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**An investigation into the process, context and organisational factors that lead to
IS driven sustained competitive advantages in Financial Services, Retailing and
Manufacturing**

**by
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**A thesis
submitted in partial fulfilment of the requirements for the award of
Doctor of Philosophy
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Abstract

The study undertook an examination of the process, context and organisational factors that lead to an IS-driven sustainable competitive advantage.

The research contributes theory-based conceptual synthesis and empirical evidence to an area that has transformed radically over the last fifteen years. The methodology adopted a pluralistic approach drawing upon both positivism and interpretist evidence. Care was taken to ensure that the primary research undertaken in Financial Services, Retailing and Manufacturing was subject to a variety of validating procedures and controls.

The study identified a role for the IS derived sustainability model and found that technology alone did not sustain a performance edge but that it needs to be combined with complementary resources to create an isolating mechanism. The work demonstrated that trade secrets, communication links to external organisations, innovative developments and accessing unique resources were the source of sustained competitive advantages. The findings also provided evidence that open culture and communications, workgroup consensus, top management support and possessing a highly flexible organisation were also important attributes of non ephemeral IS based advantages. A practical framework was proposed which allows an organisation to assess the potential of deriving IS based sustainable competitive advantage from analysing its resources and capabilities and discusses ways in which those resources and capabilities can be augmented.

Keywords: Strategic Information Systems, Competitive Advantage, Sustainability, Complementary Resources, Isolating Mechanisms

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Declaration

Neither the thesis nor the original work contained herein has been submitted in part or whole towards an award at this University or any other University.

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Chapter 1

Introduction

The notion that “competitive advantage is at the heart of a firm’s performance in competitive markets” (Porter 1985, p15) is axiomatic in studies on Strategic Information Systems (SIS). The literature is fragmented generally and much has been based on oft repeated anecdotal evidence. Although there has been much theoretical work developed (Parsons (1983), McFarlan (1984), Benjamin et al. (1984), Porter and Millar (1985), Clemons and Row (1991), Kettinger et al. (1994) etc.) few empirical findings have been forthcoming. An attempt was made to reconcile the complex array of existing models, cases, and opinions in the subject area. Many of the conflicting views can be summarised by Clemons (1986) who acknowledged that IS had produced performance advantages in a few cases but that relatively little was known about the impact of Information Systems (IS) on organisations:

“Surely much is media hype or current business fad there is now a large, and largely anecdotal, literature, most of it referencing similar stories of technologically directed competitive triumphs. How much do we understand? How many of the stories are true, or accurately reported?”

The research reported in this thesis examines the role of IS in producing ephemeral competitive advantage and the conditions necessary for sustained competitive advantage. The study includes an investigation into the role of management in the process of planning and implementing IS. Barney (1991) comments :

“it is managers that are able to understand and describe the economic performance potential of a firm’s endowments. Without such managerial analyses, sustained competitive advantage is not likely”.

1.1 Competitive Advantage

Competitive advantage has been described as “positional superiority based on some combination of differentiation, cost superiority, or operating in a protected niche” (Day 1984, p26). This superiority is achieved through the development of superior resources and the utilisation of superior skills (Olusoga et al. 1995). Porter (1985) regards competitive advantage as the ability to earn returns on investment persistently above the average for the industry. The ability of an IS innovation to contribute towards a competitive advantage depends on the innovator incurring a lower cost in implementing the innovation than its competitors or obtaining a larger share of the economic benefits from the innovation. It is the use of IS externally to disturb, enhance or limit the

competitive forces at work in a firm's sector. The 'forces at work' will include the effects of rivals, the power of supplies and customers and the threat of new entrants entering the market sector.

Clemons and Kimbrough (1987) offer a less financially bound definition and consider:

“anything that one business does appreciably better than another may be the source of competitive advantage if the business finds some way to base a competitive strategy on its comparative advantage and if customers value the difference offered by this strategy and seek it out”.

Thus, competitive advantage may be the source of enhanced profit margins or increased market share. Kay (1993) states that firms add value by creating a distinctive capability through a unique set of relationships, establishing a competitive advantage based on that distinctive capability in relevant markets and maximising the value of that advantage through the firm's business strategy.

1.2 The research conducted in this study

The study undertook an examination of the process, context and organisational factors that lead to IS - driven sustained competitive advantage. The methodology adopted a pluralistic approach drawing upon both positivism and interpretism. Following a detailed literature review hypotheses were developed and a model proposed, the 'IS derived sustainability model', which was tested by questionnaire. The research design encompassed four distinct phases, namely: pre-test, pilot, questionnaire and qualitative interviews which permitted elements of induction (see glossary).

The empirical work was UK based and chosen for the range of information intensity (Cronin 1988). Following extensive pre-testing and pilot testing, questionnaires were sent to 246 IS Managers in Financial Services (high intensity), Retailing (medium intensity) and Manufacturing (low intensity). The IS Managers named a Business Manager who was familiar with the nominated IS development to whom an amended questionnaire was sent. Statistical analysis was carried out on the questionnaire and 30 IS and Business Managers were selected for interview.

The findings supported the view that IS alone will not sustain a competitive advantage but that it must be combined with an isolating mechanism or complementary resources. The study demonstrated that trade secrets, developing communication links to external organisations, being innovative, possessing an open culture and communications, developing workgroup consensus, being a highly flexible organisation and obtaining top management support were important factors in gaining a sustainable competitive advantage. These benefits are enhanced if those firms have a clear competitive strategy.

The research demonstrates the importance of using IS to leverage or exploit firm specific, tangible and intangible resources in order to differentiate pioneers from followers as far as the customer or supplier is concerned and thus help to prolong any advantage gained.

1.3 Clarification of terms

In the Management Information Systems (MIS) literature there has been much debate about what constitutes *IS* (Information Systems) as oppose to *IT* (Information Technology) leading to an image of *confusion* and *incoherence* (Avison 1996). The arguments over appropriate definitions for each term have been debated since Leavitt and Whisler's (1958) seminal article "Management in the 1980's", the paper where Culnan (1986) traced the origins of the IS field.

Earl (1989) comments :

"Unfortunately, the function suffers from many descriptors – information technology, information systems, information management and MIS are common examples".

Gunton (1990) describes IS as a system within an organisation that processes and distributes the information the organisation needs to plan, monitor and control its activities and that these Information Systems are operated by, and therefore include, people as well as technology. Kaasboll (1995) includes "programs, hardware, data, transformations and transportation of data, people interpreting and producing the data. The data, and the information that people have, refer to phenomena in problem domains". Silver et al. (1995) offers the following rather straightforward definition of IS: comprising hardware, software, data, people and procedures.

IT is generally perceived as being concerned almost entirely with technologies and Illingworth et al. (1990) states that IT is "any form of technology (i.e. any equipment or technique) used by people to handle informationit incorporates the whole of computing and telecommunications technology together with major parts of consumer electronics and broadcasting". Gunton (1990) regards IT as including electronic technologies for collecting, storing, processing and communicating information and Davenport and Short (1990) offer "the capabilities offered by computers, software applications, and telecommunications".

The author regards IS as being inclusive of IT and concurs with the views of Buckingham et al. (1987) who support a multi-faceted definition of IS :

"a system which assembles, stores, processes and delivers information relevant to an organisation (or to society) in such a way that the information is accessible and useful to those who wish to use it, including managers, staff, clients and

citizens. An information system is a human activity (social) system which may or may not involve computer systems”.

This definition encompasses a wide range of areas, for example, information theory (information), semiology (delivers information), organisation theory and sociology (organisation and society), ethics and economics (impact on society) and computer science and engineering (computer systems). The UK Academy of Information Systems (UK AIS) offer a similar description:

“The study of information systems and their development is a multi-disciplinary subject and addresses the range of strategic, managerial, and operational activities involved in the gathering, processing, storing, distributing and use of information, and its associated technologies, in society and organisations.”
(UK AIS 1996)

These definitions illustrate the linkage between people, organisations and the technology. Avison (1996) reminds us that technology is “surely not the essence of an IS (just as a word processing system is not the essence of a good novel)”. This is supported by Davis (1987) who regards computer technology as being “one management tool amongst many”.

These definitions differ from many used in the U.S. where IT is viewed more centrally in discussions of IS. For example, Cougar et al. (1995) describes two main aspects:

- the acquisition, development and management of IT resources and services, which is referred to as the information systems function, and
- the development and evolution of infrastructure and systems for information use in organisational processes, which is referred to as systems development

Definitions of *IS* and *IT* have been used by some authors interchangeably and whilst a plethora of terms have been used (*IS*, *IT*, *IT/IS*, *IS/T*, computer information systems, information management, information resources management, management information systems etc.) the differences are not perceived consistently by everyone in the field (Avison 1996). The Society of IT Managers (SOCITM 1992), for example, use the abbreviation *IS/T*.

For these reasons throughout the thesis the term *IS* has been used using the definition provided by Buckingham et al. (1987) and this term encapsulates what is referred to by others as *IT*, *IS* and the terms above. The terms *IT* and *IS/IT* have only been used when quoting and in the references when explicitly *IT* or *IS/IT* have been used by the original author(s). A detailed glossary containing definitions of all the terms used in this thesis is included in Appendix.

Chapter 2

Methodology

Introduction

This chapter discusses social science research traditions, to indicate how a methodology embraces both ontological and epistemological assumptions, and practical techniques. The chapter then explains apparent conflicts between quantitative and qualitative research, describes the data collection techniques employed, and then concludes with a discussion of the development of the research instrument.

2.1 Research theory

Research findings are enhanced if it is clear how they are derived. This involves explaining the methodology used. A methodology is more than just the methods of data collection; rather, it is:

“the analysis of, and rationale for, the particular method or methods used in a given study, and in that type of study in general”.

(Jankowicz 1991)

Hence methodology involves understanding the assumptions that underpin the way the research was conducted, the sources of data, and how those data were collected and interpreted. For this reason, this chapter begins by discussing briefly the complex area of social science research traditions and explains the research methodology employed in this research. The chapter then discusses the specific research techniques used, how samples were constructed and access obtained, and how the data were analysed and interpreted.

2.1.1 Research traditions

The area of research traditions is an extremely complex one, but there is a common view that it is possible to speak of two very broad traditions, the quantitative/positivist approach, and the qualitative/interpretive approach. Within this two-fold categorisation are of course many different positions.

Morgan's (1979) work on the concept of a paradigm has been extended by Easterby-Smith, Thorpe and Lowe (1991) to indicate how each of these two traditions embraces three important issues :

- 1. fundamental beliefs about the world and about knowledge**
- 2. guidelines about how to conduct research**
- 3. techniques to be employed**

Fundamental beliefs

Discussions about the two traditions may emphasise one or more aspects of the three issues. If the emphasis is on fundamental beliefs, then the researcher's *ontology* (view of the nature of the world) and *epistemology* (view of the nature of knowledge) are stressed. In the quantitative/positivist approach, the researcher is viewed as independent of the subject under examination. The science they study is value-free and part of an objective and external world which Archer (1988) refers to as *external realism*. Knowledge of that world is restricted to phenomena which can be observed directly or indirectly via the senses:

“We are entitled to record only that which is actually manifested in experience; opinions concerning occult entities of which experienced things are supposedly the manifestations are untrustworthy” (Kolakowski 1972).

The fundamental beliefs underlying the qualitative/interpretive tradition recognise that the researcher is part of the world he or she investigates. That world is a social construction of the people in it, including him or herself; it is based on peoples' experiences, and is subjective.

Guidelines

The observational field of the social scientist, social reality, has a specific meaning and relevance structure for the people living, acting, and thinking within it. The thought objects constructed by the social scientist, in order to grasp this social reality, have to be founded upon it. If discussion about research traditions focuses on guidelines about how research should be conducted, then it may be noted that the quantitative/positivist researcher tries to discover causal explanation to be expressed in the form of laws. Preceding the formulation of laws is the posing of hypotheses, which are to be tested by observation. Thus there is a strong element of deductive reasoning; but also there is inductivism, in that the laws are based on empirically-established facts:

“these laws are general in scope in that they cover a range of observations and they are universal in form in that they apply, without exception, across time and space.”

(Blaikie 1993)

On the other hand, qualitative/interpretive research emphasises meanings rather than facts and understanding rather than explanation. The overall approach is inductive, and new theories emerge during data collection and analysis, rather than being developed beforehand via deduction. Where qualitative research is influenced by prior theory, such theory serves as "sensitizing concepts" which provide "a general sense of reference and guidance in approaching empirical instances" (Blumer 1954 quoted in Bryman 1988, p.68). There is also the need to look at the context of what is being studied, implying a requirement for "*thick description*" of social settings (Walsham 1995). Rather than studying isolated, simple elements, qualitative research is generally holistic:

“The researcher strives to understand the gestalt, the totality, and the unifying nature of particular settings... the holistic approach to research design is open to gathering data on any number of aspects of the setting under study in order to put together a complete picture of the social dynamic of a particular situation”.

(Patton 1980)

The proponents of qualitative/interpretive approaches argue that the scientific ethos is misplaced in social scientific enquiry because of :

- ① the possibility of many different interpretations of social phenomena
- ② the impact of the social scientist on the social system being studied
- ③ the problems associated with forecasting future events concerned with human activity [given that] there will always be a mixture of intended and unintended effects and the danger of self-fulfilling prophecies or the opposite.

(Galliers 1985, after Checkland 1981)

Archer (1988) claims that the management research literature can be divided into 3 distinct positions :

a) using qualitative/interpretist techniques in order to pay attention to microlevel aspects that would not be possible by quantitative approaches. With relatively small numbers of observations of a large numbers of variables, statistical methods are deemed inappropriate. Here both epistemological viewpoints are regarded as *complementary*.

b) those that maintain that quantitative/positivist research is the *rigorous, hard* approach but that there are situations where they can not be employed due to the immaturity of theoretical development. This type of research aims to establish corroborated empirical generalisations. Phenomena that do not lend themselves to being treated as instances of empirical generalisations are not considered as being 'researchable' in a rigorous sense.

c) those that maintain that qualitative research is the *only true* approach allowing access to the 'real stuff' of human interaction. Here, it is considered that the empirical generalisations characteristic of the natural sciences are inappropriate in the social-behavioural field.

Abdel-Khalik and Ajinkya (1979) support the approach detailed in b) yielding a view of science where knowledge which is expressed in terms of measurements is superior to knowledge which cannot. Douglas (1971), quoted by Knorr-Cetina (1982) has the view that:

“the only valid and meaningful phenomena we can possibly have is that based ultimately on systematic observations of everyday life”.

Pepper (1942) states that

“quantitatively based studies display a concern for multiplicative collaboration of research hypotheses at the expense of structural corroboration and cognitive refinement the researcher is interested in multiplying the number of observations that are consistent with the hypothesis, rather than in developing a richer hypothesis that has a greater explanatory power, but also a greater chance of being refuted, and whose corroboration would therefore be more significant”.

Abdel-Khalik and Ajinkya (1979) amongst others maintain that rigorous research involves the testing of hypothesis against multiple observations using statistical tools and that this, according to Archer (1988) can be identified with a combination of positivism and external realism. The reality under investigation is regarded as existing independently of the research community that studies it (external realism), and the observations made by researchers (‘facts’) are considered as being independent of the beliefs and values to which the researchers adhere (positivism), and that rigour depends on maintaining such independence. There is a great deal of emphasis on the generalisability of research findings, which tends to be seen in terms of statistical generalisation rather than analytical generalisation (the extension of theory). Those that promote the superiority of ‘qualitative’ approaches tend to see rigour as requiring the intimate observation that can only be given to a small number of examples at any one time. According to Bryman (1988):

“the researcher's greater proximity to, and involvement with, his or her subjects in qualitative research induces a feeling of greater confidence in the validity and solidity of data deriving from its associated methods”.

Mintzberg (1979) claims that the field of organisation theory has

“paid dearly for the obsession with rigor in the choice of methodology”.

Miles (1979) taking a less inductive stance than Mintzberg, describes qualitative data as having some attributes of an ‘attractive nuisance’ which can lead to ‘injury’, and who emphasises the need for ‘well-formulated methods of analysis’, ‘guidelines for protection against self-delusion’ and ‘explicit preliminary frameworks’.

The differing views of Mintzberg and Miles affects their different opinion of knowledge and reality. Miles (1979) acknowledges that inquiry is impelled by certain working hypotheses and background assumptions which are better made explicit, and that knowledge claims face the problem of validation:

“of analysis and how it can be carried out in ways that deserve the name of science”.

Mintzberg (1979) takes a contrary view and holds that his strategy of ‘direct research’ involves something close to pure description (unladen with theoretical presuppositions) from which conclusions are then drawn by means of inductive inferences in the form of ‘creative leaps’. Critics (e.g. see Lakatos 1970a,b) warn of the dangers of *ad hoc* theorising that excessive inductivism inevitably leads and claims that ‘serendipitous’ discoveries do not lead to coherent theoretical development’. In addition, Mintzberg and colleagues have apparently little or no concern for the issues of validity.

For the objectivist researcher (typically pursuing a quantitative research design), social facts exist independently of the research community that studies them, and they can be observed in the form of empirical relationships which can be captured by suitable research design and statistical inference that are considered to be value-free. This approach tends to focus, at the organisational level, on states rather than social processes, the latter being less easy to accommodate within an objectivist perspective (e.g. differing accounts of them typically exist). For the interpretive researcher, social facts are to be considered in the intentional contexts intersubjectively constructed by the social actors whose interactions constitute such facts. This approach is more sensitive to the dynamics of social processes, as it is able to accommodate more than the account of a process.

Objectivism is an appealing aim and lies in its assumed affinity with the approaches made in the natural sciences. Tomkins and Groves (1983) however claim that this predominantly objectivist character of management research is largely responsible for the ‘schism’ between academics and practitioners. It certainly seems plausible that approaches that ignore the subjective rationalities of managers and impose an alien theoretical framework can produce a ‘schism’ preventing the sharing of ideas.

Objectivist approaches tend to ignore a whole raft of potential explanatory variables (beliefs, desires, and other intentional states) and make a number of assumptions in order to operationalise standard concepts. Scientific models can be highly simplified abstractions dependent upon restricted assumptions and idealised conditions and reflecting only a very partial understanding of the phenomena.

Techniques to be employed

For quantitative / positivist research the techniques focus upon operationalising concepts so that they can be measured whereas qualitative / interpretive research is more concerned with using multiple methods to establish different views of phenomena. There are a number of methods that can be used, some of which (for example interviews) can be used for both quantitative / positivist research as well as qualitative / interpretive research.

Some attention needs to be given to the way in which samples are constructed. Quantitative research prefers large samples, from which findings can be tested by statistical data collection techniques. The quantitative researcher is concerned with the operationalisation of concepts, so that objective and precise measurement can be achieved. Collecting quantitative evidence, because it deals with numbers, appears to be both precise and hard. However, it is important to remember that the value of the numbers depends upon both the assumptions under which they were produced or calculated and the way in which they are interpreted. Due to these limitations, frequently quantitative evidence is neither more precise nor robust than qualitative evidence.

In qualitative research, there is recognition that using different investigation methods can give different results. Thus qualitative data are more variable, and are analysed by reflection and intuition rather than objective measurement:

“Quantitative measures are succinct, parsimonious, and easily aggregated for analysis; quantitative data are systematic, standardized, and easily presented in a short space. By contrast, the qualitative measures are longer, more detailed, and variable in content; analysis is difficult because responses are neither systematic nor standardised” (Patton 1980).

“In speculating on causes, consequences, and relationships all we can provide is perspective. The perspective gained through careful qualitative analysis is not arbitrary, nor is it predetermined, but it does fall short of being truth.”

(Patton 1980)

2.1.2 Eclecticism and Pluralism

Many have argued for eclectic approaches (Banville and Landry 1989, Lloyd-Williams and Collins 1999) stating that the field of IS can only be understood and analysed with the help of pluralistic models. Chua (1986) suggests a need for epistemological and methodological pluralism reflecting a range of philosophical viewpoints particularly in immature fields like accounting. This would apply to the field of IS.

Clearly the two approaches of quantitative / positivism and qualitative / interpretism are not mutually exclusive and research scientists will often work with both, so that “qualitative and quantitative research techniques are sometimes viewed as the ends of a continuum”(Gable 1994). Researchers should be ready to draw on both kinds of evidence in order to address different aspects of a research problem.

In addition, research involves not just philosophical positions but also practical considerations. For most researchers, the latter may be more important than the former:

“Where a researcher does rely on either qualitative or quantitative methods this will tend to be justified on pragmatic rather than epistemological grounds.”

(Henwood and Pidgeon 1992)

McGrath (1982) describes the research process as a series of interlocking choices, in which we try simultaneously to maximise several *conflicting desiderata*. He states further that the research process involves the three horned dilemmas of generalisability, precision in the control and measurement of variables and realism and that there is no strategy that can adequately cope with all three. Approaches must be made at the strategy, design and method level to be compliant with one or sometimes more of the conflicting desiderata. This agrees with the beliefs of Morgan (1980) and Polkinghorne (1983) who discuss the need for *methodological pluralism* (Hirschheim 1985) - the assertion that there is no one correct method of science but many methods. This pluralist approach to IS research is a view supported by Galliers (1993).

2.2 The Cycle of Empirical Research

Reflecting upon Runkel and McGrath’s (1972) *Cycle of Empirical Research* (problem, design, operational plan, observations of the real world, data, variables, relations and conclusions), McGrath (1982) states the importance of considering the dilemmas within each stage of research and in particular the dilemmas inherent in :

❶ Strategies for gaining knowledge - whether positivism (attempting to support the hypotheses made - deduction¹) and/or phenomenology (inducing new theories through interpretation) are to be used.

❷ Research Design - the operational plans proposed

❸ Research Method - the research instrument(s) to be utilised for the study

¹ *To be precise, no scientific explanation is ever confirmed, incorrect explanations are simply eliminated from consideration (Popper 1968)*

2.2.1 Strategies for gaining knowledge

Clearly the design depends on the paradigm adopted by the researcher. Those following a quantitative/positivist tradition focus on facts, have a reductionist approach, aim to identify causality and laws and then formulate hypothesis and test them. Qualitative/interpretive researchers focus on meanings, adopt a holistic approach to the situation, attempt to gain understanding and develop “ideas through induction from data” (Easterby-Smith et al. 1991).

2.2.2 Research Design

There are four important choices that have to be made when considering the research design and these choices are very closely allied to the philosophical stance that has been adopted.

***Involvement* - this refers to how close the researcher should get to the material being researched or whether he/she should remain distanced. In social science where it is difficult to claim true independence, some have chosen to incorporate this apparent problem into the change process itself. This ‘action research’ can be criticised from the positivist viewpoint.**

***Sampling strategy* - the design choice is between following a small number of companies investigating them over a long time period or selecting different units in different contexts and investigating how other factors vary across the units, attempting to establish correlations between variables. This latter approach using cross-sectional designs benefits from being able to describe features of many organisations in different industrial sectors but suffers from the inability to explain *why* correlations exist and in eliminating all other external factors that might have caused the observed correlation. Pettigrew (1985) suggests that the alternative, a longitudinal design, removes these drawbacks and recommends that the study should investigate the elements of change within the political, environmental, economic, social, legal and technological context surrounding each organisation and accumulate ‘time series data’ over a large timeframe. Although this reduces the need for access to a large number of organisations it can be extremely time-consuming and will suffer from the limitations of phenomenological interpretist research.**

Theory and data - the third design choice is the order of theory and data. The positivist view stipulates that the researcher commences with a theory about organisations and then attempts to collect data that will disprove the hypotheses or research questions. The advantage of this stance is that there is initial clarity about the area of investigation which lends itself to replication by other specialists (Easterby-Smith et al. 1991). Use of Glaser and Strauss's (1967) grounded theory approach supports the phenomenological paradigm and benefits from being flexible and is useful in providing both explanations and new insights. Some academics have found that grounded theory is suspect because of the lack of clarity and consistency of methods and *"have to live with the fear that nothing of interest will emerge from the work"* (Easterby-Smith et al. 1991).

Validity - is a measure of the 'goodness of a final product or outcome' and that it involves judgement about the state of an experiment or system (Archer 1988). ***Validation*** is the process of checking the extent to which the results of a research activity are trustworthy: are the relationships that have been determined 'true'.

McGrath (1982) in particular emphasises the importance of seeking convergence among measures that differ in their methodological weakness. In particular he stresses the need for multiple operations in order to address the following :

*** Content Validity** - are instrument measures drawn from all measures available and hence to what extent are the things being measured representative of the things about the area under investigation?

***Construct Validity** - the extent to which an operational measure measures the concept it is supposed to measure (Cook and Campbell 1979)

*** Reliability** - a reliable instrument measures the same object with consistent and error free results (Bailey and Pearson (1983). Reliability is needed of any measurement instrument.

Determining reliability addresses the question: Would the method used to produce the results produce the same results if applied in identical circumstances? In qualitative research, this degree of replicability can not normally be sought, because it is recognised that social life involves constant change. Human beings find that their circumstances alter; they are exposed

to different influences; they change their minds about issues; they react in different ways to being participants in research. Hence qualitative researchers may find that similar findings emerge from different researchers at different times investigating similar situations; but they do not expect to find identical situations nor to produce identical results.

*** Internal Validity** - quantitatively this can be summed up as - ‘are there any rival - as yet untested - hypotheses for the observed effects?’. The qualitative researcher however is concerned to gain access to research participants' views and understandings, to explain the way these were obtained, and to present the findings so that other readers may arrive at conclusions consistent with the researcher's.

*** Statistical Conclusion Validity** - do the variables demonstrate relationships not explainable by chance or some other standard of comparison?

*** Discriminant Validity** - the degree to which measures of different concepts are distinct (Campbell and Fiske 1959). The notion is that if two or more concepts are unique, then valid measures of each should not be highly correlated.

*** Generalisability (external validity)** - for the quantitative researcher, there is a concern about the degree to which findings from a sample are present in the population from which the sample is drawn. There are also concerns over the formation of the sample population – a *prior* population (one which is defined at the outset) as opposed to a *posterior* population (a population defined after the event). However, for the qualitative researcher, the emphasis is different. Although various types of generalisability can be identified (Walsham 1995), there is general agreement among qualitative researchers about its overall nature:

“A consensus appears to be emerging that, for qualitative research, generalizability is best thought of as a matter of the 'fit' between the situation studied and others to which one might be interested in applying the concepts and conclusions of that study” (Schofield 1989).

2.2.3 Research Method (instruments)

Case studies have been used frequently as a research instrument (Easterby-Smith et al. (1991)) . It could be argued that a single case study would be enough to enable the researcher to add to the body of knowledge provided access to a suitable organisation could be obtained. However the single case study approach has interesting implications. Clearly the discovery of a phenomenon as a result of a single case study may add significantly to the body of knowledge simply because it has established that this phenomenon exists. However, in most cases, the object of research is, *inter alia*, to be able to comment on what is expected to be found under a variety of different circumstances. If the single case study was comprehensive enough, especially if it had a longitudinal dimension, then it could satisfy all the requirements. However, in most instances, the findings of a single case study are usually only regarded as suggestive, and are thus regarded as only a mechanism to lead on to further investigate a new phenomenon under a variety of conditions. A broader exercise, including investigating multiple organisations and evidence from a variety of sources, was selected as it was considered that it was more likely to lead to interesting generalisations about the phenomenon under investigation.

Although questionnaires are essentially snapshots of practices, situations or views at a particular point in time; with careful design, surveys are an appropriate means of studying a far greater number of variables than is the case with, for example experimental approaches (Galliers 1991). They can therefore provide a reasonably accurate description of real world situations from a variety of viewpoints and lend themselves to investigating factors that are well defined. Reasonable sample sizes address some of the issues of generalisation.

Care needs to be taken to avoid bias of those responding to questionnaires (as they can be self selecting), in the researcher and in the time that the research is undertaken although practicalities have to be considered. Also there are limitations as to insights into the causes or processes behind the phenomena under study due to the research method. However as Galliers (1991) states, the survey approach has a wide applicability in IS research and that as a method it offers the opportunity to assess an organisation's approach to IS and can contribute to theory building (induction) as well as theory testing (deduction) with possibilities for theory extension (Galliers and Land 1987).

Structured interviews frequently constitute a major part of the research method (Bell, 1987; Kasanen & Suomi, 1987; Yin, 1989, 93). During such an interview the informants will typically provide a large amount of information that will be recorded. Care must be taken to recognise and acknowledge bias including the Hawthorn Effect where subjects change to conform to the behaviour which they feel the interviewer is looking for (see Dolan 1978). Bias can be represented both in the researcher (Vitalari, 1985) and the researched, and thus may permeate the whole research process. Bias may be in the form of perceptual distortions or deceptions (White, 1985). Although it cannot be totally eradicated, bias may be minimised by the use of such techniques as triangulation. The issue of bias is especially important if the research is based on a single case study as oppose to multiple cases as any attempt to generalise from such a study would be problematic. Interviews are useful in investigating factors that are vague but care must be taken to avoid ‘leading’ respondents.

Other qualitative techniques e.g. diary keeping and observation - are more appropriate for in-depth contemporaneous case studies which, even if found, would have made the difficult issue of access tougher still (Beynon, 1988; Buchanan, Boddy and McCalman 1988). However this close observation does not readily permit the independence between researcher and researched, or between fact and value, to which positivist external realists attach great importance.

In positivist studies, the research design needs to ensure that all instruments are sufficiently validated. Some studies in MIS research rely upon previously utilised instruments as a primary means of validation (Straub 1989). This has a number of difficulties from a methodologically viewpoint. Many previously used instruments were themselves never fully validated. There could be a weak argument to be made from a nomological standpoint but nomological validity normally occurs only after a long and well developed stream of research. Frequently, instruments have been adapted from those validated in previous research in non IS areas and altered significantly. Some (e.g. Straub 1989) feel that it is not appropriate to extract items from another instrument even if it has previously undergone comprehensive validation. Straub sums this up:

“the more the format, order, wording and procedural setting of the original instrument is changed, the greater the likelihood that the derived instrument will lack validated qualities of the original instrument”.

Straub (1989)

The importance of pre-testing and piloting research instruments for each particularly study should not be understated. Presser and Blair (1994) found that the use of an expert panel when pre-testing was very effective compared to other methods in identifying respondents’ problems with a questionnaire. An expert panel is frequently made up of academics and subject-matter professionals. However Czaja and Blair (1996) warn of the dangers of only using experts as a substitute for pretesting with respondents.

2.3 The research described in this thesis

The methodology strategy adopted was primarily a positivist/quantitative approach. From the literature, a number of research questions were formed and a model developed. This was tested using a questionnaire as the main research instrument following extensive pre-testing and pilot trials. An element of interpretist research was utilised in the final interview stage where 30 IS and Business Managers were selected. Thus the research strategy used in this thesis was pluralistic.

2.3.1 The research questions

The research investigates the process, context and organisational factors that lead to IS - driven sustained competitive advantage. Specifically the research questions were:

❶ What *proportion* of organisations have implemented systems in order to gain a competitive advantage or to nullify a rival’s advantage?

It was acknowledged that there would be difficulties in obtaining a precise figure and these difficulties are discussed in Chapter 5.

❷ By what *means* have organisations used IS to gain a competitive advantage?

❸ To what *extent* has IS advantage been sustained ?

❹ What are the *factors* (context) that lead to a *sustained* competitive advantage?

It was acknowledged that the study would also provide some insights into the *process* through which changes in IS strategy take place.

2.3.2 The population

In order to test the factors necessary for sustained competitive advantage it was necessary to identify sample frames where IS had been employed for a sufficient time for these factors to demonstrate their potential effects.

The three sample frames of Finance, Retail and Manufacturing were chosen due to their perceived variation in information intensity (Cronin et al. 1989). Within each industry it was also felt that the organisations chosen should be a) substantial, so that it may be expected that both the concepts and practice of IS Strategy are reasonably familiar and were b) either an independent entity or business unit with complete or near complete control over its own IS Strategy. Data from Price Waterhouse (1994) showed the IS budgets as percentages of turnover varied widely in 1993 - in manufacturing 0.7% (the lowest of all industrial sectors), retail 1.6% and financial services 2.9% (the highest of all industrial sectors). By 1996 the percentage spend in manufacturing increased slightly to 0.8%, retail increased considerably to 2.4% and financial services decreased slightly to 2.5%. The UK IS average for all industrial segments as a percentage of turnover in 1996 was 1.8% (Price Waterhouse 1996).

The Financial sector was chosen because “IT has become the most important factor within the financial services industry in the 1990s. The fate of many financial service providers, as they face up to new sources of competition, will depend on how effectively new data processing, telecommunications and customer information systems can be deployed by them” (Mintel 1996).

By utilising IS over the last few years, many Personal Finance Product Providers (PFPPs) have been able to substantially reduce costs, improve their levels of service and evaluate methods of gaining an advantage from a static consumer base. This has primarily been achieved by switching from mainframe based systems to client server based customer information systems, telephone banking centres and through the increasing use of Automated Teller Machines (Mintel 1996). The number of ATMs in Banks and Building Societies increased by 38%

during 1988-1994 (Intel/BBA/BSA 1996). Ernst and Young (1996) projected that transactions at traditional branches would fall from 61% in 1995 to 41% in 1997 and some forecasters (e.g. Intel 1996) go so far as to suggest that by the year 2000, 30% of current accounts will be telephone based compared with 7% in 1994. It has also been suggested that the proportion of investments sold by telephone will rise to 25% by 2000 with general insurance sales increasing to 40% (Intel 1996). This highly IS intensive sector is set for further dramatic changes as PC and card based electronic cash ('Digicash' and 'Cybercash') are launched and as virtual banking in multimedia kiosks, through interactive TV and the internet become more popular.

The Retail industry was chosen as it was considered to be a relatively low-technology industry that had undergone significant change as a result of identifiable Information Technologies (Powell and Dent-Micallef 1997). In the US, retail is the largest industry measured by sales (approximately \$500 billion annually) and total employment (>4 million employees). In the UK, turnover rose from £80 billion in 1984 to £157 billion in 1994 (DTI 1996). The number of retail businesses declined by 50,000 between 1984 and 1994 to 290,000 outlets (DTI 1996) but employment has remained relatively stable at around 2.2million. Retail has traditionally been a fragmented industry, consisting of limited technological capabilities until 1980. From this time increasingly sophisticated point-of-sale (POS) scanning technologies, electronic data interchange (EDI) with suppliers, and computer-based systems for inventory management, administration, human resource management, communications and marketing were installed. Leveraging leading-edge technological developments, a few large grocery chains, most notably Sainsburys in the UK, revolutionised retail competition, establishing direct electronic linkages among stores, distribution centres and suppliers, and redefining power relationships with suppliers and customers. Moreover, retail IS appear to be disseminating rapidly so that all large retailers have now implemented, at a minimum, the first-level POS scanning and inventory management technologies and many have introduced systems to track loyalty cards and to aid the selling of new financial products. However, despite this investment, retail productivity in the US measured as average output per hour increased at an average rate of 1.1 percent between 1973 and 1989. This compares with 2.4 percent in the preceding 25-year period (Quinn and Baily, 1994).

The third sample frame, UK Manufacturing, consists of a number of distinct sub sectors (DTI 1997), six of which are listed in Table 2.1.

	Employees (,000)	Annual Sales (£ Billion)
Chemicals	400	41
Telecommunications	200	19
Automotive Components	150	12
Textiles	426	20
Semiconductors	25	4
Printing	170	10

Table 2.1 Breakdown of major Manufacturing sub sectors showing number of staff employed and annual turnover

Source: DTI 1997

Nearly a third of the Manufacturing businesses that were included in the sample were positioned in mature, concentrated industries selling heterogeneous products in domestic markets. The remaining two thirds were selling products into industrial markets internationally.

2.4 The Cycle of Empirical Research

2.4.1 Strategies for gaining knowledge

Although "debate continues on the relative merits of interpretivist versus positivist approaches" (Walsham 1995), and "cessation of hostilities seems to have been achieved by an agreement to differ rather than any consensus or final solution" (Crompton and Jones 1988), the research study described in this thesis adopted a pluralistic approach to its methodology, combining positivism and interpretism. The positivist/quantitative approach was applied within a well defined theoretical framework. This framework (encapsulated in the IS derived sustainability model) was developed from the literature and previous research.

2.4.2 Research Design

***Involvement* – the approach taken was to remain distanced from the material being researched and in the positivist tradition utilise questionnaires and semi-structured interviews.**

***Sampling strategy* - the design choice made was to select a large number of organisations in different contexts and investigate how factors varied across the units, attempting to establish correlations between variables.**

***Theory and data* - the review of relevant literature produced a series of research questions. These developed into a model that described those factors deemed to be important for IS derived sustainability. It was acknowledged that some of these factors would be more appropriately investigated via questionnaire and others through interview e.g. an examination into the factor “organisational learning” is more appropriately examined at an interview rather than at the questionnaire phase.**

2.4.3 Research method (instruments)

The design encompassed four distinct phases following recommendations made by Straub (1989) : namely pre-test, pilot, questionnaire and post questionnaire interviews.

a) Pre-test interviews - the draft research instrument was to be subjected to qualitative testing to help establish validity. The interviews were to be loosely structured and concerned the scope, relevance, clarity and form of the survey items. The pre-test interviews were to be aimed at including some aspects of the expert panel as proposed in the model by Presser and Blair (1994) but resisted the temptation of only using experts as a substitute for pre-testing with respondents. Personal Interviews were to be conducted with 11 participants in order to locate and correct weaknesses in the questionnaire. Interviewees were selected to derive maximum feedback from a range of senior organisational roles including the sample frames of Financial Services, Retailing and Manufacturing. Those targeted were to be three IS Managers, three Business Managers, three academic experts in IS and two IS Vendors. Each version of the instrument was to reflect changes suggested by participants up to that point but if significant changes needed to be made then new participants would need to be added in order to validate the instrument. As the measures of competitive advantage were to be subjective, an assumption was made that given the level of manager involved in the interviews (IS Directors, IS Manager, Senior Business Managers or Directors) the respondents had sufficient perspective and information to assess their firms performance relative to rivals. Previous studies (e.g. Lawrence and Lorsch, 1967; Dess, 1987; Powell, 1992) have used subjective measures and are often preferred to financial statement data, since firms may adopt different accounting conventions and comparisons between large and medium sized organisations, Strategic Business Units and conglomerates can be problematic. Dess and Robinson (1984) stated that subjective measures of performance correlate strongly with objective measures and recommended the use of subjective measures, especially when obtaining non-financial data. It was also felt that if questions were to be focused upon actual financial performance the response rate would have declined. Triangulation in the use of these subjective measures was to be used as the views of the IS Manager and a senior Business Manager referring to the *same* IS development was to be utilised.

The research design required the pre-test interviews to move progressively from an open-ended general discussion format to a semi structured format and finally to a highly structured item by item examination of the draft instrument. Misunderstandings and discrepancies or variations in answers were to be highlighted and concepts independently introduced by more than two respondents were noted as well as the precise language in which these constructs were perceived by the participants (content validity and reliability). Clarification of constructs and the means of operationalising selected constructs were undertaken (construct validity and reliability).

Participants were to evaluate the questionnaire in order to help remove ambiguities and ensure that it was completely self-explanatory. Content validity was to be emphasised by participants, highlighting pointless questions and suggesting new areas for inquiry.

Following the 11 pre-test interviews, data related to all variables was to be collected and the detailed analysis of this data was to contribute to reliability.

b) Pilot Interviews with the questionnaire - these were to aid validity and would offer the final *dry run* for the questionnaires. Questions producing bunching anywhere (low discrimination) or generally a lack of variance were to be addressed.

The pilots were to be conducted by the author with 12 companies, 4 in each sample frame. In each company, the IS Manager and the Business Manager were to be contacted. In randomly chosen alternate companies one was to be interviewed using the questionnaire, whilst the other completed the questionnaire without guidance. Of the 12 companies therefore, 6 Business Managers were to have had been formally interviewed in a highly structured way whilst the 6 IS Managers in the same companies were to be instructed to complete the questionnaire without guidance. Likewise, as illustrated in Table 2.2, in the remaining six companies the IS

	Manufacturing		Retail		Finance	
	<i>IS</i>	<i>Bus</i>	<i>IS</i>	<i>Bus</i>	<i>IS</i>	<i>Bus</i>
Stream A	G	Q	G	Q	G	Q
Stream B	Q	G	Q	G	Q	G
Stream C	G	Q	G	Q	G	Q
Stream D	Q	G	Q	G	Q	G

Q - participants will be given the questionnaire without guidance.
G - participants will be guided through the questionnaire in an interview.
IS - Head of IS department, IS Director or senior IS Project Team Leader
Bus - Senior Business Manager

Table 2.2 Pilot interview matrix

Managers were to be formally interviewed and the Business Managers required to complete the questionnaire alone. In all cases the IS Manager had to be interviewed/complete the questionnaire first before the Business Manager in order to identify an IS development that had enabled the company to achieve a competitive advantage or nullify a rival’s advantage and this identified the corresponding manager. In order to ensure independence of answers, there was to be no conferring between any of the respondents.

It was expected that each questionnaire would take respondents around 20 minutes to complete and that each interview would be of 1 hour duration.

