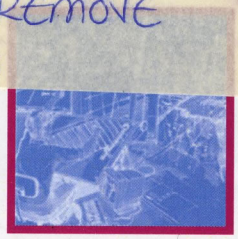

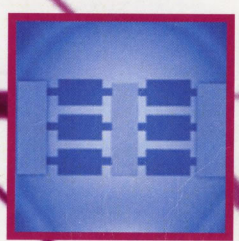

Development of an Integrated Business Improvement System for Construction

Simon Beatham

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Development of an Integrated Business Improvement System for Construction

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DEVELOPMENT OF AN INTEGRATED BUSINESS IMPROVEMENT SYSTEM FOR CONSTRUCTION

By
Simon Beatham

A dissertation thesis submitted in partial fulfilment of the requirements for the award of the degree of Doctor of Engineering (EngD), at Loughborough University

October, 2003

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On the academic side, my two supervisors, Tony Thorpe and Chimay Anumba have been the stabilising force within the team. The changes that occurred to the primary case study unit during the project, meant that there was significant uncertainty. Their commitment, guidance and advice throughout the project have been invaluable. It was their belief in my ability to complete the work, which enabled me to overcome some very difficult periods during the project.

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I would also like to thank my wife, Helen, whose constant support and understanding over the last four years has kept me going and enabled me to get to this point.

ABSTRACT

The construction industry has inherent problems due to its structure and fragmentation. Its poor performance has been challenged by its client base and it has been forced to seek ways to deliver improved performance. This project was initiated as a response to this challenge and represents one organisation's attempt to deliver improvements. This organisation provides both design and construction solutions, offering 'total life of asset support' from business consultancy through to decommissioning, in a neutral contractual environment. Initial investigations of the integration of design and construction and of the use of the EFQM Excellence Model concluded that a holistic view of the organisation's performance was needed. Most organisations use traditional, easily quantifiable measures, such as time and cost, whilst neglecting the softer cultural issues, as a way of assessing overall business performance. This prompted further research into the use of performance measurement and also a review of the culture that existed within the organisation. It became clear that many performance initiatives failed because of the lack of 'Change Action driven by Results (CAR)'. The failure to initiate change or implement action based on the results achieved, means that performance measures are not being integrated into the management systems of the organisations. Based on the conclusions of this work, this project has developed and implemented the Integrated Business Improvement System (IBIS) within the primary case study unit and also two other organisations, all of which are part of AMEC Plc. The project details the barriers that were experienced during the development and implementation of the system and concludes that it is the human component that is critical for the successful implementation and use of any improvement system. The findings of this work have been presented in five peer- reviewed papers.

KEYWORDS

Continuous Improvement, Performance Measurement Systems, Culture, Integration, KPIs, EFQM Excellence Model.

USED ACRONYMS / ABBREVIATIONS

AFI	-	Area for Improvement
AGL	-	AMEC Group Limited
AIs	-	Additional Indicators
BQF	-	British Quality Foundation
BQA	-	British Quality Award
BUSS	-	Business Unit Summary Sheet
CAR	-	Change Action driven by Results
CBP(P)	-	Construction Best Practice (Programme)
CIC	-	Construction Industry Council
CICE	-	Centre for Innovative Construction Engineering
CIRIA	-	Construction Industry Research and Information Association
CO	-	Change Order
CSF	-	Critical Success Factors
DQI	-	Design Quality Indicator
EngD	-	Doctor of Engineering
EFQM	-	European Foundation of Quality Management
EQA	-	European Quality Award
HoD	-	Head of Department
IBIS	-	Integrated Business Improvement System
IMS	-	Integrated Management System
KBPs	-	Key Business Processes
KPI	-	Key Performance Indicator
KPO	-	Key Performance Outcome
M4i	-	Movement for Innovation
MCG	-	Major Contractors Group
OC	-	Organisation Climate
OD	-	Operations Director
OSS	-	Operations Summary Sheet
PFI	-	Private Finance Initiative
PMS	-	Performance Measurement System
PP	-	Process Protocol
PPI	-	People Performance Indicator
PPP	-	Public Private Partnership
RADAR	-	Results, Approach, Deployment, Assessment and Review
RFP	-	Respect for People
SoS	-	Satisfaction of Service
VM	-	Value Management

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1 CHAPTER 1 – INTRODUCTION

The Engineering Doctorate programme is described as a "radical alternative to the traditional PhD, being better suited to the needs of industry, and providing a more vocationally-orientated doctorate in engineering" (CICE 1999). It has been distinguished from a PhD in that whereas a PhD is seen as a contribution to knowledge, "for the award of the degree of Doctor of Engineering, candidates must demonstrate innovation in the application of knowledge to the engineering business environment"(CICE 2003). The structure of this project reflects these views.

1.1 BACKGROUND TO THE RESEARCH

The construction industry is project based, with each project being unique. It has inherent problems, with its structure and its fragmentation, which has inhibited its performance (Banwell 1964, Latham 1994, Egan 1998). It largely depends on collaborative working between a number of professional teams brought together in an *ad hoc* manner for the translation of its client's requirements into physical facilities (Anumba *et al.* 2000). Within the industry there is often distrust between the clients, architects, structural engineers, contractors, subcontractors, suppliers, and facility operators leading to conflicts of interest and to relationships that are predominantly short term (Luiten *et al.* 1998). The fragmentation of the industry occurs within, and between the different stages in the construction process (Kamara *et al.* 1996) and, as such, an adversarial environment prevails with the fundamental ethos of collaboration not fully evident. This has created numerous problems for the construction industry with the result that the industry is highly inefficient compared to other sectors (Anumba and Evbuomwan 1995). Competitive pressures from within the industry as well as external political, economic and other considerations are now forcing the industry to re-examine and improve its *modus operandi* (Anumba *et al.* 2000). The government, as the largest client of the industry, has led the drive to change. Its Construction Task Force, challenged the industry to commit itself to change, to achieve radical improvements in the design, quality, sustainability and customer satisfaction of UK construction. Their report, commonly referred to as the 'Egan Report', set clear targets for improvements.

> *"The industry must replace competitive tendering with long term relationships based on clear measurement performance in quality and efficiency..(by) producing its own structured, objective performance measures agreed with clients.…Construction companies must prepare comparative performance data and share it with clients and each other without compromising legitimate needs for confidentiality" (Egan 1998)*

Following the issue of 'The Egan Report', the Construction Task Force set up the Construction Best Practice Programme (CBPP) and the Movement for Innovation (M4i). These organisations helped to clearly define the requirements needed to deliver the improvements targeted. The requirements were specified in the M4i '5-4-7' diagram (see Figure 1.1). Both organisations were charged with delivering improvements within the industry by addressing the issues raised in the report.

The CBPP led the drive to introduce performance measurement, introducing its 10 Headline Key Performance Indicators (KPIs) in 1998. The CBPP KPIs were successful in promoting the use of performance measurement within the industry, but their KPIs were criticised for being too financially biased and for being lagging/post-event measures which did not offer the opportunity to change (see Paper 3). The M4i set up several working parties and cluster groups and also invited projects to be submitted as demonstration projects. These were projects where the principles of improved performance through collaboration and integration as set out in the Egan Report were piloted. There are more than 400 projects in the programme, with a total value of over £7bn. The performances of these projects were benchmarked against the industry averages for the CBPP 10 Headline KPIs. The demonstration projects substantially outperform the average of the UK industry against the key indicators (DTI 2003b).

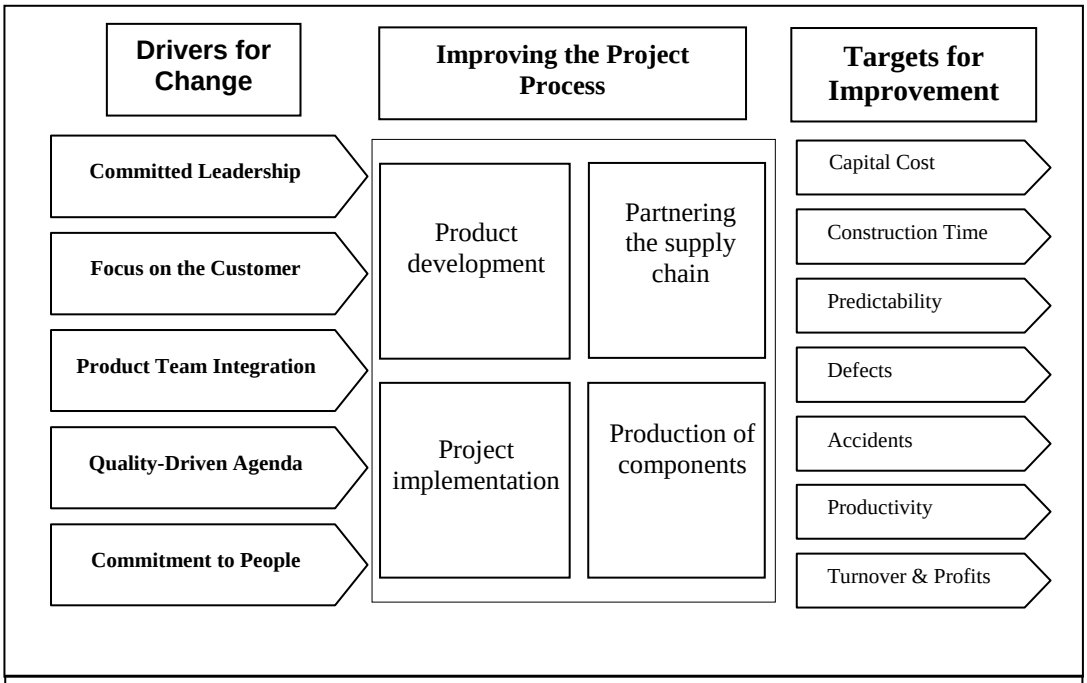

Figure 1.1 – M4i '5-4-7' Diagram

Performance measurement is now firmly on the construction industry management agenda, but it is not limited to construction. The changing nature of work; increasing competition; specific improvement initiatives; national and international quality awards; changing organisational roles; changing external demands; and the power of information technology have driven companies from all sectors to search for ways of monitoring and improving performance (Neely 1999). Traditionally, businesses have measured their performance in financial terms, such as profit and turnover. These financial measures of performance have been the sole measures of a company's success. Companies have used these financial measures both as internal benchmarks and also as competitive benchmarks (e.g. Share Price). Over recent years there has been an increasing recognition that a more holistic approach to performance measurement is required. The development of excellence awards, such as the European Foundation of Quality Management (EFQM) Excellence Award and the Baldridge Award coupled with the use of the models such as the EFQM Excellence Model and the Balanced Scorecard are representative of this shift in management styles (see Paper 3).

"If senior managers place too much emphasis on managing by the financial numbers, the organisation's long term viability becomes threatened" (Kaplan and Norton 1996)

As a response to the pressures detailed above the sponsoring organisation engaged in the Engineering Doctorate project to establish a mechanism to deliver continuous business improvement. This project forms part of the chairman of the organisation's drive towards differentiating its position within the industry, as it endeavours to move away from being perceived as a low margin construction contractor to position itself as a high-value professional services provider.

