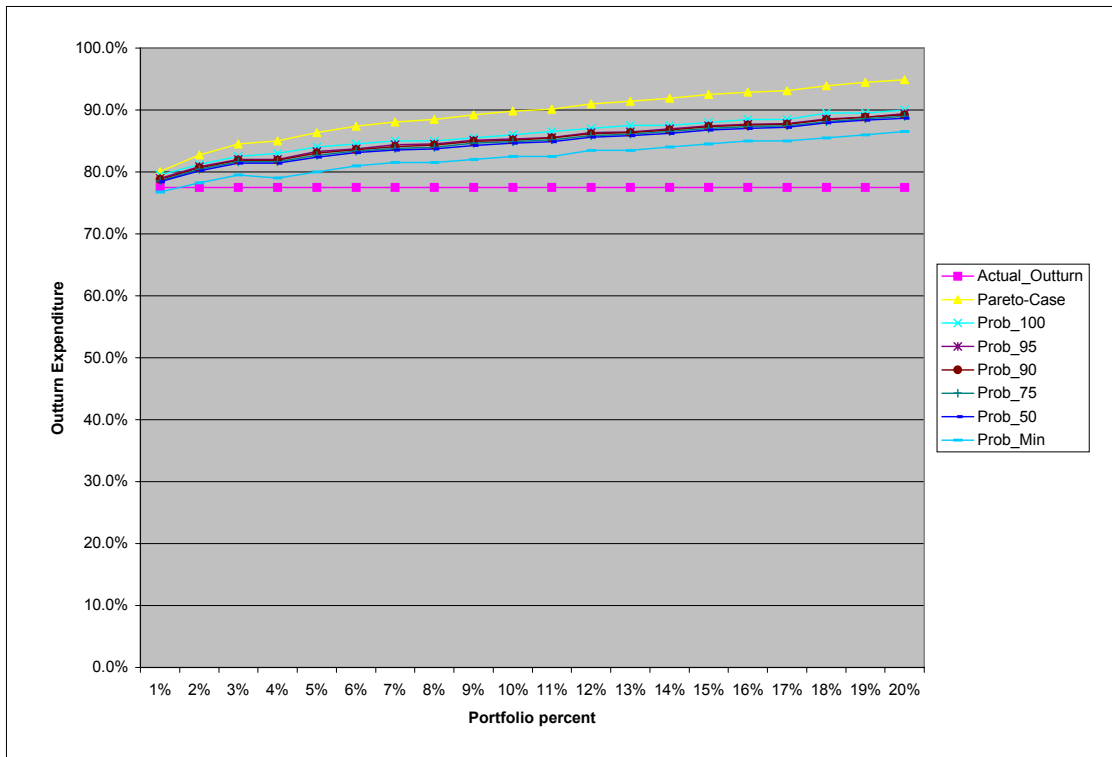


Figure 9-59 Variation in outturn expenditure 1997-98 dataset: comparison of actual outturn when significant projects achieve an ideal or probability-based ideal outcome

The percent improvement over the actual performance achieved in 1997-98 for this data set, that could theoretically be achieved, based on the assumptions in the mathematical analysis and these stochastic analyses, are set out in Table 9-135.

Percent of data-set (i.e. portfolio)		Theoretical % improved outturn		
% by Nos. Sig Projects	% by Value of Planned Exp	Assumed ideal	assumed Beta probability	
			< Maximax	> Minimin
1%	26.4%	2.5%	2.0%	-0.8%
2%	39.05	5.2%	3.7%	0.7%
3%	46.7%	7.0%	5.0%	2.0%
4%	53.5%	7.5%	5.5%	1.5%
5%	58.1%	8.8%	6.5%	2.5%
6%	62.1%	9.8%	7.0%	3.5%
7%	65.1%	10.5%	7.5%	4.0%
8%	68.1%	10.9%	7.5%	4.0%
9%	70.4%	11.7%	8.0%	4.5%
10%	72.6%	12.3%	8.5%	5.0%
11%	74.5%	12.6%	9.0%	5.0%
12%	76.4%	13.5%	9.5%	6.0%
13%	78.0%	13.9%	10.0%	6.0%
14%	79.7%	14.4%	10.0%	6.5%
15%	81.1%	15.0%	10.5%	7.0%
16%	82.5%	15.3%	11.0%	7.5%
17%	83.8%	15.6%	11.0%	7.5%
18%	85.0%	16.4%	12.0%	8.0%
19%	86.2%	16.9%	12.0%	8.5%
20%	87.3%	17.3%	12.5%	9.0%

Table 9-135 Theoretical relative outturn improvement in the outturn performance for the 1997-98 data set

The numbers of projects subject to the stochastic analysis ranges from eleven to two hundred and nineteen. The statistical attributes from each of the analyses, stated in Table 9-130, shows the distribution of outcomes to be a consistent, normal distribution. This is reasonable as the Beta distribution used in the Monte Carlo analysis tends to a uniform distribution. The range width is narrow: Two to five percent in all cases. The kurtosis values are close to the value of 3.0 associated with a normal distribution. The values of skewness are close to zero showing the distribution to be highly symmetrical. The values of the 'mean' and the 'median' are coincident due to the symmetry. The Beta distribution is itself continuous and does not lend itself to producing mode values. The Standard Deviation is also uniform.

For the purpose of this analysis, correlation coefficients less than +/- 0.5 is taken to indicate a lack of sensitivity between the individual variables and the outcome. All variables are below the 0.5 threshold.