The pilot results were to be tested by Cronbach's alpha (Cronbach, 1951) as a measure of reliability. This measures the intercorrelations between the various indicators used to capture the underlying construct. The various indicators should correlate positively, but they should not be perfectly correlated otherwise they would all be measuring the same elements of the construct. The underlying assumption is that one indicator only is inadequate to capture the construct. Cronbach measurements is a method of ensuring that the data obtained from the questionnaires did not differ significantly from the data obtained through the pilot interviews and therefore that the questionnaire research instrument that was used in *this* study was reliable.

c) Validated research instrument - the finalised questionnaire was to be sent to 108 IS Managers, 36 in each sample frame. This was to be carried out in 2 batches, 3 months apart, utilising the support of third year University placement students to help improve response levels. Random sampling was not employed as there was a relationship between the University and every organisation contacted. Students were to be briefed and each asked to select an appropriate IS Manager in their placement firm to whom the questionnaire could be directed. They were also to assist in reminding respondents that had yet to complete the questionnaire. In the briefing and follow-up letters to students and respondents, assurances of confidentiality and anonymity were to be given. Triangulation was to be utilised as questionnaires were initially sent to IS Managers who were asked to identify a senior Business Manager who was familiar with the IS development under investigation. Following the receipt of the IS Manager's questionnaire the name and description of the specific IS development was to be entered onto a copy of the questionnaire and sent to the named Business Manager for completion. Obtaining the two responses would help to mitigate the effects of single-respondent bias and satisfied the request by Atkins (1994) to report evidence from personnel with a background in business issues. The questionnaires were to be colour coded following work by Blythe and Essex (1981) and Matteson (1974) in order to help maximise response rates. However these findings have been contradicted by others (Greer and Lohtia 1994; Buttle and Thomas 1996) who found no significance difference in questionnaire response when using yellow and white paper stock.

SPSS (Statistical Package for the Social Sciences) was to be utilised to analyse the survey data as it was felt to be widely used (and therefore valid), and offered a range of statistical techniques and was considered to be relatively user friendly with good editing facilities. Cross Tabulation (Chi squared test) was to be used i) for the identification of significant associations between variables and ii) to examine the differences between the returns from the IS Managers and the Business Managers. The null hypotheses for i) was that there is no association between sustaining a competitive advantage and the factors highlighted and ii) that there is no association between the IS and the Business Manager responses. Although it is a parametric test, the Chi squared test (X^2) does not rely upon an *assumption of normality* which the questionnaire data would be unable to provide.

It was necessary at this stage to clarify what are termed *response*, *refusal*, *co-operation* and *completion* rates which have been used by different researchers to mean quite different things (Groves 1989). Whilst there have been recommendations (see Groves 1989, Hidioglou et al. 1993) for the computation and presentation of these rates, they have not been universally adopted. This report will concentrate on two rates that are widely accepted: *response* rate for the number of returned questionnaires and *co-operation* rate for the number of interviews divided by the sum of the interviews, the refusals and the partial interviews.

d) Interviews - these were to be conducted with a sample of the organisations contacted in c) in order to follow up on interesting issues raised in answer to the questionnaire. It was envisaged that these were to take place with a maximum of 20 IS and Business Managers.

Sample frames were to be selected for their level of IS utilisation but it was acknowledged that the questionnaire recipients and interviewees were also to be selected opportunistically to a certain extent as their organisations had an association with the University and were originally identified via the placement student and were available and willing to participate in an interview. This 'opportunistic' approach was advocated by Buchanan et al. (1988), who point out that "fieldwork is permeated with the conflict between what is theoretically desirable on the one hand and what is practically possible on the other".

Sampling and access are not separate issues, but intimately related. Without access there is no sample: "access is a pre-requisite; a pre-condition for research to be conducted" (Burgess 1984). The sampling approach used was not, therefore, in the quantitative tradition, neither was it wholly representative of Glaser and Strauss's (1967) *theoretical sampling*. It is probably fair to state that like other aspects of grounded theory, their particular view of the sampling process is probably cited far more frequently than it is used (Bryman 1988).

Although devising a sampling strategy and gaining access are vital if data are to be collected, a feature of the qualitative interview stage is that data collection and analysis are not clearly delineated stages; nor is analysis easily distinguishable from interpretation. Easterby-Smith et al.'s (1991) analysis stages, originating in Glaser and Strauss's (1967) approach, are useful, but as the study commenced with the IS derived sustainability conceptual framework, it

could not be wholly inductive. After all, the questionnaires were instruments aimed at testing the factors hypothesised to affect sustainability.

The interviews following the questionnaire distribution were to be semi-structured, being loosely based on the survey instrument and the respondent's comments. Interviewees were to be encouraged to discuss their opinions (Moore 1983), a technique deemed suitable in exploratory research where understanding increases incrementally. An interview can be informed by preceding interviews, so that questions and discussion topics can be revised. This was designed as the IS Manager named the appropriate Business Manager and therefore a respondent's opinion could be sought on the previous respondents' ideas and on the researcher's emerging thoughts. This incremental approach has elements of Grounded Theory's constant comparative method (Glaser and Strauss 1967). In addition of course, both interviewer and interviewee can seek clarification.

Descriptive questions were to be asked initially, such as a discussion on the nature of the business, number of IS employees or organisational structure to facilitate interviewer understanding of the organisation and to put the interviewee at ease (Spradley 1979, cited in May 1993).

Each item was to be preceded by a final check that the interviewee was giving his or her informed consent and understood the style of interview. Again, confidentiality and anonymity were to be stressed. Patton's (1980) suggested selective transcription was rejected as it was felt that it can be difficult to know what could be safely omitted, and once transcription has occurred, the researcher will usually find it easier to treat the transcription, rather than the recording, as the original data. Even interviewee rambling may have significance (Measor 1985 cited in Bryman 1988). Following transcription, a further letter was sent to interviewees thanking them for their time and hoping that, if necessary, they could be contacted again.

Chapter 3

Literature Search

Introduction

This chapter focuses upon four areas:

Strategic Information Systems Planning (SISP)

Sustainability

Evaluation and justification

Factors for successful SIS implementation

The literature identifies a consistent lack of success by organisations in achieving business benefits from their IS investments and in particular the difficulties of obtaining a sustained competitive advantage over rivals (see Earl 1989, Roach 1991, Clemons and Row 1991, Galliers, Merali and Spearing 1994, Powell 1996, Powell and Dent-Micallef 1997). There is no evidence in the literature that this record has improved as organisations increasingly rely on Strategic Information Systems to support their business strategy. This situation is not acceptable for organisations, particularly considering the strategic nature of the potential benefits and therefore their criticality for future business success. The chapter concludes by dismissing many of the traditional techniques for evaluating and justifying IS investments and finally discusses the important factors when implementing large scale IS.

3.1 Planning Literature

3.1.1 The importance of planning

IS planning is the process of identifying the computer based applications that will assist an organisation in executing its business plans and realising its business goals (Lederer and Sethi 1988). IS planning focuses upon the sequencing and implementation of IS applications, as well as the investigation of existing and proposed IS applications (Sambamurthy et al. 1994). The plans must be rigid enough to allow for large projects but also flexible in order to adjust to environmental change (Lederer and Mendelow 1993). McBride (1998) emphasises the dynamic nature of organisations and the need for strategies which adapt. He defines IS planning as the “continuous review of computer technology, applications and management structure to ensure that the current and anticipated information and process needs of the organisation are met in a way that provides an acceptable return on investment, is sensitive to the dynamic politics and culture of the organisation and is aware of the sociological environment within which the organisation exists” (McBride 1998).

Surveys throughout the 1980's consistently identified improved IS strategic planning as a major concern for both user and IS management (Brancheau and Wetherbe (1987), Galliers (1987)). This issue appeared consistently when IS and non IS executives were surveyed (Earl (1989), Galliers, Merali and Spearing (1994)). In the 1990's this issue has generally fallen in priority. It nevertheless remains among the main IS issues facing organisations (Niederman et al. (1991)) and is expected to remain important throughout the 1990's and beyond (Galliers, Merali and Spearing (1994)).

The high failure rate of IS applications in business is deemed to be largely of a managerial rather than a technical causation. Long (1987) found that 90 per cent of the failures in office applications were due to organisational problems (poor planning, poor management, lack of training) and only 10 per cent due to technical difficulty. Kearney (1990), reports that following a study of 400 British and Irish companies, only 11 per cent had been successful in their IS applications when based upon criteria of scope of applications and benefits achieved, project completion on time and return on investment. Even more startling was the fact that the survey used a self-selected set of respondents to a mailed questionnaire

which was presumably returned by the more competent and, in their own estimation, effective companies. Morley (1991) claimed that more than a quarter of the UK's major IS projects greatly exceeded budget and were well behind schedule. Seventy percent of companies state that Management Information Systems lead to confusion by generating information overload (Business Week, 1989) and Booz, Allen and Hamilton (1989) found that IS seldom leads to sustainable competitive advantage beyond market norms.

Roach (1991) states that up to 1990 despite the huge IS investments, over 85 percent of which were in service industries, both profits and productivity stagnated. In the US by 1990, a decade in which U.S. firms invested over a trillion dollars in information technology, productivity rose at an average annual rate of 1 percent, compared with nearly 5 percent in Japan. This 'productivity paradox' spurred many to conclude that overinvestment in IS had contributed to the problem (Gleckman et al. 1993).

In addition, in a retrospective examination of 30 well-known companies from the 1970s and early 1980s, Kettinger et al. (1994) found that, within 5 years of IS implementation, 21 of the 30 firms had experienced competitive declines either in market share, profits, or both. In a study involving 31 IS executives, Mahmood and Soon (1991) concluded that, in most industries, IS had no discernible impact on entry barriers, but in those industries where there was an impact they tended toward reducing, not increasing, entry barriers. In a study connecting technology policy and strategy, Zahra and Covin (1993) found no direct technology-performance connection. Neo's (1988) work on fourteen classic IS derived examples found that those companies that were most likely to develop advantages from their developments were those that had already formed an infrastructure of IS experience and learning by implementing the same types of systems in the past. This was deemed to be far more important than the technologies themselves. Powell and Dent-Micallef (1997) in a study on the US Retail industry found few examples of IS derived competitive advantage and none from technology alone.

Much of this work concentrates on competition but many including Galliers (1993), Kanter (1994) and Burton (1995) emphasise that IS for collaborative advantage should not be overlooked.

The Kobler Unit found that although the majority of companies saw IS investments as being a normal capital expenditure from which a positive return is expected, 84% of companies are investing in IS without using satisfactory methods to calculate either the true costs or the true benefits of that investment (Hochstrasser and Griffiths, 1991). Morley et al. (1995) found that over 70% of IS projects fail in terms of bottom line improvements due to poor planning and poor management.

According to Quinn and Baily (1994), IS investments, far from yielding an overnight success need a certain level of investment and time for benefits to be achieved. They also state that productivity measures ignore what would have happened without IS investments - productivity gains might have been even lower in the 1980s, and entire industries would not have existed. In addition they have demonstrated that productivity benefits disguise themselves passing from services to manufacturing. Although only one example, Quinn and Baily (1994) conducted further research into McKesson, one of the classic sustainability cases frequently quoted (for example Cronin et al. (1988), Sabherwal and King (1991)) and found that its profits declined from seven percent to three percent since implementing large scale IS whilst margins improved for the drug manufacturers and pharmacists.

IS developments have been difficult to analyse in terms of ROI or on any other accounting basis and many views have been expressed on the subject, for example:

“there is little doubt that IT has improved the performance of the service sector significantly, although macroeconomic measures of productivity may not reflect the improvement”.

Quinn and Baily (1994) p.31

The literature shows that IS planning, in some form, is common in many organisations. Galliers (1987), showed that IS planning was practised regularly by at least 60% of organisations and that 24%, while not regularly practitioners, were occasional users. Flynn and Goleneiwska (1993) found that 11% of organisations did not employ any planning technique. They found that 33% used one of the common methods described in the literature and 56% used an 'in

house' approach. Most of these approaches, however, were not focused on the strategic issues facing the organisation; they emphasised short term thinking and technical solutions. Galliers found, that while IS planning was common, the actual approach was usually based on a once a year exercise linked closely to the organisations budgeting exercise. The planning approach was initiated and led by the IS function rather than the business.

3.1.2 Problems with planning

3.1.2.1 Improved relations between IS and the business

The literature identifies, as a high priority, the need to improve the communications and relations between IS and the business, at the planning stage (Baets 1992, Burn 1993, Dutta and Doz 1995, Sillince and Frost 1995). Galliers (1987) and Galliers, Merali and Spearing (1994) called for improvements in the understanding by IS of the main processes driving the business. They also call for a greater understanding and commitment from the business management towards IS. Galliers argues that the planning of IS should be viewed as a corporate rather than an IS responsibility; planning therefore requires a close working relationship and understanding of both IS and the business, at senior management levels.

3.1.2.2 Commitment and involvement of senior management

The issue most commonly identified in the literature is the relative lack of active involvement from senior business management in the planning phase. Galliers (1987), Wilson (1989), Flynn and Goleneiwska (1993) confirmed that the commitment and active involvement of the top management were the two main factors in the achievement of success with strategic IS planning. Conversely they found a lack of top management involvement and commitment were significant pitfalls in the planning process. Lederer and Sethi (1988) found that over 50% of respondents rated difficulty in securing top management commitment to implementation as an extreme or major problem. The next most severe problem, cited by 46% of respondents, identified that projects required more detail after planning. Lederer and Sethi's findings are summarised in table 3.1.

**Table 3.1 Major barriers to IS strategy implementation
Lederer and Sethi (1988)**

Problem	% Responding that it was an extreme or major problem (A)	% Responding that it was a minor problem (B)	Total % of any degree of problem (A + B)
Difficulty to secure top management commitment to implementation	52	16	68
Plans require further analysis	46	31	77
IS strategy ignores implementation issues	33	18	51
Difficult to obtain top management approval	32	36	68
No training for IS Department	30	29	59
No financial plan for IS Dept	29	28	57
No priority for developing databases	27	26	53
No overall data architecture	27	22	49
No data Comms plan	22	38	60
No prioritisation scheme	22	19	41
No hardware plan	20	36	56
Resulting plans inflexible	20	18	38

Lederer and Mendelow (1987) reported the results of 20 3-hour interviews with senior IS managers. Their analysis provided more detail on the specific issues relating to the lack of management involvement. Table 3.2 summarises the top management issues.

Table 3.2 Top management issues – Lederer and Mendelow (1988)	
Reason	Number of respondents
Top management lacks awareness	6
Top management view IS as operational	6
Top management perceive credibility gap	5
Top management view IS as non strategic	4
Top management demand financial case	3
Top management action oriented	2

Grindley (1991) describes these top management issues in terms of the existence of a culture gap between IS and the business. Grindley reports that 56% of IS Directors believe that the culture gap is losing or delaying IS opportunities for their organisation to achieve competitive gain. Earl (1990) identified those factors most associated with success in planning Strategic Information Systems. Top management involvement and commitment were the two highest ranked success factors. These were followed by the availability of an appropriate business strategy.

Table 3.3 Planning success factors - Earl (1990)				
Rank	Success Factor	Responses	Mean	
1	Top management involvement	42	2.3	
2	Top management support	34	2.2	
3	Business strategy available	26	1.6	
4	Business before technology	23	1.4	
5	Good IS management	17		

Much of the empirical research into organisations' experiences with IS planning identifies the critical role of top management both in terms of their support and their active involvement.

3.1.3 Planning approaches

Earl (1990) provided some evidence of the wider issues involved in the success of IS planning. Earl conducted a 2 stage survey of large UK Companies. All the companies studied had experience of Strategic IS Planning (SISP). The objective was to examine the factors contributing to success or failure of SISP. The firms examined were asked to evaluate their relative success in SISP. The results were: 9.5% highly successful, 58.7% successful and 28.6% felt the experience was better than not doing it. This result again suggests a high degree of satisfaction with the planning that has been undertaken in their organisations.

The firms were also asked to identify areas where their experiences had been unsuccessful. The most common factors were: resource constraints, lack of implementation of the planned strategy, lack of top management commitment, length of time involved and poor user IS relations.

Earl classified the issues into three broad groupings: Firstly, implementation issues concerned with the lack of implementation of the strategy; secondly, process issues concerned with management acceptance, poor user relations, and non participation by line management; thirdly, issues concerned with method, a lack of strategic thinking, excessive internal focus and ineffective resource allocation methods. For Earl, method, process and implementation are all necessary conditions for success in SISP. Earl argued that it was not possible, or indeed constructive, to identify one area for particular attention. There were issues across implementation, process and method that effect the degree of success. He asserts that the interaction of method, process and implementation are necessary conditions for success in SISP. Earl's (1990) study suggests that while planning itself may be important, there are other issues that must also be considered when examining the identification and implementation of Strategic Information Systems especially when considering the potential for sustained competitive gains. This supports the holistic lifecycle research approach discussed earlier.

Earl defined five SISP approaches :

(i) 'Business led' approaches: They emphasised the business driving the technology decisions. This was seen as a simple matter whereby the business

plans/strategies were analysed to identify where Information Systems were most required. The resulting IS strategic plan was presented to the board for approval and priority setting.

(ii) 'Method driven' approaches: They were initiated by the IS function using a process, often applied by external consultants, the IS function did not believe that senior business management would think about IS opportunities or requirements without a formal process to guide them.

(iii) 'Administrative' approaches: They emphasised resource planning. Typically, IS proposals were submitted by business units or departments. Steering committees examined the viability and resource consequences of all proposals. The outcome was a portfolio of approved projects, usually identified in a bottom up manner.

(iv) 'Technological' approaches: They emphasised deriving overall architectures or blue-prints for IS. They were concerned with technology issues rather than business strategy issues.

(v) 'Organisational' approaches: These approaches concentrated on 1 or 2 themes growing in scope over several years as the organisation appreciates the potential benefits. The approach emphasised the assignment of multi disciplinary teams of senior executives to address business problems from which major IS initiatives may emerge.

Earl's conclusion was the 'Organisational' planning approach was the least likely to fail, with the 'Business led' approach second in the ranking. He found that the 'Method driven' approach was the most unsuccessful for identifying Strategic Information Systems. For Earl, the thematic, emergent, interactive characteristics of the 'Organisational' approach were most likely to lead to successful Strategic IS. Table 3.4 defines the 'Organisational' approach and compares it with the other common planning approaches identified by Earl. Table 3.5 compares the strengths and weaknesses of the approaches identified by Earl.

Whilst the 'Organisational' approach was the most likely to lead to success, the 'Business led' approach could also be successful. Earl found that because the

'business led' approach attempted to be driven by the business the most obvious business based necessities in terms of IS were actioned. Also the 'Administrative' approach, because of the high level of user involvement could on occasions lead to the identification of Strategic Information Systems.

Earl's research recognises that issues with Strategic Information Systems occur across method, process and implementation. He claims that much of the existing research focuses only on the specific issues with respect to planning. While Earl examined method, process and implementation issues he does not deal with them in detail. Earl only provides indications as to where potential issues may occur without rigorously analysing them.

3.1.4 Planning Frameworks

This section examines the various frameworks and tools detailed in the literature, and examines their appropriateness towards achieving a level of consistency between IS and Business strategy. As issues in Strategic Information Systems are complex and dynamic (Earl 1990, Stacey 1994, 1996, Levy 1994, McBride 1998), a structure is needed to analyse them; the various planning frameworks available provide this structure. They assist organisations in understanding and classifying the relationship between business strategy and information technology.

Most frameworks assess the impact of IS or search for Strategic Information Systems opportunities. Frameworks reorient the thinking and raise awareness of the IS strategy relationship.

3.4 SISP Approaches (Earl 1990)

	Business Led	Method Driven	Administrative	Technological	Organisation
Emphasis	The Business	Technique	Resources	Model	Learning
Basis	Business Support	Best Method	Procedure	Rigour	Process
Ends	Plan	Strategy	Portfolio	Architectures	Themes
Methods	Ours	Best	None	One way	Anyway
Nature	Responsive	Top Down	Bottom Up	Blueprints	Iterative
Influencer	IS Planner	Consultants	Committees	Method	Teams
Relation to Business Strategy	Fix Points	Demo	Criteria	Objectives	Look at business
Priorities	Board	Rational analysis	Central Committee	Compromise	Emerge
IS Role	Driver	Initiator	Bureaucrat	Architect	Team Member
Metaphor	Common Sense	It's good for you	Survival of the fittest	We nearly aborted it	Partnership

Table 3.5 SISP Approaches : Strengths and Weaknesses (Earl 1990)

	Business Led	Method Driven	Administrative	Technological	Organisational
Strengths	Simple	Method	System Viability	Rigor	Becomes Normal
	Business First	Plug Strategy Gap	System Synergies	Infrastructure	Implementation
	Raises IS Status	Raises Strategy Profile	User Input	Integration	IS user partnership
Weaknesses	Ad hoc method	User Involvement	Non strategic	Management Support	Regeneration
	Management Commitment	(Method)	Bureaucratic	Potential Implementations	Soft Methodology
	(Business Strategy	Follow-up	Resource Constrained	Complexity	Architecture

3.1.4.1 Awareness (or foundation) frameworks

Most of the frameworks in this category are based either explicitly or implicitly on the work by Porter (1980). Porter maintained that in every industry, competition depends on the collective strength of five basic forces: potential substitutes, potential new entrants, the influence of buyers, the influence of suppliers and the intensity of the rivalry in the industry. Benjamin et al. (1984), Parson (1983), Porter and Millar (1985), and Cash and Konsynski (1985) all provide awareness models that are variations on the work by Porter.

As models, they are helpful in increasing senior management awareness and understanding but tend to be less useful in searching for and identifying strategic uses for IS. They can be used as tools to persuade senior management of the strategic nature of IS rather than guide them in the identification of specific strategic opportunities. Awareness frameworks provide an appreciation and understanding of the strategic potential and impact of IS. They are more conceptual in nature and hint at strategic possibilities of IS. They can change the thinking of the firm's senior management concerning the potential impact of IS. These frameworks are not detailed enough to provide a detailed strategic plan but may be useful in the planning process. The techniques of themselves do not provide sufficient detail for subsequent implementation.

3.1.4.2 Positioning frameworks

In a growing organisation the demand for new and improved systems to cope with increasing operations, may prevent it ever being able to address the decision-making and planning activities. Models are therefore required to enable organisations to develop systems with higher value-adding potential. Nolan (1979) provides a six stage maturity model based on actual use of IS by large US companies. The framework from initiation to maturity allows an organisation to identify its current position and then plan what is required to move forward to the next. Nolan's work has been heavily criticised for being too simplistic and that while the stages are discrete in the model, in reality organisations have to address many of them at the same time. It is now accepted that while many businesses have attempted all six stages, they have not only failed to reach maturity but have often failed to break out of the demand-led development cycle. A further problem, when using the model as a prescriptive tool was that, being based on actual experience, it echoed what organisations had been doing in

systems development. Since most of them had been attempting to develop systems following a flawed framework, the model was simply a reflection of mistakes that they had made.

Wiseman (1985) criticised the attention given to operational systems (traditional DP) and MIS to the detriment of progression to the third era, namely SIS, aimed at improving competitiveness by changing the way organisations conduct their business. Wiseman developed his 'Extended Application Portfolio Model' which combines the functions and objectives of applications systems on one matrix. Here SIS are described as not being intrinsically different in function to MIS or DP; it is their impact on the business that is different. Also SIS put considerable stress on DP and MIS and may be inhibited by these types of system. This model must be extended to include the impact of Expert and Image-Based systems.

Newer classifications of systems suggest that:

- organisations should have information systems to support the six stages of the information lifecycle.**
- development should take into account the value-adding potential of each of the stages.**
- there should be increasing consideration of IS that can improve the way the organisation competes.**

In acknowledgement of the need to support existing DP and MIS applications whilst progressively moving into the SIS era, McFarlan (1984) proposed his 'applications portfolio management matrix'. It is concerned with four categories of system (Strategic, Turn-around, Factory and Support) and with the need to balance the applications mix so that efforts can be directed into obtaining maximum overall business leverage through its IS. Organisations attempt to balance the potential high return systems with the solid, if unspectacular, supporting systems.

3.1.4.3 Opportunity frameworks

McFarlan's (1984) framework does not offer a great deal of help in identifying the types of application that may have a strategic significance. Beside IS enabling organisations to perform business 'better' e.g. at lower cost, the work of Ward et al. (1990), who built upon other commentators' research, including Porter's, studied 150 systems that 'claimed' strategic success and arrived at the following classification:

A - those that linked the organisation via technology-based systems to its customers or suppliers. Beside well documented cases (Ford, Nissan, American Hospital Supplies etc.) this could also include jumping parts of the value system itself e.g. using IS to remove the need for middlemen in the transformation of raw materials through production to finished product (e.g. Directline Insurance).

B - those that produce more effective integration of the use of information in the organisation's value adding process

C - those that enable the organisation to develop, produce, market and deliver new or enhanced products or services based on information

D - those that provide executive management with information to support the development and implementation of strategy

A, B & C support Porter's conditions for SIS with D being an additional type of system that aids strategic planning.

We must add to this classification two more types :

E - those systems which allow an organisation to redesign its structure and practices leading to substantially increased flexibility and/or capability (Scott-Morton 1991).

F - those systems that allow synergy between functions in the organisation e.g. gains that can be derived from IS in manufacturing and distribution (computerised delivery notes bar coded in manufacture or software

manufacturers updating software versions on customers machines remotely via satellite). These gains could not occur if the responsibility for these functions were in the hands of third parties.

By specifically addressing these 6 types of system, an organisation stands the best chance of developing systems which could genuinely be called SIS.

The consequence of any SIS would be a new competitive edge which would be maintained until either:

*** the market and/or industry of an organisation's circumstances changed or**

*** the competitive edge is eroded as rivals 'catch up'**

The above so-called 'opportunity frameworks' are analytical tools that lead to firm-specific strategic IS opportunities. They are particularly good at clarifying business strategy issues as they are based on analysis of their business and business plans. Positioning frameworks such as McFarlan's (1984) Grid or Nolan's (1979) Stages of Growth model do not assist in the identification of IS opportunities but do provide a tool for assessing the contribution of any opportunity and how they should be managed for maximum value. Sullivan's (1985) model is another example where he investigated the planning experiences of 37 major US organisations to identify the factors that correlated with planning success.

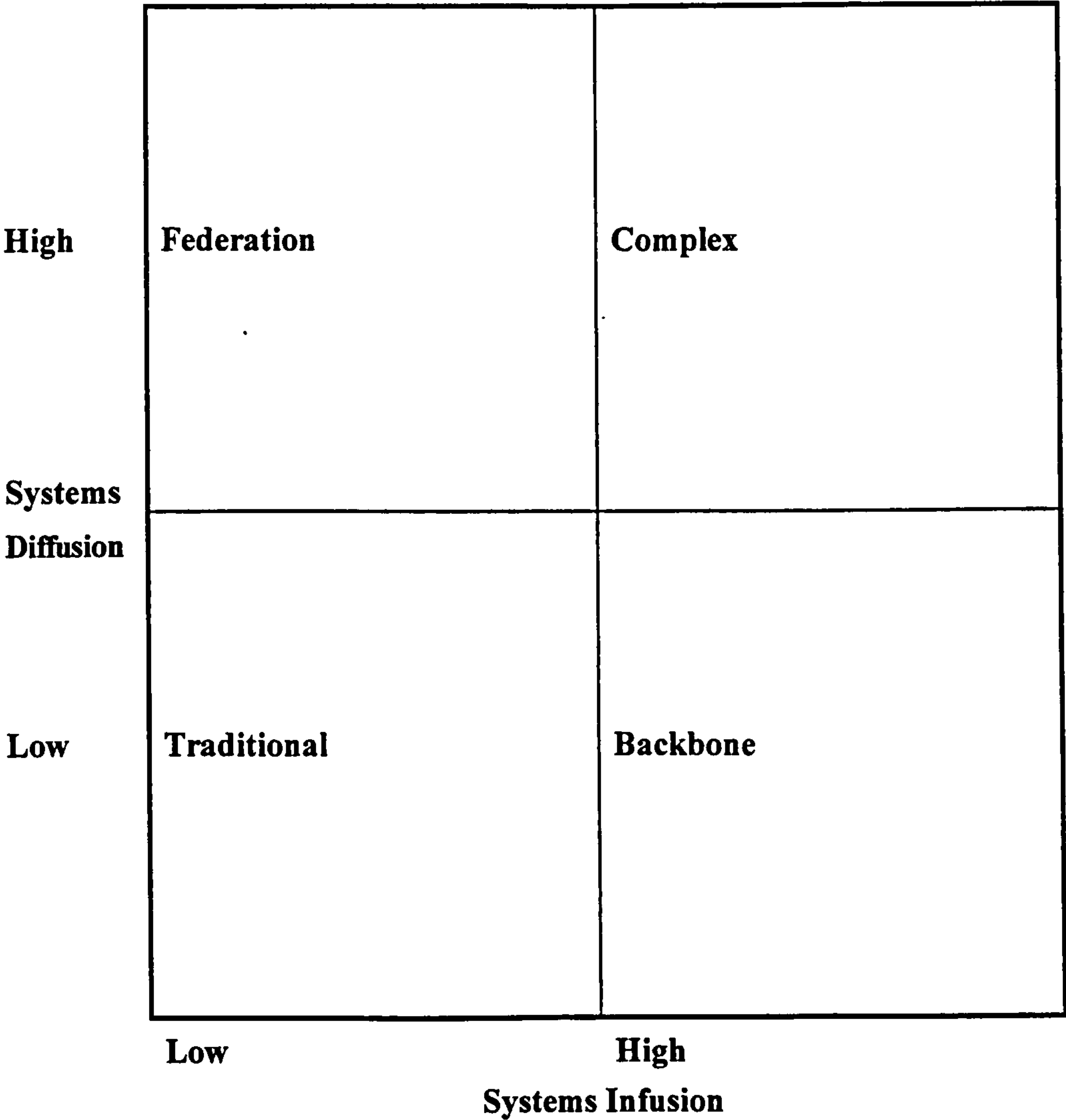
The two main factors identified by Sullivan, which determine the position of any organisation within his model (fig. 3.1) were the degree of systems dispersion (Diffusion) and the degree of impact of systems (Infusion):

i. Diffusion: This factor was defined as the extent of the deployment of IS throughout the organisation. The deployment refers to the extent of the physical deployment of IS and the extent of any devolution of the control and responsibility of the management and decision making aspect of IS throughout the organisation.

ii. Infusion: This factor was defined as the degree of impact that the organisation perceived that IS systems have on the business. A low level of

infusion was defined as one where the impact of IS was of a tactical nature. A high level of infusion was defined as one where the impact of IS was of strategic significance. IS was important to the organisations' achievement of its business objectives and therefore the organisation was dependent on IS for its ultimate success.

Fig. 3.1



Technology Environments - Sullivan (1985)

Sullivan (1985) identified and described four IS planning environments for organisations: Traditional, Backbone, Federation and Complex:

(i) The traditional environment: The traditional environment has a centralised IS support structure providing basic financial and administrative IS system and services to the organisation. The emphasis is on the functional operation of systems that deliver a narrow range of cost reduction and administrative efficiency benefits to the organisation. There is little regard for the value of IS in the business and its status is that of a support function. Management interest in IS is low and has a limited role in the organisation.

(ii) The Backbone environment: This environment is characterised by an increasing awareness from management of the importance of IS to the achievement of the organisation's business objectives. The IS emphasis progresses from implementing systems which aim to achieve efficiency benefits primarily through cost reduction and cost displacement to systems aimed at achieving effectiveness benefits by improving the business processes. Although this environment has a high level of awareness of the impact of IS in the organisation, the organisation has still in place a centralised technical and management structure for IS. Decisions and responsibility are still made centrally often under the control of a large 'monopoly' based IS function.

(iii) The Federal environment: In this environment business users and business management perform an increasingly important role in the IS control and decision making process for business users and business management. This manifests itself in the business making decisions concerning their IS requirements outside the normal IS control processes that may be in place. The perception of IS remains as a support function. The majority of the investments in this environment will be of the limited and traditional variety.

(ix) The Complex environment: This environment is characterised by a high degree of development of both the physical and organisational aspects of IS into the business. IS increasingly comes into the control of the individual business units or business divisions. The perception of IS is that it is now a strategic resource and is critical to the organisation achieving its business objectives. This environment requires the organisation to manage and solve all the many issues relating to both the 'Federation' and 'Backbone' environments, i.e. managing IS as a strategic resource in an environment where IS is physically and managerially devolved throughout the organisation.

The essential point of Sullivan's research was to examine the appropriateness of different planning approaches as applied to each of the quadrants. Sullivan defined eclectic approaches as the most suitable for the complex environment. No one planning approach is best suited to organisations in the complex environment. Organisations are recommended to employ a combination of approaches to deal with the wide range of planning issues and scenarios facing them. Sullivan argues that there are a number of issues which organisations face when they are operating in the Complex environment:

(i) Approaches used to plan in the past are no longer appropriate. It is unlikely that any one approach will suit, rather organisations should tailor approaches to suit their particular requirements. Sullivan was particularly concerned with IS planning issues, however the same argument is relevant for phases across the lifecycle of any project.

(ii) The nature of the portfolio of applications changes from a focus on automating existing business activities and functions to identifying value added, strategic applications of IS which have the potential to provide the organisation with a business advantage. As the nature of the application changes so too does the nature of the benefits expected and delivered. Benefits change from predictable, quantifiable, financial based benefits to intangible, less quantifiable benefits which require changes to the business in order to deliver.

The Complex environment and its characteristics, described by Sullivan, is the environment in which Strategic Information Systems are most likely to be identified and implemented by organisations. The backbone environment (also characterised by high levels of infusion) could also be conducive to identifying such systems. While Sullivan provides a useful model and analysis of the issues, the work is limited in that it only deals with the issues from a planning perspective.

Positioning frameworks are tools and techniques which aid the assessment of the strategic importance of IS to the organisation. As such they are approaches which improve the understanding of the senior executive management. They are concerned with the assessing, developing and improving the IS capabilities of the organisation. They are not often employed for identifying specific opportunities,

but are good at setting the scene and preparing the ground for further strategic IS analysis.

3.1.4.4 Multiple frameworks

Earl (1989) and Scott Morton (1991) argued that no single method provides the full answer. Earl suggests a multiple approach to IS planning. Earl (1990) found that firms over time use a number of planning techniques, this seemed to support his multiple method approach. The likelihood of any one particular approach being predominant depends, according to Earl, on the nature of the organisation and its industry at a particular point in time. In general no one technique is necessarily better than any other. Each framework has its place depending on the preference of the particular managers, the culture and experience of the organisation and the industry dynamics faced by the firm.

3.1.5 Business turbulence

Without appropriate planning, organisations may fail to realise the anticipated benefits of their IS investments (Clemons and Weber 1990). Work by Lederer and Mendelow (1990) demonstrated that excessive delays in the execution of IS investments resulted from poor planning, changes in business direction and changes in IS project priorities. Organisations function within a dynamic business environment where there is frequently environmental turbulence. These unpredictable environmental changes can radically impact IS strategy planning (Ein-Dor and Segev (1978), Pyburn (1983), Vitale et al. (1986), Bergeron et al (1991), Earl (1993), Stacey (1993), (1996)). A firm's abilities to plan its IS strategies adequately, choose the most appropriate IS and successfully implement systems are important particularly in rapidly changing business environments. Whilst comprehensive IS planning (i.e. adherence to most or many prescriptions) has been demonstrated to have merit (Lederer and Sethi 1988), Fredrickson (1984) and Fredrickson and Mitchell (1984) suggested that less rigorous IS planning was advantageous in turbulent environments. Change occurs so frequently that plans become obsolete before they can be followed (Lederer and Mendelow 1990). Vitale et al. (1986) found the planning process susceptible to wasted efforts, low morale and misdirected investments. Recent work by Salmela et al. (1997) contradicted Pyburn's (1983) findings that in turbulent business environments the more meticulous and comprehensive the IS planning was, the

more likely it would enable the organisation to be flexible and engage the support of those involved.

3.1.6 Emphasis on Collaboration

The collaborationist school of thought (exemplified by Kanter (1994), Dowling et al. (1994), Peters (1992), Swatmann (1993) and Webster (1993)) emphasises the positive role of co-operative arrangements between industry participants. Burton (1995) highlights the need for a composite strategy recommending a blending of competitive and collaborative strategies so that they are mutually consistent and reinforcing to optimise the firm's overall position. Although not explicitly directed towards IS, Burton (1995) offers the 'Five Sources' model of collaborative strategy as a complementary model to Porter's (1980) work.

3.1.7 Strategic Orientation

Many academics have stated that businesses could gain performance improvements on the bases of their strategic orientation (Child 1972, Miles and Snow 1978, McGee and Thomas 1986). Those businesses that have been internally oriented are typically pursuing a low cost strategy (efficiency), produce known outputs and are unwilling to experiment with new product developments have been labelled defenders or nonadaptive (McDaniel and Kolari 1987, McKee et al. 1989, Miles and Snow 1978, Wright et al. 1991). Prospectors or adaptive companies focus externally on new products and marketing effort. Analysers have both internal and external focus and Wright et al. (1995) found (using both accounting measures and risk analysis as measures of competitive advantage) that only *analysers* yielded competitive gains whilst the *defenders* and *prospectors* did not.

Summary of the literature on planning

UK and US surveys identify strategic IS planning as the dominant issue which consistently concerns IS and non-IS executives alike. This issues has been identified in most studies throughout the 1980's and 1990's. Any model,

therefore, which aims to examine an holistic view of Strategic Information Systems must incorporate and analyse the particular planning approaches adopted by organisations.

Studies have shown a degree of satisfaction with the planning phase and a high degree of acceptance of the need for IS Planning. Organisations are also able to articulate benefits from undertaking planning studies. Often the benefits are expressed in qualitative terms e.g. improved user relationships, improved top management understanding and support, improved alignment between IS and business strategy. The research on the success factors for planning have all concluded that the support and commitment of top management is crucial to success. The success factors and pitfalls in planning often seem to be focused on the issues surrounding the role of top management. While this is clearly an important success factor, there are likely to be a range of other factors of importance to the ultimate success of any strategic IS. There is little quantitative research which examines the full range of planning approach issues and examines the relationship between planning and other important lifecycle issues. Research which examines a wider range of potential planning issues will add to the available body of knowledge on the topic.

The most significant empirical research on the topic was undertaken by Earl (1990). Earl concluded that many of the approaches used for planning Strategic IS were not wholly appropriate for identifying competitive advantage applications. Earl concluded that the 'Organisational' and 'Business led' approaches were most likely to be successful in identifying Strategic IS. Earl provides a high level definition of the factors which define the planning options available to organisations, which could form the base model of a planning approach as part of the research model.

Earl also concluded that an emphasis on planning methods addresses only part of the issue (much of the research on planning addresses method issues), process and implementation must also be addressed. This is an important conclusion with respect to this research as it supports the view that a more holistic approach, addressing a wider range of factors other than planning is a legitimate approach to the study of Strategic IS success and in particular those that lead to a sustained competitive advantage. However Earl does not deal rigorously with these other issues, nor with the issues of environmental turbulence and calls for

further research in the area. Earl's analysis of process and implementation issues was very much after the fact and resulted from subsequent analysis of the data gathered, rather than part of the original research study. There has also more recently been a growing emphasis on the value of collaborative strategic networks and business alliances and the contemporary view offered is that the achievement of a sustainable competitive advantage over other players does not exclusively lie within the execution of a purely competitive strategy.

3.2 Sustainability

3.2.1 Distinction

There has been much debate as to what distinguishes sustainability from ephemeral IS derived advantage. Clemons and Kimbrough (1987) differentiate between strategic necessity and sustained competitive advantage (see glossary). IS that is a strategic necessity must be present for an organisation to operate effectively (e.g. UK supermarket chains), but it can lead to damaging effects on the industry. IS purchased by all firms in an industry in order to lower production costs may well result in higher profits for all providing prices can be maintained and all firms purchase similar technology. On the other hand, when it is necessary for all competitors to purchase technology equal savings can be obtained by all which may lead to a price war. Smaller margins occur, with the benefit being passed to the customers but the industry might well wish that IS had never being introduced (Cragg and Finlay 1991). This was indeed the situation encountered by Sager (1988) who found that no Australian retail bank had detected any advantage after massive IS spending - all gains were passed to the consumers. Beinhocker (1997) describes companies being “locked in an arms race from which they obtain no benefit to their profits”.

3.2.2 Ephemeral advantages

Much field work has focused upon the use of IS as a competitive weapon. Cronin et al. (1988) provide a mainly UK study which ranged from Aquaculture and Banking through to Distribution and the Manufacturing industry. This study, like many others, (see Neumann (1994); Eardley et al. (1995)) indicates that an IS competitive advantage is probably only sustainable in the short term. Very often organisations try to gain a competitive edge simply by adopting new technology more quickly than competitors. Clearly this advantage can rarely be maintained for long, unless the cost of acquiring similar technology is prohibitive.

Although competitors will shortly 'catch-up' with the IS, the gain that has been derived might well have caused the organisation to 'jump' ahead in terms of

market share, profitability, reducing costs etc. which could have much more long term benefits.

3.2.3 Factors for sustainability

Keen (1988) investigated the factors affecting sustainability:

1) adaptability of competitors

2) degree of change necessary

3) capabilities of competitors

4) flexibility of competitors

5) quality of IS implemented

Internally focused SIS, internally developed SIS or SIS that are aimed at 'soft' areas (e.g. involving aspects of company culture) will usually prove to be the most sustainable, simply because it is much more difficult for competitors to gain knowledge about the system. Thus SIS types A, D and E of section 3.1.4.3 are likely to create the longer lasting advantages.

However the key to successful searches for SIS is the organisation's ability to think of innovative uses for IS, and this is most likely to be the route to any really sustainable advantages i.e. by out-thinking the competitors. To maintain an IS based competitive edge, organisations must continually look to improve and redesign their SIS applications, or to ensure that there is a constant stream of new SIS's following on behind its existing ones. Lee & Adams (1990) investigated ways in which changes may be sustained for longer periods through 'mobility barriers' but their work added little to previous research in the area.