1.2 INDUSTRIAL SPONSOR

AMEC Group Limited (AGL) is the European division of AMEC plc. It has a turnover of circa £5 billion and employs over 40,000 people. Its main operations are engineering, design and construction. It adopts a matrix management approach with seven autonomous business units spanned by several functions. The primary case study unit for this research project is one of these business units (see Figure 1.2).

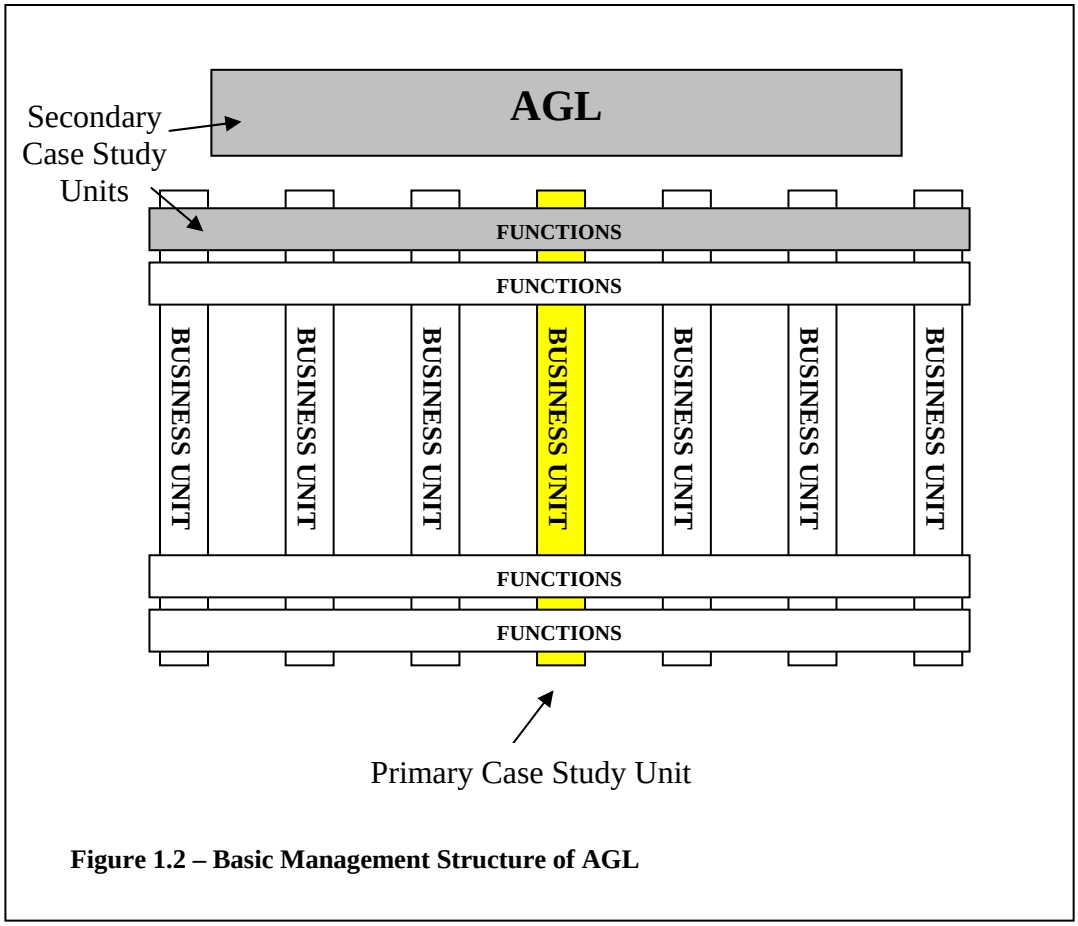

Figure 1.2 – Basic Management Structure of AGL

The unit is a large multi-national design, engineering and construction company, employing about 800 people. It believes in 'total life of asset support', offering services across the construction process, from business consultancy through to decommissioning. This is represented by its project process (see Figure 1.3). The

primary case study unit's structure, encompassing design and construction, represents its belief that having cross-functional integrated teams reduces the barriers between different groups and provides a differentiated service for its customers. The primary case study business unit has successfully utilised the EFQM Excellence Model over the past five years to help deliver business improvements. The increasing use of the model by businesses from all sectors, reflects the current shift in management philosophy, encompassing a more holistic view of a company, with an increased understanding of the importance of softer issues such as people and culture.

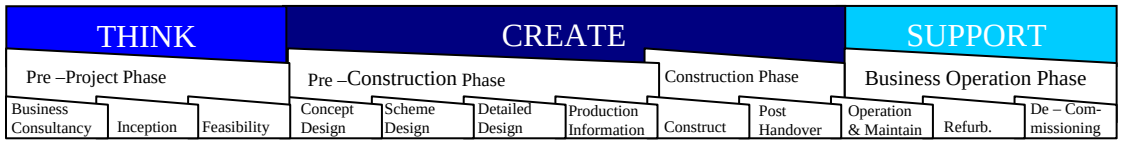

Figure 1.3: – AMEC's 'Total Life of Asset' Project Process

The management team of the primary case study unit believed that through the adoption of a primarily action research methodology, this project would deliver continuous improvements for the unit, in order to enhance its differentiated position. The methodology adopted is discussed in Chapter 3.

It should be noted that during the EngD project, the primary case study unit was restructured twice. The first restructuring occurred in December 1999 and involved separating the management and reporting structures of the design and construction functions. In December 2001, a second restructuring took place, with the design and construction functions being re-integrated and a new single leadership team being appointed. The sponsoring director of the project left the company following the second restructuring. These events had a significant impact on this study, causing the scope of some of the tasks to change, but not the focus of the overall project. The effects of these changes are discussed in Section 5.2.

1.3 STRUCTURE OF THE THESIS

Chapter 1 introduces the rationale behind the project, introduces the case study units and details the drivers for the project, both within the organisation and within the industry. Chapter 2 identifies the overall aim of the project and details the objectives and work tasks undertaken to achieve the overall aim. Chapter 3 briefly explores the different types of methodologies available and describes the portfolio of methodologies used in the project, and explains the reasons for their choice. Chapter 4 contains an explanation of the research undertaken and places it in context. Finally, Chapter 5 concludes by summarising the key findings of the research, details the impact of the research on the sponsor and across the industry, makes recommendations for the industry and for further work, and critically evaluates the overall project.

2 CHAPTER 2 - OVERALL AIM AND OBJECTIVES

The overall aim of the project was defined as follows:

> ***"To develop an integrated business improvement system within the primary case study unit".***

Five objectives were identified in order to achieve the overall aim. For each objective, specific work tasks were carried out using various methodologies. The project was initiated with the above aim, the first objective and *Tasks 1, 2 and 3* identified. As the research methodology was determined and as findings from the initial investigation phase defined the problem, further objectives and work tasks were identified. The evolution of the research methodology is discussed in Chapter 3.

Objective 1 Identify key issues required to deliver business improvements.

The first objective covered the initial investigation phase (see Table 3.3). It involved preliminary information gathering and defining the problem. Three tasks were identified in order to achieve the objective. The first task, involved using the EFQM Excellence Model as a tool for delivering improvement. The tool has had increasing use since its inception in the late 1980's. This task enabled an understanding of a wide range of tools and techniques involved in the improvement process as well as a thorough understanding of the Excellence Model. The second task was intended to provide a detailed understanding of the issues relating to the integration of design and construction. The primary case study unit's structure meant that this understanding was essential to enable the successful implementation of any system across its disciplines and functions. *Task* 3 was the first of the group wide initiatives that were included to provide additional understanding of how disparate functions and organisations come together and overcome barriers that prevent effective and efficient team working. The three tasks were:

Task 1	***Deliver specified business improvements identified during the EFQM Assessment***
Task 2	***Understand issues relating to the integration of design and construction***
Task 3	***Develop an integrated management framework within the parent company***

Objective 2 Review state of the art performance measurement and management

It was clear from the first investigation that performance measurement was a key issue related to improved performance. Two of the tasks associated with this objective involved information gathering to enable understanding of the issues relating to performance measurement. The other task involved working as one of a number of members on a steering committee on a separate industry wide initiative. The aim of this working party was to deliver a KPI Toolkit for the measurement of design. Involvement in the task provided the opportunity to interview leading measurement practitioners

from across the industry as well as research the implementation issues of the new toolkit with the primary case study unit. The tasks were:

Task 4	***Develop design KPIs as part of the CIRIA Working Party***
Task 5	***Review current use of performance measurement within the construction industry***
Task 6	***Understand the key facets of performance measurement***

Objective 3 Develop an integrated business improvement system (IBIS)

The findings from tasks associated with Objective 2 identified that measurement needed to be incorporated into a system as part of the management processes of the business and that the process of design of the system was critical to its overall success. *Task* 7 ensured that the systems design was based on the conclusion identified from the research. Before the design was completed its validity was tested (see Section 4.2). *Task* 9 emerged as the next step to the integrated management framework (*Task* 3) and provided further understanding of the issues of team/integrated working.

Task 7	***Understand the key issues relating to the development of a performance management system***
Task 8	***Complete and test the design of the IBIS***
Task 9	***Develop an Integrated Management System (IMS) within the parent company***

Objective 4 Implement the integrated business improvement system within the primary case study unit

Having developed and tested the system, it required implementing within the primary case study unit. Associated with this task, a review of the effectiveness of the system was also undertaken. Certain barriers to the implementation of the system within the primary case study unit were experienced. In order to implement and validate the system alternative case study units were sought. These are discussed under *Task* 11.

Task 10	***Implement the IBIS within the primary case study unit***
Task 11	***Develop an IBIS within the parent company***
Task 12	***Review the effectiveness of the system***

Objective 5 Deliver business improvements within the primary case study unit.

Once the system had been tested and implemented that business improvements we needed to be delivered within the business. This objective was established as a driver to ensure that actions based on performance results were undertaken.

Task 13	***Facilitate the improvement process***

3 CHAPTER 3 – ADOPTED METHODOLOGY

3.1 INTRODUCTION

This chapter explains the research design and methodology used and compares the different research types and approaches. When undertaking research it is important to choose the correct methodology, to ensure that the research objectives can be met and that the findings can be validated (Steele 2000). The Oxford Compact English Dictionary (1996), defines research as 'the systematic investigation and study of materials, sources etc., in order to establish facts and reach new conclusions'. The methodology describes the methods by which research can be carried out and lies at the heart of any investigation (Fellows and Liu 2003). Yin (1994) highlights the 5 strategies/methods of research; experiment, survey, archival analysis, history and case study. Steele (2000) extends this and includes action research and process modelling. Determining the most appropriate method depends on the type of research question (who?, what?, why?, where?, how much? and how many?), the degree of control that the researcher can exercise over the variables involved and whether the focus of the research is on past or current events (Yin 1994) (see Table 3.1).