Prop dataset	Range	Kurtosis	Skew	Mean	Median	Mode	SD	Sensitivity > 0.5
1%	2.87%	2.91	-0.13	78.1%	78.1%	-	0.5%	No (-0.40)
2%	3.12%	2.67	0.05	79.8%	79.8%	-	0.5%	No (-0.39)
3%	3.51%	2.90	-0.06	81.0%	81.0%	-	0.6%	No (-0.41)
4%	3.83%	2.83	-0.17	81.0%	81.0%	-	0.6%	No (-0.40)
5%	4.18%	3.01	0.03	82.0%	82.0%	-	0.6%	No (-0.36)
6%	3.32%	2.70	-0.03	82.7%	82.7%	-	0.6%	No (-0.39)
7%	3.94%	3.08	0.03	83.1%	83.1%	-	0.6%	No (-0.37)
8%	3.95%	3.07	-0.02	83.3%	83.3%	-	0.6%	No (-0.30)
9%	3.66%	2.77	-0.09	83.9%	83.9%	-	0.6%	No (-0.38)
10%	3.73%	2.85	-0.13	84.3%	84.3%	-	0.6%	No (-0.37)
11%	4.13%	3.12	-0.08	84.5%	84.5%	-	0.6%	No (-0.32)
12%	3.88%	2.86	-0.06	85.2%	85.2%	-	0.6%	No (-0.37)
13%	3.61%	3.11	-0.21	85.5%	85.5%	-	0.6%	No (-0.31)
14%	4.04%	3.18	-0.04	85.8%	85.8%	-	0.6%	No (-0.36)
15%	3.37%	2.91	-0.13	86.4%	86.4%	-	0.6%	No (-0.36)
16%	3.85%	2.85	-0.10	86.6%	86.6%	-	0.6%	No (-0.38)
17%	3.58%	2.75	-0.17	86.8%	86.8%	-	0.6%	No (-0.41)
18%	4.17%	3.09	-0.13	87.5%	87.5%	-	0.6%	No (-0.34)
19%	3.49%	2.57	-0.14	87.9%	87.9%	-	0.6%	No (-0.33)
20%	3.38%	2.74	-0.02	88.2%	88.2%	-	0.6%	No (-0.36)

Table 9-136 Statistical attributes of the Monte Carlo analysis of the 1997-98 data set for cases 1% to 20% project significance

The Monte Carlo analysis generates the mean value for the percent outturn variance of each project out of the one thousand cases computed in the analysis. This ranges from zero to twenty percent according to the Beta probability distribution. Table 9-137 shows the statistical attributes for these mean values in each of the analysis scenarios: from one percent significant projects to twenty percent. The average of the mean values of the outturn variance for the significant projects is 7.6% compared to 0% for the mathematical analysis.

%Sig	Statistical Mean Values from 1000 Monte Carlo Trials						
	Nos	Low	High	Mode	Mean	Median	SD
1%	10	7.39%	7.84%	7.53%	7.57%	7.55%	0.13%
2%	21	7.34%	8.05%	7.72%	7.65%	7.67%	0.17%
3%	31	7.27%	8.17%	7.65%	7.64%	7.65%	0.18%
4%	42	7.22%	7.93%	7.50%	7.56%	7.54%	0.18%
5%	52	7.00%	8.05%	7.59%	7.58%	7.59%	0.21%
6%	63	7.11%	8.05%	7.70%	7.59%	7.60%	0.19%
7%	73	7.18%	7.91%	7.69%	7.60%	7.62%	0.15%
8%	84	7.19%	7.95%	7.52%	7.60%	7.60%	0.17%
9%	94	7.16%	8.00%	7.49%	7.59%	7.58%	0.17%
10%	105	7.20%	8.10%	7.54%	7.63%	7.61%	0.18%
11%	115	7.23%	8.03%	7.58%	7.60%	7.58%	0.18%
12%	126	7.03%	8.06%	7.64%	7.62%	7.63%	0.18%
13%	136	7.11%	8.04%	7.71%	7.60%	7.62%	0.18%
14%	147	7.20%	8.07%	7.43%	7.59%	7.59%	0.17%
15%	157	7.08%	8.09%	7.52%	7.57%	7.53%	0.21%
16%	168	7.12%	8.11%	7.61%	7.61%	7.61%	0.18%
17%	178	7.15%	8.14%	7.49%	7.60%	7.59%	0.19%
18%	189	7.09%	8.21%	7.68%	7.62%	7.63%	0.18%
19%	199	7.08%	8.03%	7.52%	7.62%	7.62%	0.18%
20%	210	7.20%	8.23%	7.51%	7.61%	7.59%	0.18%

Table 9-137 Statistical attributes of mean values derived from Monte Carlo simulations of outturn performance for percents of project significance, 1997-98 portfolio

Results

Within the range of zero to twenty percent outturn variance used in the analysis the closest fit of a standard distribution is the Beta distribution ($\alpha = 0.65$, $\beta = 1.06$ scale = 0.2) in terms of the Chi-square test (26.12, $\theta = 0.523$) and the Kolmogorov-Smirnov test (0.0455).

Table 9-138 lists the results of this analysis of the 1997-98 data set. The table contains 'ideal' case results taken from the mathematical analysis and the 'stochastic' results for percentiles of 95%, 90%, 75% and 50% probability taken from the Monte Carlo analyses. The 'Ave-mean' is the average of the mean values derived from the Monte Carlo analysis of each project in the analyses. The statistical attributes for the Monte Carlo values for each percent-significance are listed in Table 9-136. Each Monte Carlo analysis produced one thousand scenarios in which the percent outturn variance could fall within the range of zero to twenty percent according to the pre-selected Beta probability distribution. The mean of the 'Ave-mean outturn variance per significant project' 7.6% compared to 0% for the mathematical analysis.