Cecil and Goldstein (1990) describe three basic reasons why IS in itself is increasingly less likely to deliver sustainable advantage:

1. Market competitors often have comparable knowledge and skills to develop particular applications;

2. The differences in application knowledge and skills is often evened out by vendors;

3. Large scale developments rarely translate into cost advantage.

Zmud and Apple (1988) basing their work on supermarket optical scanning systems distinguish between the *routinisation* of an innovation, defined as the accommodation of an organisation's governance system to the innovation, and its *institutionalisation*, defined as the organisation's achievement of higher levels of use and benefits from the innovation. Routinisation being necessary for institutionalisation, but institutionalisation is not certain to occur when an innovation is routinised.

Clemons and Row (1991) discuss how IS innovators can defend the economic value of their development :

1. barriers to duplication via patents, trade secrets, government legislation, monopoly situation or lack of technical expertise (not common with IS)

2. high financial or emotional switching costs, helped by being the 'first-mover'- examples include AHS and AA's SABRE reservation system (Vitale 1986)

3. that the innovation changes the underlying industry characteristics (e.g. customer preferences or the IS used in the industry) that influence costs to favour the innovator

They further claim that one of the best ways to achieve sustainable competitive advantage is when IS leverages differences in an organisation's strategic resources and that this underlies all 3 of the above factors to a greater or lesser extent. As these resources are unique to that firm then it will be difficult and expensive for another to copy and obtain similar benefit from the IS innovation. IS can change the value of key resources by reducing the cost of integrating and co-ordinating economic activities. This increases the potential production economies (e.g. scale, scope and specialisation) that can be exploited.

The way IS aids unstructured activities (see glossary) may lead to a more sustainable advantage as these situations are unique, and organisation specific which makes them difficult to copy (Cragg and Finlay 1991). It is the use of the information that is clearly important here and not the Information Technology itself. Computerising the routine structured tasks of order processing and stock control will never lead to a sustained gain as rivals have access to similar technology and skills.

It is important to reiterate that the unique, company specific synergy situations will be difficult for rivals to duplicate as they will not have access to the same diverse resources.

Mata et al. (1995) examined a range of factors and concluded that only IS management skills were likely to be the source of sustained competitive advantage. These skills were identified as the ability to understand and appreciate business needs; their ability to work with functional managers; ability to co-ordinate IS activities in ways that support other functional managers and ability to anticipate future needs. They recommended that organisations should focus less upon IS and more on the process of organising and managing IS within a firm. Dvorak et al. (1997) supports this view and stated that the distinguishing feature as to what separates organisations that achieved a sustained competitive advantage from those that do not is not technical superiority but the way they handle their IS activities.

Stata's (1989) viewpoint on sustainability is worth remembering. He stated that:

"the ability to learn faster than competitors may be the only truly sustainable competitive advantage".

3.2.4 Characteristics of Companies Achieving Advantage

The types of organisations that can benefit from SIS depends upon the impact that information has on its industry and the way it conducts its business. Apart from the early models presented which are useful tools, Broadbent (1991)

suggests 8 features present in companies which had already achieved some information-based advantage over their competitors:

- 1) a strong, well established but flexible planning approach, which involved staff at all levels**
- 2) strategic processes which are well documented and identify implementation stages, strategies and responsibilities**
- 3) a reasonable degree of consensus amongst senior business and IS managers concerning the organisation's major information problems**
- 4) a concern for information content and commitment to meeting management information needs**
- 5) alignment of information systems with the organisational infrastructure and decision-making process**
- 6) maximum interaction between business and IS personnel and managers**
- 7) IS literate business managers**
- 8) business literate IS staff and managers**

This reinforces some of the points made earlier:

- that information is a key resource and as such should be the concern of business and IS managers alike**
- that IS and organisational structures and practices must work together to provide the best internal environment for external survival**
- that IS must be part of the business planning process**

3.2.5 Resource-based theory

Many authors have promoted the contributions offered by resource-based theory (Rumelt, 1987; Teece, 1987; Barney, 1991) and some go as far as stating that it is a potential integrating paradigm for strategy research (Mahoney and Pandian, 1992; Peteraf, 1993). Resource-based theory is based on the premise of heterogeneous resource portfolios-whether by history, accident or design. According to Peteraf, (1993), this resource heterogeneity is responsible for observed variability in financial returns across firms. However, firms that manage to achieve sustained performance advantages by accumulating resource portfolios that produce economic value, are relatively scarce, and can sustain competitive attempts at imitation, acquisition, or substitution (Barney, 1986a).

Rumelt (1984) states that valuable, scarce resources may survive competitive imitation if protected by imitation barriers or *isolating mechanisms*. He offers the following as a non exhaustive list of such mechanisms :

(a) *time compression economies* - a resource may require accumulation over time through learning, experience, firm-specific knowledge or trained proficiency in a skill;

(b) *historical uniqueness (first-mover advantages)* - some resources are inherently unique or were originally acquired under non replicable conditions, such as a distinctive location, the co-optation of a sole raw material source, or first-mover advantages such as reputation, brand loyalty, or the power to establish industry standards;

(c) *embeddedness of resources* - the value of a resource may be inextricably linked to the presence of another complementary or cospecialized resource

(d) *causal ambiguity* - the connection between a firm's resource portfolio and its performance may be unclear, such as when a firm's success results from cultural or social phenomena too complex for managers to understand or manage (Lieberman and Montgomery, 1988; Dierickx and Cool, 1989; Barney, 1991).

Grant (1991) adds to the debate by stating that there are four characteristics that must be borne in mind when determining whether resources and

capabilities will yield a sustainable competitive advantage : replicability, transferability, transparency and durability.

Traditional strategy research was driven more by IS-oriented strategic planning focused on advantages derived from industry and competitive positioning whereas resource based research has focused on advantages stemming from firm-specific, intangible resources such as organisation culture, learning, and capabilities (Hall, 1993).

Clemons and Row (1991) and Henderson and Venkatraman (1993) conclude that companies must use IS to leverage or exploit firm specific, intangible resources such as organisational leadership, culture, and business processes. Keen (1993) divided resources into Human, Business, and Technology and developed a 'fusion' framework that strongly parallels resource-based theory arguing that the key to IS success lies in the capacity of organisations to fuse IS with latent, difficult-to-imitate, firm-specific advantages embodied in existing Human and Business resources. A variety of alternative resource typologies exist (e.g., Grant, 1991; Barney, 1991; Black and Boal, 1994), but Keen's theory arose primarily in an IS context. Keen (1993 p.17) states that "the wide difference in competitive and economic benefits that companies gain from information technology rests on a management difference and not a technical difference. Some business leaders are somewhat better able to fit the pieces together than others".

The use of *isolating mechanisms* to promote sustainability in the resource-based framework has been explored by Reed and DeFillippi (1990). The idea of isolating mechanisms, at the firm level of analysis has been described as analogous to entry barriers at the industry level, and mobility barriers at the strategic group level (Caves and Ghemawat 1992, McGee and Thomas 1986).

Lippman and Rumelt (1982) ascertained that apart from legislation, isolating mechanisms exist because of the *rich connections between uniqueness and causal ambiguity*. A number of academics, most notably Hall (1992), Itami and Roehl (1987) and Teece (1990) have stated that it is intangible (and therefore often invisible) assets and organisational capabilities that are the most likely to be unique and casually ambiguous.

3.2.6 Organisational Learning

Organisational learning is the process whereby management teams change their shared mental models of their company, their markets and their competitors (DeGeus 1988). Managers sharing mental models could involve what technologies are utilised, the customer segments and functions served (Abell 1980). The core competence of organisational learning involves both the content and the rate of learning. Morgan (1986) surmises that the process of 'learning to learn' requires that organisations keep themselves open to deep and challenging questions rather than trying to develop fixed foundations for action. Nystrom and Starbuck (1984) insist that management must readily accept dissent, interpret events as learning opportunities and view actions as experiments. They state that financial turnarounds often require *cognitive* turnarounds. Information Systems play an important role in organisational learning. Helleloid and Simon (1992) state that effective learning depends upon the acquisition, processing, storage and retrieval of knowledge. The content of knowledge (the *known*) and the process of learning (*knowing*) are fundamentally linked (Dewey and Bentley 1949). The process of knowledge acquisition by an organisation e.g. acquiring knowledge by internal development, merger, acquisition, inter-firm collaboration or open market procurement is intertwined with the content of organisational knowledge. The process of *knowing* influences the *known* and the process by which knowledge is acquired has implications for how an organisation processes, stores and later retrieves knowledge. The appropriate use of Information Systems is critical to this process so that the company can continually upgrade their dynamic organisational capabilities.

The relationship between dynamic organisational capabilities and organisational learning has been explored by Leonard-Barton (1992) who described five key aspects:

- ① focusing upon *employee knowledge* and *skills*. The importance of HRM methods in order to develop employee competencies underpins organisational capabilities (Ulrich and Lake (1991), Barnett and Burgelman (1996)).
- ② utilise emerging *technical systems* (databases, Marketing Information Systems, Expert Systems, Decision Support Systems, Geographical Information Systems etc.) which can accumulate, structure and codify knowledge. This has been termed organisational memory by Walsh and Ungson (1991) which enables a

company to retain knowledge and build on accumulated experience (Boulding 1988). Itami and Numagami (1992) feel that knowledge held by employees together with the technical systems are the most fundamental of the core capabilities of the firm.

③ appropriate *managerial systems* are required for creating and controlling knowledge. This can be achieved through a suitable incentive system. According to Prescott and Visscher (1980, p.446) “*the firm is a storehouse of information and within the [effective] firm incentives are created for the efficient accumulation and use of that information*”.

④ *Systems, structures and individual learning* within an organisation are interconnected. This covers the structure of organisational incentives that enable the evaluation and transmission of skills and knowledge with the firm (Richardson 1990). Grant (1991) states that a major thrust in the connection between resources and competencies is the ability of a firm to achieve co-operation and co-ordination within teams.

⑤ *Values and norms* (culture) are infused through ①, ② and ③ (Barney and Ouchi 1985; Fiol 1991; Leonard-Barton 1992). Norms affect the behavioural and cognitive development that a firm undergoes (Fiol and Lyles 1985).

In support of ① above, Ross et al. (1996) investigated 50 US companies highly regarded for their IS management and found that together with a reusable technology base and strong partnering relationship between IS and business management, human assets were critical. They found that the human asset characteristics that were important were a drive to consistently solve business problems and address opportunities through IS and that these firm-relevant competencies could be accumulated through formal training, on the job experience and focussed leadership.

Levitt and March (1988) summarise organisational learning to be routine-based, history dependent and target oriented and therefore influenced by departures from aspiration levels. Routines, including those underpinned by IS, allow the organisation to “*remember by doing*” (Spender 1989).

Depending on how an IS is used within an organisation and its perceived effects on people, performance and future flexibility, adaptations will be made over time to the system, the organisation or both. At Frito-Lay, for example, the impact of implementing new IS together with the revised IS infrastructure enabled the organisation to move from a once a year planning cycle to a three times a year cycle, dramatically improving the rate of organisational learning (Silver et al. 1995). As can be reasonably be expected, large scale IS developments will involve a period of learning, adjustment and restructuring before the full benefits can be realised.

3.2.7 Flexibility

According to Bahrami (1992) a flexible organisation needs to be able to effect intentional changes, continuously respond to unanticipated changes and be able to adjust to the unexpected consequences of predictable change. In turbulent business environments Knoll and Jarvenpaa (1994) stressed the criticality of organisations in having flexible strategies and in their use of IS.

Many prescriptions have been put forward to enable organisations to do this. Earl (1988), Raghunathon and Raghunathon (1991) and Bergeron et al. (1991) propose the use of multiple analysis methods which including an assessment of the competitive environment. Vitale et al (1986) and Miles and Cameron (1982) have stated that instead of optimising against predefined goals, IS planners should seek satisfactory alignments between the environmental opportunities and the organisation's resources. Many have openly called for the IS planning process to explicitly allow for flexibility in the timing of IS decisions and delays (Boynton and Zmud 1987, Ein-Dor and Segev 1978, Lederer and Salmela 1996). Galliers (1987) and Earl (1988) explore this theme further and discuss the need for IS planners to incorporate a number of alternate "futures" or scenarios rather than to rely on one particular future. IS planning should provide a flexible framework within which implications of changed circumstances can easily be identified and managed. Galliers (1987) and Lederer and Salmela (1996) stress that a constant review of the plans are required, since business objectives and information requirements are temporal in nature.

Summary of the literature on Sustainability

Sustained competitive advantage can be defined as when a firm receives a return on investment that is greater than the industry norm and persists for a long enough period as to alter the nature of industrial competition or the relative strength of the organisation vis a vis its competitors, despite market entry and rivals' attempts at replication.

Adapted from Clemons & Kimbrough (1986) and Porter (1985)

Clemons and Row (1991) discussed the role of complementary resources as a means of exploiting firm specific strengths and producing IS derived advantage. Much has been added by resource-based theory (e.g. Barney 1991) where sustaining a performance edge is based upon the accumulation of valuable resources that are firm specific. Rumelt (1984) discussed the role of 'isolating mechanisms', as a way of preventing imitation of scarce resources. Grant (1991) claims that both the resources and capabilities of an organisation are the primary sources of a firm's profitability and the key to any sustained competitive advantage is to develop a strategy that exploits each firm's unique characteristics to maximum effect.

3.3 Evaluation and Justification Literature

Introduction

Evaluation and justification approaches are the methods, tools and techniques employed by an organisation in order to appraise and justify the investment in an IS opportunity. This section reviews the main literature dealing with the specific issues of the appraisal and justification of IS investments. The limitations of using such approaches are discussed and the recommendation made that in this type of study subjective measures for evaluating IS developments are used.

3.3.1 Common evaluation approaches

Wilcocks (1996) found that the IS spend in the UK in 1995 was £33.6 billion and expected to rise by 8.2%, 7% and 6.2% in subsequent years. Actual spending levels are likely to be higher than those reported as total IS costs (including for example organisational restructuring, staff training and employee time) are unlikely to have been included (Keen 1991). With increasing IS spending levels it is no wonder that surveys have highlighted concerns over IS justification and evaluation (Niederman et al. 1991, Galliers 1993, Pollard and Hayne 1996, Pervan 1997).

A brief description of the more commonly used approaches is provided below:

3.3.1.1 Return on Investment (ROI) appraisal

Porter's well known definition of competitive advantage was stated as the "ability for an organisation to earn returns on investment persistently above the average for the industry" (Porter 1980). All ROI methods are based on the proposition that an investment must yield now to deliver a positive return over some period of time in the future. ROI approaches are supported by a number of formal investment appraisal techniques. The best known are based on evaluating the current value of estimated future cash flows on the assumption that future benefits are subject to chosen discount factor. Such calculations base their discount rate on an interest rate regarded as appropriate by the financial

management of the organisation. This approach is normally referred to as the discounted cash flow method (DCF). Two common DCF techniques are Net present value (NPV) and Internal rate of return (IRR). A simpler method which does not require reliance on a predetermined rate of interest is the Payback method. This method simply requires the investment to payback the capital over a predetermined period of time.

ROI methods rely on the calculation of cash flows and therefore are based on data which satisfy accounting criteria. It is difficult for intangible benefits to be dealt with in this way. ROI methods are commonly used and tend to be attractive to organisations with strict financial controls and disciplines. ROI methods work best when the application under review is expected to deliver direct savings or directly attributable revenue benefits and when the estimates can be supported by reliable calculations. The method is least good where the benefits cannot be precisely estimated in cash flow terms, where there is uncertainty in the value because they cannot be expressed in cash flow terms.

3.3.1.2 Cost/Revenue analysis

This is the simplest and most commonly used evaluation technique. The costs of developing, implementing and operating the IS system are calculated and compared with the value of the benefits anticipated from the investment. The method is useful when the benefits are directly attributable to the systems functionality: The method incorporates the following steps:

- (i) Estimate the cost of developing and implementing the system
- (ii) Estimate the expected life of the system
- (iii) Estimate the cost of operating the system once it has been implemented
- (iv) Estimate the value of the benefits the system is expected to generate
- (v) Tabulate the costs and savings per time period over the expected life of the system.

3.3.1.3 Cost benefit analysis

A more sophisticated version of cost/revenue analysis is cost benefit analysis. This approach originated as an attempt to deal with two problems:

- (i) The problem of identifying the value of benefits (or costs) which do not directly accrue to the investor in the project.**
- (ii) The problem of dealing with benefits which have no obvious market value of price.**

The method attempts to agree some surrogate measure of the intangible benefits which can be expressed in money terms. The method then estimates the cash flows on the basis of the notional valuations and then provides the data for a subsequent ROI appraisal. The method is particularly useful where many of the costs and benefits are of an intangible nature and where there is broad agreement on the measures used to attach a value to the intangibles.

3.3.1.4 Boundary values or spending ratios (Farbey, Land and Targett (1993))

These are intended to provide a crude but simple view of how an organisation compares to its industry peers. These measures are based on total expenditures against known aggregate values. Typical ratios include: the value of sales, total labour costs, total operating expenses, total value of assets, and total value of deposits.

3.3.1.5 Evaluation and justification issues

The literature suggests that traditional financial evaluation techniques predominate in organisations and the majority employ return on investment techniques (ROI). They particularly argue that the emphasis appears to be purely on the financial aspects of the evaluation. Willcocks and Lester (1994) found that most organisations use a narrow set of techniques with the most common being Cost Benefit Analysis and ROI. Ballantine et al (1993) found that financial criteria were still widely used as the main technique for justifying IS investments; Cost benefit analysis was employed in 72% of cases, payback in 60% of cases, return on investment in 43%, net present value in 25%, and internal rate of return in 24%. They also found that more than one technique was employed by organisations. Only one technique was used in 20.9% of cases, 19.4% used two, 28.4% used three, and 16.4% used four.

The research also finds that there exists some satisfaction with the techniques, although a significant number of managers would like to improve the IS investment decision making process, particularly recognising the need of increased senior business management involvement evaluation (Cooke and Parrish (1992)).

There is conflicting evidence, in the empirical research, regarding the degree to which organisations adopt a rigorous process for evaluating IS investments. There is research which suggests that while many organisations claim to adopt traditional techniques for evaluation they do not employ a rigorous process for evaluating all their IS investment decisions. (Remenyi et al (1991), Symons (1994), Farbey, Land and Targett (1993)). Lincoln and Shorrock (1990) found in a survey that 80% of successful projects bypassed the normal approach to evaluation.

Conversely, Ballantine et al (1993) surveyed the investment appraisal techniques of 97 organisations and found that 87% of recent projects were subjected to feasibility studies, 62% of all projects were subject to evaluation and only 9% of all projects were never evaluated. Wilcocks and Lester (1994) agreed that many projects were evaluated according to rigorous financial techniques but argued that the main drawback with many approaches was that it was often led and driven by the IS department rather than closely involving the business in the process.

A common issue in the empirical research is the lack of attention given to the evaluation of intangible benefits. Farbey, Land and Targett (1993) found that while the majority of organisations examined did attempt to evaluate quantifiable benefits, intangible benefits were examined in the minority of cases.

The research that exists on the use of evaluation and justification techniques in organisations suggests that most organisations that evaluate their IS investments are still predominately using traditional financial based approaches. The research suggests that evaluation and justification approaches adopted by organisations have not kept pace with the changing strategic benefit profile of the investments they are evaluating. The research above suggests that few organisations actually quantify the strategic benefits and rely on one (or a small number) of financial techniques. The techniques adopted by organisations are

predominately based on cost benefit and return on investment techniques. These are regarded as outdated and relatively unsophisticated financial techniques. This conclusion suggests that not only are organisations employing predominately financial techniques for evaluation but they are using the simplest of approaches. The research also indicated that those organisations which do evaluate their investment do not follow this up at the end of the project with a detailed assessment of whether the expected benefits were delivered or not.

The evidence on the degree of adoption of a formal evaluation process in organisations is not conclusive. Some research concludes that most organisations adopt formal approaches, Ballantine et al. (1993) while other research finds the opposite (Cooke and Parish (1992), Farbey, Land and Targett (1993)). The conclusion seems to be that where formal evaluation does take place, the emphasis is on traditional, quantitative analysis. At a general level it does appear that organisations have not adopted the formal evaluation approaches which allow the full range of benefits from Strategic Information Systems to be examined in detail.

This summary of the research suggests that organisations have some way to go to adopt evaluation approaches which are appropriate for the strategic benefits they are expecting to invest in. However, the research suggests that the businesses (generally represented by their financial officers) are satisfied with their evaluation approaches, whilst the IS professionals express some frustration and concern.

3.3.1.6 Limitations of the traditional evaluation approaches

There is now a large amount of literature dealing with the limitations of traditional financial techniques commonly in use in organisations. The main issues from this literature are:

The traditional techniques are felt to be unable to take account of the full range of benefits expected from their IS investments. Ward, Taylor, and Bond (1995) found that 75% of organisations felt that their evaluation techniques failed to take account of the relevant benefits. Ballantine and Stray (1988) have stated that organisations know that there will be unanticipated benefits from such

investments, but can not estimate them, or that the repercussions of IS spread beyond functional or departmental areas so that an organisation can never fully attribute costs and benefits to a particular system. They also argue that traditional techniques of appraisal are unable to account for the intangible costs and benefits of IS investments.

Financial measures are weighted towards short term returns and not the meeting of long term goals of Strategic Information Systems (Hochstrasser (1994), Coleman and Jamieson (1994)). The issue is compounded due to the shorter useful life of systems in an environment where businesses change much more rapidly thereby making systems obsolete in a shorter timeframe. Hochstrasser (1992) found that “projects aimed to improve customer support or to offer better market information might, in the short term be impossible to quantify”.

Current evaluation techniques are an outgrowth of the traditional standard accounting approaches and are therefore regarded as unsuitable for evaluation of strategic systems (Powell (1992), Diebold Group (1990), Silk (1990) Due (1989)).

Where IS projects are truly strategic, e.g.: pursuing competitive advantage or creating new business, financial hurdles may need to be modified downwards to encourage bold initiatives. Excessive hurdle rates may cause determined managers to 'cook the books' (Earl (1989), Silk (1990), Diebold (1990)).

While these criticisms of traditional techniques are strong arguments against their use for justifying and appraising SIS, Earl (1989) in particular urges caution. Earl argues that while formal appraisal of IS projects are flawed they are nevertheless an essential component in the evaluation process. Earl does not dismiss traditional methods out of hand. They cope with the nature of capital investment projects; they allow delayed or slow build-up of benefits to be evaluated and provide a structure and detail which can help overcome the often political and emotive claims of IS projects. For Earl, financial evaluation is necessary but not sufficient for effective appraisal and justification of Strategic Information Systems.

For Farbey, Land and Targett (1993) the main evaluation issue is one of alignment. They particularly criticise organisations who claim to be

implementing SIS yet only consider the hard quantitative benefits. They argue, therefore, that evaluation is a corporate feel issue, involving business and senior management and that evaluation should begin early in the lifecycle.

In their study of the evaluation process of 16 case study organisations, they identify a number of important factors in any evaluation process that can be included :

- (i) The level of business change evaluated.
- (ii) The procedure adopted.
- (iii) The extent of quantification.
- (iv) The stage in the lifecycle at which evaluation took place.
- (v) Who took part in the process.

Baker (1995) examining the broader issues of IS planning success, described a broader based approach to planning that incorporated the need for effective feedback mechanisms in order to measure the actual effectiveness of the plan. Baker argues for a more 'integrated' approach of feedback mechanisms across the lifecycle in order to understand and monitor performance of planning over time. Evaluation is viewed as an essential and integrated component of this process. Baker also calls for measurement tools and techniques which address a broader range of benefits than traditionally applied.

3.3.2 Alternative approaches

The literature proposes a number of alternative approaches which are aimed at overcoming the limitations of the traditional techniques. Many of these techniques while having merit, suffer from complexity and the evidence above suggests that they have not been widely adopted in organisations. Other well known alternatives are discussed and the section concludes by discussing the use of *subjective* measures.

3.3.2.1 Probabilistic approaches

There are several approaches which attempt to assess in detail the uncertainty and complexity involved in costs and benefits in order to provide a more

informed basis on which to make decisions. Two particular techniques are detailed by O'Leary (1979) and Jonscher (1985).

O'Leary describes an approach for cost benefit analysis which extends traditional techniques by evaluation net revenues as a stochastic random variable. The technique defines a probability distribution based on the Monte Carlo analysis. These approaches seems somewhat complex and impractical for most organisations to employ. They also require a detailed level of understanding of the benefits in advance in order to provide a useful model for the technique.

Jonscher (1985) proposed a technique termed shadow pricing. It is a technique for arriving at the true costs and benefits of large infrastructure projects. Although it is a rigorous attempt to deal with infrastructure investments, again it suffers from complexity and seems impractical to most organisations.

3.3.2.2 IS investment evaluation portfolios

In the early 1980's several approaches appeared which were aimed at the issue of priority setting among competing IS investments. McFarlan (1984) and Buss (1983) developed a portfolio approach to the evaluation of IS investments. Many of the methods varied from broad subjective criteria to detailed quantitative analysis of benefits, and presented it in the form of a matrix. McFarlan concentrated almost entirely on project risk as a means of ranking, whilst Buss used four criteria: financial cost and benefits, intangible benefits, technical importance and fit with the business objectives. Separate matrices were used to evaluate projects for each of these criteria and were later combined to focus on an overall prioritisation for the projects.

Peters (1990) provides an interesting extension to the portfolio approach. Peters reviewed the evaluation processes of over 50 organisations. He mapped all IS investments for an organisation according to their particular combination of benefits and investment orientation. Peters claims that his nine cell matrix is a useful and powerful tool for evaluating the range of IS investments available and effectively communicating the value of the range of IS investments available to the organisation thereby improving the evaluation and decision making process.

Hochstrasser's (1992) model maps IS investments according to a matrix based on the organisation's critical success factors and the match with their business objectives.

3.3.2.3 Other approaches

The remaining approaches include Information Economics (see Parker, Trainor and Benson; 1989), and the Return on Management Approach (see Strassman 1988). A useful analysis of composite and ad hoc methods is given in Farbey, Land and Targett (1993).

3.3.2.4 Subjective measures

A number of research studies (e.g. Lawrence and Lorsch, 1967; Dess, 1987; Powell, 1992) have used subjective measures for evaluating and justifying IS investments. They have been preferred to financial statement data since firms adopt different accounting conventions and comparisons between large and medium sized organisations, Strategic Business Units and conglomerates can be problematic. Dess and Robinson (1984) stated that subjective measures of performance correlate strongly with objective measures and recommended the use of subjective measures, especially when obtaining non-financial data. Cavaye and Cragg (1993) criticised many SIS research findings due to limitations of the measurement of variables and small sample sizes. They state that few studies measure the dependant variable of competitive impact success adequately. According to Cavaye and Cragg (1993):

“Competitiveness derived from an SIS is hard to quantify it is hard to attribute a definite proportion (or amount) of profitability and competitive strength to a particular IS”.

They further claim that much research has relied upon dubious quantitative figures to ascertain the extent of competitive advantage but that care should be taken with qualitative measures. If subjective measures are used safeguards must be made e.g. obtaining data from more than one source and from senior members of the organisation so that the respondents have sufficient perspective and information to assess their firms performance relative to rivals.

Summary of the literature on evaluation and justification

Clearly, traditional techniques for the appraisal and justification of IS investments are becoming subject to increasing criticism. The suggestion is that although the strategic impact of IS on the competitive business strategies of organisation is well understood, the approaches used to appraise and justify these investments has not progressed to accommodate them.

A common theme in the literature is that traditional techniques provide too simplistic a treatment of costs and benefits. Intangibles are generally inadequately dealt with and it can be these that allow uniqueness and confer advantage and even sustainable advantage. They are usually listed separately which effectively assigns a value of zero to them. Given the strategic nature of many of the benefits of Strategic Information Systems, traditional techniques on their own are not suitable to model the full range of opportunities available to the firm from their IS investments. Indeed, traditional techniques may present a barrier to investment in Strategic Information Systems.

A particularly relevant criticism of traditional techniques is that they do not allow for the treatment of the longer term nature of strategic benefits. These techniques are predominately short term in their focus whereas strategic benefits are delivered over a longer time frame. In this sense traditional techniques may encourage short term investments at the expense of longer term strategic investments. This may encourage determined managers to 'cook the books' in the evaluation phase, in order to get their projects authorised. Indeed there is evidence that the benefits are often over-emphasised to allow projects to clear excessive hurdles.

Evidence was provided to support the use of *subjective* measures when evaluating IS developments and provided certain safeguards are undertaken subjective measures may well be the most appropriate approach for many studies and were used in this thesis. This approach has been supported by Willcocks (1992) who stated "it is now widely accepted that certain measures do not assist the process of establishing how IT adds value to an organisation". Miller (1993) goes further and argues that traditional cost benefit analysis is becoming less and less relevant

for measuring IS performance. More recently, Strassmann (1997) highlighted that capital budgeting theory, on which capital investment appraisal is based has a number of limitations including the assumption that cash flows and discount rates are known with certainty and according to Ballantine and Stray (1998) nowadays *even* the “accounting and finance literature does however recognize that there are other considerations which need to be assessed when making investment decisions”.

A number of commentators provide argument in support of the use of traditional techniques. They stress that traditional techniques do have a place and should not be universally dismissed as inappropriate. Senior Management are comfortable with these techniques (Ballantine et al. (1993)). They do provide a measure of financial rigour and, given the often large sums of money involved, a sense of financial comfort is necessary for most organisations. Strategic investments are likely to deliver traditional financial based benefits as well as the strategic benefits and therefore traditional techniques will sometimes be appropriate. This view suggests that organisations require a range of techniques to evaluate and justify investments which deliver a wide range of benefit types. This view is calling for a multiple methods approach to appraising and evaluating IS investments, i.e. organisations should adopt a range of financially based and qualitative techniques. While this view has obvious merits, the conclusions from the evidence above would suggest that organisations do not employ such multiple methods and where they do it is multiple traditional techniques which are employed (Ballantine et al. 1993, Ballantine and Stray 1998).

3.4 Implementation Factors

The following discussion relates to those factors that have been found to be relevant to the successful implementation of SIS developments.

3.4.1 Recent studies

A number of research studies have examined the implementation approaches of organisations to identify the main issues. The research literature suggests the following as being the main causes of failure:

- (i) Lack of top management support and understanding (Earl (1989) and Brookes (1992), Earl and Feeney (1994), Mata et al. (1995), Ross et al. (1996), Venkatraman (1997)).**
- (ii) A lack of user commitment to projects (Tait and Vessey (1988)).**
- (iii) A poor level of communication between users and IS staff (Whyte (1987), Iles (1990), Taylor-Cummings and Feeney (1997)).**
- (iv) Over optimistic estimates which lead to systems being delivered late (Keen (1987), Galloway and Whyte (1989), Galliers (1994)).**
- (v) Serious cost budget overruns due to insufficient understanding of the work necessary to deliver the project (Keen (1987), Rademacher (1989), Henderson and Venkatraman (1993), Ward and Griffiths (1996), Dutta (1996)).**
- (vi) Poorly defined business objectives caused by inadequate appreciation of the business's needs (Keen (1987), Lyytinen (1988), Rademacher (1989)).**

There are few studies of the implementation issues with particular respect to SIS within the literature. Much of the research examines IS as a general category

and does not examine SIS specifically. Three detailed examinations of the implementation issues for SIS which have taken place are: Wilson (1989), Crescenzi (1988) and the Pagoda Associates (1994).

Wilson (1989) found that difficulties in recruiting appropriate staff, the lack of resources to engage in user education, the nature of the business and difficulties with measuring the benefits of IS were significant implementation issues. Wilson particularly argued that implementation issues cannot be separated from the strategic planning process. The implementation of IS strategies is itself a strategic, not a tactical, issue.

Crescenzi (1988) examined 30 organisations' experiences with SIS projects. He concluded that 17% of the projects succeeded and 83% of the projects failed. The main conclusion was that the examples of failure were not due to ill-conceived systems at the planning stage, but poor implementation. In every instance, the failure to implement the system successfully was due to organisational, not technological, causes. Crescenzi (1988) analysed the successful examples using the McKinsey 7S model and concluded that successful companies succeeded in balancing the 7S carefully, while unsuccessful companies failed to manage at least four of the seven S's.

Using the 7S Framework, Crescenzi (1988) found that:

- (i) Strategy: The champion of the strategic system was a senior executive in the business unit in which the system was used. The senior strategic decision maker led the implementation. Strategic systems were developed through a phased, adaptive, evolutionary approach.**
- (ii) Structure: The most appropriate project structure was one where the team members had overlapping roles on the project.**
- (iii) Skills: Project members had good business acumen as well as technical skills.**
- (iv) Systems: Successful implementations involved a change in the company's risk/renewal structure.**

- (v) Style:** Team members were flexible, willing to accept change and cope with uncertainty.
- (vi) Staff:** An effective management champion was crucial to successful implementation. A partnership at the strategic business level between IS and business management was also seen as critical. Particularly IS managers must be recognised as peers with their business management colleagues.
- (vii) Shared values:** Team members must have a belief in the value of their efforts and share a common, well communicated vision of the project's outcome.

Pagoda Associates (1994) examined the reasons for failure of SIS. They claimed that only 11% of systems examined were fully successful. They argued that the crucial success factor in implementation was the way the human and organisational issues were handled. This was, they believed, because technical factors were no longer a constraint and IS systems were now central to many organisations and affect a wider number of individuals in the organisations. They argued that the reason why these critical factors are so often mismanaged were: IS departments use flawed methodologies and line managers lack skills in change management.

3.4.2 Specific implementation issues

3.4.2.1 Lack of top management commitment

The lack of top management commitment to the implementation is identified as a general issue in the empirical studies reviewed above (Crescenzi 1988).

Addressing the issue is recognised as a pre-requisite to successful IS strategy implementation (Applegate and Elam (1992), Stephens et al. (1992), Yap and Thong (1997), Enns and Huff (1997)).

Kantrow (1980) summarises the issue:

"What makes technology go is exactly what makes business go:

Coherent strategy and managers closely committed to it."

More detailed examination of the impact of senior management was provided by Nutt (1987) who examined how strategic implementation was performed by strategic management and considered the relative effectiveness of various implementation tactics. He identified four distinct implementation tactics: Intervention, Participation, Persuasion, Edict. His conclusions were that a senior manager's active participation in a project was found to improve its chances of success, and yet in 50% of cases studied, senior managers failed to act in this way. When a senior manager took charge and created an environment where plans that help to realise a strategy could be justified and understood, implementation was usually successful (participation behaviour). The worst performing behaviour was Edict.

The active involvement of senior management, according to Brookes et al. (1992) should take place within the context of well defined and understood roles for user management, IS management and senior management. All three roles, for Brookes et al. (1992), are essential for success with Strategic Information Systems. Nicholas (1989) takes a similar view and demonstrates that the involvement and commitment of a number of participants are essential to achieve project success. These participants are: top management, project management, project team and user management. Work by Ross et al. (1996) highlighted the importance of Top Management's role in establishing IS priorities.

3.4.2.2 Changes issues

The failure to take account of, and understand, the business change issues at the implementation stage is a common issue in the literature (Prager and Overholt (1994), Benjamin and Levinson (1993), Korunka et al. (1993), Gellman (1990), Mckay, Draecky and Savin (1991)). They all provide their variant of a change management based model which recognises that people are the core of organisations and that human related issues must be recognised and managed during a technical implementation. The main components of their change management models are:

- * Top management support**

- * Publicly articulated organisational beliefs
- * Develop a systematic process for change
- * Manage the adoption of technology and new business processes
- * Analyse and manage stakeholder's commitment
- * Find and use a project champion
- * Prototype the response of the organisation
- * Build change reviews into the management process
- * Dealing with organisational cultures
- * Dealing with organisational politics

3.4.2.3 Role of the project champion

The literature highlights the potential impact that project champions have on the success of a project: the existence of a project champion is a key factor determining the success of IS projects. A number of authors have identified the importance of the role of a project champion (Prager and Overholt (1994), Lederer and Nath (1991), Pinto and Slevin (1987), McGee and Thomas (1989)). The literature argues that the project champion should be a senior manager from the business.

3.4.2.4 Financial reserves

Management has to be willing to invest substantial financial resources in order to develop a SIS as most developments require an abundance of resources (Reich and Benbasat 1990). A strong financial position of the firm has therefore been identified as a major enabling factor for the development of SIS, while budgeting constraints act as an inhibitor (King, Grover and Hufnagel 1989). Copeland and McKenney (1988) showed that organisations need appropriate financial reserves in order to invest in SIS projects.

3.4.2.5 IS Project structure

The traditional approach to organising an IS project involves the appointment of a project manager, often with IS experience, to manage the delivery of the technical solution. The role of business resources is often limited to the provision of business requirements and user testing and acceptance. The overall emphasis in the traditional project structure is the delivery of the technical solution. There

is a growing body of literature which argues that the traditional project structure is inappropriate for the successful implementation of Strategic Information Systems. McKersie and Walton (1991) recommend a project structure based on the definition of the main roles necessary for effective implementation of SIS:

(i) The role of the senior manager:

They argue that there is a clear and necessary role for a senior manager who has responsibility for SIS. The main role is to provide the vision and delineate the steps necessary for realising the vision. The specific roles include: setting the policy regarding the introduction of IS; have a reasonable understanding of the capabilities and limitations of IS; understand the interplay of the technical and social aspects of the system, ensure that the human resource aspects are carefully managed; exhibit a strong commitment to the successful introduction of the project, and address middle management concerns concerning displacement by IS.

This view supports that of other researchers (Stivers and Beard (1987), Necco et al. (1989), Earl and Feeney (1994) and Ross et al. (1996)). The general view is that not only do senior managers need to be involved but the quality of their involvement has to be sufficient to guide the project over organisational objectives.

(ii) The role of middle management:

McKersie and Walton (1991) claim that the stakeholder group most at risk from IS developments is the group which is most crucial to its success. As a result, it is important that the group members are well educated and supportive towards IS. The specific roles of this group include: understanding the interplay between the technical and social aspects, promoting an environment of continuous learning, and involving users.

(iii) The role of users:

User participation is recognised as a key facilitator in successful implementation. Their main role is to provide assistance in the selecting, introduction and

assessment of systems. This view is supported by other studies which also show that lack of user involvement throughout the implementation phase will lead to a greater likelihood of project failure (Tait and Vessey (1988), Kydd (1989), Taylor-Cummings and Feeney (1997), Yap and Thong (1997)). Methodologies such as Checkland's (1981) Soft Systems Methodology attempt to emphasise the close involvement of the end users at every stage of the analysis and design. The use of CATWOE and 'rich pictures' aim to ensure that all stakeholder viewpoints are represented.

Summary of literature on factors for successful IS implementation

Aspects of the literature argue that the traditional approaches to developing systems which are based on a structured and inflexible method-orientated approach may not be the most appropriate for developing SIS. SIS by their nature require a flexible approach as the business may change constantly (Stacey, 1994, 1996) and the nature of the strategic opportunity may be difficult to define in the detail expected from traditional methods. The claim is that newer approaches which are based upon working closely and iteratively with the business users and utilising such techniques as prototyping, are better approaches for SIS. The literature also argues that traditional systems development approaches can be counter productive because they focus attention on technological factors at the expense of human and organisational factors. Traditional approaches require systems to be specified at the start and permit little change thereafter. In implementing strategic systems the requirement is for constant adaptation and change, indeed the nature of these systems is often that requirements cannot be specified in sufficient detail in advance. They also claim that few traditional methods make provision for activities essential to change management. Considering that Strategic Information Systems are concerned with enabling business change, this is a major criticism. Another criticism of traditional methods is that they do not encourage communication between the IS function and the business. Traditional methods place a rigid contractual approach to developing systems. The detailed requirements are used as the basis of a contractual commitment which the IS department agree to deliver (Lederer and Nather (1988), Pagoda Associates (1994)). For a fuller discussion of methodologies (including Checkland's (1981) Soft Systems Methodology) see Wilson (1991) and Rose (1997).

The empirical research on IS project implementation suggests a high degree of failure at the implementation stage. The emphasis in this literature tends to be on IS as a whole and not specifically on Strategic Information Systems. The implicit conclusion could be that if organisations have a high failure rate with the broad range of IS projects then this problem can only be compounded when more complex Strategic Information Systems are considered.

Chapter 4

The Model

Introduction

This chapter synthesises the factors that have been identified in chapter 3 into a model of IS based sustainable advantages. Each factor is associated with the appropriate research instrument that was used in the study.

4.1 IS driven sustainability model

From the literature the model was developed as shown in fig. 4.1. This consists of three groups of factors :

- **those that lead to *performance improvement***
- **those that lead to a *sustainable advantage***
- **those that were regarded as enablers for sustained competitive advantage (*realisation factors*) in order to successful *implement* the development**

4.1.1 Factors leading to performance improvement

The sources of IS driven advantages have been well documented and are listed in table 4.1. For example Jelassi (1994) found how the Union Bank of Switzerland used a new dealing system to improve efficiency and reduce costs, Otis Elevator provided a superior IS based customer service, BP chemicals used IS to improve the firm's ability to handle information and make decisions and Papeteries Brun Passot used telepurchasing applications to link both customers and suppliers. Sabherwal and King (1991) discussed how Navistar International used a system termed 'Focus' to improve long term planning of parts inventory and maintenance personnel, General Electric built a database to produce new products and improve communications and Equitable Life Assurance to lower the price of financial products. Recently King (1998) has reported how the Internet has reduced costs by \$125M at Cisco and how intranets have been used by a number of firms in order to support new product development.