Table 3.1- Research Methods (Adapted from Steele, 2000)

Methods	Form of Research Question	Requires Control over Behavioural Events	Focuses on Contemporary Events
Action research	Who, what, why, how many, how much?	Yes/No	Yes
Case Study	How, why?	No	Yes
Survey	Who, what, why, where, how many, how much?	No	Yes
Archival Analysis	Who, what, why, where, how many, how much?	No	Yes/No
Modelling	Who, what, how many, how much?	No	Yes/No
History	How, why?	No	No
Experiment	How, why?	Yes	Yes

3.2 OVERALL RESEARCH METHODOLOGY

Due to the business context changes during the EngD project it was necessary to have a portfolio of research methods that could be used as and when appropriate based on the contextual requirements at the time. This flexibility was a significant factor when the primary case study unit decided to engage in the project. The primary case study unit had identified the overall aim of the project, a need to deliver a systematic approach to improved business performance. It recognised the need to investigate to gain a greater understanding of their business, in particular how the different cultures of design and construction worked together, and how they could improve their differentiated position within the industry sector. The overall methodology was to split the research into three phases: investigation, synthesis, and application (adapted from Morse, (1994)). Each phase was subdivided into separate stages (see Table 3.2). Investigation occurs whilst the research gathers data from various sources to provide an in depth understanding of the subject matter of the research. Analysis of this data will identify shortcomings in the research subject and further aspects to be researched. Once the investigation is complete, further objectives and work tasks can be identified during the synthesis phase. This is when further data collection and analysis is undertaken (secondary information gathering). During this phase, secondary problem definition occurs leading to proposal, system design and system validation. Once the system has been validated, then the third phase, application, occurs. This includes validation and observation of the use of the system.

Table 3.2 – Research Phases and Stages

PHASE	STAGE
Investigation	Preliminary Information Gathering
	Problem Definition
Synthesis	Secondary Information Gathering
	Secondary Problem Definition
	Solution System Proposal
	Solution System Design
	Solution System Validation
Application	Solution Implementation
	Solution Validation
	Observation

3.3 RESEARCH METHODS

Table 3.3 presents the overall research methodology and demonstrates where various research methods identified below were used during the different stages of the research. It should be noted that several of the work tasks occurred concurrently. The table identifies the objectives and work tasks against the phases and stages of the research methodology.

Table 3.3 – Research Map

OVERALL AIM :	DELIVER AN INTEGRATED BUSINESS IMPROVEMENT SYSTEM WITHIN THE PRIMARY CASE STUDY UNIT				
OBJECTIVES	**WORK TASKS**	**METHODOLOGY** PHASE	STAGE	METHOD	**OUTPUT**
1. Identify key issues required to deliver business improvements	1. Deliver specified business improvements identified during EFQM Assessment	----INVESTIGATION----	Preliminary information gathering	AR S	PAPER 1
	2. Understand issues relating to the integration of design and construction		Preliminary information gathering Problem definition	AR S AA	PAPER 2 PAPER 3
	3. Develop an integrated management framework within the parent company		Preliminary information gathering	AR S	Internal
2. Review state of the art of performance measurement and management	4. Develop Design KPIs as part of CIRIA Working Party	----------SYNTHESIS----------	Secondary Information gathering	AR S	PAPER 4 MSc Dis.
	5. Review current use of performance measurement within the construction industry		Secondary Information gathering	AA S O	
	6. Understand the key facets of performance measurement		Secondary information gathering Secondary problem definition	AA O S	
3. Develop an integrated business improvement system (IBIS)	7. Understand the key issues relating to the development of a performance measurement system		Secondary information gathering Solution system proposal	AA O S	PAPER 5
	8. Complete and test the design of the IBIS		Solution system design Solution system validation	AR O S	PAPER 5
	9. Develop an integrated management system (IMS) within the parent company		Observation	AR S	Internal
4. Implement the Integrated Business Improvement System (IBIS)	10. Implement the IBIS within the primary case study unit	----------APPLICATION----------	Solution implementation Solution validation	AR O S	PAPER 5
	11. Develop an IBIS within the parent company		Solution implementation Solution validation	AR O S	Thesis
	12. Review the effectiveness of the system		Solution validation	O S	PAPER 5 Thesis
5. Deliver business improvements within the primary case study unit	13. Facilitate the improvement process		Observation	O M	Thesis

NOTE : Shaded tasks represent tasks associated with wider Group initiatives

Key

AR	–	Action research	MSc Dis	-	MSc Dissertation
AA	–	Archival analysis	Internal	-	Internal reports and systems within case study and parent company
O	–	Observation			
S	–	Survey	Paper #	-	Published
M	-	Modelling	Thesis	-	EngD Thesis

It also identifies which of the portfolio of research methods were used as appropriate and what the outputs were. There are four main outputs from the research. These are published papers, (see Table 3.4), internal reports within the case study units, part of the MSc dissertation (completed at the end of the second year) and within this thesis.

Table 3.4 – Status and Description of Papers

Paper #	Title	Status	Description
1	The EFQM Excellence Model: A Driver for Continuos Improvement	Accepted for publication in International Journal of Advanced Manufacturing Systems	Review of alternative uses of EFQM Excellence Model to deliver business improvements
2	The Integration of Design and Construction – A Review	Proceedings 10th ISPE International Conference on Concurrent Engineering Invited to submit paper for inclusion in normal edition of Itcon Journal	Review of the facets of the integration of design and construction
3	The Cultural Web – An Industrial Case Study	Proceedings 2nd International Conference on Innovation in Architecture, Engineering and Construction	Cultural survey of the two main offices of the primary case study unit
4	KPIs – A critical appraisal of their use in construction	Accepted for publication in Benchmarking: International Journal	Review of KPIs in construction. Concludes on the need for different types of measures and the need to initiate change
5	An Integrated Business Improvement System for Construction	Submitted to Journal - Measuring Business Excellence	Details the development and implementation of the IBIS within the primary case study unit

3.4 QUANTITATIVE AND QUALITATIVE RESEARCH

For all types of research, the methods of collecting data will impact upon the analysis which may then be executed, and therefore the conclusions, and validity of the study (Fellows and Liu 2003). This data can be classified as either quantitative or qualitative.

Quantitative data can be gathered using a variety of techniques such as questionnaires, measurements etc. It may be considered 'hard' and is often analysed using analytical or descriptive statistics. Quantitative approaches compare factual data with theory, how many and how much? (Walker 1997). Data of this type can be characterised by its existence before identification by the study.

Qualitative data tends to be gathered using techniques such as interviews, observation etc. It may be considered 'soft' and is typically analysed using methods such as content analysis (to structure unstructured information). Qualitative approaches seek to find out individual beliefs by asking how and why? Data of this type is generated by the study as

a consequence of its implementation. Modern construction research benefits from the merits of both approaches (Seymour and Rooke 1995, Wing *et al.* 1998).

The research methods below are dependent on the use of data, some involve both quantitative and qualitative approaches.

3.4.1 CASE STUDY

Definitions on what constitutes a case study vary. Blismas (2001), concluded that it is an empirical (Yin 1994), in-depth, multifaceted inquiry (Orum *et al.* 1991), which seeks to holistically explain and understand the dynamics (Eisenhardt 1989, Stoecker 1991) of a single contemporary social phenomenon (Orum *et al.* 1991, Yin 1994). The Business unit that engaged in the project acts as the primary unit of analysis for the case study investigation. They are chosen on the basis that they are representative of a sample group and can be used to demonstrate particular facets of the topic of research. Case studies may combine a variety of data collection methods and research strategies (Fellows and Liu 2003). The research methods identified below were used within the case study units. It should be noted that four of the tasks involved activities outside the primary case study unit (see Table 3.3). *Tasks 3,9 & 11* involved action research in internal AGL initiatives, whereas *Task 4* involved research as a member of a steering group on an industry wide initiative.

3.4.2 ACTION RESEARCH

Action Research "aims to contribute, both to the practical concerns of people in an immediate problematic situation and to the goals of social science by joint collaboration within a mutually acceptable ethical framework" (Rappoport 1970). Gill and Johnson (2002) describe action research as a planned intervention into a naturally occurring event. Knowledge is used to effect the change which then creates knowledge about the process of change and the consequences of change (Lewin 1946). The effects of the intervention are then monitored and evaluated with the aim of discerning whether or not that action has produced the expected consequences. The researcher 'acts' upon his or her beliefs or theories. As action research is designed to suggest and test solutions to particular problems, it falls within the applied research category (Fellows and Liu 2003). Fellows and Liu (2003) cite Liu (1997) in concluding that as action research is highly context dependent and reliant on the project and the knowledge and subjectivity/perceptions of persons involved, it is neither standardised nor permanent. The observer is involved and has the main role of creating a field for discussion and interpretation of the process and products. As change/innovation is the subject of the research, co-ordination and evaluation mechanisms are necessary which involve both the researcher and the participants. Fellows and Liu (2003) cite Henry (2000) who concludes that due to the nature of action research, three primary requirements exist:

(1). "A trust-based relationship…..built up beforehand….accepted by all parties.
(2). The researcher will have fully accepted the firm's or institution's objectives for innovation or change by having negotiated the extent to which they will be involved and their freedom as regards access to information and interpretation.

(3). A research and innovation project will be jointly drawn up which must be open-ended with regard to the problems to be explored, but very precise in terms of methodology."

This project satisfied all three requirements. The researcher had been employed by the primary case study unit for seven years prior to the project and was involved in defining the scope of the project and defining the methodology to be used.

3.4.3 OBSERVATION

Case studies encourage in-depth investigation by observation of particular instances. The observation role of the observer may vary. Ackroyd and Hughes (1992) describe four roles of observation from participant to complete observer (see Table 3.5).

The majority of the observations in this project falls under participant as observer. All employees within the case study units were aware of the researcher's role. This will have influenced the behaviour of the participants as described in the Hawthorne Investigations of Elton Mayo (1933). The extent of this was not investigated.

Table 3.5 -Participant Observation Roles (Ackroyd and Hughes 1992)

	ROLE	DESCRIPTION
1	Complete participant	The role in which the observer becomes a fully fledged member of the group under study, any research purpose being concealed.
2	Participant as observer	Both researcher and subjects are aware of the facts that theirs is a fieldwork relationship
3	Observer as participant	Involvement with the subjects is deliberately, or for a number of practical reasons, kept to a minimum
4	Complete observer	Requires investigators to insulate themselves from any social contact whatsoever with the subjects

The author has been a senior assessor of the EFQM Excellence Award for the duration of the project. This involves leading a team of six assessors who assess the Award applicant using their submission document and a site visit. The role of senior assessor of the EFQM Excellence Model involved the role as 'Observer as participant', with interaction with the subjects restricted to a minimum. Four organisations were assessed over the duration of the project. They agreed only for observations to be included in the research as input data and not to be directly reported.

3.4.4 SURVEY

Surveys are used to provide a representative sample of the subject. They vary from highly structured questionnaires to unstructured interviews. Over the course of the EngD project several different surveying methodologies were employed. These are detailed below.

3.4.4.1 Questionnaire

Steele (2000) cites Brenner *et al*, (1985) who suggest that the design of a questionnaire involves a process with several general stages: i) understanding the areas to be explored; ii) the question wording and sequencing; and iii) the physical design and layout.