When deriving heuristics from this data, the 'evens' probability is used, i.e., the 50% percentile. This is because the difference between 95% and 50% percentiles values in

the case of ten percent and twenty percent of significant projects is less than 1.0% and is not significant.

% No projects modified outturn	% Value	Outturn percent of target expenditure achieved						
		Actual %	Ideal %	Monte Carlo Percentiles				50%
				Ave-Mean outturn variance per project	95%	90%	75%	
1%	26.4	77.5	80.1	7.57%	78.95	78.81	78.6	78.4
2%	39.0	77.5	82.8	7.65%	80.9	80.7	80.4	80.2
3%	46.7	77.5	84.5	7.64%	82.0	81.9	81.6	81.4
4%	53.5	77.5	85.0	7.56%	82.0	81.9	81.7	81.4
5%	58.1	77.5	86.4	7.58%	83.3	83.1	82.7	82.4
6%	62.1	77.5	87.4	7.59%	83.7	83.6	83.3	83.1
7%	65.1	77.5	88.0	7.60%	84.4	84.1	83.8	83.5
8%	68.1	77.5	88.5	7.60%	84.5	84.3	84.0	83.7
9%	70.4	77.5	89.2	7.59%	85.1	84.9	84.6	84.3
10%	72.6	77.5	89.8	7.63%	85.3	85.2	84.9	84.7
11%	74.5	77.5	90.0	7.60%	85.6	85.5	85.2	84.9
12%	76.4	77.5	91.0	7.62%	86.3	86.2	85.9	85.6
13%	78.0	77.5	91.4	7.60%	86.5	86.3	86.1	85.6
14%	79.7	77.5	91.9	7.59%	86.9	86.8	86.5	86.2
15%	81.1	77.5	92.5	7.57%	87.5	87.3	87.0	86.8
16%	82.5	77.5	92.9	7.61%	87.7	87.6	87.3	87.0
17%	83.8	77.5	93.1	7.60%	87.8	87.7	87.5	87.2
18%	85.0	77.5	93.9	7.62%	88.5	88.4	88.1	87.9
19%	86.2	77.5	94.4	7.62%	88.8	88.8	88.6	88.4
20%	87.3	77.5	94.9	7.61%	89.4	89.2	88.9	88.6

Table 9-138 Comparison of the improved outturn for the 1997-98 portfolio due to the impact of the outturn-variance for 1% to 20% significant projects according to 'actual', 'ideal' and 'stochastic' scenarios.

Using the results shown in Table 9-138, three heuristics are proposed corresponding to the twenty-percent, the ten-percent and the five percent levels of significant projects in the portfolio.

- 80:20 rule case:

Twenty percent of the number of the projects in the 1997-98 portfolio contain eighty-seven percent of the 'planned expenditure' of the portfolio. There is an evens probability of achieving an eighty nine percent spending performance for the portfolio overall *compared to the seventy-six percent outturn actually achieved*.

This assumes that best endeavor management effort is applied to each of the twenty percent projects with greatest planned expenditure that year so that they each achieve a high performance outturn variance that is within the range of zero to twenty percent. Other projects remain at current performance levels.

- 60:10 rule case

Ten percent of the number of the projects in the 1997-98 portfolio contain seventy-three percent of the 'planned expenditure' of the portfolio. There is an evens probability of achieving an eighty five percent spending performance for the portfolio overall *compared to the seventy-six percent outturn actually achieved*.

This assumes that best endeavor management effort is applied to each of the ten percent projects with greatest planned expenditure that year so that they each achieve a high performance outturn variance that is within the range of zero to twenty percent. Other projects remain at current performance levels.

- 50:5 rule case

Five percent of the number of the projects in the 1997-98 portfolio contain fifty-eight percent of the 'planned expenditure' of the portfolio. There is an evens probability of achieving an eighty-two percent spending performance for the portfolio overall *compared to the seventy-six percent outturn actually achieved*.

This assumes that best endeavor management effort is applied to each of the twenty percent projects with greatest planned expenditure that year so that they each achieve a high performance outturn variance that is within the range of zero to twenty percent. Other projects remain at current performance levels.

1998-99

Mathematical Analysis

The attributes of the 1998-99 data set used in this analysis are described in Section 9.3.

The outturn variance in the 1998-99 data set is an under-spend of HK\$ 6212 millions, or twenty-five percent of the planned expenditure. In this analysis, the effect on the outturn for the portfolio of projects as a whole is calculated as those projects with the more significant values of planned expenditure achieve a perfect outcome of zero outturn variance.