Fig 4.1 IS DRIVEN SUSTAINABILITY MODEL

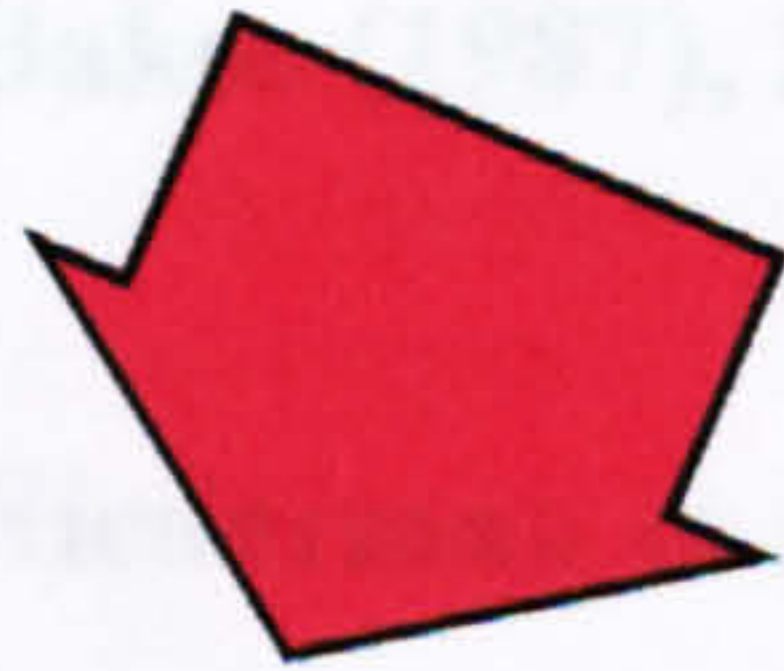
Factors leading to an advantage

- Ability to attract quality staff
- Encourage long term planning
- Higher product/service quality
- Improved communications
- Improved links with suppliers & customers
- Improved quality of decision making info
- Increased customer satisfaction
- Lower product price
- Optimising internal efficiency
- Producing new products/services
- Reduced costs



Advantage

**Sustainable
Competitive
Advantage**



Realisation Factors

- FINANCIAL RESERVES
- GOOD PLANNING & PROCESS
- ORGANISATIONAL COMPONENTS
- PERSONNEL RESOURCES
- PROFICIENT IMPLEMENTORS
- PROJECT LEADERSHIP
- SYSTEM CHAMPION
- TECHNICAL SKILLS
- TOP MANAGEMENT SUPPORT



Sustainability

Sustainability Factors

- COMPLEMENTARY RESOURCES
- CULTURE
- FIRST MOVER EFFECTS
- FLEXIBILITY
- GOVERNMENT LEGISLATION
- HIGH ENTRY COSTS
- HIGH SWITCHING COSTS
- INNOVATIVE USE OF IS
- MONOPOLIES
- ORGANISATIONAL LEARNING
- RESTRICTED EXPERTISE
- SCALE ADVANTAGES
- TRADE SECRETS
- QUALITY OF STAFF

Factor	Previous Work
Ability to attract quality staff	Broadbent (1991), Ross et al. (1996)
Encourage long term planning	Sabherwal and King (1991), Galliers et al. (1994)
Higher product/service quality	Galliers et al. (1994), Jelassi (1994)
Improve communications	Parker and Idundun (1988), Niederman et al. (1991)
Improve links with suppliers / customers	Bakos (1987), Swatman et al. (1993)
Improve quality of decision making information	Niederman et al. (1991), Galliers et al. (1994)
Increase customer satisfaction	Ives and Learmonth 1984, Wiseman (1985)
Lower product price	Benjamin et al. (1984), McFarlan (1984), Wiseman (1985)
Optimising internal efficiency Galliers (1988), Neo (1988)	Bakos and Treacy (1986), Bakos (1987),
Producing new products/services	Parsons (1983), McFarlan (1984), Sabherwal and King (1991)
Reduce costs	Synnott (1987), Cavaye and Cragg (1993), King (1998)

Table 4.1 Factors facilitating an improved performance

4.1.2 Factors that lead to a sustained advantage

The sustainability factors have been divided into three categories:

- those that reflect environmental or unique situations**
- those that exist by virtue of a firm's infrastructure**
- action strategies adopted by the initiating firm to leverage IS**

The list is wide ranging as some are content oriented, whilst others are process oriented, some are contingency factors whilst others are deliberate actions taken by the firm. These factors have been identified and listed in Table 4.2. Although this list is diverse, their dimensions have been captured and some operationalised in past strategic management models. In particular, this framework is consistent with normative models of strategic planning in organisations. This grouping identifies environmental and firm-specific contingencies that influence strategic choice. Similar models have been outlined that include environmental and firm resource analysis in strategy formulation and draw a direct casual relationship to firm performance (Grant, 1985; Schendel and Hofer, 1979). This normative relationship has been further identified in the IS literature. For example, “strategic resource differences among firms are important in explaining and predicting the competitive outcomes of strategic applications of IT” (Clemons and Row, 1991, p.276).

The model shows the ability of a firm to leverage its sustainability factors through effective IS strategies and actions should inhibit competitor response and subsequently nurture sustainability. It should be noted that the factors identified are not intended to be mutually exclusive and several factors may show interdependence.

Factor	Previous work
Complementary Resources	Clemons and Row (1991), Grant (1991), Barney (1991), Keen (1993)
Culture	Fiol (1991), Leonard-Barton (1992), Kouna and Weiss (1993), Hall (1993), Pager and Overholt (1994)
First Mover Effects	MacMillan (1983), Rumelt (1984), Clemons (1986), Vitale (1986), Clemons and Knez (1987), Ives and Vitale (1992), Kettinger (1994)
Flexibility	Keen (1988), Bahrami (1992), Scott-Morton (1991), Knoll and Jarvenpaa (1994), Lederer and Salmela (1996)
Government Legislation	Cragg and Finlay (1991), Kay (1993)
High Entry Costs	Porter (1980), Clemons and Kimbrough (1987), Caves and Ghemawat (1992)

High Switching Costs	Bakos and Treacy (1986), Ward (1990), Kettinger (1994)
Innovative use of IS	Grant (1991), Ives and Learmonth (1992), Kay (1993), Kettinger (1994)
Monopolies	Bakos and Treacy (1986), Bakos (1987), Clemons and Row (1991), Dess and Davis (1984), Ginsberg (1984), Cool and Schendel (1987), Venkatraman and Grant (1986)
Organisational Learning	Stata (1989), Grant (1991), Leonard-Barton (1992), Senge (1995)
Restricted Expertise	Clemons and Row (1991), Ulrich and Lake (1991), Ross et al. (1996)
Scale Advantages	Cragg and Finlay (1991), Clemons and Row (1991), Kettinger (1994)
Trade Secrets	Clemons and Knez (1988), Clemons and Row (1991), Cragg and Finlay (1991)
Quality of Staff	Broadbent (1991), Ulrich and Lake (1991), Ross et al. (1996), Barnett and Burgelman (1996)

Table 4.2 Factors facilitating a sustained competitive advantage

4.1.2.1 Factors that reflect environmental or unique situations

Several environmental factors, principally industry characteristic and competitor restrictions, influence a firm's capability to achieve and sustain a competitive advantage (Porter, 1980). The amount of industry competition, strategic groupings, process or product orientation, capital intensity, information intensity, and the current financial situation of an industry as a whole have all been offered as industrial contingencies in the realisation and preservation of competitive advantage resulting from and have been well documented IS (Cash et al. 1992; Clemons and Row, 1991; Porter and Millar, 1985).

The prevailing industry structure within which the firm competes is perhaps the most influential of the industry characteristics. In strategic management, numerous measures have been developed in an effort to model industry structure and its impact upon prevailing strategic orientation and performance (Dess and Davis, 1984, Ginsberg, 1984; Cool and Schendel, 1987). Venkatraman and Grant's (1986) framework which measures the number of direct competitors in terms of size and market strength has been used repeatedly as a measure of the

degree of industry competition. A large number of competitors may be indicative of an industry with generic products, low entry barriers and competition based on cost. No or few competitors may signal *monopolistic* or oligopolistic structures in which differentiation dictates competition, and entry barriers are high (Porter 1985).

Competitive restrictions and unique situations such as macro-economic, political, and regulatory factors may also all have the potential to influence sustainability. Such restrictions can prevent a competitor from responding to a threat that it would otherwise answer. A company that is on the right side of public policy can exploit its position to build sustainability (Ghemawat, 1986). *Government legislation* and *trade secrets* are examples of inhibitors to a competitor's ability to initiate a pre-emptive strategy. However, it can be extraordinarily difficult to protect innovative applications of IT through *trade secrets*, patents, or the use of proprietary technology (Clemons and Knez, 1988).

4.1.2.2 Factors that exist by virtue of a firm's infrastructure

These factors include many of what Kettinger (1994) describes as foundation factors and when leveraged with IS these factors may become almost proprietary for the initiating firm (Clemons and Row 1991). These *complementary resources* are firm specific and often intangible making them difficult to duplicate. *Scale advantages* can work on a local, national or global scale as long as there are compelling economies to being large. IS derived *scale advantage* occurs where superiority in size and investment of a firm makes it prohibitively expensive for competitors to imitate the strategic IS user (Clemons and Row 1991). Due to Strategic Information Systems development tending to involve large fixed costs and low variable costs, there exists the possibility of significant scale economies as well as significant penalties for failure.

Flexibility has been defined by Bahrami (1992) as the ability of a firm to effect intentional change, continuously respond to unanticipated change and to be able to adjust to the unexpected consequences of predictable change. This capability to act upon an identified IS opportunity is influenced by the availability of organisational slack and may be critical to a company if it is to halt system obsolescence and/or the strategic response from competitors (Vitale 1986, Clemons and Row 1991). IS has the capability of expanding geographical reach or extending levels of operation. The *flexibility* to rapidly respond to changing market demands and improve service quality is an important factor in the first mover's ability to enhance the system and "keep the pole position" (Feeny and Ives 1990).

The *culture* of an organisation has the potential for developing sustained competitive advantages as its articulation is problematic and involves complicated relationships (Reed and DeFillippi 1990; Fiol 1991). Competence to develop or exploit an IS opportunity is influenced by the organisation's *culture* as well as its previous IS experiences.

A firm's sophistication in managing the human side of IS in terms of *quality of staff*, skill base, education, relevant experience and career development is key to gaining and maintaining competitive advantage (Keen 1991). The ability of the firm to effectively utilise employees and/or produce its product or service at low cost has been considered indicative of *organisational learning* (Cool and Schendel 1987, Senge 1997). In essence, firms with high measures along these operationalised dimensions are further along the competitive learning curve than rivals and may be rewarded with asymmetric and sustainable competitive gains (Kettinger 1994). As noted by Ross et al. (1996) organisations that exploit IS in an area of *restricted expertise* can maintain an advantage over other industry participants as has been demonstrated with early Ecommerce developments. Feeny and Ives (1990) claim the uniqueness of technological resources and *expertise* in use and under development may be a source of sustainability.

4.1.2.3 Action strategies by the initiating firm to leverage IS

IS *first movers* into the marketplace enjoy an enduring competitive advantage over late entrants (Ives and Learmonth 1984, Porter and Millar 1985, Kettinger 1994). Early movers can gain advantage by controlling existing assets via a pre-emption strategy. A pre-emption move is defined as a major shift by a focal business, ahead of moves by its adversaries, which allows it to secure an advantageous position that is difficult to dislodge because of the advantage it has captured by benefit shifts (MacMillan 1983). *First movers* can set up unassailable *entry costs* or barriers to entry (Bain 1956, Porter 1985) allowing the pioneer to purchase assets cheaper, secure better terms or achieve pre-emption in geographic space (Feeny and Ives 1990). *First movers* can also create *switching costs* which increase the value of the market share obtained early in the development of a successful market (Lieberman and Montgomery 1988). Companies that follow need to expend extra resources to attract customers. These may be in the form of new hardware and software, time being spent qualifying a new supplier or customer or the disruption and financial costs of training employees. From an analysis of the literature, Kettinger (1994) cites 'supplier specific learning' as the most common form of *switching cost* preventing defection to rivals.

The lead or lag time produced by the IS before a competitor's substantive response usually means that there is a "small window of opportunity" (Clemons and Kimbrough 1986) and that the ratio of customer adoption time to rival copy time should be small to attain sustainable competitive advantage.

4.1.3 'Realisation' factors

The following factors are those that were regarded as being enablers for sustainable competitive advantage as discussed in chapter 3. This grouping summarises the capability of an organisation to implement an IS effectively. Even with a source of advantage and one or more sustainability factors present it

will not be possible to achieve an IS based sustainable competitive advantage without the enabling realisation factors. These are listed in table 4.3.

Competence to exploit an IS opportunity is influenced by Top Management (Earl 1989; Earl and Feeny 1994; Venkatraman 1997). It is important for senior management to understand and be involved in the use of IS for competitive advantage. There must be managerial vision (willingness to take risks), managerial adaptability (willingness to redesign the organisation) and a willingness to commit the necessary financial resources (Mata et al. 1995). Firms with more extensive and advanced technological resources would be expected to devote relatively more financial reserves to developmental and technology investments than other industry participants. Crescenzi (1988) and Earl (1990) highlight the importance of being a proficient implementor in order to capitalise on the IS development and many authors stress the need for appropriate technical skills. The existence of a strong technological infrastructure and competence facilitates rapid building of complex and flexible systems and technical products. King and Grover (1991) state that technical capability can be one of the “principal facilitators in the uses of IT for competitive advantage”. Prager and Overholt (1994) and more

Factor	Previous work
Financial Reserves	Copeland and McKenney (1988), Reich and Benbasat (1990), Mata et al. (1995)
Good Planning & Process	Earl (1990)
Organisational Components	Teece (1990), Broadbent (1991), Powell (1995)
Personnel Resources and (1996)	McKersie and Walton (1991), Ross et al.
Technical Skills	King, Grover and Hufnagel (1989), Reich and Benbasat (1990), Mata et al. (1995)
Proficient Implementors	Neo (1988), Earl (1990), Keen (1993)
Project Leadership	Henderson and Venkatraman (1993)
System Champion	Runge (1985), Lockett and Stratford (1987), McGee and Thomas (1989), Benjamin and Levinson (1993), Prager and Overholt (1994), Chesher (1997)

Top Management Support	Stivers and Beard (1987), Necco (1989), Flynn and Goleneiwska (1993), Mata et al. (1995), Ross et al. (1996), Yap and Thong (1997), Venkatraman (1997), Enns and Huff (1997)
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Table 4.3 Realisation factors necessary for enabling a sustainable competitive advantage

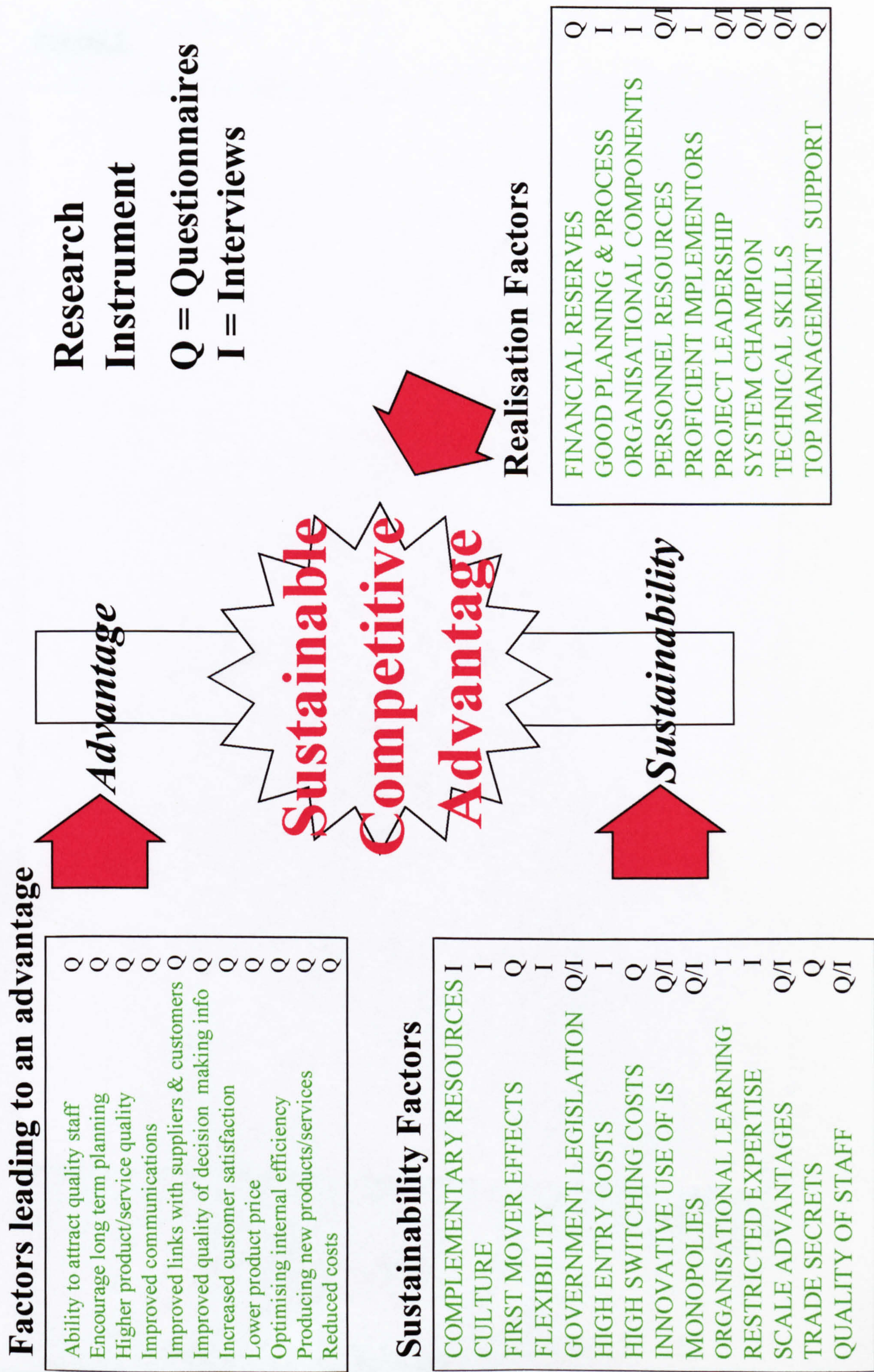
recently Chesher (1997) discuss how a system champion influences projects from development through to implementation and Henderson and Venkatraman (1993) emphasise the need for effective project leadership managing and facilitating teams drawn from a range of backgrounds. Powell (1995) focuses upon the assistance given by appropriate organisational components and Ross et al. (1996) highlights the need for suitable personnel resources throughout an organisation to aid in the successful implementation of the IS development and not just in the project team.

Integrating the types of improvement that IS can bring, the factors facilitating the sustainability of any advantage and the factors enabling the efficient implementation of IS, produces the IS driven sustainability model set out in Fig. 4.1.

4.2 Research Instruments

The above factors were investigated through the questionnaire and/or structured interviews as discussed in Chapter 2. These are indicated in Fig 4.2.

Fig 4.2 IS DRIVEN SUSTAINABILITY MODEL



Chapter 5

Research design review

Introduction

This chapter reviews the research design and method employed against the plans as outlined in chapter 2. It discusses validity at the pre-test phase, reliability at the pilot phase, survey distribution and the response rates of the questionnaire survey. Interview co-operation is also discussed.

5.1 Questionnaire Development

5.1.1 Pre-test interviews

The pre-test phase was designed to ensure *construct* and *content validity* of the questionnaire. There were 8 different drafts of the survey. Some simply minor modifications of previous drafts and others with major alterations. A discussion of these have been simplified and referred to as versions 1a, 1b, 2a, 2b and 2c. Version 1a and the final version, 2c (pink for the IS Manager and yellow for the Business Manager) are included in appendix 2.

5.1.1.1 Survey version 1a

The initial questionnaire, version 1a consisted of an introductory letter and an 11 page questionnaire. The two page introductory letter outlined the purpose of the research and asked respondents questions pertaining to their company and annual spend on IS. Version 1a consisted of 38 questions which contained numerous sub questions, in all requiring 143 separate responses. This was subsequently felt by the author and colleagues to be both too long and too complex in structure. The structured directed respondents to other parts of the questionnaire depending on the responses.

5.1.1.2 Survey version 1b

Version 1b was examined by :

3 academics, 3 IS Managers, 3 Business Managers and 2 IS vendors but following feedback from 2 academics, 2 IS Managers and 1 Business Manager the questionnaire had to be radically reduced. It was then felt that the questionnaire should be fully pre-tested once more. All 5 respondents stated that the questionnaire was far too long which would severely affect response rates. Following these pre-test interviews, sections on IS Planning Methodology, individual respondent details, organisational structures and the initiation of ideas for IS developments, were removed or decreased dramatically. In addition there were confusions as to the definition of *organisation* and this led to the inclusion of a front page cover sheet where the IS Managers were asked to specify whom they serviced. They were then instructed to use this as their definition of *organisation* when answering subsequent questions. As an *indication* of IS spending, respondents were asked for the £ spent on IS per year and %age of turnover. It was acknowledged that this would not always be made available.

Feedback from two Business Managers stated that the questionnaire was still too long. There was already substantial knowledge available regarding some of the questions posed e.g. nature of IS development and education levels of top managers, length of time in role, number of IS staff in the organisation and number of non-IS staff processing their own data and hence it was felt that many of these questions could be omitted.

Section A of the questionnaire concerned details of the respondent and his/her organisation. Following the first 5 pre-test interviews Section A was streamlined as questions 5 - 10 were considered interesting but not directly relevant to the model or in areas where many research studies had already been undertaken (e.g. Neo 1988, Galliers 1994, Kettinger 1994). Questions 1 to 4 were considered for removal as it was regarded as obvious as to the name, organisation and role of respondents as they were selected via placement students. However the IS Managers stated that they receive frequent questionnaires and may pass them on to colleagues to complete. Questions 1 to 4 were therefore retained and worded appropriately so as to ease the respondent in to the questionnaire. However two respondents felt that detailed information relating to specific values such as total

sales, profit, number of employees etc. might not be to hand or involve too much effort to obtain, delaying the return of surveys. This resulted in only one question : “Please give a guide as to your organisation’s annual IS budget in £ sterling or as a percentage of turnover?”

Section B concerned the organisation’s approaches to planning its IS and required 45 responses, each on a Likert scale of 1, 2, 3 or 4 where 1 expressed disagreement with the statement and 4 referred to agreement. An even number in the Likert scale was used to avoid respondents selecting the *via media*. Much has been written on IS planning methodology including the use of similar questionnaires (see Atkins (1990), Brancheau and Wetherbe (1987), Galliers (1987), Earl (1989), Niederman et al (1991), Galliers, Merali and Spearing (1994)). It was also felt that some of these areas could be investigated in the post questionnaire interview stage. However due to the reduction of this section in the survey the research questions were reviewed and this resulted in the downgrading of a possible Research Question on the *process* by which changes in IS strategy occur.

Section C referred to the scope of IS developments within the organisation including electronic mail, electronic commerce, Marketing Information Systems, Database Management Systems and Decision Support Systems. Again, these questions although interesting were felt to be not overly relevant to the IS derived sustainability model and produced little variance (all respondents answered 4 (strongly agree) to questions 12, 13, 14, 15 and 20 and all respondents answered 1 (strongly disagree) to questions 16 and 18. Section C was therefore removed from the questionnaire.

Section D was concerned with the outcomes of the Information Systems that had been implemented in the sample frames. Respondents felt that question 21 was fundamental to the questionnaire. This was removed to the covering letter where respondents were asked to state whether their organisation adopted a pioneering or follower strategy. Question 22 asked whether any Information Systems had produced a business advantage over rivals and the remaining part of section D investigated the origin and development time of the system, the advantage gained and the investigation of sustainability factors. This section directly related to the factors detailed in the IS derived sustainability model. The two page glossary of terms was removed as this increased the length of the questionnaire

and perceived difficulty. Some of the terms within the main body of the questionnaire were simplified in order to avoid confusion.

5.1.1.3 Survey versions 2a, 2b, 2c

Version 1b being significantly changed, evolved into 2a which required full pre-testing once more. Versions 2a, 2b and 2c (incorporating more minor revisions) were pre-tested with 9 interviewees: 3 academics, 3 IS Managers (M&S Financial Services, Martin Dawes, GEC-Alsthom), 3 Business Managers (NWS Bank, Martin Dawes, Carrimat) and 2 IS vendors (Xerox and Hewlett Packard). Compared to version 1b, 2a was shorter, having been reduced to a one page covering letter and a three page highly condensed dual column questionnaire. Following these detailed interviews the author felt that the opening question should clearly differentiate between IS developments that have produced a competitive advantage, those that have nullified a rival's advantage and those IS that are mainstream applications (payroll, word processing, spreadsheets). Interviewees selecting the latter category as the only type of application present in their organisation were asked to leave the questionnaire. From this differentiation the questionnaire divided naturally in sections focusing on developments that had produced a competitive advantage and those that had nullified a rival's advantage.

The remaining interviews concerned the scope, relevance, clarity and form of the survey items. Participant suggestions resulted in minor modifications for form and clarity. Five respondents queried the wording of question 2 regarding the length of time that an advantage lasted. Other phraseology including *IS Development* and *serendipitous developments* were raised as potential issues by 1 and 4 respondents respectively. Question 12 was considered by some to omit some important sources of ideas for IS development i.e. middle management, the media and IS champions. All these alterations were included in version 2b. Q13 considered whether the IS development was in response to a specific problem and if it was, in which *functional* area did the problem arise. Respondents criticised this as the problem might not have arisen from a specific *functional* area. The wording was changed to reflect the comments.

As an attempt had been made to condense questions into columns it was felt that in some instances (e.g. questions 6, 8 and 9) this led to confusion necessitating a slight reformatting and restructuring of the questionnaire which was reflected in version 2b.

As the data collection method was to incorporate triangulation it was necessary for the questionnaires to be sent initially to IS Managers who would then identify a senior Business Manager who was familiar with the IS development mentioned. All but one respondent felt that this was appropriate and practical. The one respondent upon reflection raised issues of confidentiality and questioned whether it was fitting to single out one colleague who had not agreed to take part in the study. Despite this objection the author decided to persist with the procedure as it was felt that the benefits to be gained by triangulation more than offset the drawbacks from a potentially smaller return of business questionnaires. Colleagues who had been named by the IS Manager who were unwilling to participate in the research study would not be pursued.

Some minor rewording and allocation of spacing resulted in the formation of version 2c. For clarification and simplicity the three dimensional checkboxes were changed to modest squares.

No further changes were deemed necessary with the last 4 pre-test interviews.

5.1.2 Pilot Interviews

The pilot interviews were aimed at ensuring *reliability* of the instrument and were conducted with the final version of the questionnaire (version 2c).

5.1.2.1 Pilot organisations

The pilot interviews were highly structured and conducted by the author with the following organisations:

<u>Financial</u>	<u>Retail</u>	<u>Manufacturing</u>
Lloyds Bank (IS)	C & A (IS)	Air Products (IS)
Midland Bank (IS)	Sainsburys (IS)	Ciba-Geigy (IS)
Bradford & Bingley (Bus)	GUS (Bus)	GCN (Bus)
Soverign Finance (Bus)	Crosley (Bus)	Airbags Int. (Bus)

Table 5.1 Participants in pilot interviews

(IS) - indicates those organisations where the IS Manager was interviewed and a named Business Manager asked to complete the questionnaire

(Bus) - indicates those organisations where the Business Manager was interviewed following the completion of the questionnaire by the IS Manager

Questionnaires took an average of 16 minutes to complete (4 less than expected) and the average length of the interviews was 55 minutes.

5.1.2.2 Reliability result

Cronbach's alpha was computed on the pilot survey data as a measure of reliability to ensure that the data obtained from the questionnaires did not differ significantly from the data obtained through the pilot interviews (Cronbach 1951). Cronbach alpha values of 0.83 were noted for all variables (see appendix) except those relating to budgets and two others where the number of responses was low as the question was optional. Although no precise ranges exist to evaluate Cronbach's alpha, these values fall in line with those recommended by Van de Ven and Ferry (1979), Powell and Dent-Micallef (1997) and the “0.80 rule of thumb test” as offered by Straub (1989). Although Cronbach's alpha is no guarantee of ‘accuracy’ or ‘appropriateness’ (both instruments may be equally biased) it is a gauge for reliable measures.

5.2 Main questionnaire survey

Version 2c of the questionnaire - from now on simply ‘the questionnaire’ – was used in the main survey. A copy is given in the appendix.

The finalised questionnaire was sent to 246 IS Managers, (73 Financial, 83 Retail and 90 Manufacturing companies). This was 138 more than intended due to the low rate of initial response from batches 1 and 2. It was decided to send the questionnaires through a further cohort of placement students the following year in different organisations so that response rates could be improved. These students were briefed in person and via letter and each asked to select an appropriate IS Manager to whom the questionnaire could be directed in the same way as batches 1 and 2. Again triangulation was utilised as questionnaires

that were distributed asked IS Managers to identify a senior Business Manager who was familiar with the IS development under investigation.

Issues of overcoverage were addressed as the initial company list contained some organisations that appeared to be a member of the defined population but on closer inspection were found to be of a different sample frame. Such organisations were screened out from the study during data collection.

Issues of multiplicity occurred when lists of placement students for Business Studies and Business Information Technology were merged. Often however students were employed in different departments and widely dispersed geographically. In order to reduce bias in the selection sample, a subsample was made of those organisations occurring multiple times. Half of the companies that occurred twice on the list were deleted and two thirds of those that occurred three times were eliminated which resulted in the remaining sample being an equal probability sample of the list members (Groves 1989).

Other potential sources of error in the data collection occurred in the mundane tasks such as mailings, briefing students, tracking sample results, data entry and neglecting to rework *soft* refusals². Reasonable care was given to these matters and it was felt that these sources of error were minimised.

Only 28 completed questionnaires were received from Business Managers. This slightly undermined the triangular aspect of the methodology and limited the reliability of the findings. However an attempt was made to rectify this by interviewing more business managers in 5.4.2.

Cross tabulations (X^2) were utilised within the IS Manager questionnaire returns (to investigate associations between factors) and to test the similarity of responses between IS and Business Managers. However as a result of the relatively small sample size of the Business Manager returns ($n=28$) it was not considered appropriate to use cross tabulations to investigate the association of factors from *within* the Business Manager sample. Other statistical tests were considered e.g. the Mann-Whitney U test but were also deemed unsuitable due to the small number of questionnaires being considered (Curwin and Slater 1996).

² *soft* refusals are those respondents that are less adamant about refusing to complete a questionnaire or attend an interview and potentially could be encouraged to partake further in the study

Cronbach tests on the 28 Business and IS Manager returns produced a value of 0.72. This provided a degree of reliability indicating that there was broad agreement between the questionnaires from the IS and Business Managers but differences on particular issues which will be referred to in Chapter 6.

5.3 Qualitative interviews

Interviews were conducted with 30 Managers from IS and Business - 8 from Financial Services, 12 from Retailing and 10 from Manufacturing. The interviews were conducted over a period of 14 months. Twenty two of the interviews were conducted at the organisation's premises and 8 were completed at the author's office in Manchester. More interviews were conducted than anticipated due to low levels of initial response and the large numbers stating 'no relevant system'. Greater emphasis was placed upon interviewing Retailers due to a lower Retail questionnaire response.

The 30 interviews, lasted between 55 and 112 minutes with an average of 67 minutes. All interviews were taped and the transcription time for each hour of material averaged nearly 6 hours - closer to May's (1993) estimate than Patton's (1980).

At the beginning of each interview, time was set aside in order to ensure that there was a common vocabulary particularly relating to terms such as Information Systems, pioneers, organisational flexibility, trade secrets, Strategic Information Systems and competitive advantage. Explanations of these and other terms are provided in the glossary. Even though most (25) had completed the questionnaire previously, in many cases this was some time ago and an re-introduction to the topic under discussion was required. This introductory element was especially important for the 5 Managers who had previously rejected the opportunity to complete the questionnaire but had later agreed to a confidential interview.

Interviewing Managers on Information Strategy was found to be a sensitive subject and it often took time for mutual trust to be established before the true facts and opinions could openly be discussed.

5.4 Response Rates

5.4.1 Surveys

5.4.1.1 Survey responses from IS Managers

The survey was sent to 246 companies in the finance, retail and manufacturing industrial sectors. This occurred in 4 batches and produced a return of 141 questionnaires. However for reasons detailed later, 36 had to be discarded, and 40 professed to have ‘no relevant system’, leaving 65 questionnaires from IS Managers. The usable response rate for detailed analysis was 26% which consisted of response rates of 28%, 25% and 29% for Finance, Retail and Manufacturing respectively. However as 102 organisations (40 from the questionnaire returns and 62 from follow up calls) were found to have ‘no relevant systems’, a response rate of 45% could be claimed from those with ‘relevant systems’.

	Financial	Retail	Manuf.	Total	Response Rate (%)
Sent Out	73	83	90	246	
Returned	38	23	25	141	35
Useable for detailed analysis	26	17	22	65	26

Table 5.2: Response rates for IS Manager questionnaire

Although the Business Manager returns compared to those sent out were very favourable, the overall study shows that only 11% of the surveys that were disseminated were completed by *both* the IS Manager and the Business Manager of the same company. Removing the 102 with ‘no relevant systems’ however increases this to 19%.

	Financial	Retail	Manuf.	Total	Response Rate (overall)
Bus Manager Returns	10	9	9	28	11

Table 5.3: Percentage response rates for Business Manager questionnaire

Missing data of both the unit (the questionnaire) and item (questions within the questionnaire) occurred which impacted upon the quality of the survey. The missing data for some items within the questionnaire was not random. 51% of respondents did not offer a response to the question regarding the actual amount spent on IS in the company and 68% did not indicate the spending on IS as a percentage of total sales. Thirteen of these omissions were confirmed at the interview stage to be due to confidentiality and although all respondents were not asked explicitly it was very likely that they wished the details to be kept private. The omissions of answers to other questions were less than 1.5% and deemed as randomly missing data. This could be attributed to coding errors or non deliberate omissions by respondents.

5.4.1.2 Overrepresentation/Underrepresentation

Table 5.4 details the response to the IS questionnaire in each industry.

As only 17 of the retailers produced usable returns there was the issue of underrepresentation of the subgroup. Weighting adjustments were considered but rejected due to the likely increase in other error sources. It was decided to address this underrepresentation at the interview stage of data collection.

Industrial Sector	%age
Financial	36
Retail	21
Manufacturing	24

Table 5.4 Co-operation rates for participation in questionnaire phase

This variety in response levels was probably due to a number of reasons. IS Managers in the Financial Services industry had the highest levels of response. This was despite evidence to show that the sector operates in a turbulent business environment with increasingly shorter product lifecycles. The explanation could be that IS are seen as critical to both operations and strategy (Price Waterhouse surveys 1994, 1995, 1996) and that there are interesting stories to relate and managers are keen to do so. Practitioners in Banking and Insurance are also anxious to learn about the developments of others in the same industry.

5.4.1.3 Unit Nonresponse

Only 26% of the questionnaires sent to IS Managers were useable for detailed analysis. The rate obtained was somewhat disappointing but compares with a 21 percent response rate reported by Powell (1992), 28% response rates reported in studies by Gomez-Mejia (1992) and Zahra and Covin (1993) and 24% in study by Sethi and King (1994). Substantial efforts had been made to use effective data collection procedures such as well crafted introduction letters, training students to act as intermediaries, the opportunity of entering a prize draw (for both respondents and students) and the use of phone, letter and email follow up to try to cajole students and respondents directly.

The following reasons for *non response* by IS Managers were surmised by the researcher or communicated either directly or via the student :

<u>Explanation</u>	<u>Actual</u>	<u>%age of total non-response of unit</u>
Confidentiality	26	33
Inappropriate	11	14
Personal policy	10	13
Company policy	10	13
Bad timing	7	9
Too busy	6	8
Too complicated	5	6
Not interested	2	3
Miscellaneous	2	3
Total	<u>79</u>	<u>100%</u>

Table 5.5 Final causes for non response from questionnaires sent to IS Managers

Obviously as the achieved sample differed from the selected sample the potential effect of non-response could become an issue. Some of the sample of non respondents were questioned using an alternative data collection method i.e. formal interview and although this sample was small (8) it was estimated that the views of this sample did not differ radically from the sample that completed the questionnaire.

At least 3 attempts were made to encourage respondents to return the questionnaire. This involved two phone or email reminders to the student and

finally a phone message directly to the relevant Manager. Dillman (1978) discusses the need for call-backs to offer another copy of the survey instrument as simple misplacement, loss or perhaps inadvertent discarding of the questionnaire is commonplace.

Confidentiality was cited as the most common reason for non-response. Twenty six companies felt that commercially sensitive information about their IS developments and strategy would be valuable to competitors. This was despite the assurances that had been outlined in all initial correspondence. Further emphasis was placed upon these issues in all follow up contact by assuring firms that anonymity would be preserved and that the results would not be released to commercial organisations and no organisational identities would be published except by prior consent. This attitude does lend tentative support to some of the data that was collected where a significant number of IS ideas are generated from observing rivals (to be discussed later).

Inappropriate - this referred to the person who received the questionnaire or that it was inappropriate for the department or organisation. Due to reorganisations in thirteen cases, it was not clear initially who was the senior IS Manager/Director. On two occasions new names were given and the questionnaire was directed to them. Eight new incumbents in the role felt insufficiently qualified to comment on current and past IS developments and three others were due to retire or move within the organisation without a named successor. Identifying the appropriate person would have been even more difficult without the use of a student *in situ*. Although largely anecdotal this evidence is indicative of the high turnover of staff in IS related areas and hence a tendency towards the short term nature of IS strategy.

Personal policy - this occurred in situations where an individual had formed their own policy of not responding to questionnaires from outside the company. Of the 10, 7 said that it had resulted from questionnaire fatigue. Three IS Managers stated that they received an average of six surveys per week either from students or various companies who use 'industrial questionnaires' to generate sales leads.

Company policy was mentioned by 13% of non-respondents. Two of these also referred to the issue of confidentiality as a secondary reason and the remaining 8

stated that the organisation had decided to not participate in surveys as they did not wish to give any opportunity for the perception that they favoured certain parties over others.

Bad timing - three firms in the sample had recently been acquired and felt that it was inappropriate to comment upon IS strategic issues at this time. Four others felt that as they were just about to implement large scale IS, the questionnaire would be more suitably addressed in 9 - 12 months time.

Too busy - the recipients of the questionnaires were frequently in high profile positions in medium and large organisations and 6 felt that there were other more pressing demands to be made upon their time.

Too complicated - despite frequent revisions of the questionnaire in extensive pretesting emphasising clarity 5 firms felt that the questionnaire was still too complex. One of these organisations did finally agree to participate as part of the interview sample however and the author felt that the reason for non response was more to do with *confidentiality* than *complexity* - meeting the recipient face to face allowed these reservations to be discussed more fully.

Not interested - when pressed two firms stated that they were not interested in discussing IS issues as they felt that the company would not benefit from such exposure.

Miscellaneous - two companies failed to give a specific reason for non completion to the student or the author despite repeated attempts to elicit an answer.

Care and diplomacy are frequently required when contacting potential respondents and on reflection it was felt that the over aggressive approach conveyed by some students helped to turn reluctance into refusal. Even though attempts by the researcher during face to face meetings and correspondence with the students outlined precisely the introduction to be used, detailing survey sponsor and topic and distributing a hard copy letter directly to the respondent 4 IS Managers still felt that it was a disguised sales call or some other solicitation.

Reworking refusals proved effective in 19% of cases. Respondents who refused to complete the questionnaire initially were converted by subsequent attempts by

either the student or researcher. Research by Blair and Chun (1992) found small differences in item non responses between initial co-operators and those who were converted from refusals. In this study however, questionnaires from the reworked refusals did not appear to differ from the original co-operators and as the number was relatively small were not considered to affect the overall conclusions.

5.4.1.4 Responses from Business Managers

The response rate for the return of questionnaires from the nominated Business Managers was 43%. This relatively high level of commitment was probably due to the fact that the Business Manager knew that he/she had been nominated by a colleague.

The reasons for *non response* by Business Managers are detailed in table 5.6 and were surmised by the researcher or were communicated either directly or via the student. These were broadly similar in nature to those of the IS Managers although there were some exceptions.

Work commitments were referred to by seven managers. Interestingly, five expressed concerns over confidentiality and two stated that it was company policy to not complete questionnaires even though the IS Managers in the same organisation had done so! This could be due to the IS Manager being unaware of the confidential nature of the development or not being informed of the policy. It could also be a convenient excuse for the Business Manager to avoid responding. Six stated that they were not the appropriate Business Managers due to job changes but only one questionnaire was returned by a new name. It might well be that questionnaires which have the name of the previous incumbent scored through and sent on do not feel as committed to the task. When pressed by phone, two of the new incumbents said that they did not recognise the system and two others felt that they were unqualified to comment on the IS development. Three of the six who described themselves as 'Not interested' referred the researcher to the IS department and the 'Miscellaneous' category covered the 5 respondents who were uncontactable.

<u>Explanation</u>	<u>Actual</u>	<u>%age of total</u>
Confidentiality	5	14%
Company policy	2	5%
Too busy	7	19%
Personal policy	4	11%
Too complicated	0	0%
Inappropriate	5	14%
Bad timing	3	8%
Not interested	6	16%
Miscellaneous	5	14%
Total	<u>37</u>	<u>100%</u>

Table 5.6 Causes of non response from questionnaires sent to Business Managers

5.4.2 Post questionnaire phase interviews

The co-operation rates for interviews was pleasing. As listed in table 5.7, 79% of requests resulted eventually in agreement for an interview. This was surprising and meant that more interviews were conducted than originally intended. Those refusing interviews most commonly cited confidentiality and/or time pressures.