Questionnaires were used for two of the work tasks. A questionnaire was used as part of the survey strategy used in *Task 2* to assess the culture of the primary case study unit (see Paper 3). A questionnaire was also developed for the review of the CIRIA KPIs toolkit as part of *Task 4* (see Section 4.2).

3.4.4.2 Interviews

An interview is described as any form of interaction in which two or more people are brought together into direct contact for at least one party to learn something from the other. Cognisance must be taken of the strengths and weaknesses associated with using interviews as a means of data collection. Strengths include the opportunity to explore the meaning of the question, immediate clarification of misunderstandings and the immediateness of the response. Weaknesses include possible errors in interpretation, an opportunity for bias and that the success is strongly influenced by the skills of the interviewer (adapted from Brenner *et al*, 1985*).*

3.4.4.2.1 Semi-Structured Interviews

Semi-structured interviews are used as an open surveying method. One to one interviews are carried out with topic areas for review previously identified by the interviewer. During the interviews, using probing questions, matters as they arise are developed further often resulting in new rich sources of data. Semi-structured interviews were carried out with employees from the primary case study unit. They occurred with all participants in the pilot schemes and regularly with the Head of Business Improvement, the Director of Design, the Direct of Design Management, the Director of Construction and the Operations Director.

3.4.4.2.2 Focus Groups

Focus groups are a form of qualitative research, which are fundamentally a group interview, with reliance put upon interaction within a group centred around topics predetermined by the researcher, who typically acts as a moderator or facilitator throughout (Morgan 1988). Several focus groups were used at various stages throughout the project. The author was a member of several steering committees on many of the work tasks. Following the formal aspects of these committee meetings, the remaining time was used as ‘mini focus groups’, where the research was discussed as it stood at the time, or from questions proposed by the author (Pavitt 2002).

3.4.5 ARCHIVAL ANALYSIS

A literature survey was chosen to initiate the research investigation as it is the most efficient means of initial information gathering (Steele 2000). The search of industrial

and academic literature was used to identify gaps in existing knowledge and therefore act to focus and direct the research to addressing these gaps.

3.4.6 MODELLING

Process modelling was used in the later stages of the project. It was used by the improvement projects teams involved in *Task 13* to map business processes (see Table 3.4). These were used to benchmark and challenge the existing processes and enable analysis of the implications of the changes once introduced.

3.5 VALIDITY AND RELIABILITY

There are four commonly accepted tests used to establish the quality of the research. Voyatzaki (1996) describes them as:

- **Construct Validity**: research becomes increasingly valid when multiple sources of evidence are used to substantiate any findings. Ensuring that respondents are key informants (integral players in the process) can increase construct validity (Yin 1984).

- **Internal Validity**, which is the degree to which an observed and measured effect is due to an identified causal rather than spurious relationship. Data verification in qualitative approaches, which are fundamentally individual's interpretations of events and therefore cannot be differentiated in terms of levels of correctness, can be reached by attempting to discover similarities across accounts.

- **External Validity,** which is the degree to which its findings can be generalised outside the study.

- **Reliability**, where minimising errors and biases will help to achieve reliability of findings. Gathering rich documentation to support any findings can avoid errors (Yin 1994).

The project addressed all of the above tests, using a variety of approaches within the overall portfolio of methods. The validity and reliability of the research is recorded in the five papers and is commented on in Chapter 4. Two specific validation stages were also included in the methodology. The 'solution system validation' stage included the pilot study where five managers tested the proposed system (see Section 4.3). The 'solution validation' stage involved reviewing the implementation and use of the system, using primarily interview methods (see Section 4.4 & 4.5).

3.6 SUMMARY

When the management of the primary case study unit engaged in the EngD project, they had the basic aim of delivering improved performance. They had an understanding of the research process and of the flexibility of action research as a method to help deliver their broad aim. The issues were not understood and the scope of the project was not clearly defined. The methodology identified above provided a structure and focus of the

research, yet maintained the flexibility they required to meet the changing business needs. Due to the concurrent nature of some of the tasks, new sources of data could be collected, analysed and included in the research programme.

4 CHAPTER 4 - THE RESEARCH UNDERTAKEN

The work tasks are detailed in such a way as to demonstrate their alignment to achieving the objectives. It should be noted that these events were not undertaken sequentially.

4.1 OBJECTIVE 1 – IDENTIFY KEY ISSUES REQUIRED TO DELIVER BUSINESS IMPROVEMENTS

Three work tasks were identified to achieve this objective. As part of the preliminary information gathering, action research was undertaken to manage the project teams, complete and implement the findings of 8 improvement projects that had already commenced following an internal assessment using the EFQM Excellence Model. The 8 projects had been rationalised from 180 areas for improvement developed during the assessment process. All 8 projects were completed within the first year of the EngD project with the outputs from each being used as input data into *Task 2* within the programme (see Table 3.4). Various techniques were used to capture and analyse data within these projects: these included questionnaires/surveys/focus groups and literature reviews. Following completion of the initial 8 projects, further initiatives and development programmes, using action research, were undertaken. Details of how these were undertaken are presented in Paper 1.

One of the 8 improvement projects from the EFQM assessment, concentrated on the integration of design and construction. Several workshops were carried out with participants from the different functions within the construction process. The outputs from these workshops were analysed and detailed recommendations on structure, training and working practices made and implemented within the primary case study unit. Coupled with this information, a detailed archival analysis was undertaken. Paper 2 documents the results of this research and comments on the inherent problems associated within the construction industry and the need for improved service through better integration of the disparate functions. Paper 2 concluded that much work was needed to understand the softer cultural issues relating to the integration of design and construction. As a result of this conclusion a further study was initiated, to map the cultures of the primary case study unit. Paper 3 presents the findings of this study. This work was carried out across the two main office locations and used two techniques to capture the culture within the unit. The culture was mapped onto ‘the cultural web’ (Johnson and Scholes 1999) using peer group workshops in an open-ended environment and the completion of a questionnaire enabled further comparisons to made (see Paper 3). The culture of the construction industry has long been recognised as a problem, although little work has been carried out in this area. The results of this study therefore form an initial benchmark against which subsequent studies could be compared. They were analysed and presented to the senior management team of the primary case study unit. A prioritised action list of issues was agreed to be addressed by the project teams. The research results were carried forward and included in the population of the IBIS (see *Task 10*).

The nature of the EngD programme and its flexibility to be adapted to meet current business needs meant that involvement occurred in several AGL-wide initiatives. Whilst trying to understand and develop the level of integration within the primary case study unit, an AGL-wide initiative was set up to get the disparate business units to work, where appropriate, in the same way. It was agreed that issues that occurred during this initiative may be useful in this overall EngD project. Using action research, the author was one of three members of a steering committee charged with developing a framework, which enabled similar activities to be catalogued together. This would then allow comparison and informed rationalisation of activities to be undertaken. It was the vision of the UK Operations Director, that there should be only one way of working and that should be 'The AMEC Way'. This project ran for two years, and directly involved facilitating workshops with members of all of the business units within AGL. From these workshops, a framework structure was developed from an initial concept design and further workshops were used to test and populate the framework. This work was outside the main context of the EngD project, however the observations of issues about how employees from different parts of AGL, worked together and accepted a common method of working, were utilised in the deciding on a methodology for developing the process for the system design of the IBIS.

4.2 OBJECTIVE 2 –REVIEW STATE OF THE ART OF PERFORMANCE MEASUREMENT

Following the completion of the investigation phase, it was clear that there was a need to improve performance and need to establish a mechanism to demonstrate this improvement of business performance. As a result, three tasks were identified to address the issue of performance measurement. *Task 4* involved being part of the steering committee of the CIRIA working party charged with developing a tool to measure design performance. The primary case study unit, was one of eleven initial parties involved in addressing several issues raised in a start up meeting in 1998. The measurement of design was the second issue to be addressed. CIRIA commissioned a desk-top study by the Science Policy Research Unit (SPRU) at the University of Sussex, to identify the key issues associated with performance measurement of design (CIRIA 2001). From the findings of this study, using the steering committee, CIRIA undertook to develop a tool for measuring design activities. Through facilitated workshops and investigation within their own companies, the steering committee agreed the areas to be measured and the tool for doing so. The author had been a representative on the steering group, along with Director of Design, since the start of the EngD project. The work involved completing five pilot studies using the draft tool on completed design commissions. The results were presented to the steering committee and adjustments made to the tool. The KPI Assessment Tool for Performance Measurements in Design Organisations was launched in December 2000. Following the launch of tool, a benchmarking study was set up. 15 companies were involved in this study. This involved assessing five further design commissions within the primary case study unit. As part of the EngD project a survey on the use of the tool within the primary case study unit, was undertaken. This used a questionnaire to assess the qualitative perceptions of the sample group and an open-ended interview with the Head of Design Management. The results were presented in the MSc Dissertation.

Tasks 5 & 6 are concerned with the use of performance measurement. *Task 5* concentrated on the use within construction, whilst *Task 6* looked at use within other industries. They involved a detailed literature review, including a web-based search and review of academic and industrial literature. Several conferences were attended on the subject of performance measurement, and semi-structured open-ended interviews carried out with practitioners of performance measurement within the industry. Through work as an assessor for the EFQM Excellence Model, open-ended interviews were also carried out with practitioners from four other service and manufacturing industries. Whilst the findings of these interviews can not be directly included due to the confidentiality agreements, it was agreed that the understanding gained could be used to inform the solution proposals. The results of this work are presented in Paper 4.