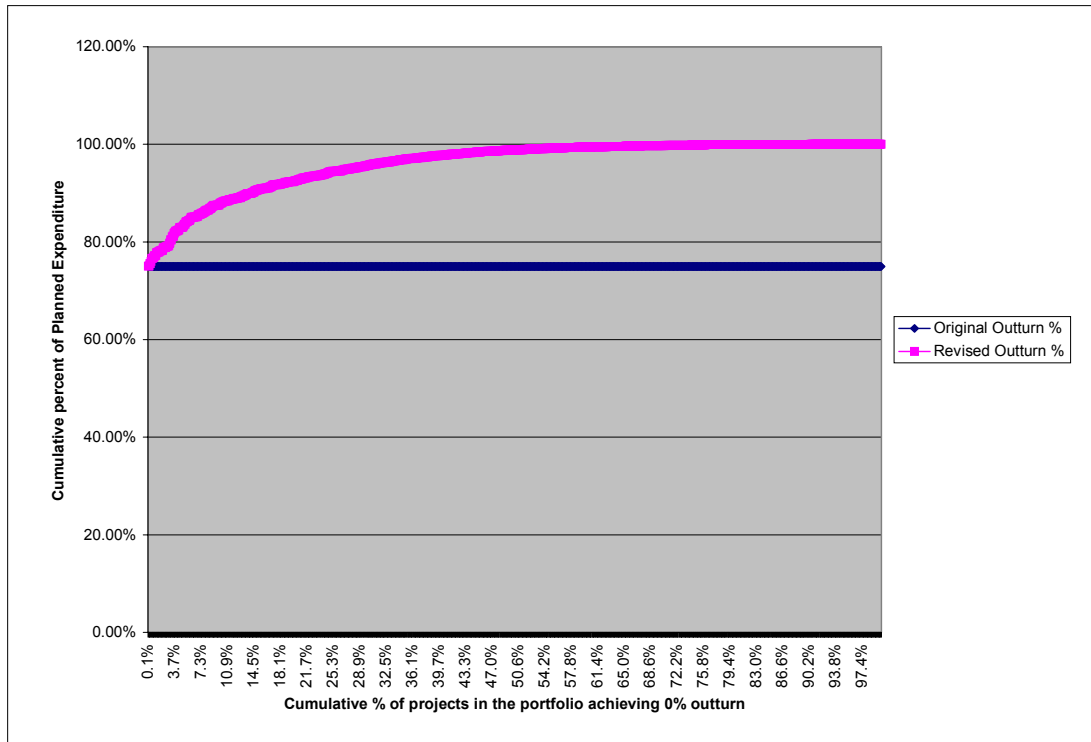


Figure 9-60 Improved outturn achieved in 1998-99 dataset as ideal outturn is achieved by significant projects

Figure 9-60 and Table 9-139, shows the rate of improvement as increasing percentiles of the significant projects in portfolio achieve a perfect outcome. The greatest rate of improvement occurs within the 5% percentile.

Percentile (Projects in dataset)	Outturn Achieved	Diff to Actual Outturn
2.5%	79%	4%
5%	84%	9%
7.5%	86%	11%
10%	88%	13%
12.5%	89%	14%
15%	91%	16%
17.5%	92%	17%
20%	93%	18%
22.5%	93%	19%
25%	94%	19%
27.5%	95%	20%
30%	96%	21%
35%	97%	22%
40%	98%	23%
50%	99%	24%

Table 9-139 Improved outturn achievement for 1998-99 dataset

This analysis indicates that an ideal delivery for the significant value twenty percent of the projects in the data set will deliver on overall outturn for the portfolio that is ninety-three percent of the planned outcome – all other things being unchanged.

Stochastic Analysis

The stochastic validation is the same as the mathematical analysis except for a change to the earlier assumption that increasing numbers of significant value project will achieve a perfect outcome. As in the stochastic analyses before, this assumption is replaced by outcome for each significant project that are based upon a probability distribution derived from the 1998-99 empirical data as described in Section 9.3.

This probability curve is based upon the actual performance for this data set within the limits of x-values of 0 to 0.2, i.e., ratios of outturn performance that range from zero to a twenty percent under-spending of the planned expenditure. . The probability distribution for this range of values is a Beta distribution with parameters of:

- Alpha value = 0.67
- Beta value = 0.99
- Scale value = 0.20

Crystal Ball® software by Decisioneering Inc is used to perform Monte Carlo analysis on the variable ‘Outturn variance/Amended Estimate’ for each of the significant projects identified within the 1998-99 data set within ranges of one to twenty percent of the 1,082 projects in the data set

The Crystal Ball® analysis produced a frequency diagram for outturn for the data set in terms of total expenditure and also percent outturn. For example, Figure 9-61 shows the range of total expenditures for the data set whilst Figure 9-62 shows the corresponding outturn in terms of percent. For brevity in this thesis the frequency

diagrams are not reproduced in all analyses, however the results corresponding to percentiles are tabulated here.

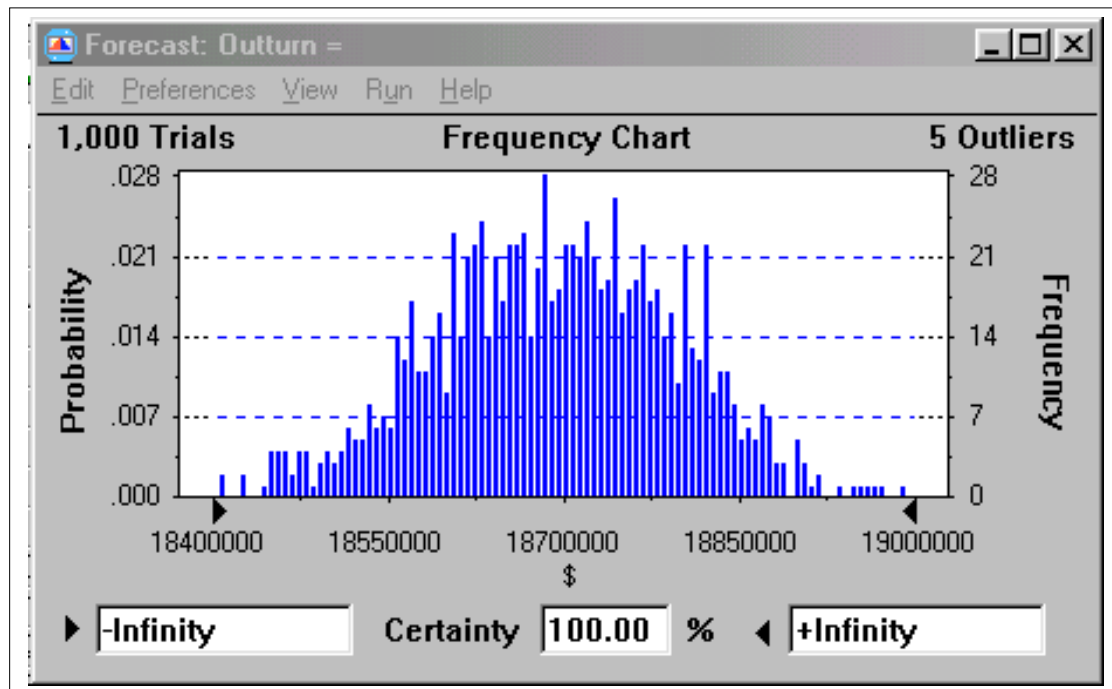


Figure 9-61 Frequency chart derived from Monte Carlo analysis of 1998-99 data set with one percent of significant projects subject to stochastic outturn