The interview population was not a random sample of those initially sent questionnaires. A pragmatic approach was taken with those geographically situated in clusters or within the Greater Manchester area receiving a higher chance of being interviewed. Of these, 40% were from the Retail sector specifically in order to boost underrepresentation from the questionnaire phase. Although this resulted in significant bias in the population of respondents at the interview phase, as the research had developed towards a more qualitative/interpretist stage this was less of a concern than it would have been.

The high agreement levels for interviews were probably due to a number of factors: direct approach by researcher rather than a student enhancing credibility, that

	Original Questionnaire Respondents	Original Non-Respondents
Target	25 (15 IS & 10 Bus Mgrs)	13 (all IS Mgrs)
Accepted	22 (15 IS & 7 Bus Mgrs)	8 (all IS Mgrs)
% success	88%	62%

Table 5.7 Interview co-operation rates (original questionnaire respondents and non-respondents)

many had already shown a degree of interest and motivation as they had actively participated in the previous stage and thirdly as this stage was completed towards or at the end of the student placement, respondents felt a degree of gratitude to the University, particularly if they had been impressed with the student’s work. Some of the interviewees also probably felt that they had a ‘good story to tell’ or thought that they could gain valuable insights about rivals from spending time with the researcher. However a number required up to 4 contact attempts which agrees with the call-back work conducted by Groves (1989). The relatively high acceptance rate of 63% of original non-respondents was pleasing although attention was directed to those organisations who were most likely to

partake in the interview process e.g. firms where colleagues had contacts or other University pressure could be applied or in cases where individual students who had completed their placements were anxious to maintain contact. From this it was clear that the transition from the population targeted for questionnaires and those receiving an interview was not a random process but it was felt that it did not invalidate the findings.

The interviews undertaken with IS and Business Managers consisted of what Chan and Huff (1992) describe as:

“providing a richness in understanding strategy that cannot be obtained by a survey approach”.

Chapter 6

Results

Introduction

This chapter presents the main findings of the IS and Business Manager surveys and provides details of the interviews conducted. Sections 6.1 and 6.2 explain the statistical significance of the main questionnaire findings. Section 6.3 considers complementary resources that were not supported by statistical testing and section 6.4 reflects on feelings and hunches found during the research where there is scope for further study. Section 6.5 refers to other findings that are not directly related to the IS derived sustainability model but which arose from the study and are of interest. Section 6.6 summarises the differences between the responses from IS and Business Managers in those organisations where both Managers completed the questionnaire.

6.1 Questionnaires

For full details of the questionnaire results please see the appendices.

6.1.1 ‘No relevant systems’

Question:

We are interested in your organisation’s Information Systems (IS) that have either produced a competitive advantage or have reduced the advantage created by a rival’s IS. We are not concerned with mainstream applications (e.g. payroll systems, word processing) or systems that *all* companies must have in your competitive arena in order to compete effectively.

Regarding your IS portfolio please state whether there are systems that :

Tick *all* that apply

a) have produced a competitive advantage over rivals

☐

b) have nullified a competitive advantage caused by a rivals IS

☐

The number of companies stating that they had ‘no relevant systems’ was 102. These organisations apparently had never implemented a SIS that had either given them a competitive advantage or nullified a rival’s advantage. The wording on the survey instrument was clear and had undergone extensive pretesting. It asked respondents that if they had mainstream applications only (e.g. payroll systems or word processing or only used systems that were a strategic necessity in their industry) they could withdraw from the data collection process. Although there could be a number who ticked this box in order to save themselves time, 10 were followed up by a student or the researcher in order to confirm the initial response.

Experience of previous studies (e.g. Cronin et al. 1988) has demonstrated that those who have achieved a competitive advantage over rivals or used an IS to ‘catch up’ with others are keen to discuss their success.

The numbers of non-respondents could have affected the results. The range of figures for the percentage of organisations that have ‘no relevant systems’ are given in Fig. 6.1

Proportion	Finance	Retail	Manuf.	Total
<u>Actual</u>	48% (24)	64% (30)	69% (48)	61% (102)
<u>Minimum</u>	33%	36%	53%	41%
<u>Maximum</u>	64%	80%	76%	74%

Table 6.1 Percentage of ‘No relevant systems’ per sector (number obtained in parenthesis)

Actual is the number of organisations with no SIS (‘no relevant systems’) divided by the number *responding* to the questionnaire. Minimum is the smallest number of organisations if it is assumed that *none* of the non-respondents were in organisations where there were no SIS present. Maximum is the largest number of organisations if it is assumed that *all* of the non-respondents were in organisations where there were no SIS.

Based upon the actual figures obtained, the interviews of respondents and non-respondents, knowledge of the sample frames and evidence from previous studies the figures for all three sample frames for ‘no relevant systems’ was between the *Actual* and the *Maximum* indicating that a majority of the organisations overall did not have any SIS that had either obtained a competitive advantage nor specifically nullified a rival’s competitive advantage. In the author’s view the figures should be nearer to 55% for Finance, 70% for Retail and 75% for Manufacturing with 70% overall.

6.1.2 Strategic Systems

The following provides detailed item responses for those organisations that stated that they had ‘relevant systems’ i.e. systems that had either obtained a competitive advantage, nullified a rival’s competitive advantage or both.

6.1.2.1 IS Budgets

Relevant question:

Please give a guide as to your organisation's annual IT budget :

in £ sterling £_____ and/or as a percentage of turnover _____ %

There were 65 usable responses from IS Managers. Thirty two responded to the question regarding their company's IS budget which revealed the highest budget to be £4.5 million, the lowest £15000 and a mean of £1.2 million. The breakdown between industrial sectors is shown in Table 6.3.

Sector	Average IS Budget £m	No. of Organisations
Financial	1.3	15
Retail	1.7	6
Manufacturing	0.96	11

Table 6.2 IS budgets per sample frame

Only 21 gave the IS budget as a percentage of total sales. The highest was 5%, the lowest 0.5% and the mean 2.2 %.

Sector	Avg. budget as % of total sales	No. of Organisations
Financial	2.77	7
Retail	2.59	8
Manufacturing	1.12	6

Table 6.3 IS Budgets as percentage of total sales per sample frame

6.1.2.2 Competitive Advantage

Relevant question:

For the Information System that has produced the most *significant competitive advantage*...

1. Please name the IS application and briefly describe the nature of the business advantage created :

Fifty organisations stated that they had achieved a competitive advantage from at least one of their systems. However the numbers of non-respondents may have affected the results. The percentage range of organisations that have produced a competitive advantage are given in Table 6.5.

	Finance	Retail	Manuf.	Total
<u>Actual</u>	46% (23)	23% (11)	23% (16)	30% (50)
<u>Minimum</u>	32%	13%	18%	20%
<u>Maximum</u>	63%	57%	40%	52%

Table 6.4 Organisations claiming a competitive advantage from IS per sector (number obtained in parenthesis)

Actual is the number of organisations claiming to have obtained a competitive advantage from IS divided by the number *responding* to the questionnaire. Minimum is the smallest number of organisations if it is assumed that *none* of the non-respondents were in organisations where a competitive advantage had been obtained. Maximum is the largest number of organisations if it is assumed that *all* of the non-respondents were in organisations where there was a competitive advantage from IS.

Based upon the actual figures obtained, the interviews of respondents and non-respondents, knowledge of the sample frames and evidence from previous studies the author feels that figures for all three sample frames were different to the *Actual* figures obtained.

Finance was the sector where competitive advantages were most likely to occur. This is supported by findings by Dent-Micallef and Powell (1997). In Retailing, four of the original non-respondents were interviewed but only one was found to have a system that had produced a competitive advantage but was *paranoid* about confidentiality. Many developments were of the “me-too” variety, where firms had implemented similar systems related to EPOS, stock control and inventory

replenishment. In Manufacturing the author felt that following the interviews of original non-respondents a more accurate figure would be nearer the *Minimum* figure obtained (18%) than the *Actual* (23%). It was felt that many Manufacturers simply had no such strategic systems. It was also felt that some of those responding to the survey were atypical but as they had an interesting story to relate were keen to do so. This is supported by research by Atkins (1994) who found that of those organisations studied (a high proportion being in the manufacturing and process industries) many developed defensive non strategic IS.

Analysis of the 28 organisations where an IS *and* Business Manager completed the questionnaire showed that the Business Managers, in all but two, agreed that the IS development in question had achieved a competitive advantage over rivals. Although this lends support to the reliability of the findings, the author feels that the figures still need to be adjusted. The percentage for the Financial sector was between the *Minimum* and the *Actual* obtained (40%). In Retailing the figures were nearer *Actual* than *Minimum* (20%) and in Manufacturing the figures should be nearer the *Minimum* than the *Actual* (20%).

6.1.2.3 Duration of competitive advantages

Relevant question:

2. How long do you consider that the advantage lasted?	less than 6 months	<input type="checkbox"/>
	more than 6 but no more than 18 months	<input type="checkbox"/>
	more than 18 but no more than 36 months	<input type="checkbox"/>
	more than 36 months but less than 5 years	<input type="checkbox"/>
	5 years or more	<input type="checkbox"/>
	rivals have yet to catch up	<input type="checkbox"/>
	and it has been _____ years since implementation	

The duration of these advantages is shown in the following figure.

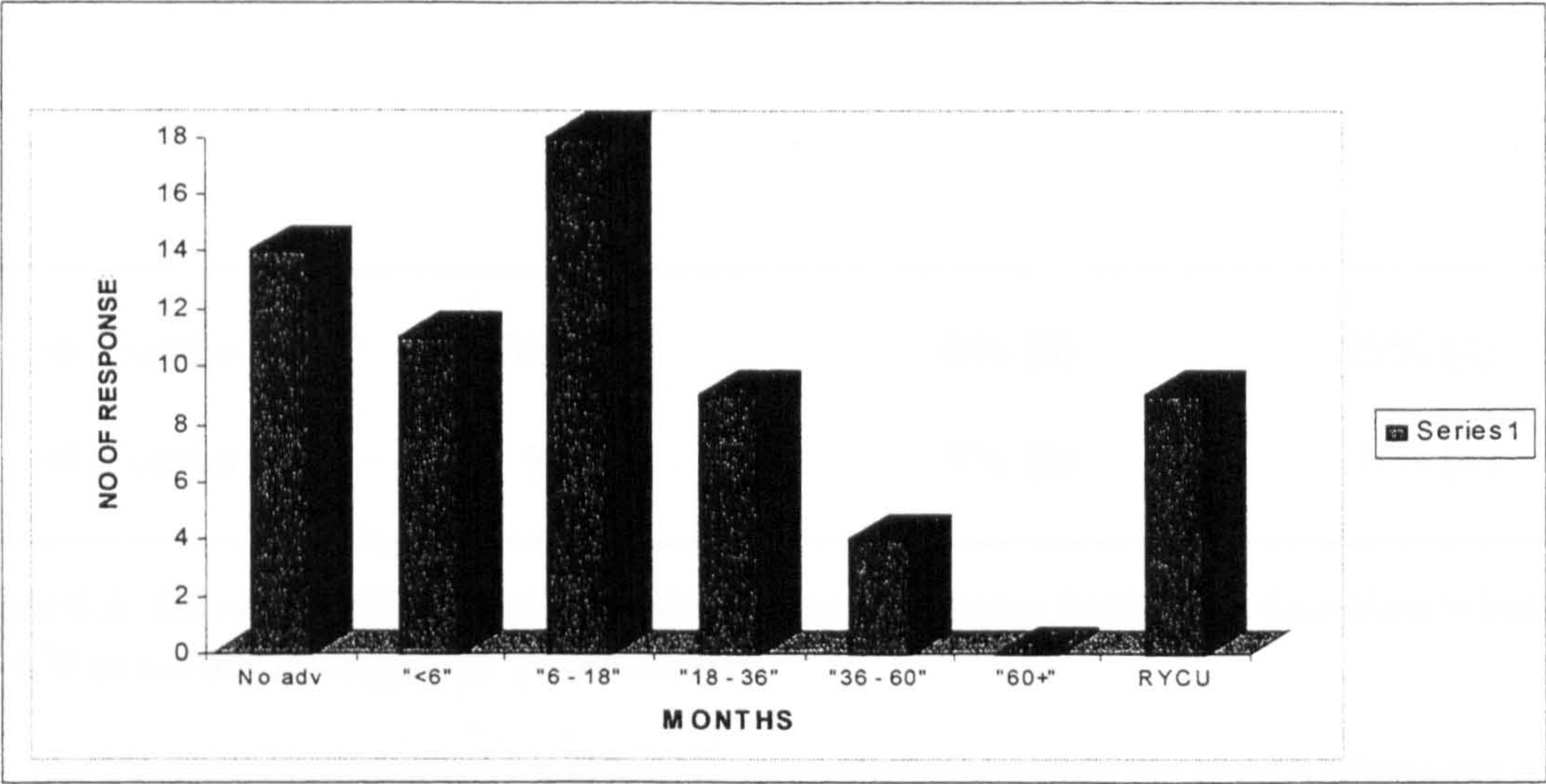


Fig 6.1 Duration of competitive advantage across all 3 three sample frames

In the nine cases where rivals had yet to catch up (RYCU) six had implemented the system within the last year, one had implemented less than two years ago and two companies had implemented the innovation three years ago.

Analysing the duration of competitive advantage per sector :

Duration of advantage	Financial	Retail	Manufacturing
< 6 months	13% (3)	36% (4)	25% (4)
6 - 18 months	30% (7)	46% (5)	38% (6)
18 - 36 months	22% (5)	0% (0)	25% (4)
36 - 60 months	9% (2)	9% (1)	0% (0)
RYCU	26% (6)	9% (1)	13% (2)

Table 6.5 Duration of competitive advantage per sector as percentage of total obtaining an advantage (number obtained in parenthesis)

Duration of advantage	Financial	Retail	Manufacturing
< 6 months	30% (7)	36% (4)	38% (6)
6 - 18 months	30% (7)	55% (6)	38% (6)

18 - 36 months	30% (7)	0% (0)	25% (4)
36 - 60 months	9% (2)	9% (1)	0% (0)

Table 6.6 Duration of competitive advantage per sector including duration where RYCU (number obtained in parenthesis)

For the 28 organisations that had questionnaires completed by the IS Manager and the Business Manager, the Business Managers tended to be more conservative regarding the duration of the advantage gained by the IS development.

Duration of advantage	IS Manager	Business Manager
< 6 months	6	11
6 - 18 months	7	8
18 - 36 months	4	1
36 - 60 months	2	0
RYCU	4	1

Table 6.7 Comparison of Manager type with duration of IS derived competitive advantage (all sectors)

Two Business Managers disagreed with their IS Managers that the particular development had produced a competitive advantage.

6.1.2.4 Nullifying competitive advantages

Relevant question:

This section is concerned with how you nullified a rival’s IS driven business advantage. If your organisation has nullified a number of developments from rivals please answer the following based on the most significant.

3. Briefly describe the IS development and the nature of the rival’s advantage :

The following table details the number of organisations that stated that they had nullified a rival’s competitive advantage through the development of IS. As the number of non respondents could have affected the results the figures for the *Minimum* and *Maximum* are also shown.

	Finance	Retail	Manuf.	Total
<u>Actual</u>	26% (13)	28% (13)	29% (20)	28% (46)
<u>Minimum</u>	18%	16%	22%	19%
<u>Maximum</u>	49%	59%	44%	51%

Table 6.8 Organisations claiming to have nullified a rival’s competitive advantage per sector (number obtained in parenthesis)

Actual is the number of organisations that had SIS that nullified a rival’s advantage divided by the number *responding* to the questionnaire. Minimum is the smallest number of organisations if it is assumed that *none* of the non-respondents were in organisations that had nullified a rival’s advantage. Maximum is the largest number of organisations if it is assumed that *all* of the non-respondents were in organisations that had nullified a rival’s competitive advantage.

Based upon the numbers obtained as well as the interviews of respondents and non-respondents, knowledge of the sample frames and evidence from previous studies it was felt that the figures for all three sample frames for nullifying the competitive advantage of rivals did not require adjustment. In the authors view the figures are as stated for the *Actual* in Table 6.10.

Business Managers agreed that the particular IS development had nullified a rival’s advantage in 14 out of the 17 occasions (82%) and although this ‘agreement’ is slightly less than that obtained in 6.1.2.2 it does lend support for the reliability of the IS Managers responses.

6.1.2.5 Duration of advantages before nullified by rivals

Relevant question:

4. For how long did the rival hold the advantage?	less than 6 months	<input type="checkbox"/>
	more than 6 but no more than 18 months	<input type="checkbox"/>
	more than 18 but no more than 36 months	<input type="checkbox"/>

more than 36 months but less than 5 years	<input type="checkbox"/>
5 years or more	<input type="checkbox"/>

The duration that a rival held an advantage before the organisation nullified that advantage was :

Length of advantage	%age
< 6 mths	23
6 – 18 mths	51
18 – 36 mths	21
36 – 60 mths	4

Table 6.9 Duration of competitive advantage held by rival before nullified (all sectors)

There was a significant difference ($p \leq 0.05$) between the duration of these advantages before nullification in the opinion of the Business Managers and the IS Managers. The tendency was for Business Managers to be more conservative in their estimates as to how long the rival held the advantage (Table 6.12)

IS Manager more optimistic	Business Manager more optimistic	Optimism the same	Business Manager not recognise the system
6	3	8	2

Table 6.10 Duration of competitive advantage held by rival before nullification (IS and Business Managers)

Relevant question:

5. How long did it take you to <i>develop</i> the system to significantly nullify the rival's advantage?	
less than 6 months	<input type="checkbox"/>
more than 6 but no more than 18 months	<input type="checkbox"/>
more than 18 but no more than 36 months	<input type="checkbox"/>
more than 36 months but less than 5 years	<input type="checkbox"/>
5 years or more	<input type="checkbox"/>

The length of time taken to develop a nullifying system ranged from 1 month to over 5 years:

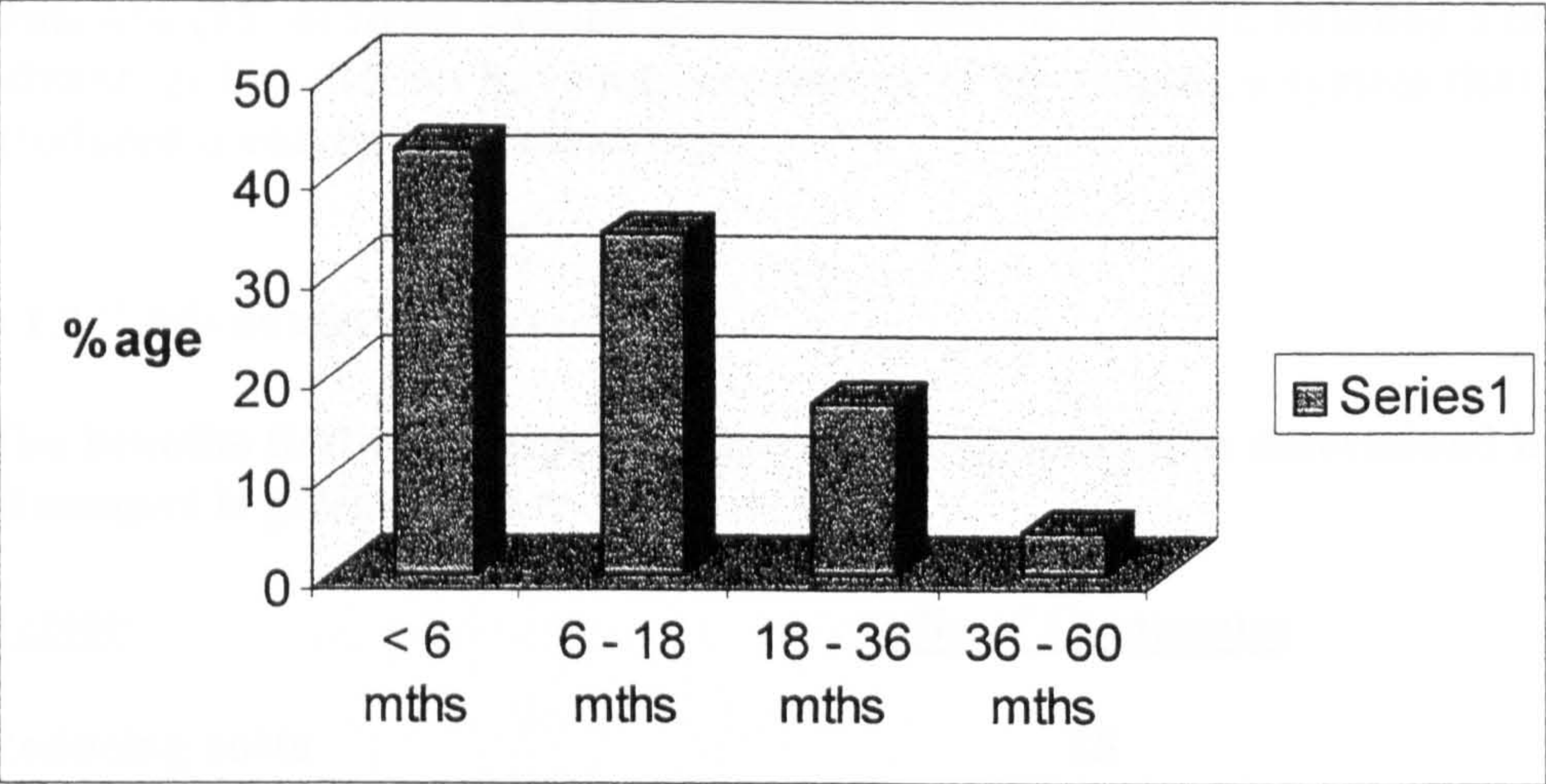


Fig 6.2 Length of time taken to develop the nullifying system

Length of time rival held advantage	Length of time to develop nullifying system		
	< 6 mths	6 – 18 mths	18 – 36 mths
< 6 mths	90%	10%	0
6 – 18 mths	47.8%	47.8%	4.4%
18 – 36 mths	0	33.3%	66.6%

Table 6.11 Length of time to develop nullifying system (% all sectors)

There was a significant difference ($p \leq 0.05$) between the estimates of the IS Managers and Business Managers over this development period. Business Managers had tended to indicate that the developments had been produced more slowly than the IS Managers.

6.1.2.6 Organisations producing competitive advantage *and* nullifying a rival’s advantage

Organisations having both systems that produced a competitive advantage over rivals as well as systems that have nullified a rival’s competitive advantage :-

	Total	Finance	Retail	Manufacturing
Numbers	31	10	7	14
% of total/frame	12.6	13.7	8.4	15.6

Table 6.12 Numbers of organisations achieving both a competitive advantage and the nullification of a rival’s advantage from their IS.

Only 6% (15) of firms studied possessed a system that had nullified a competitor’s advantage but did not have any experience of developing a system that had produced a competitive advantage.

6.1.2.7 Advantages achieved

The benefits that the competitive advantage generated as determined by the IS Managers is given below :

<u>Factor</u>	<u>No of Companies</u>
Reducing costs	35
Improved levels of customer service	30
Improved external communications	26
Improved internal communications	26
Enabled closer monitoring of costs	25
Reduced cost of obtaining supplies	21
Reduced sales and marketing costs	18
First mover	14
Reduced distribution costs	13
Reduced costs associated with co-ordinating functional activities	13
Enabled an increase in economies of scale	12
Enables use of restricted expertise	11
Prevents new entrants competing	11
Increases economies of scale	11
Reduced costs of transforming components into finished product	10
Improved customer loyalty	10
Prevents customers from switching	10
Helps to attract high quality staff	8
Provides access to information outside the firm	8
Provides unique access to customers, retailers, suppliers or distributors	7
Enables ‘lock-in’ of customers	3
Enables exploitation of monopolistic situations	2

Table 6.13 Advantage obtained from SIS as indicated by IS Managers

6.2 Significant factors

Table 6.16 shows the *cross tabulations* (Chi squared test) on the IS Managers’ questionnaire responses that were found to be statistically significant at 5%

confidence levels. The null hypotheses for these tests is that *x* (a factor) is not associated with a sustained competitive advantage.

Obtaining a *sustained competitive advantage* was associated with

- following a *pioneering* strategy
- focusing IS on improving *external communication*
- accessing *unique* resources
- the utilisation of *trade secrets*
- developing particularly *innovative* Information Systems

Table 6.14 – Summary of statistically significant factors at 5% confidence levels

These statistically significant factors are now discussed. Evidence from Business Manager questionnaires and interviews of IS and Business Managers is also used where appropriate.

6.2.1 Pioneers

Relevant question:

In your <i>opinion</i> compared to rivals, does your organisation aim to be: (tick one box)	
always an IS pioneer	<input type="checkbox"/>
mainly an IS pioneer but occasionally an IS follower	<input type="checkbox"/>
occasionally an IS pioneer but mainly an IS follower	<input type="checkbox"/>
always an IS follower	<input type="checkbox"/>
there is no formal positioning regarding whether the organisation adopts an IS pioneering or follower strategy	<input type="checkbox"/>

There was a significant association from the surveys between those organisations that had adopted a pioneering IS Strategy (identified by their response on the questionnaire) and their ability to sustain a competitive advantage. One organisation (Retail 1) known for its innovative developments, had introduced a supply chain management system that enabled them to reorder stocks automatically from suppliers both VANs (Value Added Networks). This had significant cost savings over traditional EDI and allowed ease of switching from one supplier to another depending on price, quality and delivery schedule.

On interview, some firms highlighted the need for pioneering collaboration e.g. one IS Manager stated that :

“Teaming up with NatWest/Bank of Scotland has enabled us to develop this technology - we could never have done it alone. Smartcard technology will be expensive for some to follow”

IS Manager (Financial 6)

Others, highlighted the importance of continuous development e.g.

“we aim to develop in this department innovative systems that are at the leading edge”.

IS Manager (Retail 5)

6.2.2 Trade Secrets

Relevant question:

11. This specific IS development :	Yes	No
is protected from imitation by patents, copyrights, contracts or trade secrets	<input type="checkbox"/>	<input type="checkbox"/>

Along with the statistical significance at 5% confidence levels, two questionnaires completed by IS Managers provided support for trade secrets.

“Our contract forces suppliers to be quiet about our joint TimeComp development”

IS Manager (Manufacturing 10)

“ We had a commercial embargo for a long time internally and with IBM and then formed a quasi-cartel with the other clearers”(referring to their integrated customer transactional database and personal loan scoring system)

IS Manager (Financial 11)

An interview with a large Retailer added support for the difficulties encountered by hiding developments :

“In the 80’s we were pioneers along with BHS with *in-house* ‘complements’ loyalty card but now automatic stock allocation systems and Data Warehousing has taken over and we need to get help from outside and/or involve suppliers - this allows others to view what we are doing and how it is being accomplished”

IS Manager (Retail 1)

Trade agreements and patents can be difficult to achieve and an interview with a Senior Marketing Manager at a major Bank revealed:

“We have patented the Mondex POS device and specifications but it’s stemming the inevitable. We want to compete on products and have *open specs*”

Business Manager (Financial 2)

Keeping developments quiet are difficult to maintain. In an interview Retail 6 outlined their strategy for releasing new systems :

“ We aim to be an IS pioneer - the secret is to develop the technology, keep it very quiet and roll it out very quickly - we managed to do this with scanning in the early 80’s”

IS Manager (Retail 6)

“We have formed legal contracts with the software house but our rivals recently saw the system at a trade show – it’s hard to keep anything quiet for long”

Business Manager (Manufacturing 6)

6.2.3 Innovation

Relevant question:

11. This specific IS development :	Yes	No
is a particularly innovative use of IS	<input type="checkbox"/>	<input type="checkbox"/>

The study supports a statistically significant correlation from the questionnaires between innovation and a firm’s ability to achieve a competitive advantage.

This was supported by a number of interviews including :

“we focus upon teams of R&D engineers at Head Office whose principal objective is to develop innovative applications that we can directly exploit in our sales centres”

Business Manager (Financial 5)

6.2.4 External communication and links with suppliers

Relevant question:

6. These questions refer to the benefits associated with the IS development .			
The IS has :	Yes	No	Unsure
Improved external communication	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

A significant correlation was found between those companies that achieved a competitive advantage and those that focused upon improving external communications.

One Business Manager stated that :

“there needs to be a necessary ‘trusting’ relationship with a supplier *before* EDI is implemented - this is aided by strong, effective communication links”

Business Manager (Retail 6)

Much has been written on the nature and power displacement in company - supplier relationships (see Swatmann 1993, Webster 1993). One IS Manager stated that :

“Linking to our suppliers enable us to exert pressure more specifically”

IS Manager (Manufacturing 7)

**Improved communication helps to ‘lock-in’ suppliers as stated by :
“Tying in our suppliers with Stratos [EDI system] prevented them from going to Sainsburys, Safeway or Asda”**

Business Managers (Retail 1)

6.3 Complementary resources and capabilities

The following discussion relates to the evidence collected or induced regarding complementary resources and capabilities. These findings are less substantiated than those above and were *not* supported by statistical analysis from the IS Manager returns.

6.3.1 Flexibility

The environment was succinctly described by a Business Manager in Financial Services:

“No one likes change. I don’t and the end users certainly don’t but it’s the way of the world, particularly the IT world”

Business Manager (Financial 9)

and from an IS Manager in Manufacturing:

“Most of our company have embraced client-server technology willingly - some of our older members have required further training however. Very few can’t make or are unwilling to make the transition”

IS Manager (Manufacturing 4)

Two respondents in large Banks referred to the importance of flexibility as follows:

“the new system has slotted quite easily within our new organisation and evolving culture”

IS Manager (Finance 2)

and

“I’ve been surprised at how well colleagues have accepted the changes”

IS Manager (Finance 5)

However there were dissenting voices :

“New systems always cause a degree of concern with users and this one, it is fair to say, is no exception!”

IS Manager (Retail 7)

and flexibility is only viable within fairly well defined boundaries :

“The trouble here is that we don’t really know what’s going on. The merger with Lloyds was relatively surprising and made the IT plans at this site look a little silly - we now have to integrate incompatible systems”

IS Manager (Finance 2)

6.3.2 Culture and Open Communications

The findings demonstrated that organisations that adopted an open culture with open and free communications between all levels were better able to develop SIS successfully. Two supporting quotations were given in the questionnaires and three from interviewing:

“We are very open with our suppliers - some are regarded as extensions to our own company rather than external companies linked via electronic commerce”

IS Manager (Retail 8)

“There is big restructuring and emphasis on ‘open’ culture - this helped to make the advantage sustainable”

Business Manager (Financial 5)

“New systems that previously would never have been implemented successfully can now be approached in a new way and with unexpected positive results”

IS Manager (Manufacturing 2)

“Communication is very open - we have frequent coffee break meetings where all the staff attend in order to distribute new information - its very informal really”

IS Manager (Retail 4)

“Everyone now says what a loose, informal company this is to work for - quite different from what many of us are used to!”

Business Manager (Financial 7)

However there is still evidence that not all companies have adopted this approach:

“All decision making is top down which makes us bureaucratic and slow to react”

Business Manager Manufacturing 1

“Unfortunately we’re often the last to know of changes in the business strategy”

IS Manager Financial 8

6.3.3 Workgroup Consensus

Many interviews highlighted the importance of consensus amongst planning and implementation teams as well as with the end user beneficiaries. For example :

“we all come together three times a week to ensure that we are all singing from the same hymnsheet”

IS Manager (Manufacturing 10)

“There used to be lots of conflict in our organisation - now its much easier to get things through - new developments, new ideas”

IS Manager (Retail 4)

“Agreement is sought and achieved, perhaps through compromise, before we can move on”

Business Manager (Retail 6)

6.3.4 Organisational Learning

The interviews provided insight into the relationship between obtaining a competitive advantage and the role of organisational learning:

“the only way to improve and compete better is to continuously adapt and learn”

Business Manager (Retail 11)

“we emphasise learning from what we’ve got wrong and what we’ve done right”

IS Manager (Manufacturing 13)

6.3.5 Top Management Support

Although one of the ‘Realisation factors’ in the IS derived sustainability model and not specifically asked for here, there was strong support from the questionnaires and interviews that Top Management Support was an important factor in developing a successful SIS.

Relevant question:

<div>16. The project team producing this specific IS development had:</div> <div><div>full support from top management</div><div><input type="checkbox"/></div></div>

Findings from interviews revealed that top management had a more pragmatic view of the benefits that could be achieved from IS:

/

“Management has tired of hearing that the next development will have a large ROI and allow us to surge forward of Lombard”

Business Manager (Financial 13)

“Senior Management has seen us drown the Information Systems Department in money over the last few years - they now require us to justify every new line of code”

IS Manager (Retail 8)

“We have 90 IS projects on our list but Top Management has given us funding for 5 - which 5? - the ones missing might be the very ones to yield an advantage”

IS Manager (Retail 14)

The chances of IS success are increased by Senior Management commitment by making human and financial resources available for implementation, integrating IS with business strategy and processes, selecting strategic opportunities, applications and ensuring continuity in IS investments over time (Kettinger et al. 1994).

There was some evidence for this e.g. :

“ The Director always shows a keen interest in any new development”

Business Manager (Manufacturing 5)

Although largely anecdotal and conjecture, findings from the research indicate that significant time was spent by senior management dealing with issues relating to IS strategy.

Business Managers felt that the IS development had full support of Top Management even more than the IS Managers (20 as oppose to 17 where both Managers completed surveys).

6.4 Other factors suggested

The remaining factors that follow can not be supported statistically but have been suggested from the questionnaires and/or interviews. Some ideas presented here are conjecture.

6.4.1 Other Realisation Factors

6.4.1.1 Good Process and Planning

The study showed that only 55% of firms used formal IS plans for the specific development and there was no significant association between the presence of formal IS Plans and the firms ability to either gain a competitive advantage from its IS innovations or to sustain advantages once they had been gained. In the interviews, many organisations felt that firm IS plans were inappropriate as the organisation needs to react to environmental change, changes in business direction and to take account of the changes in technology.

Only 28% of companies questioned used a *named* IS planning methodology according to the IS manager. Of these just over half (17% of the total organisations) had modified standard approaches (Business System Planning, Information Engineering, Critical Success Factors etc.). Not surprisingly a fairly large number of Business Managers (16 out of the 28 surveyed) did not know whether a methodology had been used.

Many interviews highlighted the need for short term development plans and the lack of integration of IS strategy with planning:

“Top management have strategic plans but we develop the systems that highlight imminent real needs”

IS Manager (Retail 6)

“There are plans, but these go out of the window when the time comes to implement a new system fast (to meet a real need that may only just have been realised)”

IS Manager (Manufacturing 5)

A view held by a Marketing Manager in a major Building Society hinting at the short term thinking towards IS strategy:

“We don’t want perfect systems, we want them Friday!”

Business Manager (Financial 5)

Many offered a pragmatic view :

“Inevitably there is a lag between new business initiatives and the systems we need to support them or to execute the strategy”

Business Manager (Retail 9)

6.4.1.2 System Champion

Relevant question:

16. The project team producing this specific IS development had	
a system champion(s)	<input type="checkbox"/>

The IS Manager in 28 out of the 50 companies that achieved a competitive advantage stated that they possessed a system champion in the project team. Interestingly, of the 28 organisations where a questionnaire response was obtained from both the IS Manager and a Business Manager, the Business Manager stated that system champions were more widely used (17 as oppose to 14).

6.4.1.3 Financial reserves

Relevant question:

16. The project team producing this specific IS development had	
access to adequate financial resources that could be directly utilised	<input type="checkbox"/>

34 out of the 50 IS Managers stated that they had access to adequate financial reserves. Of the 28 organisations where both Managers completed questionnaires the Business Managers felt that the development did have adequate financial resources (22) more often than IS Managers (18).

6.4.1.4 Project Leader

Relevant question:

16. The project team producing this specific IS development had	
a highly effective project leader	<input type="checkbox"/>

30 companies stated that the presence of an effective project leader was an important factor in developing an IS derived competitive advantage over rivals. The responses from the IS Managers and Business Managers were very similar with only one occasion where there was not agreement.

6.4.1.5 Proficient Implementers

A number of companies stated that being a “good implementer” was important in order to maximise the benefits from their IS developments.

“You can have the best plans in the world but unless they actually come to fruition there is no benefit. Perhaps the hardest part is the implementation and I think it’s fair to say that we’ve made progress in this area over the last two years”.

Business Manager (Financial 2)

“Most people now look upon new IT implementations as a painful process”

IS Manager (Manufacturing 6)

“Customers loyalty suffers when IT goes wrong - you get nothing extra when things go right”

IS Manager (Retail 7)

6.4.1.6 Technical Skills

Relevant question:

16. The project team producing this specific IS development had
adequate technical skills <input type="checkbox"/>

No significant association was found between the technical expertise held by project teams and the ability of the organisation to sustain a competitive advantage. Evidence from interviews indicated that organisations were taking radical steps to prevent the loss of expertise. One IS Manager made an interesting and very relevant comment :

“We are now trying to do everything in-house and are considering 3 month notice periods to all IT staff. When we use consultants we make them sign a contract that they will not work for a competitor for 3 years”

IS Manager (Retail 1)

Interestingly, more Business Managers (23) thought the project team had adequate technical skills than the IS Managers (18).

However there was considerable evidence of outsourcing product development although firms felt the management and control of projects should remain in house.

6.4.1.7 Organisational Components

Agreement was reached by many interviewees that the appropriate organisational components and structures must be in place in order to maximise the potential of new developments. More detailed research is needed to further investigate this factor.

“Clearly in order to make the most of an IS development, the company must be structured appropriately and everything must be in place – we must have full backing from the rest of the company”

IS Manager (Manufacturing 3)

6.4.1.8 Personnel Resources

Little evidence of support except :

“All personnel are valued and contribute in some way to new [IS] programmes”

IS Manager (Financial 4)

6.4.2 Other Factors

6.4.2.1 Scale Advantages

Relevant question:

11. This specific IS development :	Yes	No
enables our organisation to gain economies of scale	<input type="checkbox"/>	<input type="checkbox"/>

11 companies answered positively and felt that the SIS had enabled them to gain economies of scale.

One respondent in Manufacturing commented:

“Hooking electronically to our suppliers allows us to buy in large quantities when we want, avoiding large price fluctuations. It has helped us to be a major player in the market”.

IS Manager (Manufacturing 7)

6.4.2.2 Government Legislation

Relevant question:

11. This specific IS development :	Yes	No
is protected from imitation by government legislation	<input type="checkbox"/>	<input type="checkbox"/>

Only one organisation stated that their development had been protected from imitation to at least some extent, by government legislation:

“The Bank of England has stated that non Banking institutions can not originate the technology, they can only use it under licence”

IS Manager (Financial 4)

6.5 Other findings

This section provides details of findings in areas that are not directly related to the IS derived sustainability model but have implications for organisations that are considering SIS. Evidence from questionnaires and interviews is provided including statistical tests where appropriate.

6.5.1 Contribution to profit

Analysis of the IS Manager responses found an association (at 5% levels of significance) between sustaining a competitive advantage and its contribution to profit. Although some Business Managers disputed this there was not a significant difference between Manager type and the perceived contribution to profit made by the particular development.

6.5.2 IS and Business integration

Induction from the interviews suggests that there is a close degree of linkage between IS Strategy and Business strategy in all the sample frames investigated and most strikingly in the Financial Services sector.

“We work very closely with the IT people so that business needs are adhered to”

Business Manager (Financial 9)

6.5.3 Ease of observation

Relevant question:

8. Do you consider that the benefits of this IS development are:

very easily observed by competitors

☐

easily observed by competitors

☐

difficult to detect by competitors

☐

very difficult to detect by competitors

☐

Comments

For those companies that achieved a competitive advantage the ease by which competitors could observe the benefits were:

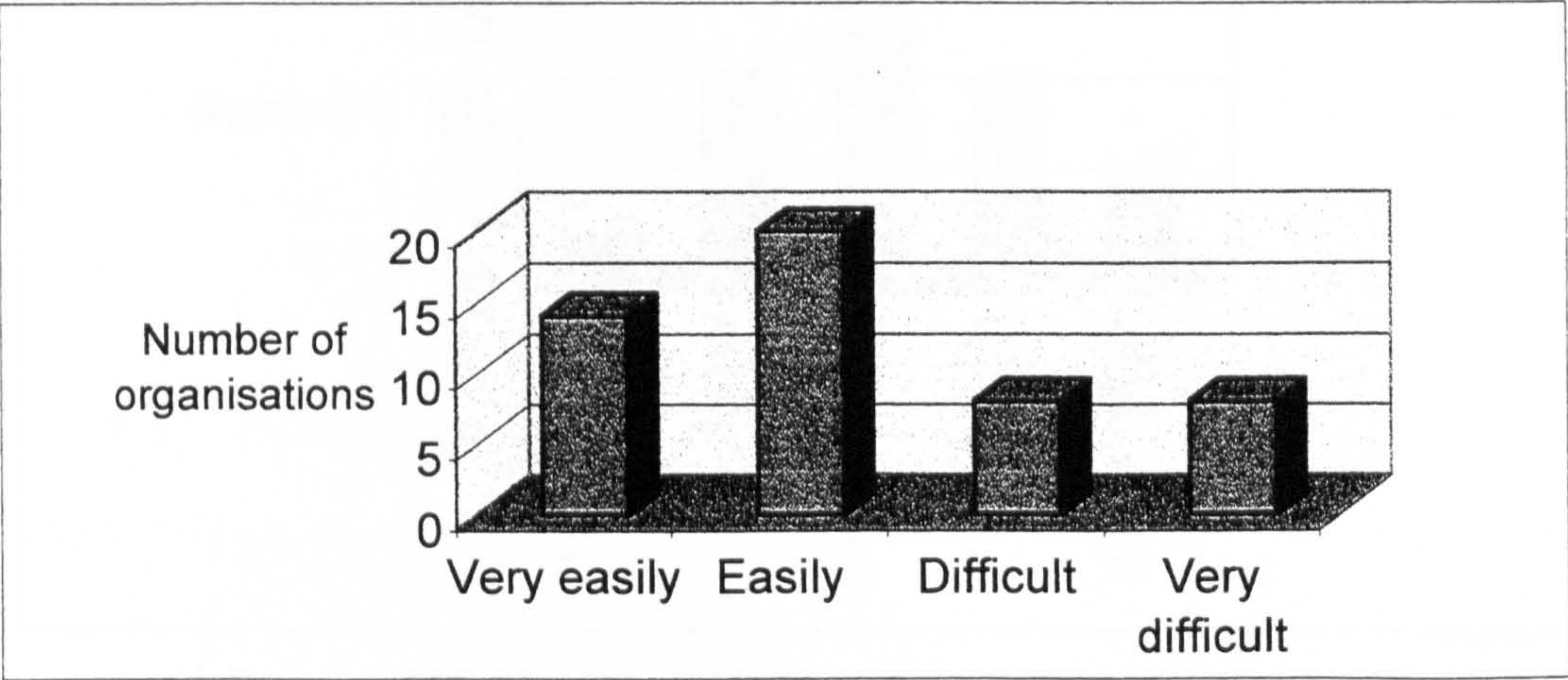


Fig 6.3 Ease of observation of IS benefits as indicated by IS Managers

Although based on a smaller sample (n=23) Business Managers indicated that the IS developments that had gained a competitive advantage tended to be more easily observable with no developments being categorised as ‘very difficult’ to detect.