4.3 OBJECTIVE 3 –DEVELOP AN INTEGRATED BUSINESS IMPROVEMENT SYSTEM (IBIS)

One of the key findings from Objective 2 was the need to include performance measurement within a system. This system must include two cycles; in the first cycle the results are recorded and presented; in the second cycle, actions are taken based on results. This is known as 'Change Action driven by Results (CAR)'. This second cycle is critical to performance measurement systems and differentiates performance measurement and performance measurement systems (see Paper 4). Following this conclusion further work was undertaken to understand the key issues of performance measurement systems. A literature review, involvement in national benchmarking clubs, including the Major Contractors Group (MCG) and the CBBP as well as action research within the primary case study unit were completed. The results of this work are presented in Paper 5. Once a thorough understanding of performance measurement systems was established, the development of the system design was undertaken. It was apparent from the literature study that the process of system design was as important as using the system once established (Kaplan and Norton 2000). Following the literature review, three main stages were used in the development of a system. These were: Performance Measures System Design; Implementation of Performance Measures; and Use of Performance Measures (see Paper 5). Initially the concept design of the system was completed. Due to criticisms of the use of performance measurement within construction, it was established that a more holistic view of performance measurement was required. Through the experience in the use of the EFQM Excellence Model it was decided that the model would provide a suitable framework to introduce leading issues as well as other critical none financial areas. This idea was developed through action research in conjunction with the then Director of Design within the primary case study unit. Initially a mechanism for business level measures was established. It was agreed that the system should follow convention within the industry and have three levels; business (headline), operational and diagnostic (DETR 2000). Following the departure from the primary case study unit of the Director of Design, the system design had to be 're-sold' to the newly appointed Operations Director. Having gained agreement to continue with the study, a new IBIS Steering Committee was appointed. This included the Operations Director, the Head of Construction and the Head of Business Improvement who was also a senior assessor of the Excellence Model. Through action research, a detailed programme was established to develop and test the design of the

system. The primary case study unit's Managing Director and Operations Director had developed a set of business objectives under the four criteria identified under the Balanced Scorecard (Kaplan and Norton 1996). These objectives had been used to assist in the establishment of the individual objectives for all members of the senior management team. From these objectives, it was proposed that Critical Success Factors (CFSs) be defined. The satisfaction of these CSF would demonstrate achievement of the objective. KPIs would be established against each of the CSF to measure the success in achieving the desired result (see Paper 5). In order to validate the proposed system solution, five senior managers from this team were identified to take part in a pilot study. Their individual objectives were combined with the business objectives to populate the top two levels of the system. For each of their objectives, Critical Success Factors (CSFs) and KPIs were suggested. They were required to review and agree these or propose alternatives. Summary sheets at each level capture the objective, CSF, KPI and also the target for the measure and the previous results (see Figure 4.1). The managers were required to complete a KPI data sheet for each measure. The KPI data sheets recorded the source of the data required for the measure, how it would be collected and analysed, how often it would be measured and who had responsibility for reporting the results. Through semi-structured open-ended interviews, the five managers

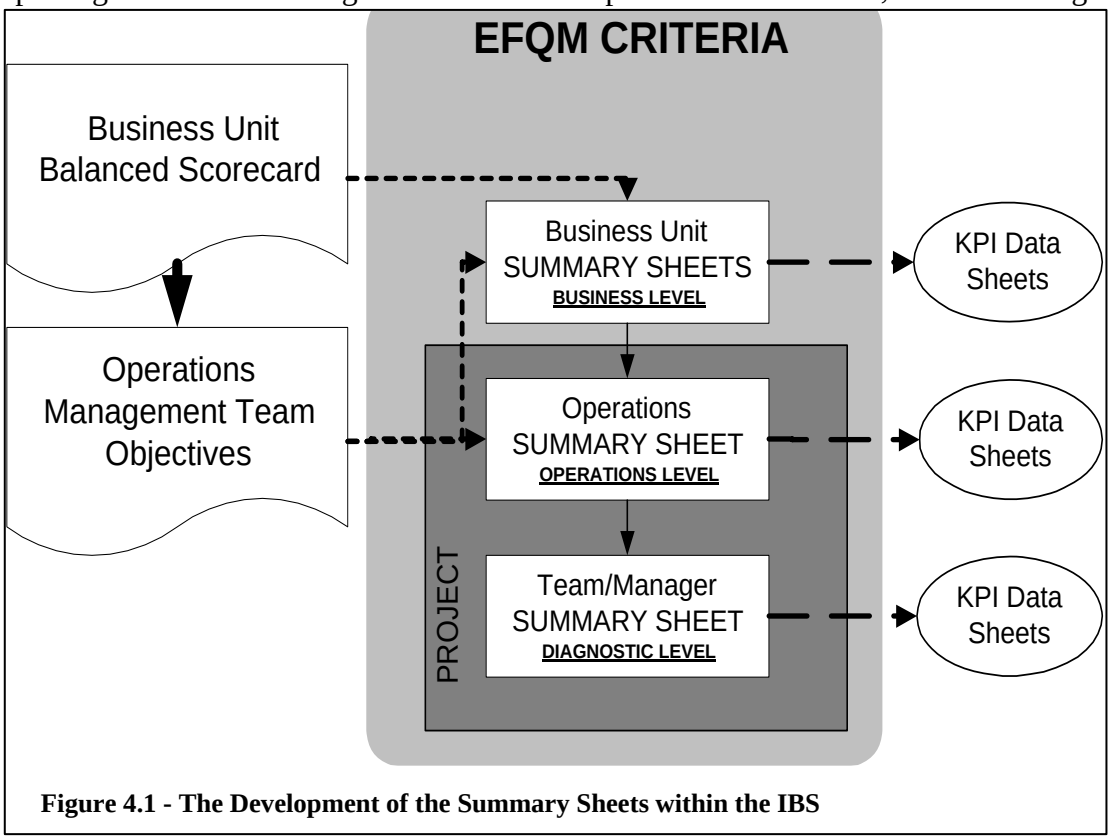

Figure 4.1 - The Development of the Summary Sheets within the IBS

gave qualitative feedback on the structure and usability of the system. These comments were reviewed by the steering committee and appropriate adjustments made to the system design. These changes were then reviewed by the managers involved in the pilot study and agreement on the final design reached.

Concurrently with this task, an Integrated Management System (IMS) was being developed. Following the completion of the development of the integrated management framework, the concepts of this work were transferred to the development of an IMS.

This was an extension of the framework and was intended to provide a single portal to all management systems within the company and ensure that the 'AMEC Way' was a 'consistent, recognisable way' across AGL. This work required the researcher to be involved on a steering committee of four members within specific responsibility for developing the system that allowed for comparison and rationalisation, where appropriate, of similar activities carried out differently by different business units within AGL. The steering committee discussed how a system could be implemented and utilised across AGL. The conclusions of these discussions were used as input data into the system design of the IBIS. The design of the IMS is complete and is being rolled out and populated by all business units within AGL.

4.4 OBJECTIVE 4 –IMPLEMENT THE INTEGRATED BUSINESS IMPROVEMENT SYSTEM (IBIS)

During *Task 7*, it became apparent that many barriers existed when implementing a performance measurement system. These are detailed in Paper 5. An implementation plan was developed to overcome these barriers. The implementation of the system involved action research. Following the system design the proposed implementation plan was presented to the Operations Director and Construction Director. The plan had four stages. From the research it was clear that engagement in the use of the system was critical to the system's success. The four stages identified were:

1. Understanding

This stage was designed to ensure that everyone that would be involved with the system would understand its origins, what it is trying to achieve, how it is structured and how it would be operated. It was proposed that this be done at a workshop with the senior management team.

2. Empowerment

This stage would involve providing the opportunity for all the senior management team, to be responsible for the development of the business objectives, the CSFs and the KPIs for each objective. This was also proposed to be completed during a facilitated workshop.

3. Engagement

Having established agreement of Objectives and CSF and KPIs, the senior management team would agree individual ownership of each objective. The owner would be responsible for the completion of the KPI data sheets, setting the targets and establishing the reporting method and frequency. This stage would be facilitated by the action researcher.

4. Application

The results to the measures would be reviewed periodically and used to make management decisions. In this respect they become an integral part of the core

performance management of the business and are used to initiate changes to improve performance.

However the above proposal was not appropriate for the current business position and alternatives were discussed with the IBIS Steering Committee. This steering committee was used as a mechanism to validate the appropriateness of the system.

Objectives had already been set for the senior management team. These objectives were to be used within the IBIS. These were inputted into the IBIS and several gaps against the criteria of the EFQM Excellence Model were discovered. Proposals to address these gaps were completed by the author and the Head of Business Improvement. These were presented as a proposal at the IBIS Steering committee and accepted. It was decided that the IBIS would be presented to the senior management team with objectives and CSFs included. However, due to external influences, this presentation did not take place. The steering committee then agreed that due to external factors and business demands a rationalisation of the contents of the IBIS was necessary. It was agreed that the prioritised objectives be presented to the senior management team. This presentation was also cancelled. An alternative to the above plan was subsequently proposed to the steering committee. This is detailed in Paper 5. This alternative was used to establish a mechanism to implement the IBIS, although is scope has been significantly reduced.

Concurrently with the work being undertaken within the primary case study unit, AGL and one of the main functions (secondary case study units) engaged in the use of the IBIS. Through action research the IBIS has been accepted by and is being rolled out by the largest function and is now being rolled out by AGL. Both entities have utilised the proposed plan detailed above. For the parent company the benefits to be gained from achieving each objective had to be identified under four categories. These were Cost (£), Value (£), Sustainability and Behaviour. Other developments of the systems are discussed in Chapter 5.

Validation of the effectiveness of the system was undertaken throughout the process of the system design and implementation. Synthesis of continually reviewing and updating the design has occurred through action research and semi-structured interviews within the case study units. Once the use of system has been established for a period of time then further analysis of this will be required.

4.5 OBJECTIVE 5 –DELIVER BUSINESS IMPROVEMENTS WITHIN THE PRIMARY CASE STUDY UNIT

This task is ongoing within the primary case study unit. Due to the limited engagement in the use of the IBIS, three separate improvement projects have been initiated. All three projects involve action research, with the author being an active member of the project teams and assisting in the development and delivery of the programmes and identifying the deliverables.

The first involves cultural issues based against the 14 areas for improvement identified in the cultural benchmark study (see Paper 3). The project team have identified the required objective and have identified some CSFs to achieving this. Some of these are sequential, single events, which the project team believes will help achieve the target.

For example, training of employees in coaching techniques is believed to influence their behaviour. It is expected that this change in behaviour will manifest itself into the culture of the business and help achieve the target of being a 'listening organisation'. These are causal actions and can be measured. Their results will be measured after an appropriate period against the benchmark taken with the first cultural survey.

The second project involves customer satisfaction and has been carried out in the same way as the first project.

The third project involves improving the 'bid process'. This has been identified as one of the key business processes. Clear targets were set within the IBIS. The owner of the process is currently mapping the process and with the aim of recording a benchmark against which improvements can be measured. Once this has been completed, the process will be reengineered and deployed. Improvements will then be measured against the benchmark and reported to the senior management.

4.6 SUMMARY

The tasks evolved as the project developed, but remained aligned to the achievement of the overall aim. Across the five objectives, a variety of the research methods have been utilised. This was dependent of the nature of the task and also the context and situation of the primary case study unit at that time. This demonstrated the need to have a portfolio of research methods available for use as and when required. The findings from each of the objectives have been used to define the next stages of project (see Chapter 5).

5 FINDINGS & IMPLICATIONS

5.1 THE KEY FINDINGS OF THE RESEARCH

5.1.1 OBJECTIVE 1 – IDENTIFY KEY ISSUES REQUIRED TO DELIVER BUSINESS IMPROVMENTS

The first task for this objective involved using the EFQM Excellence model as a tool to identify and deliver business improvements. The findings of this work can be seen in detail in Paper 1. It concludes that change was required by those who wanted to use the model to deliver business improvement. It must be driven top down and have clear leadership with authority from the senior management team. It must also be accepted as a core part of business development, critical to business and not just another initiative that has little effect on everyday business performance. The model can be used in a variety of ways; to assist in the definition and shaping of a new business unit; to enable partnering teams on new projects to set out their working practices; to develop process improvement aligned to business needs in mature organisations, and also as a process for the rationalisation of improvement activities within any organisation. There is a need for trained facilitation for those wanting to gain the full benefits from using the model and the value of engagement in the use of the model needs to be demonstrated to potential users. Ensuring that there are some 'quick wins' in the improvement projects was important to demonstrate the value. Paper 1 also identifies the need to develop further the key business processes and sub-processes in order to allow performance assessments to be undertaken during the process. This highlights areas for improvement during the process.