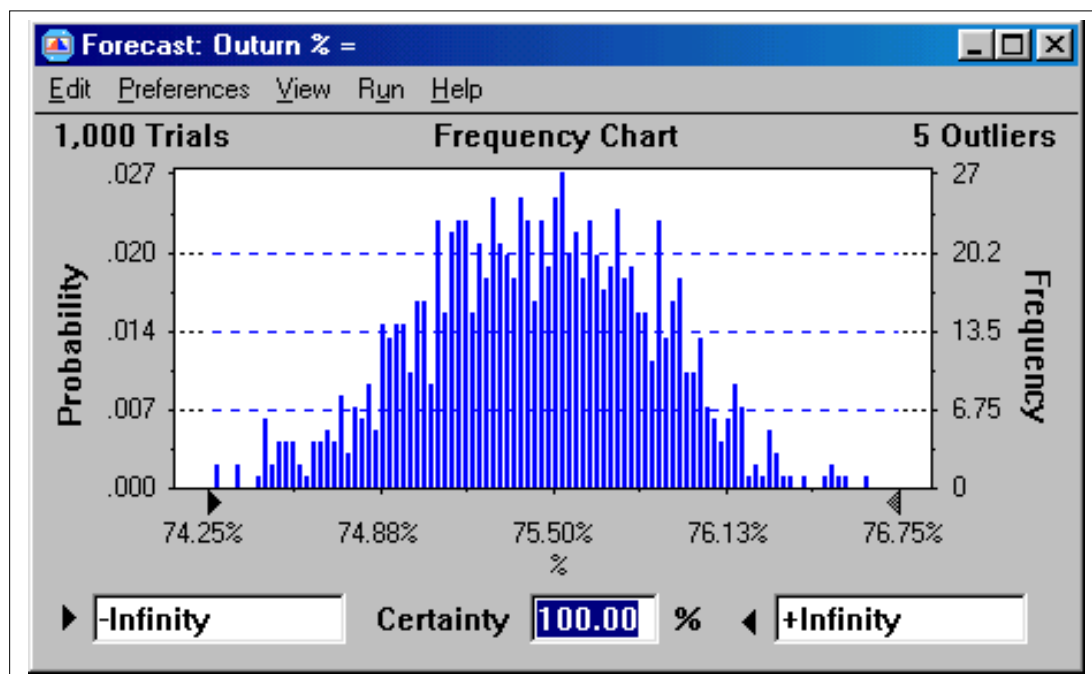


Figure 9-62 Frequency chart of outturn percent for 1998-99 data set when one percent of high impact projects are subject to stochastic analysis

The percentiles for Figure 9-62 shows the range of values for 'percent outturn', when one percent of the highest value projects in terms of planned expenditure (Amended

Estimate) achieve an outturn governed by the Monte Carlo analysis. This one percent by number of projects, contains twenty percent of the total planned expenditure value of the data set.

Percentiles for 95%, 90%, 75%, and 50% are recorded for each frequency chart generated as shown in Table 9-140. It states the probable percent outturn when one percent to twenty percent of the highest value projects in the 1998-99 data set, in terms of planned expenditure (Amended Estimate), achieve an outturn governed by a Monte Carlo analysis based on the Beta probability distribution. The Beta distribution is constrained to produce an outturn variance that falls within zero to twenty percent.

% by Nos	% by \$	Percentiles results compared to 74.93 % actual outturn				
		100%	95%	90%	75%	50%
1%	27.7%	74.25 – 76.75	74.48 – 76.16	74.68 – 76.05	74.93 – 75.91	75.14 – 75.73
2%	33.6%	74.25 – 77.00	74.27 – 76.44	74.73 – 76.33	75.01 – 76.14	75.26 – 75.94
3%	40.3%	75.25 – 78.00	75.61 – 77.53	75.72 – 77.40	75.97 – 77.16	76.22 – 76.92
4%	46.0%	77.25 – 80.00	77.56 – 79.45	77.71 – 79.33	77.98 – 79.12	78.23 – 78.92
5%	50.6%	78.00 – 81.00	78.47 – 80.51	78.65 – 80.39	78.92 – 80.18	79.20 – 79.92
6%	54.6%	79.25 – 82.00	79.51 – 81.55	79.69 – 81.44	80.05 – 81.21	80.29 – 80.99
7%	58.1%	79.50 – 82.25	79.69 – 81.79	79.97 – 81.65	80.23 – 81.44	80.50 – 81.21
8%	61.1%	80.00 – 83.00	80.57 – 82.64	80.74 – 82.45	80.99 – 82.20	81.22 – 81.94
9%	63.7%	81.00 – 83.75	81.18 – 83.24	81.40 – 83.16	81.75 – 82.91	81.98 – 82.70
10%	66.0%	81.00 – 83.75	81.51 – 83.59	81.69 – 83.46	82.00 – 83.22	82.28 – 82.96
11%	68.4%	81.50 – 84.50	81.89 – 84.01	82.14 – 83.88	82.43 – 83.66	82.71 – 83.42
12%	70.5%	81.50 – 85.00	82.12 – 84.17	82.31 – 84.08	82.60 – 83.83	82.83 – 83.61
13%	72.5%	82.00 – 85.00	82.27 – 84.45	82.54 – 84.32	82.84 – 84.09	83.13 – 83.87
14%	74.4%	82.50 – 85.50	82.88 – 84.92	83.07 – 84.75	83.39 – 84.51	83.63 – 84.29
15%	75.9%	83.00 – 86.00	83.53 – 85.59	83.63 – 85.41	83.93 – 85.20	84.18 – 84.92
16%	77.6%	83.00 – 86.50	83.64 – 85.73	83.84 – 85.59	84.10 – 85.34	84.35 – 85.14
17%	79.1%	83.50 – 87.00	84.23 – 86.27	84.32 – 86.10	84.56 – 85.83	84.81 – 85.58
18%	80.7%	83.50 – 87.00	83.94 – 86.25	84.33 – 86.16	84.64 – 85.93	84.93 – 85.69
19%	82.1%	84.00 – 87.50	84.44 – 86.58	84.69 – 86.43	84.97 – 86.22	85.20 – 85.97
20%	83.4%	84.00 – 87.00	84.57 – 86.65	84.76 – 86.53	85.05 – 86.27	85.32 – 86.05