6.5.4 Cost of obtaining rival system

Relevant question:

9. The implementation of any IS development includes a number of costs - hardware, software, training, management time, organisational changes, infrastructure etc. The total cost to a rival of acquiring the IS referred to is:

very low

☐

low

☐

moderate

☐

high☐

very high☐

Comments

The total cost to rivals of obtaining the system that had produced a competitive advantage in order to ‘catch up’ was :

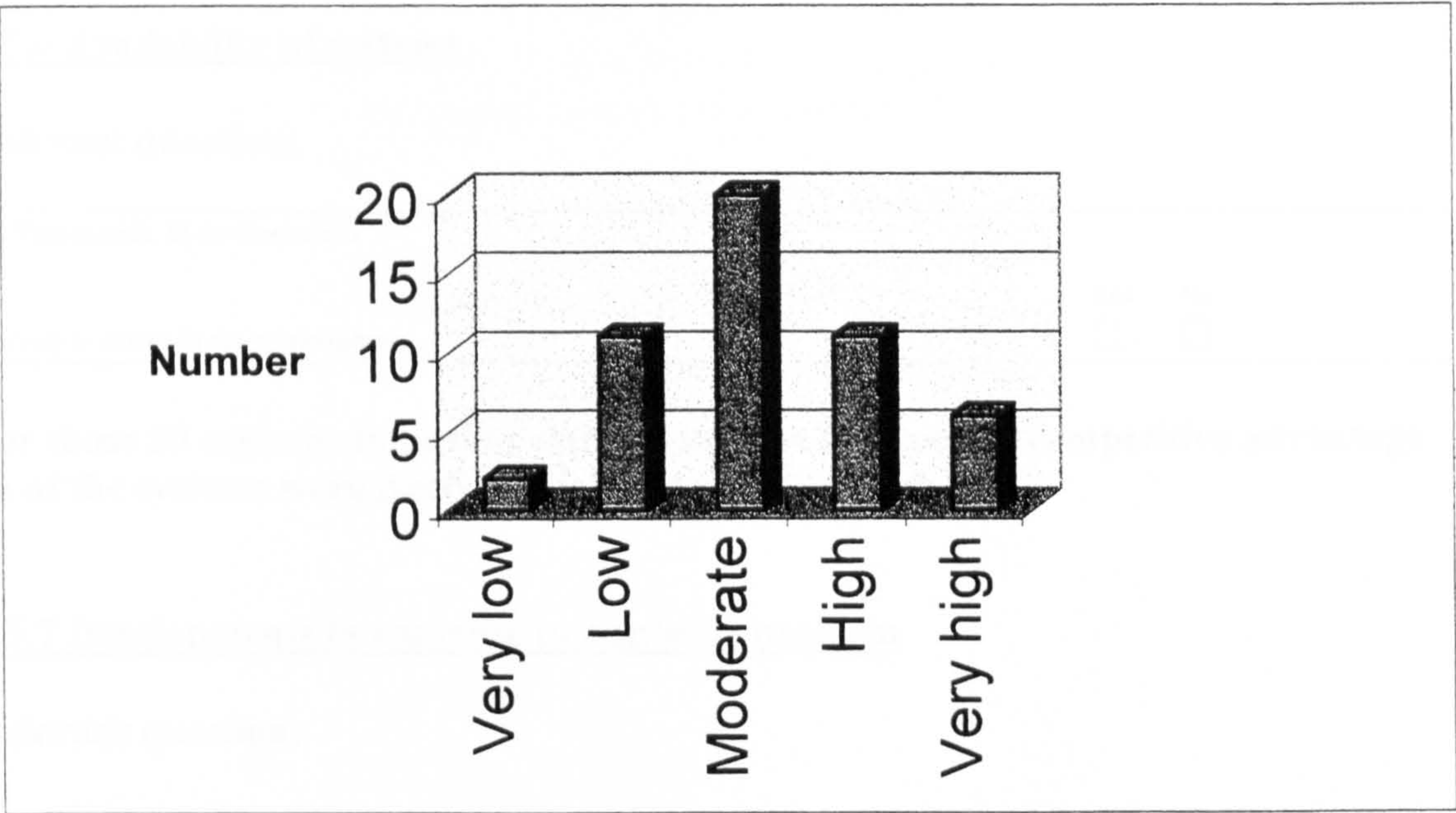


Fig 6.4 Cost of rivals’ acquiring system (all sectors)

Business Managers stated that the costs to rivals of acquiring the IS development were on average slightly higher than the responses given by IS Managers and had no responses in the ‘very low’ range.

6.5.5 The reuse of unique resources

Relevant question:

10. This specific IS development :

exploits unique resources within our organisation which are unavailable to competitors

Yes

No

Unsure

☐

☐

☐

If your answer is Yes, please answer the following question. If not please go to question 11.

Could the unique resources referred to above be readily used for other purposes by users if they were to divest the IS development?

Yes	<input type="checkbox"/>
No	<input type="checkbox"/>

The number of organisations that used unique resources which were unavailable to competitors were 19, and 18 of these could be reused for other purposes if they were to divest the IS development.

6.5.6 Availability of systems

Relevant question:

11. This specific IS development :	Yes	No
is freely available in the marketplace	<input type="checkbox"/>	<input type="checkbox"/>

For those 50 organisations that claimed to have produced a competitive advantage 16 of the systems were freely available in the marketplace.

6.5.7 Developments in response to a specific problem

Relevant question:

13. Was the IS development in response to a specific problem?	Yes	No	Unsure
	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
If yes, what was the nature of the problem?			
<hr/>			

Of the 50 organisations that obtained a competitive advantage, 29 stated that it was in response to a specific problem. However there was a significant difference ($p \leq 0.05$) between the way Business Managers responded to this question with 26% of the Business Managers (11) being unsure. Twenty eight IS managers stated that the development was generated as a result of the formal IS planning process.

6.5.8 Ideas for developments

Relevant question:

12. Where did the idea for this IS development come from ? [Please tick <i>all</i> that apply]
--

IS Dept.	<input type="checkbox"/>	Suppliers	<input type="checkbox"/>	Middle Management	<input type="checkbox"/>	Senior Management	<input type="checkbox"/>
Consultants	<input type="checkbox"/>	End Users	<input type="checkbox"/>	Customers	<input type="checkbox"/>	Office Champion	<input type="checkbox"/>
Sales/Marketing	<input type="checkbox"/>	Rivals	<input type="checkbox"/>	The media	<input type="checkbox"/>	Manufacturers	<input type="checkbox"/>
Don't Know	<input type="checkbox"/>						
Other (please specify)							
<hr/>							

Cross tabulations (X^2) on the IS Managers’ responses were found to be statistically significant at 5% confidence levels ($p\leq0.05$) where the *idea* for the IS had been generated by *senior management* and that the system had produced a sustained competitive advantage.

The following table summarises where the ideas for those developments that produced a competitive advantage arose:

Idea Generation	Number of responses
Senior Mgt	18
Consultants	18
Sales and Marketing	17
IS Dept	15
End Users	13
Customers	11
Manufacturers	7
Supplies	5
Media	4
Office Champion	3
Rivals	3
Middle Mgt	2
Don't Know	2

Table 6.15 – Source of ideas for developments (IS Manager questionnaires)

Not surprisingly perhaps but 80% of the Business Managers who were from Sales and Marketing stated that Sales and Marketing were responsible for generating the idea for the IS development. No Business Manager commented that an idea for IS development had derived from the manufacturing function which was a statistically significant difference to the views expressed by IS Managers. Understandably more Business Managers did not know *where* the idea for the development had originated (7:1 for the companies that completed both questionnaires).

Interview evidence indicated that competitors observe closely what happens with regards to IS in rival camps and rapidly move to develop similar systems:

“We always scrutinise our main competitors’ actions with regards to IT – we would be stupid not to!”

Business Manager (Financial 2)

“Competition is intensive so we need to monitor very closely what others are doing and copy the system if it is any good”

IS Manager (Retail 9)

Evidence from the interviews also supported the role of end users as generating new IS ideas:

“Our best systems have always come from the end users at the coalface”

Business Managers (Retail 12)

6.5.9 Development effort

Relevant question:

15. What effort has your organisation expended in terms of marketing, promoting and training users in order to use the IS successfully?	
Considerable effort	<input type="checkbox"/>
Reasonable effort	<input type="checkbox"/>
There was no need to market, promote or train users as the system was straightforward/ intuitive/ very similar to the one used previously	<input type="checkbox"/>
Don't know	<input type="checkbox"/>
Comments _____	

The effort that the organisations’ expended in terms of marketing, promoting and training users to use the IS that had given them a competitive advantage is given in the following chart:

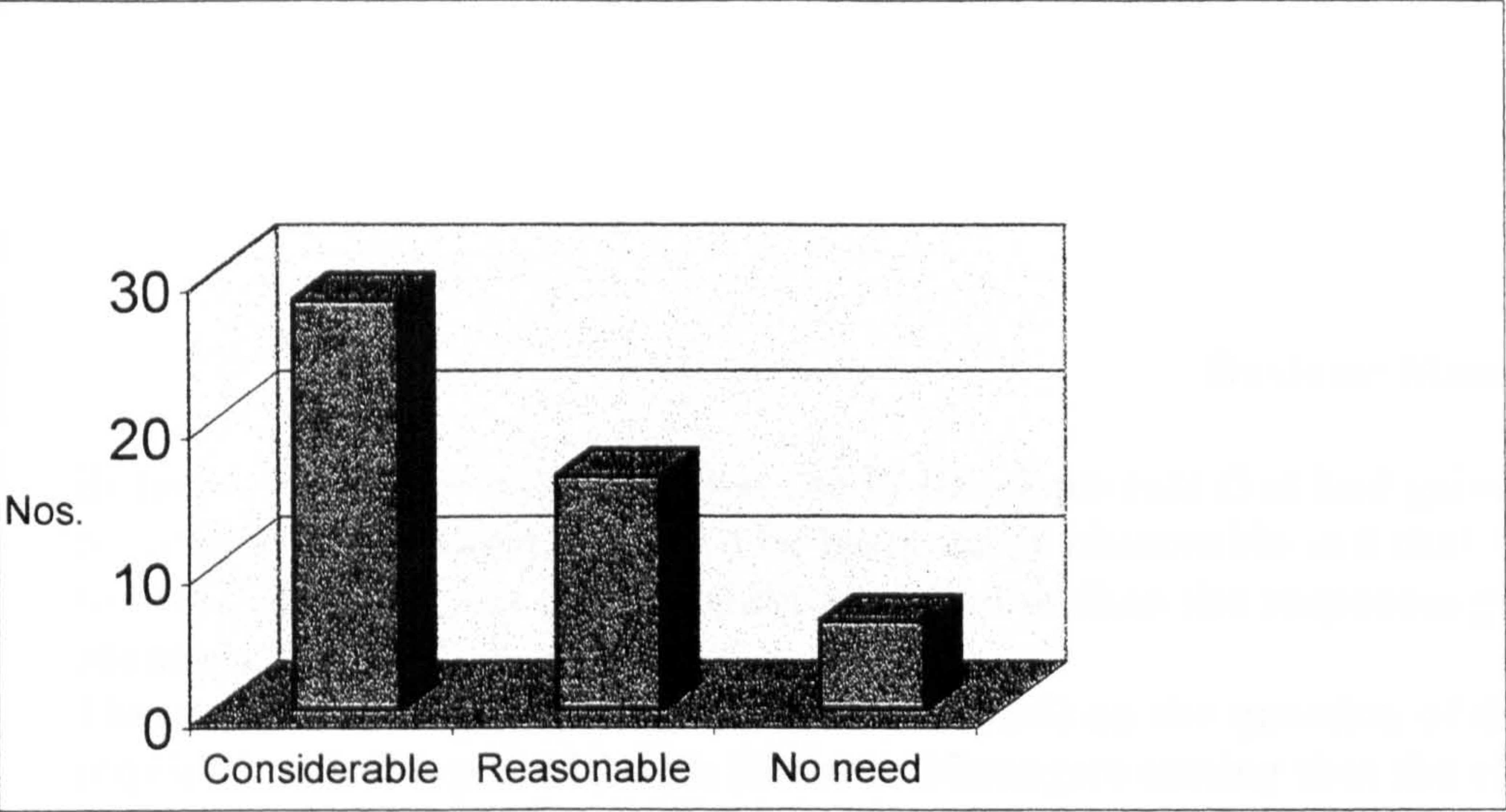


Fig 6.5 Effort expended by those organisations achieving a competitive advantage from their developments

The Business Manager questionnaires disagreed significantly on this item (at 5% confidence levels) and tended to feel that either less effort had been expended than the IS Managers claimed or that they were unable to comment.

6.6. Summary of IS Manager *and* Business Manager responses

This final section summarises the main differences between the responses from the 28 organisations where the IS Manager and the Business Manager completed the questionnaire. Some of these findings have been presented earlier when discussing the factors in the model but they have been grouped together here for reasons of clarity. Evidence of interviews is also presented.

Cronbach tests on the 28 Business and IS Manager returns produced a value of 0.72 which provided a degree of reliability indicating that there was broad agreement between the questionnaires but differences on certain items.

All but two of the Business Managers, agreed that the IS development in question had achieved a competitive advantage over rivals. Both Managers felt that the developments were non strategic. Overall the Business Managers tended to be more conservative regarding the duration of the advantage gained by the IS development.

All but three of the Business Managers agreed that the IS development had nullified a rival’s advantage and there was a significant difference ($p \leq 0.05$) between the duration of these advantages. Business Managers felt that advantages had been held for less time.

There was a significant difference ($p \leq 0.05$) between the length of time taken to develop the system where Business Managers felt that the developments had been produced more slowly than the IS Managers. According to one Business Manager:

“Developments always seem to take forever – certainly longer than anticipated”

Business Manager (Retail 11)

Business Managers indicated that the IS developments that had gained a competitive advantage tended to be more easily observable and that the costs to rivals of acquiring the development were higher than the responses given by IS Managers.

There was also a significant difference ($p \leq 0.05$) on the question of the effort required to develop the IS with Business Managers stating that the effort expended was less. One Manager commented:

“Progress meetings in front of David [Managing Director] frequently come down to two sides with him acting as umpire. Peter [IS Director] always discusses the complexities and difficulties they are having with the development and we try to encourage them to speed up for the sake of sales.”

Business Manager (Manufacturing 7)

The following table details the differences in responses between the IS and Business Managers to IS project team factors:

Factor	No. of IS Managers	No. of Business Managers
Top Management Support	17	20
Presence of System Champion	14	17
Adequate Financial Reserves	18	22
Adequate technical skills	18	23

Table 6.16 IS and Business Manager responses to IS project team factors

More IS Managers stated that the development was in response to a specific problem. This was a significant difference ($p \leq 0.05$) as 11 Business Managers were unsure.

On analysing the source of ideas for IS, the only significant difference ($p \leq 0.05$) was that the Business Managers felt that none of the ideas had originated in the Manufacturing department. Seven Business Managers and only 1 IS Manager did not know *where* the idea for the development had originated.

Sixteen Business Managers out of the 28 did not know whether the organisation used an IS planning methodology which again was a significant, although not surprising, difference ($p \leq 0.05$).

Chapter 7

Discussion

Introduction

This chapter revisits the research questions and IS derived sustainability model in the light of the results presented in Chapter 6. Their analysis leads to a discussion of the implications for an organisation's policy and proposes a practical framework to allow a firm to assess the potential of sustaining competitive advantages from its IS.

7.1 Strategic Information Systems

Research question ① referred to the number of organisations that have implemented systems in order to gain a competitive advantage or to nullify a rival's advantage. Of the organisations in the study, 25% had developed systems that produced a competitive advantage over rivals and 28% had developed systems that had nullified a rival's advantage.

The research has provided support for the view that Information Technologies have become pervasive and relatively easy to acquire in competitive markets and that obtaining a competitive advantage is difficult. The IS world has shifted and *moved on* since the late 1980s and IS Managers focus upon preventing competitive disadvantage from IS, often content with adopting a follower strategy. This supports Kettinger et al.'s (1994) review that found few sustainable IS financial impacts. In the Financial sector due to the nature of the business, there appears to be more of an emphasis on attempting to produce a competitive advantage through IS (40%) than for either Retailing (20%) or Manufacturing (20%). Although the Retail industry is more IS intensive than Manufacturing it appears that they are no more likely to achieve a competitive advantage. Almost all large UK retailers have implemented scanning technologies, EPOS and supply chain management systems and have sophisticated IS infrastructures which closely resemble each other. It may well be that the identification of their main rivals is straightforward and that these systems are rather visible. In Manufacturing, similarly there are many developments (CAD/CAM, CIM, JIT etc.) that could be considered a strategic necessity.

7.2 Methods of obtaining advantages

Research question ② sought to investigate the *means* by which organisations used IS to gain a competitive advantage

The research suggested that enhanced performance was obtained by companies that used IS to reduce costs, improve the levels of customer service, improve external communications, being particularly innovative, improve internal communications, enable closer monitoring of costs, reduce the cost of obtaining supplies, sales, marketing, distribution costs and those associated with co-ordinating functional activities, being a 'first mover', enabling an increase in economies of scale, through the use of restricted expertise and by preventing new entrants joining the competitive arena.

7.3 Sustaining advantages

Research question ③ sought to examine the *extent* to which IS advantages have been sustained.

The findings demonstrated the difficulty of sustaining advantages. Retailers and Manufacturers that had achieved an advantage only held on to it for less than 18 months for most of their developments (82% and 63% respectively). In the Financial sector where an advantage had been gained, 43% lasted less than 18 months, with 22% taking between two to three years to be nullified, 9% taking between three to 5 years and over a quarter (26%) where rivals had yet to catch up. This may seem contradictory to other findings detailed in Chapter 6 regarding the Financial sector but most of the systems where rivals had yet to catch up had only recently being implemented and so added to the body of evidence supporting intensive and continual development in this sector.

Industrial sectors

The findings indicate the relatively short generic lead time of advantages across all three sample frames with no companies reporting the length of sustained advantages outlined by Cronin et al. (1989) and Sabherwal and King (1991). Although short lived, the Financial sector is where competitive advantages were more likely to occur. This is probably due to the importance of market knowledge and information required in this highly intensive industry where IS leaders can generate an important though ephemeral performance improvement.

Over time, competitive advantages are reduced through the depreciation of the company's resources and capabilities and through imitation by rivals. How quickly this occurs depends upon the characteristics of the resources and capabilities. In Retailing where the duration of advantages through IS were found to last for shorter periods than in Financial Services or Manufacturing it may well be that IS can be provided on equal terms to all and therefore sustaining the advantage without the other factors in the model proves difficult. Even in the Financial Services industry (where the basic requirements are information and finance), if an organisation has proprietary information which can yield performance gains, the nature of the industry means that other companies will tend to readily obtain that same information through IS and quickly erode the advantage.

Induction from the interviews suggests that there is a close degree of linkage between Information Systems Strategy and Business strategy in all the sample frames investigated and most strikingly in the Financial Services sector. However, these findings contrast with those of Conrath et al. (1992) who found that in a questionnaire sent to the largest 67 Canadian companies, a significant number (30%) did not express this linkage. There might well be differences in IS strategy formulation in Canada which warrants investigation in greater depth or it might provide further evidence that this area of MIS research has matured with respect to IS planning.

The nature of nullifying a rival's advantage also appears to be frenetic. Generally it appears that industrial competitors observe closely what happens with regards to IS in rival camps and rapidly move to develop similar systems. Those responding to the questionnaires may have been more adept than the sector average however and possibly could be considered 'IS leaders' rather than 'IS mainstreamers' or 'IS laggards'. Some evidence for this was provided by the average IS budget as a proportion of total sales. The Finance sample frame was 2.8% compared to the sector average of 2.5%, Retail was 2.6% compared to an average of 2.4% and Manufacturing 1.1 % compared to a sector average of 0.8% (Price Waterhouse 1996).

Anecdotal evidence from the retailers lends support to the view by some analysts that IS have contributed to ongoing industry consolidation by creating scale economies and switching costs, and that transaction cost reductions along the value chain have revolutionised retail-supplier relationships.

7.4 Factors for sustaining competitive advantages

Research question ④ focussed upon the *factors* that lead to a *sustained* competitive advantage. A summary of all factors together with the level of supporting evidence is detailed in Fig 7.1.

This model shows the factors that lead to an advantage (the sources of the benefits), the complementary resources or isolating mechanisms that need to be combined with these sources in order to leverage sustainability (the sustainability factors) and those that were regarded as being enablers for sustainable competitive advantage (the realisation factors). The sustainability factors include those that reflect environmental or unique situations, those that exist by virtue of a firm's infrastructure and the action strategies adopted by the initiating firm to leverage IS.

The questionnaire findings showed a significant association between sustaining competitive advantages and following a *pioneering* strategy, accessing *unique resources*, developing particularly *innovative* systems, utilising *trade secrets* and focussing IS upon improving *external communications*.

The additional factors induced from the interviews that were found to be important in sustaining advantages were open communications and workgroup consensus. The interviews also provided support for two factors that already existed in the model, namely: flexibility and organisational learning.

The model's colour coding indicates the level of support given to the factors from the empirical research. Those in red were substantiated statistically via the questionnaires, those in black were supported strongly by the questionnaire (but were not found to be statistically significant) and/or supported via the interview stage and those in green were not statistically supported by the questionnaires or strongly supported via the interviews. Some of the factors in green could be described as conjecture.

One or more of the sustainability factors must be present in order to leverage the sources of IS driven improvements. However knowing the types of improvement that IS can bring and the factors facilitating the sustainability of any advantage are not in themselves sufficient; this knowledge needs to be combined with the capability to implement IS efficiently (the realisation factors).

7.4.1 Significant factors

7.4.1.1 Pioneers

Pioneers can gain a sustainable competitive advantage over followers if they possess an appropriate set of resources and a strategy that aligns those resources effectively (Miller, Gartner and Wilson 1989; Lillien and Yoon 1990; Gannon, Smith and Grimm 1992; Mascarenhas 1992; De Castro and Chrisman 1995). This has been demonstrated by IS derived advantages (see Sabherwal and King (1991)), most notably with the classic American Airlines Sabre system (Hopper 1988). Lieberman and Montgomery (1988) and Kerin, Varadarajan and Peterson (1992) suggest that technological, pre-emptive, economic and behavioural factors may allow pioneers in general to obtain and sustain a competitive advantage. From the questionnaires and interviews the technological factors included developing innovative products, processes, structures and systems and keeping them proprietary through trade secrets or combining them with other complementary resources. Fifteen companies explicitly stated that they aimed to be a pioneer in IS as the benefits outweighed the drawbacks of high cost and high risk. Four of these were from Financial Services, seven from Retail and four from Manufacturing.

Many of the pre-emption factors were those that limit or prevent followers from gaining access to suppliers of raw materials, valuable assets, channels of distribution and favourable geographic locations. Economic factors include financial benefits related to cost differences and economies of scale.

Pioneering firms need to consider that the timing advantages of being the first mover is important and that they can be maintained if the organisation acts so that its initial competitive advantages are not lost. Work by De Castro and Chrisman (1995) found that companies that were first movers in a wide variety

of areas including technological innovation were more likely to maintain their competitive edge if they moved over time toward a position of low cost *and* differentiation.

7.4.1.2 Innovation

Statistical and anecdotal evidence supported the role of IS innovation as an important factor in sustaining competitive advantages. The author concurs with the views of Nelson (1991) that firm dynamic capabilities to generate and gain from innovation are the source of durable, not easily imitable differences among firms. As argued by Clemons and Row (1991), for the economic value of the innovation to be defended there needs to be barriers to duplication, high financial or emotional switching costs or that the innovation changes the underlying industry characteristics that influence costs in favour of the innovator.

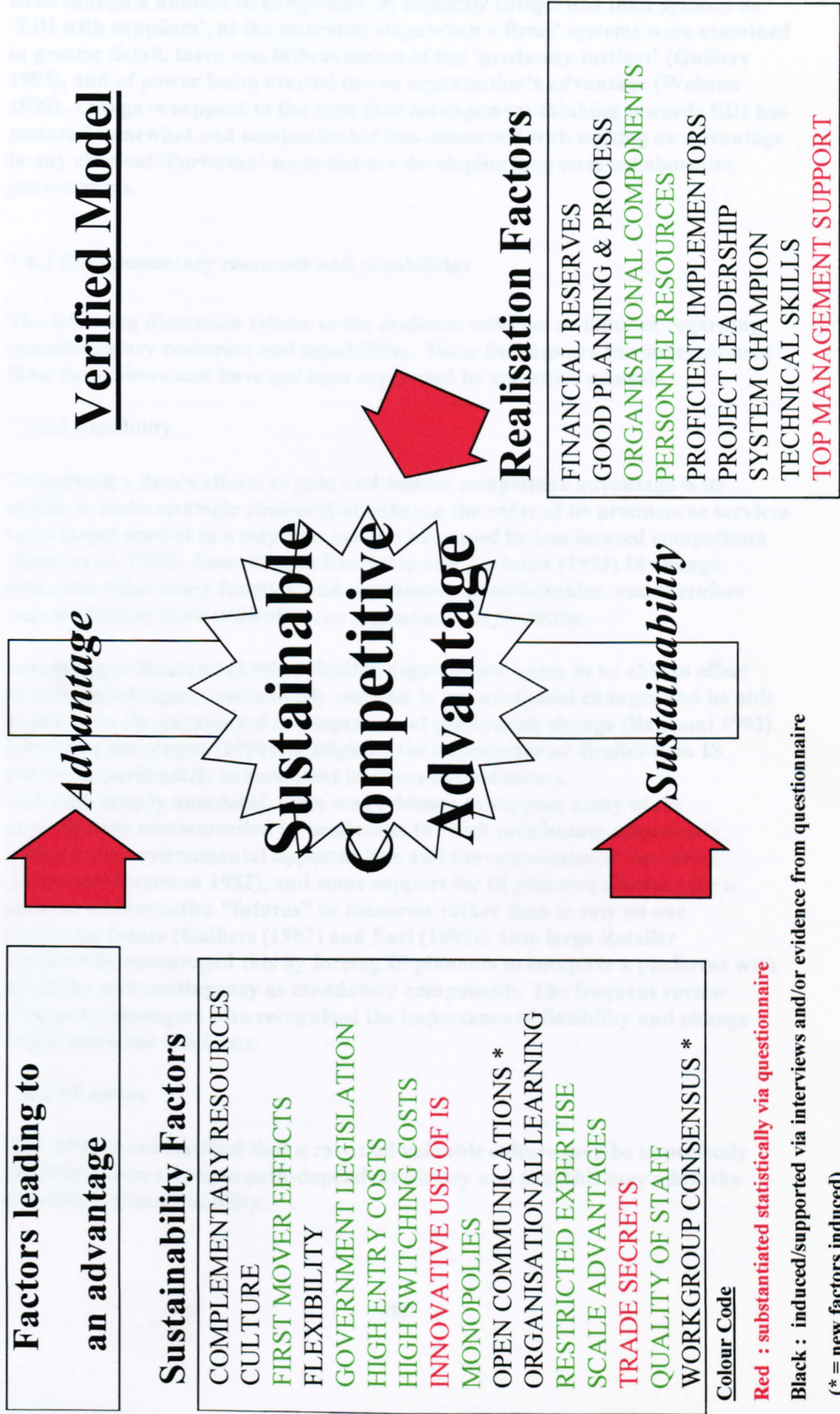
7.4.1.3 Trade secrets

Unfortunately patent law has been unable to keep pace with the range and complexity of modern innovation, and it is almost a matter of accident whether or not a specific innovation can achieve effective patent protection (Kay 1993). Kay (1993) remarks “most innovations are unpatentable”. However many organisations formed agreements with the supplier or software house regarding the IS development. This occurred explicitly in a legal context or via a ‘Gentleman’s agreement’ often based on the strong personal relationship between an individual or individuals in one organisation (the customer) and an individual in the software house. With the case of the latter, the software houses tended to be small (under 20 employees) and the individual concerned was at Director level. Although there were examples of formal legal agreements (preventing vendors from selling to competitors) it seemed that all parties were aware of the limitations of such contracts. In one example where legal agreements had been instigated, three programmers had recently left to join another software house that was producing systems for the main competitor.

7.4.1.4 External communications and links to suppliers

Keen (1993) details the need for organisations to integrate technologies with business logistics and practices, supplier logistics, business process design and IS planning. In the absence of open and trusting supplier relationships, such systems can do little but “magnify existing suspicions” (Johnston and Vitale 1988) and “fracture tenuous relationships” (Holland et al. 1992). The ability to craft trusting and economically viable supplier relationships, using sophisticated interorganisational IS appears to require tacit, complex co-ordination and communications skills that competitors may find extremely difficult to copy (Hall, 1993).

Fig 7.1 IS DRIVEN SUSTAINABILITY MODEL



Even though a number of companies (9) explicitly categorised their systems as 'EDI with suppliers', at the interview stage when 4 firms' systems were examined in greater detail, there was little evidence of the 'predatory instinct' (Galliers 1993), and of power being exerted to one organisation's advantage (Webster 1993). This gave support to the view that management thinking towards EDI has matured somewhat and companies are less concerned with seeking an advantage in any classical 'Porterian' sense but are developing long term collaborative partnerships.

7.4.2 Complementary resources and capabilities

The following discussion relates to the evidence collected or induced regarding complementary resources and capabilities. These findings are less substantiated than those above and have *not* been supported by statistical analysis.

7.4.2.1 Flexibility

Underlying a firm's efforts to gain and sustain competitive advantage is its ability to make strategic choices that enhance the value of its products or services to its target market in a way that can not be copied by less focused competitors (Schul et al. 1995). According to Benjamin and Levinson (1993) IS change processes affect every function and organisational stakeholder, and therefore require fluidity of co-ordination, or *organisational flexibility*.

According to Bahrami (1992) a flexible organisation needs to be able to effect intentional changes, continuously respond to unanticipated changes and be able to adjust to the unexpected consequences of predictable change (Bahrami 1992). Knoll and Jarvenpaa (1994) highlighted the importance of flexibility in IS provision particularly in turbulent business environments.

Although largely anecdotal, there was evidence to support many of the prescriptions recommended by academics to "seek satisfactory alignments between the environmental opportunities and the organisations' resources" (Miles and Cameron 1982), and some support for IS planners allowing for a number of alternative "futures" or scenarios rather than to rely on one particular future (Galliers (1987) and Earl (1988)). One large Retailer deliberately encouraged this by forcing IS planners to complete a proforma with flexibility and contingency as mandatory components. The frequent review process by managers who recognised the importance of flexibility and change would reinforce this focus.

7.4.2.2 Culture

Fiol (1991) has identified that a rare and valuable culture may be imperfectly imitable due to a unique path-dependent history and that this may allow the possibility of sustainability.

The culture of an organisation has the potential for forming a competitive advantage (Reed and DeFillippi (1990) and Fiol (1991)). Culture is difficult to articulate and involves complex relationships.

Evidence from both questionnaire returns and the interviews supported the need for organisations to embrace an open culture with communications between all levels in order to maximise the benefits from IS.

An organisation's culture and structure influences the system's success. IS that shares data across departmental boundaries results in design and implementation concerns and are especially susceptible to user resistance due to loss of flexibility (Silver et al. 1995).

Those firms that have transformed into flatter, more organic structures (see Daft (1992), Handy (1993)) allowed sufficient scope for multi communications within organisations unbridled by the limits of the traditional project team or functional group. The transition from hierarchical structures assists in employee empowerment (Kanter 1994). The organisational structures present can influence the IS consequences. Despite the IS developments removing many of the technical impediments to information sharing, organisational structure often remains a formidable barrier to the timely sharing of data due to organisational units fearing the negative political consequences that may accompany sharing their information with others. Rather than reaping the expected benefits, organisations can find that these fears lead to the misuse of the IS.

Zuboff (1988) stated that the benefits of IS lay in their potential to release information throughout an organisation, and that artificial cultural or structural constrictions reduce their value. She further discusses the need for the 'informed' organisation to operate with lean structures, retraining or eliminating middle managers, and fostering frequent, unstructured communications across functional and project boundaries. Induction from interviews did provide support that change had occurred in this direction and evidence that some senior managers had transformed into supporting counsellors giving up some elements of autocratic control and top down communications allowing those best positioned to make timely, informed decisions.

However it was interesting to note that despite their open and co-operative culture three companies were extremely concerned about the future direction of their IS. Two of the organisations had recently been involved in merger discussions with larger firms and the third had recently been acquired by a French organisation. The new business environment helped to spread a general malaise and it was felt that both business and IS strategy was currently in a state of limbo, awaiting instructions from the new (larger) partners.

Besides shared values, basic assumptions and the behaviour of its organisational members, culture encompasses notions of individuality versus teamwork and whether risk taking (commonly associated with IS developments) is rewarded or reproached (Silver et al. 1995). In organisations, known for promoting individual

innovation and creativity rather than teamwork e.g. Finance 2, it comes as no surprise that Groupware implementations failed to achieve the objective of producing co-operative and collaborative work. However in another context, the use of Groupware could help in the transformation of the company culture to be more team focussed. When companies wish to challenge their existing culture or users' behaviour a close fit between the existing organisation and the particular IS would not be appropriate. If this is the case, the firm must address the need to change other aspects of the organisation first or simultaneously with the introduction of the system. This strategy whereby the IS is at odds with the pre-existing organisation but fits the transformed firm creates the fit needed to ensure that the IS is used effectively and changes the broader organisational system into a new configuration, enabling the improvements in performance (Silver et al. 1995). BPR as proposed by Davenport and Short (1990), Hammer (1990), Venkatraman (1991) and Davenport (1993) amongst others, addresses this tension between the need for fit and the need for change. BPR aims to produce radical performance improvements by completely redesigning business processes through the use of IS rather than merely "paving over the cowpaths" (Hammer 1990) and automating flawed processes.

7.4.2.3 Workgroup Consensus

Whilst few companies would want to discourage consensus, the need for workgroup agreement and alignment was explicitly mentioned by five Managers during the interviews. Although not always couched in the same terminology it was clear that deliberate efforts were made to encourage agreement between project members. The workgroups in question frequently included IS staff and personnel from a range of business activities. This supports findings by Broadbent (1991) who found that companies that achieved some information based advantage over their competitors possessed "a reasonable degree of consensus amongst senior Business and IS Managers". This consensus can be facilitated by IS itself as organisations become less hierarchical and more organic (Daft 1992, Handy 1993). Organisational time needs to be spent on managing the interaction between IS (e.g. Groupware, Videoconferencing, Electronic Mail, the Internet, Intranets, Extranets, Project Management Software, Voice Mail) and teamworking (Nolan and Croson 1995).

7.4.2.4 Organisational Learning

McKee and Varadarajan (1995) state that

"competitive advantage is the cornerstone of strategy, and enacted knowledge is the essence of competitive advantage".

Taking this view, knowledge precedes (1) physical assets (plant and machinery, equipment, location) (2) industry position (e.g. dominant share, first to enter) and (3) processes (e.g. proprietary manufacturing or service delivery processes) as sources of sustainable competitive advantage.

Mahoney (1995) states that a company's physical resources and its capabilities interact to create a competitive edge. Itami and Roehl (1987) developed the theory of "invisible" assets (e.g. information and experience) that combined Barney's (1991) resource based theory with those of capabilities based theory. Such assets are troublesome to copy and form the main source of sustainable competitive advantage. Resources provide the building blocks for learning and learning enables a firm to generate additional resources.

The thesis supports the view that the accumulation and deployment of intangible resources and capabilities are one of the most likely sources of sustainable competitive advantage. Mahoney (1995) suggests that intangible resources involve tacit understanding and articulate information and may be :

- a) environmental information flow - such as learning customer preferences**
- b) corporate information flow - such as proactively building brand name and reputation**
- c) internal information flow - such as increasing information processing capabilities**

Companies need to continually reinvest to maintain current capabilities in order to prevent reproducibility. Obtaining sustained competitive advantages historically have involved emphasising marketing (e.g. better knowledge of customers and markets), manufacturing (e.g. experience in production) and management (e.g. knowledge in training and recruitment). Stata (1989) and Williams (1992) amongst others stated that the only true source of sustained competitive gains is learning. It has been argued that organisational learning is *the* critical core competence (Senge and Sterman 1991, Senge 1997) and that it is a "meta-competence" that underpins the continual transformation of core competencies in order to achieve sustainability.

Mahoney (1995) supports the view proposed by Bowman (1990) and Rumelt, Schendel and Teece (1991) that the literature on organisational learning (behavioural and cognitive literature) can and should be united with the emerging resource-based theory of the firm.

IS assisted organisational learning could be a potential source of sustained competitive advantage. Learning has been described as planned or emergent (Mintzberg 1979) i.e. acquired unintendedly or unsystematically. According to Lieberman (1987) there are two types:

- *experiential* where learning is gained from first hand experience and**
- *vicarious* where learning is accrued from the second hand acquisition of knowledge**

Work by Lippman and Rumelt (1982) and Mahajan et al (1988) found that causal ambiguity however, limits the impact of effective imitation and the diffusion of knowledge.

According to Lippman and Rumelt (1982) isolating mechanisms such as differences in an organisation's ability to learn, exist because of the rich connections between uniqueness and casual ambiguity. Many researchers, most notably Cragg and Finlay (1991) and Hall (1992) have stated that intangible assets are the most likely to be organisation specific and therefore unique and causally ambiguous. IS can influence many of these intangible assets including knowledge of customer preferences, experience, culture, customer loyalty, trust, information, know-how, management skills, image, reputation, relationships and the ability to process information. Firm heterogeneity, a fundamental concept to resource based theory, may be due to a firms' differential capabilities for organisational learning.

7.4.2.5 Top Management Support

Many studies have shown associations between IS performance and CEO attributes, e.g. Ginsberg and Venkatraman (1992) cited linkages and a variety of practitioner directed studies have prescribed IS complementarities with employee participation, empowerment, and cultural openness (e.g. Broderick and Boudreau, 1992; Pfeffer, 1995; Davenport, 1994).

Drawing upon the insights of Henderson and Venkatraman (1993) in describing linkages among IS, strategy, and organisational infrastructures, induction from the interviews support the importance of the role of Top Management to the success of IS implementation. Neo's (1988) widely acclaimed work showed that 'management vision and support' differentiated successful from unsuccessful IS implementers. Other academics (most notably Quinn (1979) and Benjamin et al. (1984)) discuss the need for senior executives to consider 'top level risk-taking support', and the importance of embracing the idea of a 'senior management entrepreneur' who regards IS as fundamental to the business and whose role should include considering how all strategic business decisions are affected by IS.

Evidence supported the views of Kettinger et al. (1994), Yap and Thong (1997) and Enns and Huff (1997) who stated that the chances of IS success are increased by Senior Management commitment by making human and financial resources available for implementation, integrating IS with business strategy and processes, selecting strategic opportunities, applications and ensuring continuity in IS investments over time.

Kanter (1984) found that many top managers found IS threatening and that their contributions were frequently viewed as shallow, uninformed and unsupported by resource deployments. In a comprehensive study by Hambrick, Geletkanycz and Fredrickson (1993) Senior Managers were found to support commitments to the status quo and to "encourage successors who share their

own views and frames of reference” (Smith and White 1987). This can limit strategic IS thinking and the take-up of new technologies across the firm.

Although largely anecdotal and conjectural, findings from the research indicate that significant time was spent by senior management dealing with issues relating to IS strategy. This concurs with the findings of Walsham and Waema (1994) who discovered that the CEO of a large building company was for 25% of his time involved with issues relating to IS strategy formulation but disagrees with some early pivotal work by Lederer and Sethi (1988) that it was difficult to secure senior management attention for IS projects. This could well be due to widespread communication of these issues and that attitudes have changed since the 1980s - management thinking has ‘moved on’.

7.4.3 Suggested factors

The remaining factors that follow can not be supported statistically but have been suggested from the questionnaires and/or interviews. Some ideas presented here are conjecture.