Whereas Paper 1 concludes work on the use of the EFQM Excellence Model, Paper 2 looked at the general issue of the integration of design and construction within the industry. It concludes that the inherent adversarial nature and fragmentation of the construction industry still exists within the construction industry. The sequential nature of the construction process means that integration is critical, yet the industry is structured in such a way that full integration cannot be achieved. There is a genuine desire within the industry to work together. A two-day workshop attended by senior directors from the construction business unit, a sister company of the primary case study unit and five of their leading design partners (all internationally renowned design companies) confirmed this desire. However, the fragmentation and adversarial culture is being ingrained within new students of the profession by the structure of the degree programmes at the higher education establishments and further promulgated by the their respective professional institutions and specialist functional organisations with whom they gain employment (Faulkner and Day 1986, Gale 1992, Moore and Dainty 1999). Hard process improvements are being researched and deployed within the industry and improvements are being made. However, little work is being carried out on the softer cultural issues affecting the industry, which are seen as critical to achieving improved integration. A cultural survey was undertaken as a result of these findings and is detailed in Paper 3. It concluded that an adversarial nature still exists within the industry. The competing cultures from different projects and disciplines all impact on

industry culture (Riley and Clare-Brown 2001). The actual culture of the primary case study unit was mapped against the desired culture. A gap analysis identified fourteen areas where there was a requirement for change. These areas were passed forward and included in the IBIS and the improvement project detailed in Section 5.1.5

The development of the 'integrated management framework' occurred concurrently with these two investigations. The functional barriers between the different disciplines within the primary case study unit and other business units within AGL were acknowledged by AGL's senior management team. The framework was deliberately developed to be cross-functional. This was seen as a way of breaking down the barriers. Significant resistance was received, particularly by functional leaders. This was to such an extent that the framework had to be redesigned under the work carried out for the Integrated Management System (see *Task 9*). The findings of this work, further re-iterated the fact that cultural barriers exist within the industry and need to be addressed in order for the industry to work in a more effective and efficient manner.

5.1.1.1 Summary

This section details the findings relating to issues of delivering business improvement. The key points from this work are:

- The EFQM is an effective holistic tool to deliver improvements within the construction industry.
- Cultural barriers exist that prevent fully effective and efficient integration.
- The structure of industry, academic programmes and professional institutions promulgate the divisions within the industry.
- Measurement is required to demonstrate the level of performance within the construction process and to also provide information to focus on areas for improvement.

5.1.2 OBJECTIVE 2 – REVIEW STATE OF THE ART OF PERFORMANCE MEASUREMENT

Following the completion of the tasks associated with Objective 1, there was a clear need to develop a mechanism to measure performance and use this information as a benchmark against which improvements could be gauged. The critical appraisal of the use of KPIs in construction (Paper 4) reviews the use of performance measurement within the industry. It discusses the three different types of performance measures, Key Performance Indicators (KPIs – indicative measures of associated performance), Key Performance Outcomes (KPOs – measures of completed events) and perception measures and demonstrates how these different types of measures apply to any overall business process. It uses the criteria of the EFQM Excellence Model to distinguish between enabling (leading) measures and result (lagging) measures (see Figure 5 - Paper 4). The industry uses the term KPI to cover all three types of measure. Most of the industry-recognised measures are KPOs, lagging measures that do not offer the opportunity to change until the process being measured is repeated. Paper 4 concludes

that the three levels of measures, presented by the Construction Best Practice (CBP, formerly the CBPP), are an effective structure for a measurement system derived from the objectives of a business (see Figure 6 – Paper 4). The paper also concludes that the majority of the measures used within the industry are financially or time biased and are used as a historic review. This is now recognised by many practitioners within the industry and new measures are now beginning to focus on non-financial areas, for example the Respect for People KPIs (DTI 2003a). For the measures to be used effectively they should be derived from, and thereby aligned to, the strategy and objectives of the business. The pan-industry KPIs are generic and businesses have been accused of not integrating their use into normal management practice. The CBP have addressed this problem with their new KPI Business Solutions which is a seven step facilitation process to 'set up a system to measure and analyse KPIs relevant to your business needs' (DTI 2003a). One benefit of having pan-industry KPIs is the ability to benchmark performance. Paper 4 reviews what level of benchmarking is available from the different sources of measures (see Table 2 – Paper 4). However, if the benchmarks are used by clients as a competitive gauge, then companies will be under pressure to achieve results. There is currently no validation of results submitted to the benchmarking sources, and therefore certainty of data cannot be guaranteed. The research also concluded that for measures to be used effectively and for them to add value they must be incorporated into a system in which two cycles occur. The first cycle is that of the 'implementation of measures'. This involves collecting and recording the results of the measures. However, these measures are valueless unless they are used in the second cycle, 'Change Action driven by Results' (CAR), (see Paper 4). 70 % of performance measurement programmes using the Balanced Scorecard fail. The failure to initiate change, to enter the second cycle, is a significant reason for this failure (Neely and Bourne 2000).

5.1.2.1 Summary

The key points relating to the use of performance measurement are:

- There are three types of measures that should be used to measure enabling as well as results criteria and these should be divided into three levels.
- Measures should be derived from and aligned to strategy.
- Measures must be part of a system that involves the cycle of 'change action driven by results'.
- If measures are to be used for external benchmarks their data should be validated.

5.1.3 OBJECTIVE 3 – DEVELOP AN INTEGRATED BUSINESS IMPROVEMENT SYSTEM (IBIS)

When developing a performance measurement system, it is held that the process for developing the system is as important as the system itself (Kaplan and Norton 2000). The system must provide a structure for a more holistic appraisal of a company's performance than traditional systems. It must offer the opportunity to change (Kagioglou *et al.* 2001), and the company engaged in the system must clearly

understand why they are using the system. Neely and Bourne (2000) suggest there are four main categories as to why organisations measure performance. These are: Checking position; Communicating position; Confirm priorities; and Compel progress. It is important to ensure that the system design can deliver the requirements of the company based on their reasons for engaging in its use. Several types of performance measurement models have been developed to provide the more holistic approach required and also to help organisations develop strategies and translate these into measures. Commitment from senior management in the system design is critical for success. Many authors agree that participation is also required to give the stakeholders (those involved), the opportunity to contribute to and gain an understanding of 'why' a particular set of objectives and performance measures have been chosen (Kaplan and Norton 2000); (Beatham *et al.* 2003); (Bourne *et al.* 2000). Through participation, ownership is transferred to those involved. Further commitment can be gained by linking the results achieved within the system to the reward system within the business. This decentralised control enables decisions to be made at an operational level (Lantelme and Formoso 1999). The act of deciding what to measure forces the management team to clarify their language and define precisely what their strategy encompasses (Neely and Bourne 2000).

The IBIS system design needed to be able to show how the measures were derived from the mission, vision, objectives and strategy of the business and how they were aligned across the business, operational and diagnostic levels (see Figure 5.1).

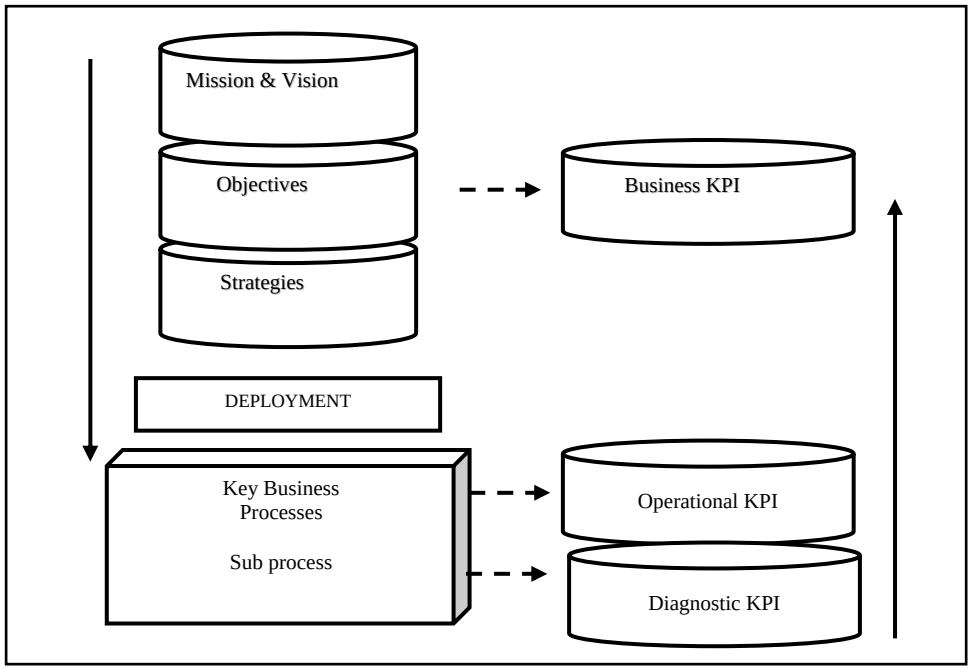

Figure 5.1 – Alignment of KPIs (Adapted from Beatham et al, 2002.)

The system also needed to provide a structure to more holistic appraisal of performance. Having used the EFQM Excellence Model within the business for the previous four years, it was decided that the nine criteria of the model, (five enabling and four results criteria) could be used to provide the required holistic structure (see Figure 5.2). The objectives of the primary case study unit were taken and inputted into the nine

criteria of the model, CSF were designed for each objective, and up to 3 KPIs produced for each CSF. Using the model demonstrated that there was a need to have a structured approach to challenge the range of objectives produced by the senior management team. When the objectives were inputted into the system, several gaps were identified. The author and the Head of Business Improvement suggested objectives, CSFs and measures for these gaps. These were all accepted by the steering committee. The three layers of the system were designed to enable the users at each level to clearly identify where their objectives have originated from and how they are aligned to the high-level business objectives. The populated concept design was reviewed by the steering committee before being piloted. Feedback from the pilot scheme was included and minor modifications made to the system design.