Table 9-140 Outturn for 1998-99 dataset when one to twenty percent of the significant projects are subject to an outturn based upon the Monte Carlo analysis.

Figure 9-63 shows graphically these results. The graph shows the relationship between the range of possible outturn when an increasing percent of the projects, in their order of greatest planned expenditure that financial year, achieve a high performance outcome within an assumed range of eighty to one hundred percent perfection. Based upon the Beta probability distribution for this constrained range, derived from the empirical data of the 1998-99 data set. All other outcomes within the data set remain unchanged, i.e., remain at the outturn achieved in reality.

The percent improvement over the actual performance achieved in 1998-99 for this data set, that could theoretically be achieved, based on the assumptions in the mathematical analysis and these stochastic analyses, are set out in Table 9-141.

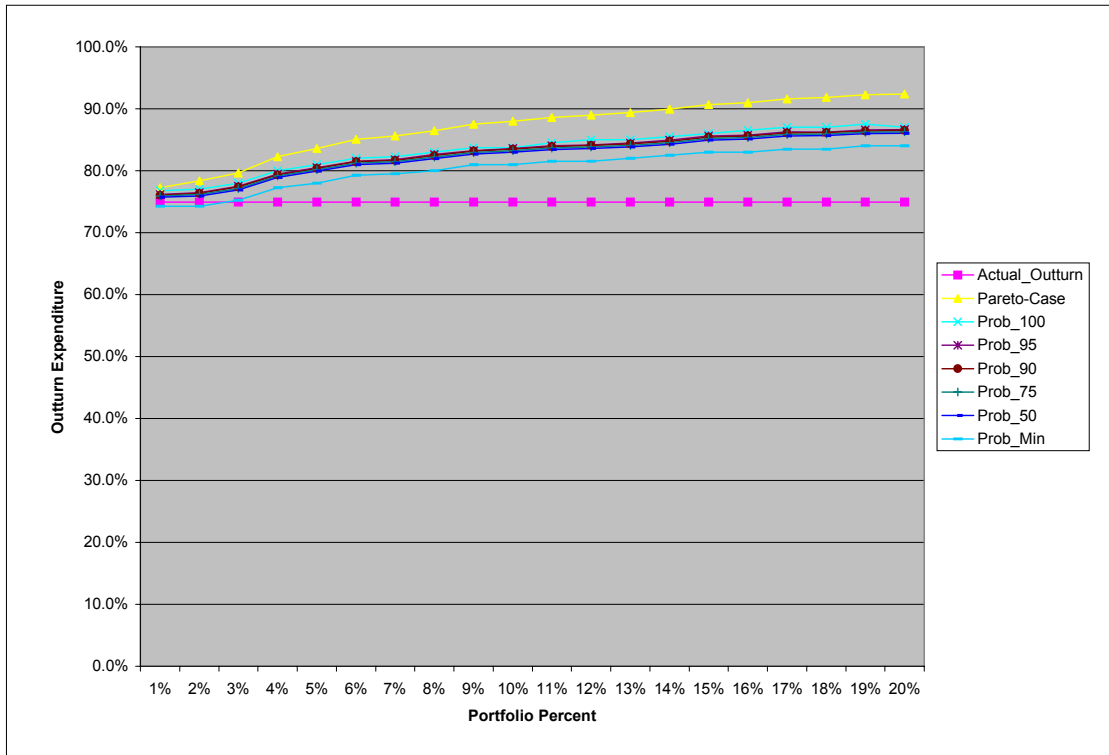


Figure 9-63 Variation in outturn expenditure 1998-99 dataset: comparison of actual outturn when significant projects achieve an ideal or probability-based ideal outcome

Percent of data-set (i.e. portfolio)		Theoretical % improved outturn		
% by Nos. Sig Projects	% by Value of Planned Exp	Assumed ideal	assumed Beta probability < Maximax	> Minimin
1%	27.7%	2.3%	1.8%	-0.7%
2%	33.6%	3.4%	2.1%	-0.7%
3%	40.3%	4.7%	3.1%	0.3%
4%	46.0%	7.3%	5.1%	2.3%
5%	50.6%	8.7%	6.1%	3.1%
6%	54.6%	10.1%	7.1%	4.3%
7%	58.1%	10.7%	7.3%	4.6%
8%	61.1%	11.6%	8.1%	5.1%
9%	63.7%	12.5%	8.8%	6.1%
10%	66.0%	13.0%	8.8%	6.1%
11%	68.4%	13.7%	9.6%	6.6%
12%	70.5%	14.0%	10.1%	6.6%
13%	72.5%	14.5%	10.1%	7.1%
14%	74.4%	15.0%	10.6%	7.6%
15%	75.9%	15.8%	11.1%	8.1%
16%	77.6%	16.1%	11.6%	8.1%
17%	79.1%	16.7%	12.1%	8.6%
18%	80.7%	16.9%	12.1%	8.6%
19%	82.1%	17.3%	12.6%	9.1%
20%	83.4%	17.5%	12.1%	9.1%