7.4.3.1 Realisation Factors

7.4.3.1.1 Good Process and Planning

Clemons and Weber (1990) found that without appropriate planning, organisations may fail to realise the anticipated benefits of their IS investments. However the study showed that only 55% of firms performed formal IS planning and there was no significant association between the presence of formal IS Plans and the firms ability to gain a sustained competitive advantage from its IS innovations. Work by Lederer and Mendelow (1990) demonstrated that excessive delays in the execution of IS investments resulted from a lack of planning. Whilst this may well be the case, when pressed in the interviews, many organisations felt that firm IS plans were inappropriate as the organisation needs to react to environmental change, changes in business direction and to take account of the changes in technology.

It seems reasonable to assume that those organisations competing in the Financial sector most closely resemble those existing in what Sambamurthy et al (1994) described as a ‘turbulent environment’. Although the research did not find evidence to support Fredrickson and Mitchell’s (1984) statement that less rigorous IS planning was advantageous, it did not find it to be disadvantageous either. This area would need to be investigated in more detail to comment further although the author found no evidence that firms were following meticulous and comprehensive IS planning as highlighted by Salmela et al (1997) when working with companies operating in turbulent environments. The author would concur with work by Vitale (1986) that respondents did not wish to engage in long term fastidious planning as it was considered a wasted effort.

Only 28% of companies questioned used a *named* IS planning methodology. This contrasts radically with a study by Galliers (1987) and Flynn and Golenciwka (1993). Of these just over half (17% of the total population) had modified standard approaches. This low reported reliance on traditional methodologies agrees with Premkumar and King (1991) in the US and Smits et al. (1997) in the Netherlands. Companies opt for a continuous and largely informal process, very loosely based on a hybrid of established planning techniques with great personal input from a number of key individuals in the organisation.

The research supported the need for short term development plans and the integration of IS strategy with planning. There was some evidence from the interviews that the business perspective was being sought in IS Planning and that the call by Galliers et al. (1994) for greater understanding and commitment from business management towards IS was being heeded.

7.4.3.1.2 System Champion

Work by Chesher (1997) highlighted the contribution made by system champions by combining vision, energy and influence to “make a difference and cause things to happen”. The findings indicated some support for the use of system champions but three interviewees indicated that the system champion had performed their role earlier and therefore was not considered relevant at the time of completing the questionnaire.

There was also some evidence for the argument proposed by Prager and Overholt (1994) that increasingly the project champion was a senior manager from the business.

7.4.3.1.3 Financial Reserves

The majority (68%) of those organisations that gained a competitive advantage from their IS stated that they had access to adequate financial reserves. The remaining 32% did not state such financial support and yet still claimed to have gained a competitive advantage. Possibly the IS developments were carried out in a “lean and mean” manner or by reorganising resources internally.

Developing IS under strict budgetary constraints might well focus effort and ensure appropriate prioritisation of tasks. On the other hand, additional sources of funding might well have ensured that developments were produced more rapidly, to higher quality thresholds or allow more timely maintenance or enhancement. IS Managers are also acutely aware of perceptions of serious cost overruns in IS projects and possibly were keen to promote the idea that projects have been completed within tight fiscal constraints.

7.4.3.1.4 Project Leader

Many companies stated that the presence of an effective project leader was important in developing a competitive advantage over rivals. This was not

surprising and concurs with work by Nicholas (1989). In the majority of cases, the project leader possessed a background in IS rather than any area of business.

7.4.3.2 Non Realisation Factors

7.4.3.2.1 Economies of Scale

The potential for following a cost leadership approach can require advanced technology, efficient manufacturing plants, ownership of low-cost sources of raw materials or supplies or access to cheap labour. Evidence from the questionnaires and interviews suggested that barriers to entry had developed from economies of scale. This was particularly apparent where IS had been used to provide EDI links with suppliers and / or customers. As with trade secrets, experience advantages, brand reputation and other resources that the incumbent firm possesses but that new entrants can only acquire slowly or at disproportionate expense, scale advantages could be a potential source of competitive advantage. However this study did not find a significant association and therefore fails to provide strong supporting evidence to the findings of earlier work (Cragg and Finlay (1991), Kettinger (1994)).

7.4.3.2.2 Government Legislation

Only one organisation indicated that government legislation affected the ability to sustain a competitive advantage. This related to a specific application where the Bank of England distributed licences associated with smartcards preventing non Banking institutions from originating the technology without the involvement of a licensed Bank.

7.4.3.2.3 Proficient Implementers

The failure to take account of, and understand the issues of the implementation stage is a common issue in the literature (Prager and Overholt (1994), Benjamin and Levinson (1993), Kouna and Weiss (1993), Gellman (1990), Mckay, Draecky and Savin (1991)). Although not evident from the questionnaires, many interviewees explicitly addressed this as a major difficulty. This concurs with the views of Feeny and Ives (1990) and Earl (1993) that having a track record of being a proficient implementer is a valuable indicator and important component of successful strategic systems deployment.

7.4.3.2.4 Human Expertise / Technical Skills

Performance gains to be made from an organisation's resources and capabilities depends on the firm's ability to appropriate these gains and its ability to sustain

a competitive position over time. In this study, no significant association was found between the technical expertise held by individuals and the ability of the organisation to sustain a competitive advantage. A straightforward assessment of the situation would lead to the thinking that technical skills can be obtained fairly easily either by training existing staff, recruiting new staff, outsourcing and by having access to consultants. However the situation is not so simple and there is frequently insufficient distinction between the technology of the firm and the individual. Even in areas where there is extremely limited expertise available in the marketplace, with limited employment control to restrict mobility it is a dangerous policy strategy to be dependent upon the skills of a few key employees and therefore high risk. Such employees can bargain with the organisation to appropriate a major part of their contribution to added value. If terms become unfavourable from the employees point of view, he/she can close the contract with the employer and readily open a more favourable one with another. Grant (1991) states that the balance of power between the organisation and the employee depends crucially on the relationship between the individual's skills and organisational routines. The more deeply embedded are organisational routines within teams of individuals and the greater they are supported by other resources, then the greater is the control that the firm's management can exercise. With the speed of change in IS (Hammer 1990), technical skills are difficult to embed and this makes these skills unlikely to confer a sustained advantage.

Evidence was presented that demonstrated that organisations were taking steps to prevent expertise transfer. However although organisations made attempts to use legal frameworks and financial bonuses to retain expertise, most seemed to acknowledge that these were only temporary measures and somewhat unenforceable and that rivals who were prepared to pay a premium could secure the services of key contributors.

7.5 Other findings

7.5.1 Ideas for developments

There was significant evidence to support the role of Senior Management in idea origination. Although the surveys were completed by a number of "Senior Managers", this view was also expressed by first line Managers. Over one third of all systems that had gained a competitive advantage had used external Consultants to generate the idea for the strategic system. This lends support to the inability of firms to sustain advantages as IS Consultants frequently offer their services across sectors as well as to direct competitors. The findings regarding End Users contrast with those of Tait and Vessey (1988) and Yap and Thong (1997) who found the majority of ideas coming from End Users. Whilst there were ideas that had been originated from End Users and from the interviews firms were increasingly

encouraging this trend, the source of ideas from these users accounted for only 25% of developments.

7.5.2 Observing Rivals

An interesting note derived from the interview findings relating to the assessment of rivals' actions when implementing IS. A number of firms developed new systems as a result of the direct observation of the actions of competitors. Although others did not explicitly highlight this linkage in the questionnaires, from the interviews it was ascertained that informally many IS Managers knew their counterparts in rival organisations fairly well and many were personally acquainted from meetings through trade shows, user groups and conferences.

7.5.3 IS Manager versus Business Manager responses

There was a substantial agreement between the responses from IS and Business Managers over whether the developments had produced a competitive advantage over rivals which was pleasing. There was also strong agreement over whether the developments had nullified a rival's advantage. However there were some significant differences between the Manager type and some of the factors. IS Managers tended to be more optimistic over the duration of the competitive advantages gained and felt that the length of time taken to develop the system that had nullified rivals was shorter. IS Managers also stated that the duration of the advantage held by a competitor was less. This may indicate a change in the confidence levels and political astuteness of IS Managers. It may well be that rather than performing in the traditional, reserved, technical role, IS Managers have learnt from their business colleagues over the years and promote themselves and the business benefits from their work much better.

Business Managers felt that the effort expended in developing and implementing the system that gave a competitive advantage was less and that the systems were more easily observed by rivals. However they did indicate that the costs of developing the system were slightly greater and this could be due to perceptions by general business personnel that IS is always associated with high levels of expense.

Not surprisingly perhaps, there were significant differences between the responses on planning methodologies and where the idea for the development originated (with the Business Managers having little knowledge of formal planning methodologies or the idea source).

Business Managers were more certain of the level of support of Top Management. IS Managers were closer to the development and possibly did not feel this support at all times.

7.6 Implications for policy

The research study has highlighted the need for companies to identify and understand the competitive forces in business, how they change over time and the importance of mobilising and managing the resources necessary for the chosen competitive response. An IS must fit within its context i.e. the organisation, its strategy, business processes and its environment. IS that do not take account of political dynamics, managerial assumptions, users or users' incentives are likely to be resisted, underused, misused or actively sabotaged (Silver et al. 1995). Hence organisations should carry out a careful analysis of the users and their needs before development so that the chances are increased that positive effects will be achieved.

The questionnaire results demonstrated the difficulty of obtaining a competitive advantage over rivals using IS. Only 30% of those originally sent the questionnaire in the Finance, Retail and Manufacturing industries stated that they had such systems. Information Technologies by themselves have not produced sustainable competitive advantages. However a number of organisations have gained sustainability by adopting a pioneering strategy, utilising trade secrets with vendors, developing particularly innovative systems, linking electronically with external suppliers and customers and leveraging intangible, complementary resources such as open culture and communications, flexibility, workgroup consensus and organisational learning. The research also reiterated the importance of top management both in idea generation and to ensure successful implementation. This contradicted Cash et al.'s (1992) findings of a *blockage* and Peppard and Ward's (1998) concept of a *gap* between top management and the dissemination of ideas throughout the organisation. The study failed to provide evidence for the utilisation of restricted expertise to the firms advantage or the use of comprehensive formal IS planning. Statistical evidence also supported the view that sustaining a competitive advantage contributed to profit for the organisation. The results support the resource-based approach, and help to explain why some firms outperform others using the same technology and why 'first movers' are frequently unable to obtain a sustainable competitive advantage derived from IS.

Winter (1987) argues that product attributes and strategic positions can be easily copied by competitors whereas firm-specific, intangible resources tend to be tacit, idiosyncratic, and deeply embedded in the organisation's social fabric and history. Protected by isolating mechanisms such as resource connectedness and causal ambiguity, these resources may offer more complex and sustainable paths to competitive advantage (Hansen and Wernerfelt (1989), Rumelt (1991), Powell (1996)).

It may well be that organisations only have two possible options for achieving an IS based advantage. Firstly to continually reinvent, leading-edge IS innovations and using the opportunity to set up unassailable first mover advantages. Secondly to embed IS in such a way as to produce sustainable resource complementarity. The first of these are difficult. Perpetual innovation may

hypothetically produce advantages, but these advantages vanish if innovation stops. Very few firms manage to be continuously innovative. The rate of technological change is ever increasing (Atkinson (1990), Hammer (1990), Grindley (1991)) making this constant struggle more problematic. First mover IS advantages seem more promising particularly when you can harness proprietary systems customised to exploit firm specific strengths or opportunities. Such systems frequently come down to resource complementarities: they produce advantage by merging with skills, relationships, or strategic positions, but even then the empirical research (e.g. Kettinger et al., 1994) suggests that such advantages rarely endure. However the proponents of resource based theory still maintain that complementary resources are the most likely way of achieving long term gains.

However many organisations do not seek to merge IS with the factors identified. The sustainability factors described in the revised model (Fig 7.1), in and of themselves, explained performance differences in the companies under study. Among Financial Services (IS-intensive firms) the attention given to cultural, communication and consensorial considerations was greater than among Manufacturers (less IS-intensive firms). This supports a recent study by Peppard and Ward (1998) who found that the “IT organisation [in the Financial sector] sees itself as a true ‘value-adder’; a partner in the business” whilst in Manufacturing “the IT organisation feels undervalued and that it is not getting either business commitment or involvement. The IT organisation is treated as a support function and service provider and not seen as central to the business”.

The findings suggest that competitive advantage and the potential for sustained competitive advantages arise from complex, causally ambiguous, intangible resources and it is here that organisations should focus effort.

The author provides support for Keen’s (1993) emphasis on dividing resources into Human, Business, and Technology with his ‘fusion’ framework. This strongly parallels resource-based theory arguing that the key to IS success lies in the capacity for organisations to fuse IS with latent, difficult-to-imitate, firm-specific advantages embodied in existing Human and Business resources. Keen (1993) also advocates the importance of effective management. A variety of alternative resource typologies exist (e.g. Grant (1991), Barney (1991), Black and Boal (1994)), but Keen’s theory arose primarily in an IS context.

Keen states that “the wide difference in competitive and economic benefits that companies gain from information technology rests on a management difference and not a technical difference. Some business leaders are somewhat better able to fit the pieces together than others”.

Keen (1993)

The figures for IS expenditure agree with those published by Willcocks (1992) and Ian (1989) who determined that firms spend between 1.5% and 3% of their revenue on IS. The work also concurs with findings presented by Sullivan-

Trainor (1989) that IS is a significant balance sheet item and should rightly be considered a priority in terms of management focus.

An organisation's ability to earn profit in excess of the cost of capital depends upon its competitive advantage over its rivals and the attractiveness of the industry in which it competes. However studies by Schmalensee (1988) and Buzzell and Gale (1987) have found that the differences in profitability within industries are much more important than differences between industries due to the global nature of competition, technology transfer and the trend for firms to market products across industry boundaries. This realisation should have focused debate away from the external environment and towards the sources of competitive advantage. Even discussions on strategic direction, whether a company adopts a cost leadership, differentiation or niche policy will be based upon the resources that the firm can draw upon. The potential for following a cost leadership approach can require advanced technology, efficient manufacturing plants, ownership of low-cost sources of raw materials or supplies or access to cheap labour. In addition differentiation strategies can be gained by proprietary technology, reputation, culture and other strategic assets that depend upon a company's resources.

On a note of caution, Porter (1985) and subsequently Dent-Micallef and Powell (1997) remind organisations of the risks of making bold IS developments. These include vulnerability to technology shifts, learning costs, the risk of low-cost competitive imitation and integrating IS with complementary resources which all firms must consider when planning their IS.

The author found that those companies that are most likely to derive IS advantages and sustainable advantages, direct their attention to ensuring that top management are intrinsically involved (from ideas through to implementation), forming trade secrets, accessing unique resources, focusing on external communication, paying attention to developing particularly innovative systems and developing the organisation's cultural, communication and structural infrastructures rather than technology itself.

The author offers the following practical framework (Fig. 7.2), which has been adapted from Grant (1991), for assessing the potential of a company to derive a sustained competitive advantage from its IS.

Resources and capabilities are fundamental in the derivation of a strategy for gaining an IS performance edge over rivals. Internal resources and capabilities provide the basic direction for a firm's strategy, and according to Grant (1991) they proffer the main source of profit for a firm.

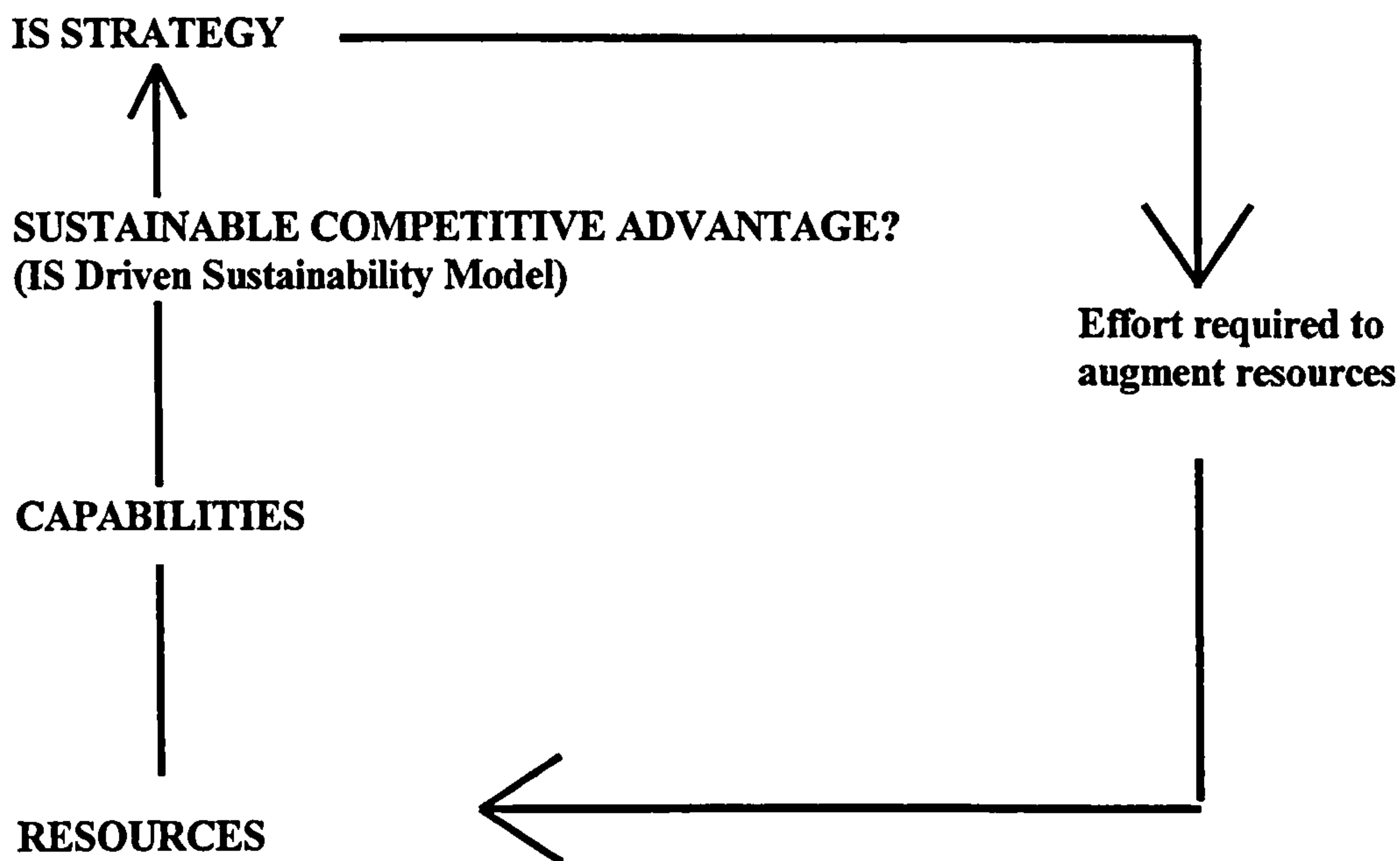


Fig. 7.2 IS Strategy and Sustainable Competitive Advantages: a Practical Framework

(Adapted from Grant, 1991)

Resources : any long-lived productive asset - tangible (manufacturing plant, vehicles etc.) and intangible (trade secrets, technical expertise, brand image etc.). A firm must identify the organisation's resources that can be enhanced/extenuated by IS.

Capabilities : the capacity for a team of resources to perform a task. What are the firm's capabilities? Is the organisation a proficient IS implementer or is the firm adept at process and planning?

Augmentation of Resources

Fig. 7.2 dismisses the notion that the sustainable competitive advantages are predetermined and only concerned with the deployment of IS in maximising existing resources. Effort must be spent in replacing resources that are being utilised and also to develop a new resource base in order to extend positions of competitive advantage. For example, a large Manufacturing company situated in Manchester in conjunction with a software house developed a new piece of software that helped with the configuration of electrical switchgear that are sold all over the world. In the industry this system was revolutionary and enabled the sales consultants to configure the appropriate settings and requirements at the customer site which could then be directly imported into the design system. The company formed a trade secret with the supplier (developing new resources) which helped to prevent rivals from contacting the same supplier and developing a similar system. A Thames Valley Retailer removed management levels and

fostered a culture of continuous innovation and improvement. New developments ranged from implementing an inventory management system which required the reorganisation of the entire company, the installation of Ecommerce in order to venture into direct selling and using the intranet to distribute details of strategic change as well as sales forecasts, company information, product updates and policies.

Porter (1990) recommends that companies continually innovate and shift the basis of competitive advantage from ‘basic’ to ‘advanced’ factors of production. IS can play an important role in sustaining gains by focusing upon ‘advanced’ factors of production which can be more specialised (and therefore less mobile through market transfer) and less easily replicated. Companies must be committed to continually enhance its resources (e.g. build expertise in specialised areas, forming trade secrets, developing a culture for IS creativity) and capabilities (e.g. developing action strategies or being a proficient implementor). Organisations can then assess their resources and capabilities in the context of the IS driven sustainability model which in turn has implications for the firm’s IS Strategy. Capabilities are learned and perfected through repetition (Grant 1991) and can develop automatically through the execution of the IS strategy. The consequence therefore is that a company through pursuing its *current* strategy, develops the expertise required for its *future* strategy. This idea was originally applied solely to business strategy by Itami (1986) who stated that companies need to follow a parallel and sequential development of strategy and capabilities.

Chapter 8

Research contribution and limitations

Introduction

This final chapter assesses the contribution made by the study, the limitations of the research and outlines areas for future investigation.

8.1 Research contribution

The researcher believes that the research contributes theory-based conceptual synthesis and empirical evidence to an area that has transformed radically over the last fifteen years. Largely anecdotal evidence supporting the relative ease of sustaining competitive edges has given way to a more sceptical view where IS derived advantages disseminate quickly.

The methodology adopted an eclectic approach drawing upon both positivism and interpretist evidence and many factors were considered when designing the empirical research. Care was taken to ensure that the primary research was subject to a variety of validating procedures and controls. Pilot studies and extensive pretesting was undertaken and measures were taken to help ensure reliability and validity addressing many of the issues raised by Straub (1989). With respect to the research design undertaken, this study confirms the views of many academics (e.g. Earl 1993, Walsham and Waema 1994) that any investigation into Information Systems strategy should not be based on one interview with one manager nor should it be based on postal surveys alone. It requires multiple input in order to successfully attempt to analyse the Information Systems strategy of an organisation due to the complicated and often implicit meanings of the concepts involved.

The UK based empirical work in the three sample frames enabled the study of a range of contexts from high information intensity (Financial), through to medium (Retail) to low information intensity (Manufacturing). This does help to support the generalisability of the findings to other contexts. Although the three industries demonstrated some differences, the findings showed remarkable similarity in the difficulties in obtaining advantages through the use of IS and the mechanisms that are required in order to sustain those gains. Findings showed that the IS world has shifted and “moved on” and many organisations now direct their attention to preventing competitive disadvantage from IS often content with adopting a follower strategy.

The study has identified a role for the use of a IS derived sustainability model whereby firms can assess their resources and capabilities against the factors that are likely to produce a sustained competitive advantage. The work supports the idea that the technology alone will not sustain the performance edge but it must be combined with complementary resources to create an isolating mechanism. The work demonstrated that trade secrets, communication links to external organisations, innovative developments and accessing unique resources - an open culture and communications, workgroup consensus, top management support and possessing a highly flexible organisation were important attributes of non ephemeral IS based advantages. A practical framework was proposed which allows organisations to assess the potential of deriving a sustainable competitive advantage from its IS from an analysis of its resources and capabilities and discusses ways in which those resources and capabilities can be augmented.

IS planning should provide a flexible framework within which implications of changed circumstances can easily be identified and managed. Galliers (1987) stresses that a constant review of the plans are required, since business objectives and information requirements are temporal in nature.

8.2 Limitations

8.2.1 Limitations to findings

The research methodology adopted was pluralistic, combining positivism and interpretism. The positivistic / quantitative approach was applied within a well defined theoretical framework, the 'IS derived sustainability model' which had been developed from the literature and previous research. During the interview process new ideas surfaced (were induced) and the research adopted an interpretist approach. However the interviews could have been tainted as the same researcher was involved in both the questionnaire and interview phases of data collection. This is a limitation of the research method and could have been avoided by a research team.

As such it was felt by the author that there were three *levels* of substantiation:

- ① the hypotheses that were tested in a positivistic way by the questionnaire**
- ② a) research questions that were identified prior to data collection and there has been indicative findings**
 - b) findings that have been induced from the interviews that are tentative**

- ③ findings that have been induced that are mere conjecture. These are suggested by the study and may well be unsubstantiated and vague requiring further investigation

8.2.2 Methodological limitations

8.2.2.1 Sample frame bias

The three sample frames were a source of potential frame bias. Organisations that were sent questionnaires were those that received industrial placement students during the years 1995/96 and 1996/97. Organisations were categorised as from Manufacturing, Retail and Financial Services as per Price Waterhouse definitions (Price Waterhouse 1994). As there were 73 Financial, 83 Retail and 90 Manufacturing organisations targeted and 26, 17 and 22 responding respectively the issue of undercoverage was possible. An adjustment was made to help ensure that the number of non-respondents (which may have differed in substantive ways from those included) did not invalidate the results. The companies used in the study were not selected at random as the organisations targeted receive placement students from the University although some did not recruit students during the time period under study and other companies who did employ placement students did not wish to participate in the survey.

8.2.2.2 Statistical limitations

At the onset of the research following discussions with quantitative specialists it became clear that if the research was to incorporate more subtle statistical techniques (e.g. factor analysis) then the questionnaire developed from the early pilots would need to be changed. A decision was made to continue with the questionnaire and that the changes arising from all pilot tests would be incorporated regardless of its effect of making analysis difficult. The aim was to produce a reliable instrument and not one that was altered in order to take into account any particular statistical techniques. This did however mean that the opportunities to perform more subtle analysis of the data were limited.

8.2.2.3 Other difficulties in researching the area

The area under research is fraught with difficulties. Peters and Waterman (1982) analysed 62 firms described as excellent and found that there were eight features prominent in all. However the same companies were investigated two years later (Business Week 1984) and already 14 were experiencing grave financial difficulties. This provides some support for the inherent rapid changes that occur in this field. In addition, clarifying a set of interconnected factors and complex relationships can be difficult as over time the performance of companies

regresses towards the average profitability of their industry (Jacobsen 1988). Also a study by Olusoga, Mokwa and Noble (1995) discussed the inherent instability for a wide variety of determinants of competitive advantage over a relatively short time period.

8.3 Ideas for future research

The factors identified as being important in generating sustained competitive advantages could be investigated further and perhaps by alternative research methods e.g. in depth case studies. This could analyse questions such as: how can organisations change the culture to be innovative? What does obtaining Top Management Support really mean? How can workgroup consensus be augmented? What are the measures and contributing factors that lead to a firm being a 'proficient implementer'? What type of person should the IS Manager be? How should he or she be trained? How can organisational learning be instilled in the IS department? Further investigation would enable the author to be more subtle about the factors highlighted, identify those factors that are more important in leveraging advantages and to examine the relationships between factors and those that are part of a cluster of factors.

The research centered upon applying mainly US based literature to a UK perspective. It would be interesting to investigate whether the factors seen as important for IS derived sustainability were the same in other countries.

Sample frames from other industrial contexts, and using alternative theoretical frameworks and methodologies would give different perspectives. A number of methodologies show promise for contributing to existing SIS research, including transaction cost economics (Williamson 1975) and the diffusion of innovation theory (Rogers 1983). These findings provide support for resource-based theory but alternative theoretical perspectives would assist in providing a fuller synthesis.

An alternative epistemological stance could be taken throughout a similar study whereby a new researcher untainted by a close examination of the literature could investigate the same UK sample frames from a purely interpretist viewpoint, inducing through a selection of interviews.

Although based largely on conjecture two other possible areas of research were generated from the interviews:

- organisations spend significant efforts in developing Strategic Information Strategies however there seems little attempt to evaluate their success or identify the true costs involved
- there appears to be very few formalised attempts to learn from the experiences of previous planning events and further research could investigate this in more detail.

Appendix 1

Glossary

Added Value : is the difference between the (comprehensively accounted) value of a firm's output and the (comprehensively accounted) cost of a firm's inputs.

Kay (1993)

Appropriability : is the capacity of the firm to retain the added value it creates for its own benefit. It is the ability to turn added value into profit.

Kay (1993)

Architecture : network of relational contracts within, or around, the firm.

Kay (1993)

Capability : the capacity for a team of resources to perform some task or activity.

Grant (1991)

Case study : from a research strategy point of view may be defined as an empirical inquiry that investigates a contemporary phenomenon within its real life context, when the boundaries between the phenomenon and the context are not clearly evident, and in which multiple sources of evidence are used. It is particularly valuable in answering who, why and how questions in management research.

Yin (1989)

Chaos : unpredictable variety within recognisable categories defined by regular features: that is an inseparable intertwining of order and disorder.

Stacey (1993)

Client-server architecture : the architecture of distributed processing where the application is distributed across a networked system. A server is a processor which provides defined services for its clients (file access, the sharing of peripherals etc.). A workstation acts as an intelligent client and requests services from the server.

Comparative Advantage : is not yet competitive advantage; it is a potential source of competitive advantage. It occurs when one firm does something better (access to strategic or human resources, better technical infrastructure, greater market presence) than its competitors.

Clemons and Kimbrough (1987)

Competition : means rivalry between groups in the pursuit of a common prize.

Daft (1992)

Competitive Advantage (CA) : the ability to earn returns on investment persistently above the average for the industry. The ability of an IT innovation to contribute towards competitive advantage depends on the innovator incurring a lower cost in implementing the innovation than its competitors or obtaining a larger share of the economic benefits from the innovation. It is the use of IT externally to disturb, enhance or limit the competitive forces at

work in a firm's sector. The 'forces at work' will include the effects of rivals, the power of supplies and customers and the threat of new entrants entering the market sector.

(Based on Porter 1985)

Competitive Advantage : anything that one business does appreciably better than another may be the source of competitive advantage if the business finds some way to base a competitive strategy on its comparative advantage and if customers value the difference offered by this strategy and seek it out. Thus, competitive advantage may be the source of enhanced profit margins or increased market share.

Clemons and Kimbrough (1987)

Competitive Advantage : firms add value by creating a distinctive capability through a unique set of relationships, establishing a competitive advantage based on that distinctive capability in relevant markets, and maximizing the value of that advantage through the firm's business strategy.

Kay (1993)

Competitive Advantage : the ability of a firm to add more value than another firm in the same market.

Kay (1993)

Competitive Advantage : can be measured not only in financial terms but in terms of market share and new customers.

Wiseman (1988)

Competitive Advantage : positional superiority based on some combination of differentiation, cost superiority, or operating in a protected niche

Day (1984)

Gaining a *competitive advantage* should result in a long term financial benefit for the firm even if benefits are difficult to quantify

Cooper and Kaplan (1988)

Economic profits are the most appropriate *measure of competitive advantage* and that "advantage exists when the pioneering firm earns positive present value of profits because of early entry"

Lieberman and Montgomery (1988)

Competitive Arena : those businesses that are producing products and services that are close substitutes of one another, and which would take market share from any of the businesses if it failed to compete effectively.

Complexity : the need to mesh together many different forms of information to achieve understanding and to be able to take reasoned action

Core Competencies : are a function of the tacit understanding, skills and resources that a firm accumulates over time.

Mahoney (1995)

Core Competencies : the central, strategic capabilities that are the collective learning in the organisation, especially how to coordinate diverse production skills and integrate multiple streams of technology.

Prahalad and Hamel (1990)

Corporate Profitability : a firm's ability to earn a rate of profit in excess of its cost of capital depending upon the attractiveness of the industry in which it is located, and its establishment of competitive advantage over rivals.

Based upon Grant (1991)

Critical Success Factors - the methodology of identifying the most important aspects that influence the attainment of the company's business goals.

Rockart (1982)

Database Management Systems (DBMS) : a system providing the organisation and retrieval of data, in a structured way.

Decision Support System (DSS) : flexible information system that allows managers to access corporate and external databases, allowing what-if analysis and report generation. Executive Support Systems like DSS attempt to solve non-structured business problems but are customised to the needs of specific individuals (the M.D. or a senior executive).

De facto standard : a standard established by the degree of acceptance by users in the marketplace.

De jure standard : a standard established both by officially recognised bodies and unofficial bodies that typically are created by groups of manufacturers, consumers and experts at an international level.

Distinctive Capabilities : enable companies to produce at lower cost than their competitors or to enhance the value of their products in ways that put them ahead of their rivals. They are the product of the organisation or the firm itself - its architecture, its reputation, or its success in innovation.

Kay (1993)

Distinctive Capability : the features of a firm's position or organisation which cannot readily be reproduced by competitors. Generally based on architecture, innovation or reputation, or the ownership of strategic assets.

Kay (1993)

Downsizing (IT) : the emerging trend where users change from mainframes to mini or personal computers in a distributed environment. This allows greater independence and flexibility and should complement a change in company strategy.

Dynamism : the rate of change

Effectiveness - the degree of attainment measured against a company's business goals or objectives. **Efficiency** is the ratio of total output (volume, quality etc.) to total input (time,

financial costs, resources). Success is the extent to which the aims of efficiency and effectiveness are fulfilled within the constraints of the market in which the company operates.

For an organisation to be *effective* it must manage the interplay of 7 basic forces :

- direction (sense of vision and mission of the organisation). The entrepreneurial form typifies organisational direction and common purpose
- efficiency (need to minimise costs and increase benefits). The best structure is the machine bureaucracy because it focuses on rationalisation and standardisation
- proficiency (carry out tasks with a high level of knowledge and skill). Proficiency is the advantage of the professional bureaucracy which uses highly trained professionals to achieve excellence
- innovation (developing new products and services to adapt to the external environment). The adhocracy form of organisation is best for meeting this need
- concentration (focusing organisational efforts on particular markets). This is the advantage of a diversified organisation which focuses its activities on specific products and markets
- cooperation (the result of common culture values) and reflects the need for harmony and cooperation among a diverse set of people
- competition (the need for individual success and recognition) but can cause politics

An effective organisation achieves the right balance among the 7 forces.

Mintzberg (1991)

Empirical (Scientific) Approaches : those that have arisen from the scientific tradition - characterised by repeatability, reductionism and refutability (Checkland 1981) and which assume that observations of the phenomena under investigation can be made objectively and rigorously.

Klein and Lytinen (1985)

Environment Turbulence : the frequency and unpredictability of changes in stakeholder expectations.

Sambamurthy, Zmud and Byrd (1994)

Epistemology : refers to our *theory of knowledge*, in particular how we apply knowledge. Knowledge was classified by the Greeks into two types: 'doxa' (that which was believed to be true) and 'episteme' (that which was known to be true). Science, they believed, was the process of inquiry which transformed 'doxa' into 'episteme'.

Hirschheim (1985)

Exception Reporting : a report/system that calls attention to unusual situations in which certain predefined conditions occur.

Firm : is a set of relationships between its various stakeholders - employees, customers, investors, shareholders. The successful firm is one which creates a distinctive character in these relationships and which operates in an environment which maximises the value of that distinctiveness.

Kay (1993)

Implementation : refers to all the management policies and interventions associated with the development, introduction, and use of an information System, from its inception to its retirement.

Silver et al. (1995)

Induction : how patterns emerge from a phenomenological data collection exercise and how a study of these patterns without previously setting hypotheses can provide useful insights. Useful propositions emerge from the data which can then be empirically tested using a deductive approach in future research.

King and Sabherwal (1991)

Industry : is a set of interrelated groups composed of environment serving organisations (ESOs), customers, suppliers and financing sources that have the following common features:

- 1. sell similar products/services to a common pool of customers/clients**
- 2. buy their inputs from a common group of suppliers**
- 3. obtain their subsidies from a common pool of donors**
- 4. share a common body of know-how called technology, which is essential for their commercial activity**

An ESO is an organisation whose primary function is to supply goods and/or services to society.

Ansoff (1979)

Industry : the group of firms within the competitive arena, plus the chain of business activities that impact on this group, both upstream and downstream.

Porter (1979)

Industry : a group of products associated by common technology or supply or distribution channels.

Kay (1993)

Information is the time sensitive product of some kind of processing which gives raw data a value. To be useful to business it must be relevant, accurate and timely.

Information intensity : the amount of intellectual work done by people as they conduct their affairs products are information intensive if their selection, purchase, use, and

maintenance require careful research and thoughtful consideration by the customers. A firm's value chain is information intensive to the extent it requires intellectual effort by employees.

Linder and Ives (1988)

Information Systems that are a *strategic necessity* : are those that a business must have in order to operate effectively. Information Systems that provide *sustained competitive advantage* : are those that confer an advantage that persists for a long period of time despite competitors' desires to eliminate what for them is a source of disadvantage.

Clemons and Kimbrough (1987)

IS planning: is the process of identifying the computer based applications that will assist an organisation in executing its business plans and realising its business goals.

Lederer and Sethi (1988)

Information Strategy : a complex of implicit or explicit visions, goals, guidelines and plans with respect to the supply and the demand of formal information in an organization, sanctioned by management, intended to support the objectives of the organization in the long run, while being able to adjust to the environment.

Smits et al. (1997)

Information System : comprises hardware, software, data, people and procedures.

Silver et al. (1995)

Information Technology : the set of all technological solutions to the problem of collecting, storing, manipulating and distributing information.

IT Leader : an organisation that successfully uses info to improve the organisation's competitive positioning

IT Loser : an organisation that spends a significant amount of money on IT but fails to improve the organisation's competitive positioning

IT Laggard : an organisation that views IT as a utility and therefore does not attempt to use IT to improve the organisation's competitive positioning

Lacity & Feeny (1996)

IT Strategy : incorporates the range of issues associated with strategy formulation and implementation with respect to information systems (Galliers 1993). This includes what Earl (1989) terms information systems strategy (what is required), IT strategy (how this might be delivered) and information management strategy (organisational and policy considerations). It also includes an implementation change management strategy and an on-going assessment and review, with a view to ensuring that things are going to plan and changes in the strategy take place in line with this assessment and with changing circumstances.

Innovations : create economic value by decreasing the costs of existing goods or services, improving their quality, or creating new goods or services for which there is sufficient

demand. In terms of Information Technology and Competitive Advantage this economic value is not necessarily captured by the innovator.

Based upon Clemons & Row (1991)

Learning : Effective learning depends upon the acquisition, processing, storage and retrieval of knowledge

Helleloid and Simonin (1992)

Management Support System : the use of information technologies to support management.

Scott Morton (1984)

Observing : examining steadily and in detail the stream of events toward which attention is directed

Barton and Lazarsfeld (1969)

Ontology : theories about existence or reality

Archer (1988)

Open Systems : a set of international standards that enable different processors, operating systems and applications to operate and exchange data. This has led to increasing product standardisation, resulting in declining margins for manufacturers.

Organisation : a structure in which information serves as the axis and as the structural support.

Drucker (1985)

Organisational Knowledge : systems, routines, data within an organisation which are only imperfectly understood by any individual member. Their value is therefore partly appropriable by the organisation.

Kay (1993)

Organisational Learning : is the process whereby management teams change their shared mental models of their company, their markets and their competitors.

De Geus (1988)

Organisational Learning : may be operationalised as a shift in organisational theory-in-use mediated by organisational inquiry.

Schon (1983)

Organisational Learning : a process of improving actions through better knowledge and understanding.

Fiol and Lyles (1985)

Positivism : an epistemology which seeks to explain and predict what happens in the social world by searching for regularities and casual relationships between its constituent elements.

Burrell and Morgan (1979)

Project : is a set of people and other resources temporarily assembled to reach a specified objective, normally with a fixed budget and with a fixed time period. Projects are generally associated with products or procedures that are being done for the first time or with known procedures that are being altered.

Graham (1985)

Project Management : the eight areas of expertise of project management include managing scope (i.e. defining boundaries), managing time, managing money, managing quality, managing communications, managing human resources, managing contracts and supply, and managing risk.

Dinsmore (1990)

Participative management approach : the 'truth, trust, love and collaboration approach to change' (Pettigrew 1985). This includes involvement, participation, ownership, communication, commitment and trust.

Qualitative methods: an array of interpretive techniques which seek to describe, decode, translate and otherwise come to terms with the meaning, not the frequency, of certain more or less naturally occurring phenomena in the social world.

Van Maanen (1983)

Rent : is increasingly used instead of economic profit due to the ambiguity associated with accounting definitions of profit. Rent is the surplus of revenue over the 'real' or 'opportunity' cost of the resources used in generating that revenue. The 'real' or 'opportunity' cost of a resource is the revenue it can generate when put to an alternative use in the firm or the price which it can be sold for.

Grant (1991)

Research Methods (v. approaches) : methods are simply ways to systematize observation. Different approaches are a way of going about one's research. They may embody a particular style and may employ different methods or techniques. Approaches are therefore a more generic concept than methods.

Weick (1984)

Resources : inputs into the production process, the basic units of analysis (capital equipment, skills of individual employees, patents, brand names, finance and so on).

Grant (1991)

Resources : any long-lived productive capability including both tangible assets (manufacturing plant, vehicles etc.) and intangible assets (patents, brand image etc.)

Clemons and Row (1991)

Ricardian rents : the returns to the resources which confer competitive advantage over and above the real costs of these resources.

Grant (1991)

Scalability : the incremental growth potential within and between systems, allowing application programs to operate on the required level of processor power without modification.

Strategic : is a label often attached to events or changes after they have occurred rather than beforehand. Change is strategic only when organisations themselves perceive that the change is indeed strategic. Change for one company that can be described as strategic, may well be mundane to another. Changes that begin as strategic often involve the implementation of many operational or commonplace elements. Likewise change that begins as operational can become strategic over time as other changes occur within the organisation or the business environment.

Mintzberg (1989)

Strategic Asset : a source of competitive advantage which is derived from factors external to the firm rather than from its own distinctive capabilities.