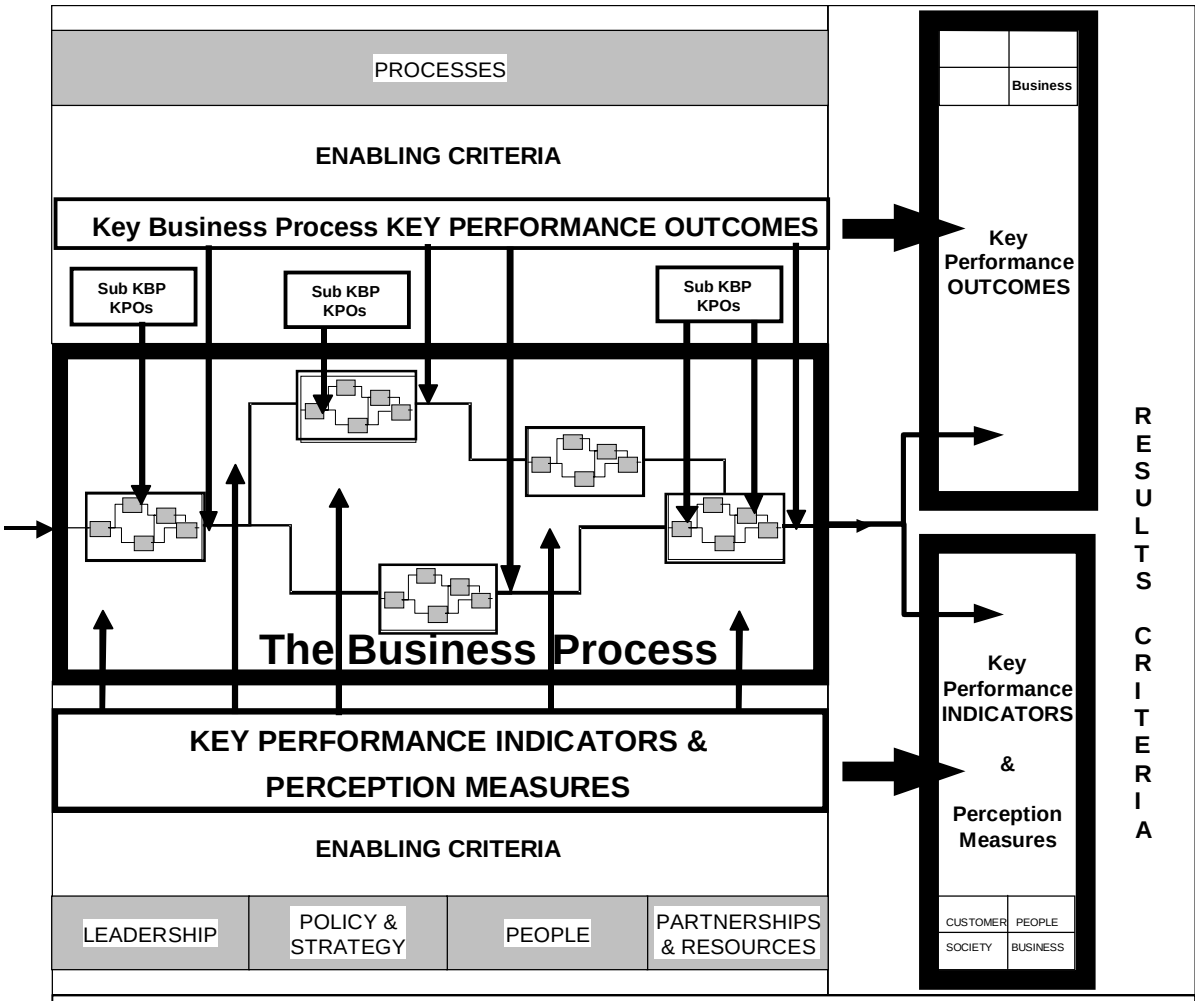

Figure 5.2- The Application of Different Types of Measures referenced to EFQM Excellence Model Criteria

The overall concept of the IBIS was understood by the sample group. Clear alignment could be identified from the individual objectives through to the business objectives. The system provided the holistic approach required and was thought to cover all key business areas. The logic within the system was easily understood and it was felt that it could be used as an effective management tool. The KPI data sheets were a useful tool to help clearly identify how the measure would be collated. Concern was expressed over

creating too many measures whose cost to produce, would outweigh their value. It was agreed that the system must deliver some benefits within a short period, in order to establish the benefits of the system.

Concurrently with this activity, the development of IMS was being completed. This was an extension to the work completed for the management framework (see *Task 3*). As discussed earlier, the functional barriers were very strong within AGL and forced the restructuring of the system, whereby the generic cross-functional framework was removed and a functionally split framework put in its place. This is reflective of the inherent culture that exists within the industry and reiterated the need to engender ownership through participation for any integrated system that spans functional boundaries.

5.1.3.1 Summary

The development of the system for the IBIS involved taking the key findings from the archival analysis and using this information to develop the system design. The key findings are:

- The process of system design is as important as the resulting system.
- The system must give a structured and holistic appraisal of performance.
- Engagement, through participation, in the system must be obtained from the participants.
- Commitment and leadership from senior management is critical for success.
- The system must be transparent to show alignment of objectives between the levels.
- Must demonstrate value of system early to retain commitment.

5.1.4 OBJECTIVE 4 – IMPLEMENT THE INTEGRATED BUSINESS IMPROVEMENT SYSTEM (IBIS)

There can be significant barriers to the implementation of any performance measurement system. Political barriers can become apparent if people start to feel threatened because their performance suddenly becomes measured. Managers can use the system as a mechanism to 'score points over other managers' (Neely and Bourne 2000) such that it can become part of the blame culture of an organisation. If people are not engaged in its use then they will either react and not participate or satisfy the measure above the business objective (Lantelme and Formoso 1999). An illustration of this is in call centres where operatives have been known to receive a call and replace the receiver immediately in order to achieve their performance targets. This is referred to as deviant activity. Resistance can also be experienced if the system is felt to be imposed by a third party 'expert'. The system could be seen as changing the rules of the game (Bourne *et al.* 2000) and people will therefore actively or passively resist the implementation (Zairi 1996). People can also be seen as 'calculative receptors'; if they feel that the changes are not in their best interest they will choose an alternative cause of

action that will maximise their own personal gain (Hrebiniak and Joyce 1984). Infrastructure barriers include problems with the format and accessibility of data for the measurement results. The more automated the collection of data, the more efficient the process. Focus barriers include the fact that managers may prefer to rely on their intuition rather than a structured set of tools and data and as stated above the value of the system needs to be demonstrated early to the users to re energise their enthusiasm in the system (Lantelme and Formoso 1999). These barriers are discussed in greater detail in Paper 5.

For the primary case study unit the IBIS was developed in isolation from the senior management team and the first workshop designed to get the managers to participate in IBIS was cancelled. During the steering committee meetings it was discussed that the system was being actively resisted by some of the managers within the senior management team. This initial plan was to give all members of the senior management team some responsibility to take ownership for delivery of certain objectives and CSF. However, as a result of the active resistance, an alternative five stage implementation plan was suggested (see Figure 5.3).

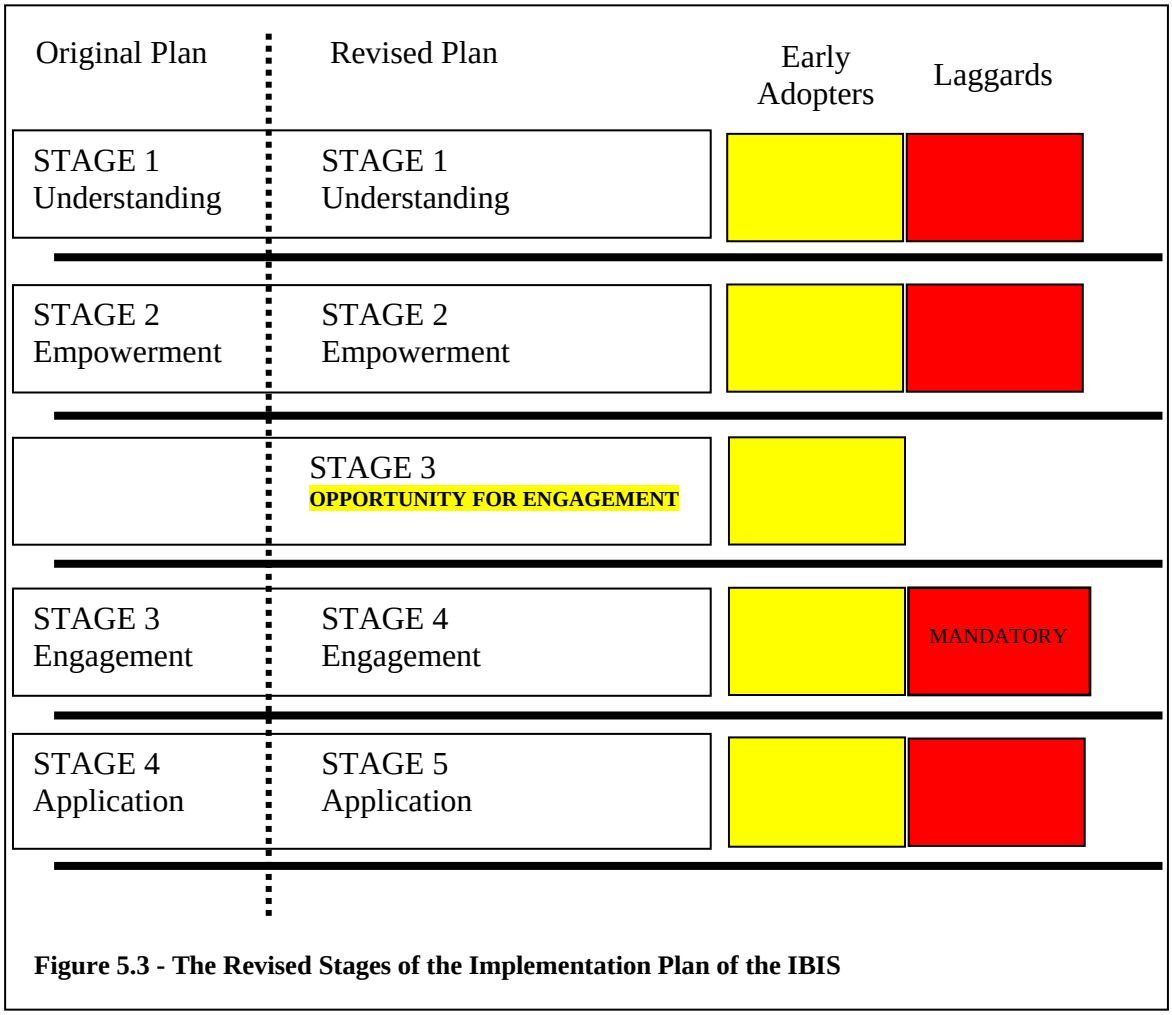

Figure 5.3 - The Revised Stages of the Implementation Plan of the IBIS

Here, the actively resistant laggards were removed from the new Stage 3 of the process and only those who wanted to take responsibility engaged in the development of the CSFs and measures. Then, once the system was being used as a core part of the management system of the business, it would become mandatory that the laggards engage in its use. This proposal was accepted by the management team, but again a managerial responsibility shift within the senior management team, coupled with increasing external pressures meant that this process was not implemented. Alternative case studies were sought for the IBIS.