Table 9-141 Theoretical relative outturn improvement in the outturn performance for the 1998-99 data set

The numbers of projects subject to the stochastic analysis ranges from eleven to two hundred and sixteen. The statistical attributes from each of the analyses, stated in Table 9-142, shows the distribution of outcomes to be a consistent, normal distribution. This is reasonable as the Beta distribution used in the Monte Carlo analysis tends to a uniform distribution.

The range width is narrow: Three to four percent in all cases. The kurtosis values are close to the value of 3.0 associated with a normal distribution (Sargeant, Wainwright, 1996). The values of skewness are close to zero showing the distribution to be highly symmetrical. The values of the 'mean' and the 'median' are coincident due to the symmetry. The Beta distribution is itself continuous and does not lend itself to producing mode values. The Standard Deviation is also uniform.

For the purpose of this analysis, correlation coefficients less than +/- 0.5 is taken to indicate a lack of sensitivity between the individual variables and the outcome. All variables are below the 0.5 threshold.

Prop dataset	Range	Kurtosis	Skew	Mean	Median	Mode	SD	Sensitivity > 0.5
1%	2.55%	2.88	-0.19	75.4%	75.5%	-	0.4%	No (-0.47)
2%	3.15%	2.96	-0.14	75.6%	75.7%	-	0.5%	No (-0.40)
3%	2.96%	2.76	-0.06	76.6%	76.6%	-	0.5%	No (-0.38)
4%	3.01%	2.94	-0.16	78.6%	78.6%	-	0.5%	No (-0.39)
5%	3.03%	2.66	-0.06	79.6%	79.6%	-	0.5%	No (-0.40)
6%	3.01%	2.85	-0.14	80.6%	80.7%	-	0.5%	No (-0.38)
7%	3.47%	2.96	-0.13	80.9%	80.9%	-	0.5%	No (-0.34)
8%	3.39%	2.85	-0.02	81.6%	81.6%	-	0.5%	No (-0.38)
9%	3.22%	2.91	-0.09	82.4%	82.4%	-	0.5%	No (-0.34)
10%	3.25%	3.02	-0.02	82.6%	82.6%	-	0.5%	No (-0.34)
11%	3.19%	2.94	-0.11	83.1%	83.1%	-	0.5%	No (-0.39)
12%	3.70%	2.80	-0.06	83.3%	83.3%	-	0.5%	No (-0.40)
13%	3.36%	2.76	-0.11	83.5%	83.5%	-	0.5%	No (-0.38)
14%	2.98%	2.94	-0.03	84.0%	84.0%	-	0.5%	No (-0.38)
15%	3.06%	2.70	-0.01	84.6%	84.6%	-	0.5%	No (-0.38)
16%	3.16%	2.62	-0.06	84.8%	84.8%	-	0.5%	No (-0.38)
17%	3.12%	2.61	0.04	85.2%	85.2%	-	0.5%	No (-0.37)
18%	4.02%	3.08	-0.05	85.3%	85.3%	-	0.6%	No (-0.39)
19%	3.37%	2.83	-0.06	85.6%	85.6%	-	0.5%	No (-0.43)
20%	3.92%	3.10	-0.10	85.7%	85.7%	-	0.5%	No (-0.37)

Table 9-142 Statistical attributes of the Monte Carlo analysis of the 1998-99 data set for cases 1% to 20% project significance

The Monte Carlo analysis generates the mean value for the percent outturn variance of each project out of the one thousand cases computed in the analysis. This ranges from zero to twenty percent according to the Beta probability distribution. Table 9-143 shows the statistical attributes for these mean values in each of the analysis scenarios: from one percent significant projects to twenty percent.

%Sig	Statistical Mean Values from 1000 Monte Carlo Trials						
	Nos	Low	High	Mode	Mean	Median	SD
1%	11	7.54%	8.36%	-	8.02%	7.99%	0.22%
2%	22	7.68%	8.50%	8.04%	8.04%	8.03%	0.21%
3%	33	7.85%	8.35%	8.08%	8.07%	8.08%	0.13%
4%	43	7.75%	8.48%	7.86%	8.08%	8.02%	0.17%
5%	54	7.51%	8.46%	8.00%	8.05%	8.06%	0.21%
6%	65	7.74%	8.46%	8.33%	8.10%	8.09%	0.18%
7%	76	7.58%	8.66%	8.18%	8.08%	8.10%	0.20%
8%	87	7.72%	8.48%	8.10%	8.10%	8.10%	0.18%
9%	97	7.58%	8.55%	8.01%	8.06%	8.07%	0.19%
10%	108	7.59%	8.60%	8.30%	8.10%	8.11%	0.19%
11%	119	7.44%	8.51%	7.98%	8.04%	8.05%	0.18%
12%	130	7.62%	8.61%	8.02%	8.07%	8.06%	0.20%
13%	141	7.37%	8.59%	8.08%	8.05%	8.06%	0.19%
14%	152	7.48%	8.53%	8.08%	8.07%	8.08%	0.19%
15%	162	7.57%	8.57%	8.08%	8.10%	8.11%	0.19%
16%	173	7.54%	8.53%	8.17%	8.07%	8.08%	0.19%
17%	184	7.63%	8.67%	8.03%	8.08%	8.05%	0.20%
18%	195	7.59%	8.59%	8.10%	8.05%	8.03%	0.20%
19%	206	7.62%	8.94%	8.12%	8.09%	8.10%	0.20%
20%	216	7.57%	8.56%	8.05%	8.07%	8.08%	0.19%