Kay (1993)

Strategic Business Decisions : are primarily concerned with external, rather than internal, problems of the firm and specifically with the selection of the product-mix which the firm will produce and the markets to which it will sell. This means that strategy is about the environmental context of the organisation and not just 'important' issues.

Ansoff (1987)

Strategic Business Unit : is a grouping of related businesses under common supervision. The SBU provides a broadly diversified company with a way to rationalise its multi-faceted organisation. For example, it is reported that General Electric grouped 190 units into 43 SBUs and then aggregated them into six sectors.

Hall (1978)

SBU : the level of a multi divisional organisation at which strategy is determined.

Kay (1993)

Strategic Group : those firms the company identifies as its primary competitors.

Kay (1993)

Strategic Group : Firms which adopt similar strategies and hence see themselves as in direct competition.

Kay (1993)

Strategic Group : a group of firms in an industry that follows the same or similar strategy along dimensions such as specialization, brand identification, product quality, technological leadership, and so forth.

Porter (1980)

Strategic Group : is a grouping of organisations that pursue similar strategies with similar resources Groups are a device to segment industries into sets of companies whose competitors, actions and results are relevant to each other.

Hatten and Hatten (1987 p329)

Strategic Information Systems (SIS) : 'information systems used to support or shape the competitive strategy of the organisation'. This is probably too broad a definition and refers to SIS performing a purely supportive role rather than being integrated or aligned with business strategy. The definition (in ' ') was reported and adopted by Reich and Huff (1991) but proposed originally by Wiseman (1985).

SIS : information systems that generate internal and comparative efficiency.

Bakos and Treacy (1986)

SIS : 'is a system that helps a firm improve its long-term performance by directly increasing its value-added contribution to the industry value chain. An SIS will give management an opportunity to increase the effectiveness with which a firm relates to and operates within its industry value chain . . . An SIS has an internal orientation with regard to intent [and normally] focuses on a value activity within a specific business unit.'

Remenyi (1988)

SIS : an information system which either supports or facilitates a particular business strategy or some facet of it.

Earl (1988)

SIS : an information system that 'confers a unique sustainable, or otherwise significant, performance advantage'. He excludes systems that provide only 'small or short term improvements'

Ciborra (1994)

SIS : should reduce cost, add value and create significant switching costs that result in financial benefit before the system is copied by competitors

Kettinger et al (1994)

SIS : must have at least 3 characteristics: 'linking multiple parties, providing direct benefits to the involved parties, and affecting the competition'

Liang and Tang (1992)

Strategic Information Systems Planning (SISP) : the process of deciding the objectives for organizational computing and identifying potential computer applications which the organization should implement.

Lederer and Sethi (1988)

SISP : consists of the development of various methodologies that incorporate the business strategies of the corporation into the information systems plan.

Ang et al. (1995)

SISP : is the process of ensuring the alignment between business strategies and information systems development.

Gao, Liu and Eardley (1997)

Strategic IT : investment made to gain a competitive advantage and gain market share via sales growth

Weill and Broadbent (1988)

Strategic Management : Successful strategic management means improving the total control system of the organisation so that it is fit and flexible enough to play dynamic business games in highly uncertain environments. It is not preparing long-term plans - the future is far too uncertain for that.

Based on Stacey (1990)

Strategic Market : the smallest range of activities across which a firm can viably compete.
Kay (1993)

Strategic Necessity : Items that are strategic necessities often have high acquisition costs and a long development and implementation time. They are not the same in all organisations, they might well have different suppliers and different costs but are required by all firms in the industry in order to compete effectively. These are not the same as basic business necessities (phones, paper clips, pens) which an organisation must have in order to remain in business and which are easily available to all with very similar functionality at a very similar cost.

Based on Clemons and Kimbrough (1987)

Strategic Planning : the definition of goals and objectives.

Anthony (1965)

Strategy : the match an organisation makes between its internal resources and skills . . . and the opportunities and risks created by its external environment.

Hofer and Schendel (1978)

Strategy : the direction and scope of an organisation over the long term: ideally, which matches its resources to its changing environment, and in particular its markets, customers or clients so as to meet stakeholder expectations.

Johnson and Scholes (1993)

Strategy : is a mechanism for coping with a complex and changing environment

Ansoff (1984)

Strategy : can be viewed in 5 different ways: as a *plan* (rules leading to a goal), a *ploy* (a trick to beat competitors), a *pattern* (a way of behaving), a *position* (a safe place) and a *perspective* (a vision, a set of assumptions).

Mintzberg (1980)

Strategy : the pattern of decisions. . . .that determines. . . . goals, produces principal policies, plans and defines the range of business.

Andrews (1980)

Strategy : the usual definition of 'strategy' encourages the notion that strategies, as we recognise them ex post facto, are the deliberate plans conceived in advance of the making of specific decisions. By defining a strategy as 'a pattern in a stream of decisions', we are able to research strategy formulation in a broad descriptive context. Specifically, we can study both strategies that were intended and those that were realised despite intentions. [emergent]

Mintzberg (1978)

Structured Activities : are repetitive, routine and often well defined (sometimes through standards) e.g. stock control or order processing.

Sustainable (regarding distinctive capabilities or strategic assets) : Capable of being maintained over time despite market entry and competitor attempts at replication.

Sustained C.A. : when a firm receives a return on investment that is greater than the industry norms and is sustained for a long enough period to alter the nature of industry competition

Clemons & Kimbrough (1986); Porter (1985)

Sustained C.A. : One that persists for such time as to alter the relative strength of the organisation vis a vis its rivals

Clemons & Kimbrough (1986)

System - a set of elements that is considered to act as a single, goal-orientated entity.

Triangulation : "the use of multiple, but independent, measures"

Easterby-Smith et al (1991)

Turbulence : the situation in which the environment is changing in an irregular, unpredictable way

Bowman and Faulkner (1988)

Unstructured Activities : are novel and judgmental where no preset procedure can exist.

Appendix 2

QUESTIONNAIRE

[Version 1a]

All answers will be treated in strict confidence

If you are unsure of any of the terms used please refer to the glossary at the back of the questionnaire.

Section A

The first section deals with you and your organisation

- 1. Your name** _____
- 2. Your organisation** _____
- 3. The main business activities of your organisation** _____

- 4. Your job title** _____
- 5. Length of time in an Information Systems (IS) role** _____ years
- 6. Number of executives beyond yourself and the Chief Executive or equivalent (If you report directly the answer is zero)** _____
- 7. What is the job title of the most senior IS executive?**

- 8. Please estimate the number of employees**
 - (a) at your particular site** _____
 - (b) in your organisation as a whole** _____
- 9. Please estimate the number of IS staff**
 - (a) at your particular site** _____
 - (b) in your organisation as a whole** _____
- 10. How many non-IS staff process their own data using PCs, minicomputers or mainframes?**

(a) at your particular site _____
(b) in your organisation as a whole _____

Section B

This section is concerned with your organisation’s approach to planning its Information Systems (IS).

11. Please indicate the extent to which you agree or disagree with the following statements *as they relate to your organisation*. 1 indicates strong disagreement and 4 strong agreement. If you feel that a particular question is not relevant to your organisation please leave the response blank.

	Disagree		Agree	
	1	2	3	4
The organisation develops formal Information Systems (IS) Plans	1	2	3	4
These IS plans are updated regularly (at least every 6 months)	1	2	3	4
IS plans are driven by business needs	1	2	3	4
IS plans are driven by technology	1	2	3	4
When planning IS the users requirements are methodically determined	1	2	3	4
Major IS planning decisions are first initiated by the board of directors	1	2	3	4
Major IS planning decisions are first initiated by close consultation with individual business units	1	2	3	4
Major IS planning decisions are first initiated within the IS dept.	1	2	3	4
All IS developments have to pass stringent cost/benefit criteria	1	2	3	4
Senior Managers <i>work together</i> to integrate IS plans into the general business plans	1	2	3	4

Costs and benefits of IS developments are monitored & used to control future developments	1	2	3	4
The board recognises that stringent cost benefit tests are neither practical nor desirable for all IS developments	1	2	3	4
IS plans are related to general business plans but in an informal manner	1	2	3	4
IS planning is viewed as a departmental or division responsibility rather than a corporate function	1	2	3	4
We tried to develop long term IS plans but we were knocked off course by external factors	1	2	3	4
IS planning is developed in an ad hoc way	1	2	3	4
Our IS planning approach follows a well recognised methodology	1	2	3	4
It is hard to find a team leader who meets the criteria specified by the planning methodology	1	2	3	4
It is hard to find team members who meet the criteria specified by the planning methodology	1	2	3	4
Time scales used by formal methodologies are inappropriate	1	2	3	4
Too many support personnel are required to gather data by the planning methodology	1	2	3	4
The planning exercise is too long	1	2	3	4
The planning exercise is too expensive	1	2	3	4
Most new IS developments are extensions of existing IS	1	2	3	4
Implementing a formal methodology is difficult because the documentation does not describe the steps sufficiently	1	2	3	4
It is very difficult to gain approval for the methodology by senior management	1	2	3	4
The methodology necessitates making over simplified assumptions about the organisation	1	2	3	4
The methodology does not take sufficient notice of organisational goals	1	2	3	4
The methodology does not take sufficient notice of the competitive environment	1	2	3	4
The methodology fully takes into account the external technological environment	1	2	3	4

The methodology does not provide sufficient prioritisation	1	2	3	4
The methodology fails to take into account changes in the organisation during IS planning	1	2	3	4
The methodology needs the assistance of external consultants in order to be successful	1	2	3	4
The methodology does not adequately assess the <i>current</i> IS	1	2	3	4
The methodology does not help to analyse the strengths and weaknesses of the IS dept.	1	2	3	4
Personnel find it difficult to answer questions posed by the methodology	1	2	3	4
The methodology requires too much user involvement	1	2	3	4
Implementing the projects identified in the IS plan requires significant further analysis	1	2	3	4
The organisation finds difficulty in changing IS plans	1	2	3	4
The final planning document is not very useful	1	2	3	4
The final planning document does not capture all relevant information gathered during the study	1	2	3	4
The final planning document is not in accordance with the expectations of senior management	1	2	3	4
Experiences from using the methodology are not sufficiently transferable to other units within the organisation	1	2	3	4
The resulting IS plans are too inflexible	1	2	3	4
The organisation is very successful at implementing IS plans	1	2	3	4

Section C

The following statements refer to the extent of the IS developments within your organisation and with business partners. Again 1 indicates strong disagreement and 4 strong agreement. If you feel that a particular question is not relevant to your organisation please leave the response blank.

	Disagree		Agree	
	1	2	3	4
12. Electronic Mail is an essential means of communication within the organisation				

13. Electronic links to our suppliers are essential to our business	1	2	3	4
14. Electronic links to our customers are essential to our business	1	2	3	4
15. Marketing Information Systems are used to aid the development of new products or services	1	2	3	4
16. The organisations use of data as a corporate resource is underutilised	1	2	3	4
17. The organisation uses existing customer data in order to help target products	1	2	3	4
18. Managers do not have all the information available to help decision making	1	2	3	4
19. Decision Support Systems are of little use in the organisation	1	2	3	4
20. End Users are encouraged to develop their own applications	1	2	3	4

SECTION D

This final section is concerned with the outcomes of the Information Systems that have been implemented in your organisation.

Many organisations develop Information Systems in order to gain an advantage over competitors.

21. In your industry, does your organisation aim to be:

- always an IS pioneer** ☐
- mainly an IS pioneer but occasionally an IS follower** ☐
- occasionally an IS pioneer but mainly an IS follower** ☐
- always an IS follower** ☐
- there is no formal positioning regarding whether the organisation adopts a pioneer or follower strategy** ☐

22. Have any of your organisation’s Information Systems produced a business advantage over rivals?

- YES

NO
- ☐

☐

For the Information System that has produce the most significant advantage, please answer the following questions ticking all responses that apply. If your answer to question 22 was NO, please go to question 37.

23. Briefly describe the IS development and the nature of the business advantage created?

24. How long did the IS take to develop?

- Less than 6 months

More than 6 but no more than 12 months

More than 12 but no more than 18 months

More than 18 but no more than 24 months

More than 24 but no more than 36 months

More than 36 but less than 5 years

5 years or more
- ☐

☐

☐

☐

☐

☐

☐

25. How long did the IS take to implement

- Less than 6 months

More than 6 but no more than 12 months

More than 12 but no more than 18 months

More than 18 but no more than 24 months

More than 24 but no more than 36 months

More than 36 months but less than 5 years

5 years or more
- ☐

☐

☐

☐

☐

☐

☐

26. How long has your organisation been using the system?

_____ **Months/Years**

27. Where did the idea for this IS development come from ? [Please tick *all* that apply]

Internal Influences

IS Dept. ☐
End Users ☐
Sales/Marketing ☐
Senior Management ☐

External Influences

Suppliers ☐
Customers ☐
Rivals ☐
Consultants ☐
Manufacturers ☐

28. Was the IS development in response to a specific problem?

If yes, in which functional area did the problem arise?

29. For this significant IS development that produced a competitive advantage, how long did the advantage last?

The advantage lasted less than 6 months ☐
The advantage lasted more than 6 but no more than 18 months ☐
The advantage lasted more than 18 but no more than 36 months ☐
More than 36 months but less than 5 years ☐
5 years or more ☐
Rivals have yet to catch up ☐

If rivals have nullified the advantage, are there any ways (with the benefit of hindsight!) in which you think this could have been delayed further?

30. The benefits of the IS development are

- very easily observed by competitors** ☐
- fairly easy to observe by competitors** ☐
- fairly difficult to detect by competitors** ☐
- very difficult to detect by competitors** ☐

31. This specific IS development was

- generated as a result of the formal IS planning process** ☐
- partly generated as a result of the formal IS planning process** ☐
- produced serendipitously** ☐

32. This specific IS development

- exploits unique resources within our organisation which are unavailable to competitors** ☐ *
- provides unique access to customers, retailers, suppliers or distributors** ☐
- Provides unique access to information resources outside the organisation** ☐
- None of the above apply** ☐

If you ticked * please answer the following question. If not please go to question 32.

Could the unique resources referred to above be readily used for other purposes by users if they were to divest the IS development

- Yes** ☐
- No** ☐

33. This specific IS development

- is protected from imitation by patents, copyrights or trade secrets** ☐
- is protected by another mechanism (please specify)** ☐

- has no protection from imitation but takes considerable effort to duplicate** ☐
- has no protection from imitation and is relatively easy to duplicate** ☐
- is freely available in the marketplace** ☐

Comments _____

34. The total cost to rivals of acquiring the system is

- very low** ☐
- low** ☐
- moderate** ☐
- high** ☐
- very high** ☐

Comments _____

35. The IS development

- enabled benefits to be gained via synergy within different parts of the organisation** ☐
- enabled benefits to be gained via synergy with business partners** ☐
- has had no synergistic benefits** ☐

Comments _____

36. The development of the IS has

- promoted Business Process Re-engineering within the organisation** ☐
- had little impact on the design of business processes** ☐
- merely automated the manual process** ☐

37. Regarding your organisation’s efforts in terms of marketing, promoting and training users in order to use the IS successfully

- Considerable effort has been expended**
- Reasonable effort has been expended**
- There was no need to market, promote or train users as the system was straightforward/intuitive/very similar to the one used previously**
- ☐
- ☐
- ☐

Comments _____

38. These final questions refer to the financial costs and benefits associated with the IS development . Please indicate the extent to which you agree or disagree with the following statements *as they relate to the specific IS development mentioned above*. If your organisation has not gained a competitive advantage from an IS development and you have jumped to this question from question 22 please respond referring to the IS development that has made the *most significant contribution* to your organisation. 1 indicates strong disagreement and 4 strong agreement. If you feel that a particular question is not relevant to your organisation please leave the response blank.

	Disagree		Agree	
The IS has enabled us to increase market share	1	2	3	4
The IS has enabled us to maintain market share	1	2	3	4
The IS has enabled us to increase sales	1	2	3	4
The IS has enabled us to reduce costs	1	2	3	4
The IS has enabled us to monitor costs	1	2	3	4
The IS does not contribute to profit	1	2	3	4
The IS improves our level of customer service	1	2	3	4
The IS increases our company’s ability to achieve better economies of scale	1	2	3	4
The IS has reduced the costs associated with obtaining supplies	1	2	3	4

The IS has reduced the costs of transforming components into the finished product	1	2	3	4
The IS has reduced the costs associated with distributing the final product to customers	1	2	3	4
The IS has reduced the costs associated with co-ordinating different activities e.g. purchasing, production, planning, marketing, administration	1	2	3	4
The IS has reduced the costs associated with sales and marketing	1	2	3	4
If <i>your customers</i> changed suppliers they would incur large costs	1	2	3	4

Please add any other further information or comments that you think are appropriate

Many thanks for participating in the survey. If you would like a summary report of how all organisations responded please tick here.

No company/personnel names will be disclosed.

☐

Please return all questionnaires to :

Glossary

Business Process Re-engineering: it provides opportunities for organisations to rethink key business processes for improved efficiency and effectiveness

Competitive Advantage: the ability to earn returns on investment persistently above the average for the industry. The ability of an IS innovation to contribute towards a competitive advantage depends on the innovator incurring a lower cost in implementing the innovation than its competitors or obtaining a larger share of the economic benefits from the innovation.

Decision Support Systems: improving managers' ability to make effective decisions is an important objective for IS. Decision Support Systems can help managers to model different situations and make more informed choices

Efficiency: is the ratio of total output (volume, quality etc.) to total input (time, financial costs, resources).

Effectiveness: the degree of attainment measured against a company's business goals or objectives.

Information System: comprises hardware, software, data, people and procedures

Information Systems Plans: the planning of all technological solutions to the problem of collecting, storing, manipulating and distributing information

Appendix 3

Abbreviations used in statistical calculations

<u>Abbreviation</u>	<u>Description</u>	<u>Question in survey</u>
Pioneer	Strategic orientation	Covering letter
Budget £	IS budget (in £ sterling)	Covering letter
Budget %	IS budget (as % of sales)	Covering letter
PCA	Systems producing a CA	a
NCA	Systems nullifying a CA	b
LenCA	Length of CA	2
YrsImpln	Years since implementation	2
LenRival	Duration of rival's CA	4
LenDev	Duration of development	5
BincMS	Increase in market share	6
BincS	Increase in sales	6
BredC	Reduce costs	6
BcontP	Contributed to profit	6
BimpExtc	Improved external communications	6
BincEcoS	Increasing economies of scale	6
Bredtransf	Reduce costs of transforming	6
BredAsso	Reduce costs associated	6
BmaintMS	Maintain market share	6
Battqual	Attract quality staff	6
BmonCst	Monitor costs	6
BimpIntc	Improved internal communication	6
BimpCS	Improved customer service	6
BredcSup	Reduced cost of obtaining supplies	6
BredDist	Reduced distribution costs	6
BredSMkt	Reduced sales/marketing costs	6
BimpLoy	Improved customer loyalty	6
ChSuppl	Changing suppliers	7
Observed	Ease of observation	8
CstAquire	Cost of to rivals of acquiring system	9
Unique	Unique resources	10
OthPurps	Resource used for other purposes	10
UqeAccss	System provides unique access	11
FirstMov	First mover	11
InfoOutsd	Accessing info outside the organisation	11
TrSecrets	Trade secrets	11
Innovative	Innovative development	11
PrevNewE	Prevent new entrants	11
EconScal	Economies of scale	11
PrevSwith	Prevent switching costs	11
AttQStaff	Attract quality staff	11
ExpMono	Exploit monopolistic situations	11
RestExp	Restrictive expertise	11
GovLegis	Government legislation	11
Lockin	'Lock-in' customers/suppliers	11

FreeAvail	Development freely available	11
AnthMec	Protected by another mechanism	11
IISDept	Idea from IS Department	12
ISupp	Idea from suppliers	12
IMidMgt	Idea from Middle Management	12
ISrMgt	Idea from Senior Management	12
Icons	Idea from Consultants	12
IEU	Idea from End Users	12
ICusts	Idea from Customers	12
IOffCh	Idea from Office Champion	12
ISMktg	Idea from Sales/Marketing	12
IRivals	Idea from rivals	12
Imedia	Idea from the media	12
Imanuf	Idea from manufacturers	12
IDK	Don't know source of idea	12
SpecProb	Special problem	13
FormPlng	Formal planning	14
Effort	Effort expended on development	15
SuppTMgt	Support of Top Management	16
SysCham	Support of System Champion	16
TechSkls	Adequate technical skills	16
ProjLder	Effective project leader	16
Finance	Adequate finance	16
PlngMeth	Planning methodology	17

RELIABILITY ANALYSIS - SCALE (ALPHA)

Item-total Statistics

	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected. Item- Total Correlation	Squared Multiple Correlation	Alpha if Item Deleted
BATTQUAL	42.4545	88.2727	.2975	.	.7743
BCONTP	42.4545	90.8727	.3519	.	.7745
BIMPCS	42.4545	91.0727	.3280	.	.7751
BIMPEXTC	42.8182	84.7636	.7133	.	.7600
BIMPINTC	42.5455	89.6727	.4023	.	.7723
BIMPLOY	42.7273	102.2182	-.6549	.	.8038
BINCECOS	42.7273	88.4182	.3406	.	.7726
BINCMS	42.3636	95.2545	-.1399	.	.7867
BINCS	42.3636	91.6545	.2060	.	.7776
BMAINTMS	42.9091	81.6909	.7897	.	.7530
BMONCST	42.5455	89.6727	.4023	.	.7723
BREDASSO	42.2727	88.2182	.4847	.	.7691
BREDC	42.4545	90.8727	.3519	.	.7745
BREDCSUP	42.5455	93.4727	.0873	.	.7801
BREDDIST	42.5455	89.6727	.4023	.	.7723
BREDSMKT	42.6364	92.8545	.0735	.	.7815
BREDTRAN	42.6364	84.4545	.5513	.	.7628
CSTAQUIR	39.8182	82.7636	.4125	.	.7686
ECONSCAL	43.0909	90.4909	.3466	.	.7741
EFFORT	42.2727	95.0182	-.1406	.	.7848
FINANCE	42.6364	94.4545	-.0694	.	.7834
FIRSTMOV	43.1818	88.1636	.6488	.	.7673
FORMPLNG	43.0909	88.0909	.6047	.	.7675
GOVLEGIS	43.1818	92.3636	.1661	.	.7787
ICONS	43.2727	90.0182	.5069	.	.7718
ICUSTS	43.1818	89.9636	.4391	.	.7723
IEU	43.3636	91.6545	.4031	.	.7754
IISDEPT	43.2727	90.6182	.4273	.	.7734
IMANUF	43.3636	92.4545	.2634	.	.7775
IMEDIA	43.2727	90.0182	.5069	.	.7718
INFOOUTS	43.2727	89.8182	.5335	.	.7713
INNOVATI	42.6364	90.8545	.3961	.	.7741
IOFFCH	43.3636	91.6545	.4031	.	.7754
IRIVALS	43.0000	88.0000	.5920	.	.7674
ISMKTG	42.6364	94.6545	-.0947	.	.7839
ISRMGT	43.2727	92.4182	.1917	.	.7782
ISUPP	43.3636	91.6545	.4031	.	.7754
LENCA	41.2727	89.4182	.1711	.	.7815
LENDEV .	41.7273	91.8182	.0829	.	.7839
LENRIVAL	41.4545	92.8727	.0104	.	.7886
LOCKIN	43.0000	88.6000	.5289	.	.7691
OBSERVED	41.1818	84.7636	.3599	.	.7716

RELIABILITY ANALYSIS - SCALE (ALPHA)

Item-total Statistics

	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item- Total Correlation	Squared Multiple Correlation	Alpha if Item Deleted
OTHPURPS	42.7273	96.4182	-.2795	.	.7887
PATENTS	43.2727	93.2182	.0885	.	.7803
PIONEER	40.0000	99.4000	-.2528	.	.8167
PLNGMETH	43.0909	88.2909	.5830	.	.7680
PREVNEW	42.7273	98.0182	-.4502	.	.7925
PREVSWIT	43.1818	92.1636	.1885	.	.7781
PROJLDER	42.9091	92.8909	.0903	.	.7806
RESTEXP	43.2727	93.2182	.0885	.	.7803
SPECPROB	43.0909	92.0909	.1784	.	.7784
SYSCHAM	43.0000	91.4000	.2403	.	.7768
UQEACCSS	43.0909	89.6909	.4319	.	.7719
ANTHMEC	43.3636	92.4545	.2634	.	.7775
CHSUPPL	43.0000	93.2000	.0126	.	.7858
FREEAVAI	42.8182	97.1636	-.3363	.	.7909
IDK	43.2727	90.6182	.4273	.	.7734

Reliability Coefficients 57 items

Alpha = .7804 Standardized item alpha = .8330

Appendix 4

LENCA by BCONTP

LENCA	Count Exp Val	BCONTP			Row Total
		.00	1.00	2.00	
	.00	8 6.5	1 5.2	5 2.4	14 21.5%
	1.00	6 5.1	3 4.1	2 1.9	11 16.9%
	2.00	6 8.3	10 6.6	2 3.0	18 27.7%
	3.00	4 4.2	5 3.3	0 1.5	9 13.8%
	4.00	2 1.8	0 1.5	2 .7	4 6.2%
	6.00	4 4.2	5 3.3	0 1.5	9 13.8%
Column Total		30 46.2%	24 36.9%	11 16.9%	65 100.0%

Chi-Square	Value	DF	Significance
Pearson	18.62426	10	.04530
Likelihood Ratio	22.87797	10	.01121
Mantel-Haenszel test for linear association	.27047	1	.60302

Minimum Expected Frequency - .677
Cells with Expected Frequency < 5 - 13 OF 18 (72.2%)

LENCA	Count Exp Val	BIMPEXTC			Row Total
		.00	1.00	2.00	
	.00	10 7.3	2 6.0	2 .6	14 21.5%
	1.00	6 5.8	5 4.7	0 .5	11 16.9%
	2.00	12 9.4	6 7.8	0 .8	18 27.7%
	3.00	3 4.7	6 3.9	0 .4	9 13.8%
	4.00	3 2.1	1 1.7	0 .2	4 6.2%
	6.00	0 4.7	8 3.9	1 .4	9 13.8%
Column Total		34 52.3%	28 43.1%	3 4.6%	65 100.0%

Chi-Square	Value	DF	Significance
-----	-----	----	-----
Pearson	21.97349	10	.01524
Likelihood Ratio	27.07835	10	.00253
Mantel-Haenszel test for linear association	6.93185	1	.00847

Minimum Expected Frequency - .185
Cells with Expected Frequency < 5 - 13 OF 18 (72.2%)

		INNOVATI		Page 1 of 1
LENCA	Count Exp Val			Row Total
		.00	1.00	
	.00	11 7.5	3 6.5	14 21.5%
	1.00	7 5.9	4 5.1	11 16.9%
	2.00	7 9.7	11 8.3	18 27.7%
	3.00	2 4.8	7 4.2	9 13.8%
	4.00	1 2.2	3 1.8	4 6.2%
	6.00	7 4.8	2 4.2	9 13.8%
Column Total		35 53.8%	30 46.2%	65 100.0%

Chi-Square	Value	DF	Significance
-----	-----	-----	-----
Pearson	12.52354	5	.02828
Likelihood Ratio	13.13025	5	.02219
Mantel-Haenszel test for linear association	.35026	1	.55396

Minimum Expected Frequency - 1.846
Cells with Expected Frequency < 5 - 6 OF 12 (50.0%)

LENCA by ISRMGT

		ISRMGT		Page 1 of 1
LENCA	Count Exp Val			Row Total
		.00	1.00	
	.00	14 10.1	0 3.9	14 21.5%
	1.00	6 8.0	5 3.0	11 16.9%
	2.00	14 13.0	4 5.0	18 27.7%
	3.00	3 6.5	6 2.5	9 13.8%
	4.00	3 2.9	1 1.1	4 6.2%
	6.00	7 6.5	2 2.5	9 13.8%
Column Total		47 72.3%	18 27.7%	65 100.0%

Chi-Square	Value	DF	Significance
Pearson	14.34026	5	.01359
Likelihood Ratio	16.98481	5	.00453
Mantel-Haenszel test for linear association	1.07086	1	.30075

Minimum Expected Frequency - 1.108
Cells with Expected Frequency < 5 - 7 OF 12 (58.3%)

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LENCA by PIONEER

		PIONEER				Page 1 of 1
LENCA	Count Exp Val Tot Pct	2.00	3.00	4.00	5.00	Row Total
	.00	4 6.2 6.2%	7 4.4 10.8%	1 .9 1.5%	3 3.5 4.6%	15 23.1%
	1.00	3 4.6 4.6%	3 3.2 4.6%	1 .7 1.5%	4 2.5 6.2%	11 16.9%
	2.00	7 7.5 10.8%	6 5.3 9.2%	1 1.1 1.5%	4 4.2 6.2%	18 27.7%
	3.00	8 3.7 12.3%	0 2.6 .0%	0 .6 .0%	1 2.1 1.5%	9 13.8%
	4.00	1 1.2 1.5%	0 .9 .0%	0 .2 .0%	2 .7 3.1%	3 4.6%
	6.00	4 3.7 6.2%	3 2.6 4.6%	1 .6 1.5%	1 2.1 1.5%	9 13.8%
	Column Total	27 41.5%	19 29.2%	4 6.2%	15 23.1%	65 100.0%

Chi-Square	Value	DF	Significance
Pearson	17.29494	15	.04154
Likelihood Ratio	19.49263	15	.19227
Mantel-Haenszel test for linear association	.88206	1	.34764

Minimum Expected Frequency - .185
Cells with Expected Frequency < 5 - 21 OF 24 (87.5%)

		TRSECRET		Page 1 of 1
LENCA	Count Exp Val			Row Total
		.00	1.00	
	.00	8 11.2	6 2.8	14 21.5%
	1.00	11 8.8	0 2.2	11 16.9%
	2.00	17 14.4	1 3.6	18 27.7%
	3.00	6 7.2	3 1.8	9 13.8%
	4.00	2 3.2	2 .8	4 6.2%
	6.00	8 7.2	1 1.8	9 13.8%
Column Total		52 80.0%	13 20.0%	65 100.0%

Chi-Square	Value	DF	Significance
Pearson	13.36310	5	.02020
Likelihood Ratio	14.92535	5	.01069
Mantel-Haenszel test for linear association	.38141	1	.53685

Minimum Expected Frequency - .800
Cells with Expected Frequency < 5 - 7 OF 12 (58.3%)

LENCA by UNIQUE

LENCA	Count Exp Val Tot Pct	UNIQUE			Row Total
		.00	1.00	2.00	
	.00	12 9.9 18.5%	2 4.8 3.1%	1 .2 1.5%	15 23.1%
	1.00	9 7.3 13.8%	2 3.6 3.1%	0 .2 .0%	11 16.9%
	2.00	8 11.9 12.3%	10 5.8 15.4%	0 .3 .0%	18 27.7%
	3.00	4 6.0 6.2%	5 2.9 7.7%	0 .1 .0%	9 13.8%
	4.00	3 2.0 4.6%	0 1.0 .0%	0 .0 .0%	3 4.6%
	6.00	7 6.0 10.8%	2 2.9 3.1%	0 .1 .0%	9 13.8%
Column Total		43 66.2%	21 32.3%	1 1.5%	65 100.0%

Chi-Square	Value	DF	Significance
-----	-----	-----	-----
Pearson	14.92316	10	.03489
Likelihood Ratio	15.44433	10	.11668
Mantel-Haenszel test for linear association	.00469	1	.94538

Minimum Expected Frequency - .046
Cells with Expected Frequency < 5 - 12 OF 18 (66.7%)

EFFORT by MGRTYPE

Page 1 of 1

	Count Exp Val Tot Pct	MGRTYPE		Row Total
		1.00	2.00	
EFFORT	1.00	15 13.0 26.8%	11 13.0 19.6%	26 46.4%
	2.00	8 9.0 14.3%	10 9.0 17.9%	18 32.1%
	3.00	5 3.0 8.9%	1 3.0 1.8%	6 10.7%
	4.00	0 3.0 .0%	6 3.0 10.7%	6 10.7%
Column Total		28 50.0%	28 50.0%	56 100.0%

Chi-Square	Value	DF	Significance
Pearson	9.50427	3	.02329
Likelihood Ratio	12.06932	3	.00715
Mantel-Haenszel test for linear association	2.57813	1	.10835

Minimum Expected Frequency - 3.000
Cells with Expected Frequency < 5 - 4 OF 8 (50.0%)

FORMPLNG by MGRTYPE

		MGRTYPE		Page 1 of 1
FORMPLNG	Count Exp Val Tot Pct			Row Total
		1.00	2.00	
	.00	13 11.5 23.2%	10 11.5 17.9%	23 41.1%
	1.00	15 11.5 26.8%	8 11.5 14.3%	23 41.1%
	2.00	0 5.0 .0%	10 5.0 17.9%	10 17.9%
Column Total		28 50.0%	28 50.0%	56 100.0%

Chi-Square	Value	DF	Significance
Pearson	12.52174	2	.00191
Likelihood Ratio	16.41997	2	.00027
Mantel-Haenszel test for linear association	5.53603	1	.01863
Minimum Expected Frequency - 5.000			

IDK by MGRTYPE

	Count Exp Val Tot Pct	MGRTYPE		Row Total
		1.00	2.00	
IDK	.00	27 24.0 48.2%	21 24.0 37.5%	48 85.7%
	1.00	1 4.0 1.8%	7 4.0 12.5%	8 14.3%
Column Total		28 50.0%	28 50.0%	56 100.0%

Chi-Square	Value	DF	Significance
Pearson	5.25000	1	.02195
Continuity Correction	3.64583	1	.05621
Likelihood Ratio	5.81400	1	.01590
Mantel-Haenszel test for linear association	5.15625	1	.02316
Fisher's Exact Test:			
One-Tail			.02553
Two-Tail			.05105

Minimum Expected Frequency - 4.000
Cells with Expected Frequency < 5 - 2 OF 4 (50.0%)

IMANUF by MGRTYPE

Page 1 of 1

	Count Exp Val Tot Pct	MGRTYPE		Row Total
		1.00	2.00	
IMANUF	.00	24 26.0 42.9%	28 26.0 50.0%	52 92.9%
	1.00	4 2.0 7.1%	0 2.0 .0%	4 7.1%
Column Total		28 50.0%	28 50.0%	56 100.0%

Chi-Square	Value	DF	Significance
Pearson	4.30769	1	.03794
Continuity Correction	2.42308	1	.11956
Likelihood Ratio	5.85317	1	.01555
Mantel-Haenszel test for linear association	4.23077	1	.03970
Fisher's Exact Test:			
One-Tail			.05575
Two-Tail			.11149

Minimum Expected Frequency - 2.000
Cells with Expected Frequency < 5 - 2 OF 4 (50.0%)

MGRTYPE by LENDEV

Page 1 of 1

MGRTYPE	Count Exp Val Tot Pct	LENDEV				Row Total
		.00	1.00	2.00	3.00	
1.00	11 7.2 25.6%	10 11.1 23.3%	5 7.8 11.6%	2 2.0 4.7%	28 65.1%	
2.00	0 3.8 .0%	7 5.9 16.3%	7 4.2 16.3%	1 1.0 2.3%	15 34.9%	
Column Total	11 25.6%	17 39.5%	12 27.9%	3 7.0%	43 100.0%	

Chi-Square	Value	DF	Significance
Pearson	9.09735	3	.02802
Likelihood Ratio	12.46372	3	.00595
Mantel-Haenszel test for linear association	5.46181	1	.01944
Minimum Expected Frequency -	1.047		
Cells with Expected Frequency < 5 -	4 OF	8 (50.0%)	

MGRTYPE by LENRIVAL

Page 1 of 1

MGRTYPE	Count Exp Val Tot Pct	LENRIVAL				Row Total
		.00	1.00	2.00	3.00	
1.00	11 7.2 25.6%	5 7.2 11.6%	9 9.1 20.9%	3 4.6 7.0%	28 65.1%	
2.00	0 3.8 .0%	6 3.8 14.0%	5 4.9 11.6%	4 2.4 9.3%	15 34.9%	
Column Total	11 25.6%	11 25.6%	14 32.6%	7 16.3%	43 100.0%	

Chi-Square	Value	DF	Significance
Pearson	9.29606	3	.02560
Likelihood Ratio	12.65015	3	.00546
Mantel-Haenszel test for linear association	4.64402	1	.03116

Minimum Expected Frequency - 2.442
Cells with Expected Frequency < 5 - 5 OF 8 (62.5%)

MGRTYPE by OBSERVED

Page 1 of 1

MGRTYPE	Count Exp Val Tot Pct	OBSERVED				Row Total
		1.00	2.00	3.00	4.00	
1.00	11	12	2	3	28	
	13.0 19.6%	10.5 21.4%	3.0 3.6%	1.5 5.4%	50.0%	
2.00	15	9	4	0	28	
	13.0 26.8%	10.5 16.1%	3.0 7.1%	1.5 .0%	50.0%	
Column Total	26 46.4%	21 37.5%	6 10.7%	3 5.4%	56 100.0%	

Chi-Square	Value	DF	Significance
Pearson	4.71062	3	.04263
Likelihood Ratio	5.88636	3	.11727
Mantel-Haenszel test for linear association	1.55203	1	.21284

Minimum Expected Frequency - 1.500
Cells with Expected Frequency < 5 - 4 OF 8 (50.0%)

PLNGMETH by MGRTYPE

Page 1 of 1

PLNGMETH	Count Exp Val Tot Pct	MGRTYPE		Row Total
		1.00	2.00	
	.00	12 8.0 21.4%	4 8.0 7.1%	16 28.6%
	1.00	16 12.0 28.6%	8 12.0 14.3%	24 42.9%
	2.00	0 8.0 .0%	16 8.0 28.6%	16 28.6%
Column Total		28 50.0%	28 50.0%	56 100.0%

Chi-Square	Value	DF	Significance
Pearson	22.66667	2	.00001
Likelihood Ratio	29.08508	2	.00000
Mantel-Haenszel test for linear association	17.67857	1	.00003
Minimum Expected Frequency -	8.000		

SPECPROB by MGRTYPE

Page 1 of 1

	Count Exp Val Tot Pct	MGRTYPE		Row Total
		1.00	2.00	
SPECPROB	.00	12 9.0 21.4%	6 9.0 10.7%	18 32.1%
	1.00	16 13.5 28.6%	11 13.5 19.6%	27 48.2%
	2.00	0 5.5 .0%	11 5.5 19.6%	11 19.6%
Column Total		28 50.0%	28 50.0%	56 100.0%

Chi-Square	Value	DF	Significance
Pearson	13.92593	2	.00095
Likelihood Ratio	18.21932	2	.00011
Mantel-Haenszel test for linear association	10.09206	1	.00149
Minimum Expected Frequency -	5.500		

RELIABILITY ANALYSIS - SCALE (ALPHA)

Item-total Statistics

	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item- Total Correlation	Squared Multiple Correlation	Alpha if Item Deleted
ATTQSTAF	40.1765	110.3922	-.0873	.	.7855
BATTQUAL	39.6471	100.8414	.4678	.	.7700
BCONTP	39.3235	106.4073	.1909	.	.7808
BIMPCS	39.4118	109.9465	-.0343	.	.7864
BIMPEXTC	39.9412	108.0570	.1523	.	.7816
BIMPINTC	39.7353	104.9884	.3608	.	.7759
BIMPLOY	39.5294	98.0143	.6086	.	.7636
BINCECOS	39.9412	106.1176	.2717	.	.7784
BINCMS	39.3529	100.5989	.4657	.	.7699
BINCS	39.4412	99.4661	.6048	.	.7654
BMAINTMS	39.7059	104.2139	.2824	.	.7776
BMONCST	39.5588	107.1631	.2819	.	.7790
BREDASSO	39.8235	104.4528	.3668	.	.7753
BREDC	39.5000	104.5000	.4784	.	.7738
BREDCSUP	39.8529	104.8565	.4577	.	.7745
BREDDIST	39.8824	102.8342	.5901	.	.7703
BREDSMKT	39.8529	104.8565	.3367	.	.7763
BREDTRAN	40.0294	109.1809	.0371	.	.7843
CHSUPPL	39.9706	108.3324	.0649	.	.7849
CSTAQUIR	37.3824	103.3948	.1860	.	.7846
ECONSCAL	40.0588	109.5722	.0095	.	.7844
EFFORT	38.5588	112.0722	-.1544	.	.7960
FINANCE	39.6176	107.2130	.2542	.	.7794
FIRSTMOV	39.9706	109.6052	.0021	.	.7848
FORMPLNG	39.6176	104.1221	.3832	.	.7747
FREEAVAI	39.9118	104.3859	.5120	.	.7733
GOVLEGIS	40.2647	108.8066	.2003	.	.7814
ICONS	39.8824	107.2585	.2251	.	.7799
ICUSTS	40.1471	109.5232	.0233	.	.7838
IDK	40.2647	111.0490	-.2472	.	.7862
IEU	40.0000	109.7576	-.0122	.	.7850
IISDEPT	40.1176	111.0766	-.1599	.	.7873
IMANUF	40.2059	108.4715	.1884	.	.7812
IMEDIA	40.2647	107.7157	.4214	.	.7790
IMIDMGT	40.2647	108.2611	.3106	.	.7802
INFOOUTS	40.0882	114.0829	-.4791	.	.7935
INNOVATI	39.7647	108.6096	.0950	.	.7828
IOFFCH	40.2353	112.3066	-.4142	.	.7890
IRIVALS	40.2059	108.8957	.1259	.	.7821
ISMKTG	39.9118	106.6283	.2892	.	.7785
ISRMGT	39.9412	103.9964	.5588	.	.7724
LENCA	38.0000	104.0000	.0939	.	.7965