Table 9-143 Statistical attributes of mean values derived from Monte Carlo simulations of outturn performance for percents of project significance, 1998-99 portfolio

Results

Within the range of zero to twenty percent outturn variance used in the analysis the closest fit of a standard distribution is the Beta distribution ($\alpha = 0.67$, $\beta = 0.99$, $\text{scale} = 0.2$) in terms of the Chi-square test (23.4231, $\theta = 0.0756$) and the Kolmogorov-Smirnov test (0.0577).

Table 9-144 lists the results of this analysis of the 1998-99 data set. The table contains 'ideal' case results taken from the mathematical analysis and the 'stochastic' results for percentiles of 95%, 90%, 75% and 50% probability taken from the Monte Carlo analyses. The 'Ave-mean' is the average of the mean values derived from the Monte Carlo analysis of each project in the analyses. The statistical attributes for the Monte Carlo values for each percent-significance are listed in Table 9-142. Each Monte Carlo analysis produced one thousand scenarios in which the percent outturn variance could fall within the range of zero to twenty percent according to the pre-selected Beta probability distribution. The mean of the 'Ave-mean outturn variance per project' is 8.07%.

When deriving heuristics from this data, the 'evens' probability is used, i.e., the 50% percentile. This is because the difference between 95% and 50% percentiles values in the case of ten percent and twenty percent of significant projects is less than 1.0% and is not significant.

% No projects modified outturn	% Value	Outturn percent of target expenditure achieved						
		Actual %	Ideal %	Monte Carlo Percentiles				
				Ave-Mean outturn variance per project	95%	90%	75%	50%
1%	27.7	74.93	77.24	8.02%	76.2	76.1	75.9	75.7
2%	33.6	74.93	78.33	8.04%	76.4	76.3	76.1	75.9
3%	40.3	74.93	79.64	8.07%	77.5	77.4	77.2	76.9
4%	46.0	74.93	82.3	8.06%	79.5	79.3	79.1	78.9
5%	50.6	74.93	83.6	8.05%	80.5	80.4	80.2	79.9
6%	54.6	74.93	85.1	8.10%	81.6	81.4	81.2	81.0
7%	58.1	74.93	85.6	8.08%	81.8	81.7	81.4	81.2
8%	61.1	74.93	86.5	8.10%	82.6	82.5	82.2	81.9
9%	63.7	74.93	87.5	8.06%	83.2	83.2	82.9	82.7
10%	66.0	74.93	88.0	8.10%	83.6	83.5	83.2	83.0
11%	68.4	74.93	88.6	8.04%	84.0	83.9	83.7	83.4
12%	70.5	74.93	88.9	8.07%	84.2	84.1	83.8	83.6
13%	72.5	74.93	89.4	8.05%	84.5	84.3	84.1	83.9
14%	74.4	74.93	90.0	8.07%	84.9	84.8	84.5	84.3
15%	75.9	74.93	90.7	8.10%	85.6	85.4	85.2	84.9
16%	77.6	74.93	91.0	8.07%	85.7	85.6	85.3	85.1
17%	79.1	74.93	91.6	8.08%	86.3	86.1	85.8	85.6
18%	80.7	74.93	91.8	8.05%	86.3	86.2	85.9	85.7
19%	82.1	74.93	92.2	8.09%	86.6	86.4	86.2	86.0
20%	83.4	74.93	92.4	8.07%	86.7	86.5	86.3	86.05

Table 9-144 Comparison of the improved outturn for the 1998-99 portfolio due to the impact of the outturn-variance for 1% to 20% significant projects according to 'actual', 'ideal' and 'stochastic' scenarios.

Using the results shown in Table 9-144, three heuristics are proposed corresponding to the twenty-percent, the ten-percent and the five percent levels of significant projects in the portfolio.

- 80:20 rule case:

Twenty percent of the number of the projects in the 1998-99 portfolio contain eighty-three percent of the 'planned expenditure' of the portfolio. There is an evens probability of achieving an eighty-six percent spending performance for the portfolio overall *compared to the seventy-five percent outturn actually achieved*. This assumes that a best-endeavor management effort is applied to each of the twenty percent projects of greatest planned expenditure that year so that they each achieve a high performance outturn variance that is within the range of zero to twenty percent. Other projects remain at current performance levels.

- 60:10 rule case

Ten percent of the number of the projects in the 1998-99 portfolio contain sixty-six percent of the 'planned expenditure' of the portfolio. There is an evens probability of achieving an eighty-three percent spending performance for the portfolio overall *compared to the seventy-five percent outturn actually achieved*. This assumes that best endeavor management effort is applied to each of the ten percent projects with greatest planned expenditure that year so that they each achieve a high performance outturn variance that is within the range of zero to twenty percent. Other project remains at current performance levels.

- 50:5 rule case

Five percent of the number of the projects in the 1998-99 portfolio contain fifty-one percent of the 'planned expenditure' of the portfolio. There is an evens probability of achieving an eighty percent spending performance for the portfolio overall *compared to the seventy-five percent outturn actually achieved*. This assumes that best endeavor management effort is applied to each of the five percent projects with greatest planned expenditure that year so that they each achieve a high performance outturn variance that is within the range of zero to twenty percent. Other projects remain at current performance levels.

9.5 References

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