Following completion of the system design within the primary case study unit, the design was rolled out across AGL and also one of the main functions. Feedback from the steering committee focus groups and semi-structured interviews with the participants from both of these case studies was in line with the feedback from the primary case study unit. The two main differences related to the use of the EFQM Excellence Model and demonstration of the benefits achieved. It was expressed that because some participants had a level of 'expertise' in the use of the model, whereas other participants had none, this gave them an advantage. Participants were able to block the use of the model as the main identified structure within the IBIS, although it was agreed that a gap analysis, against the criteria of the model, be carried out of the resulting populated system. The other main difference was the perceived need to demonstrate the benefits of the system. In both cases, the steering committees were tasked with adapting the system and presenting them to a higher management team. This was suggested as the main driver of the need to demonstrate these benefits. This was a driver to such an extent for the steering committee of AGL, that it was suggested the four benefit headings be used as the criteria against which all the objectives would be aligned. However after some exploration it was agreed that this was not practical and that the benefits should be ascertained separately. Since the completion of Papers 4 and 5, work has continued on both of these case studies. Figure 5.4 shows the current structure of the system across AGL and main function. Instead of the enabling and results criteria, 'cause and effect' criteria have been used. All effects measures are reviewed against the four benefit criteria of Cost, Value, Behaviour and Sustainability. It also demonstrates how overall assessment of performance in split into 50% for completing the causal activities or projects and 50% on the actual results achieved. For behaviour and sustainability AGL-wide benchmarks will be ascertained periodically.

5.1.4.1 Summary

The achievement of this objective required revisions to plans in order to overcome the barriers to successful implementation of the IBIS. The key findings are:

- Political, infrastructure and focus barriers must all be overcome if the system is to be successfully implemented.

- The EFQM Excellence Model was resisted by some of the participants. This was attributed to disparity in knowledge of the model between the managers.

- The need to demonstrate the benefits under four categories of the results was a significant driver where those involved in using the system had to present it to a more senior management team.

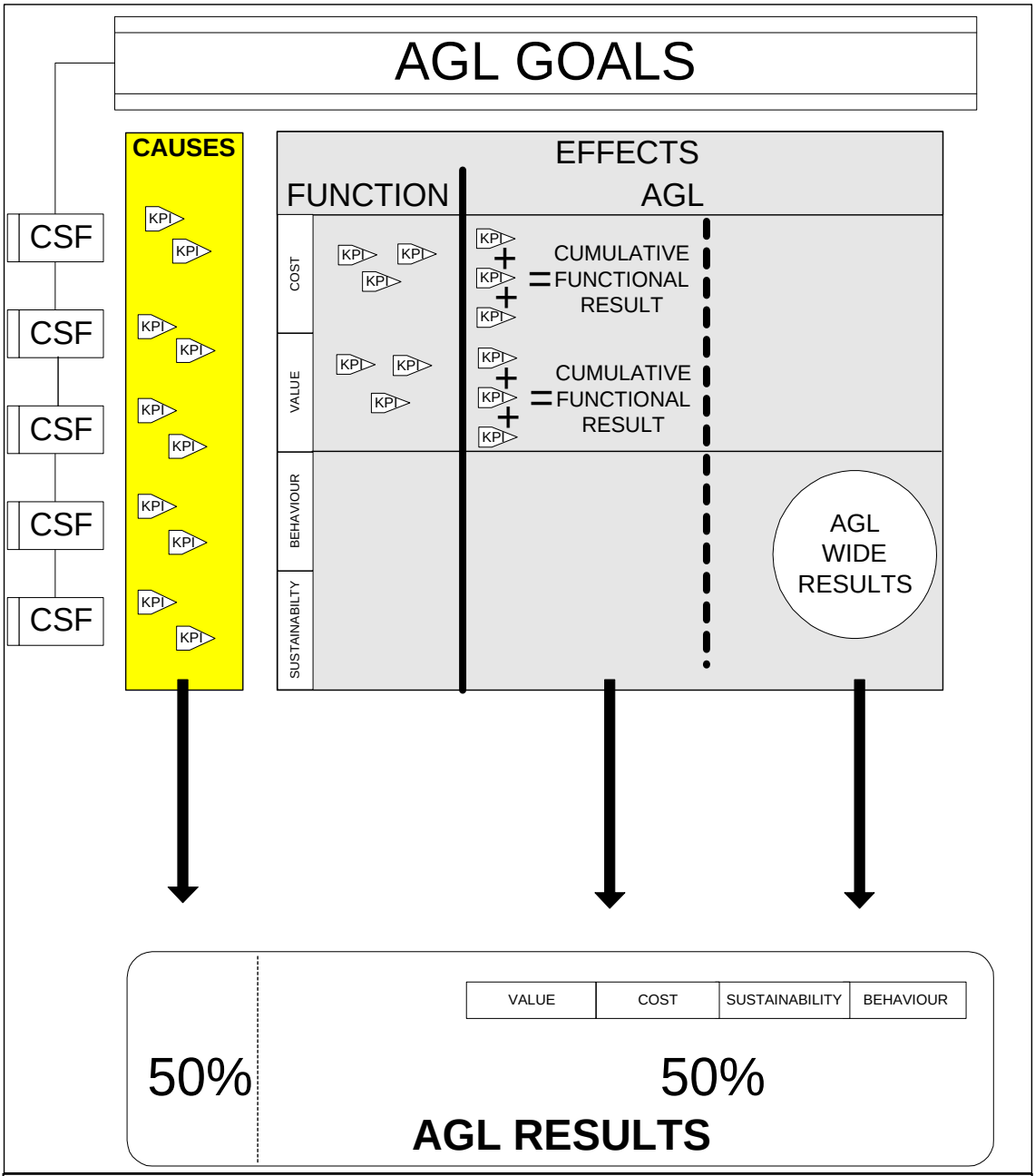

Figure 5.4 - The Structure of the IBIS for AGL (developed as part of presentation to senior management team)

5.1.5 OBJECTIVE 5 –DELIVER BUSINESS IMPROVEMENTS WITHIN THE PRIMARY CASE STUDY UNIT

The three case study units that have engaged in the use of the IBIS have all changed their business practices as a result. The discussion here focuses on the primary case study unit. The primary case study unit has used the objectives and initial results to scope the improvement activities of three separate project teams. This work is continuing within the primary case study unit, although the review programme has not yet been agreed. After having a period during which engagement in the IBIS was being blocked by some of members of the team, the senior management team, led by the Managing Director, are using the IBIS as the structure to develop and roll out their

business objectives to all staff. They have recognised the need for facilitation in this process and as a result have engaged the services of the Head of Business Improvement and the author. The IBIS has been chosen to establish aligned objectives, CSF and KPIs for all staff. Following the benchmark cultural survey (see Paper 3), the first annual review is currently being sent out to a representative sample group. The findings of this work will be used to quantify any improvements that have resulted from the work of the people and customer groups, the other two improvement projects within the primary case study unit.

AGL have established the review period and their five top level business objectives. These have been cascaded down to the business units and to the functions (including the main function used as a separate case study unit). The reporting mechanism has been developed and also issued. As a result of this, each function is developing their own aligned objectives, their causal actions/CSFs and measures of achievement. As is demonstrated in Figure 5.4, these improvements are enabling/causal actions and their results/effects may not yet have manifested themselves within the case study units. However, recognition of these is important in establishing the value of the system and demonstrating that these actions are seen as a business improvement.

5.2 THE IMPLICATIONS/IMPACT ON THE SPONSOR

As mentioned above, significant changes occurred within the primary case study unit over the period of the EngD project. The first change, in December 1999, of splitting the managerial functions for design and construction, did not affect the overall project. Access, participation and engagement were all maintained during this period. A second restructuring in December 2001 had a more significant impact on the project. At this stage, the sponsoring director left the company and a new senior management team established. The project had to be therefore 'resold' to the new Operations Director. The Department of Innovation and Technology was disbanded, with all members of the department, except the author, subsequently leaving the company. External pressures, the cause of the restructuring, had a significant impact on the implementation of the IBIS within the case study unit. Although the Operations Director was in favour of implementing the system within the unit, he did not overcome the political and focus barriers within the team, and as such, only a significantly reduced scope of the IBIS is being used within the primary case study unit. Its first set of results will be presented in October 2003. The challenge for the primary case study unit is to make sure that the measures, that are in place, are used within the IBIS system and that the second cycle of 'Change Action driven by Results' (CAR) is entered into. The Head of Business Improvement has been involved in the development of the system and is responsible for performance measurement within the unit. Whether or not the IBIS is fully utilised in the short term by the unit remains to be seen. However, the parent group of the case study unit and the one of the main functions, have fully engaged in the process of development of the IBIS and are now rolling it out across the businesses. The IBIS will therefore be driven top down from the senior management team of AGL through the functions and into the business units. It is hoped therefore that the primary case study unit will eventually be forced into engagement from senior management. AGL is initiating its first benchmark results for sustainability, customer satisfaction and behaviour. Once results have been ascertained there is a requirement for the senior management team of AGL to allocate ownership and responsibility for delivering

improvements against the benchmarks. The functional and business unit leaders have agreed to roll out the IBIS. It means that for the first time there will be a clear structure whereby the objectives of senior management of AGL will be translated into functional and business unit objectives and will be reported on and communicated across AGL. The expectation is that the IBIS will enable the organisation to understand better the key business issues, and that they will use the results to focus attention and assist in the delivery of business improvement.

5.3 THE IMPLICATIONS/IMPACT ON WIDER INDUSTRY

There are four main areas where this research project has implications/impact on the wider industry. It should be noted that this project has been entirely focused on delivering the solution within the sponsoring/case study organisation. Its findings should be used to assist other organisations that are endeavouring to go through the process of developing and implementing a performance measurement or business improvement system. The four areas are integration; performance measurement; the IBIS and culture.

- INTEGRATION

The definition of integration suggested in Paper 2 is " The agreement and commitment to work towards a set of aligned objectives enabling the effective and efficient sharing of information and knowledge by all parties involved throughout the project process". There are hard process improvements that are being deployed successfully across the industry. The challenge for the industry is to ensure that those involved in the process have clearly aligned their objectives and are committed to working cross-functionally in an integrated manner. This research has concluded that the current structure of academic and professional institutions and organisations within the industry further promulgates the barriers that exist within the construction process. The continuation of functionalisation within the process and 'over the wall mentality' means that inefficiencies will remain. This issue is recognised and the new 'Integrated Team Toolkit' launched in 2003, by the Strategic Forum for Construction, has been developed to assist teams define how they will utilise integrated working.

- PERFORMANCE MEASURMENT

Performance measurement is firmly positioned on the industry agenda. The CBP has been extremely successful at promoting and engaging people in its use. For the industry to ensure that the measures used add value, they must be aligned to specific business objectives, and integrated into a system that ensures that change is implemented based on the results achieved. The reasons why the MCG benchmarking club failed, which utilised many of the same measures as the CBP, must be understood and acted upon by the industry practitioners. The industry measures primarily focus on easily quantifiable criteria such as cost and time, which are post event lagging measures. Their data is historic, reviewed annually, which means that it can be up to 12 months old plus the time of the project. The information is not validated and therefore subject to interpretation. The research has developed a clear structure of where and how the three types of measures should be used across the process. The industry needs to respond and ensure that a coherent strategy is in place to review the disparate sources of industry

wide measures and produce a complete suite which cover all areas required. Measures must be established, during the project process, that offer the opportunity to change. As the key business processes for the construction industry have not been agreed, in the first instance, companies must use these measures, for their own key business processes, as internal benchmarks against which their own improvements can be gauged.

- CULTURE

The research has found that the inherent attitudes and adversarial nature of the industry are apparent within the primary case study unit. The restructuring of the industry is discussed above. Currently within the industry there is not a clear understanding of the cultural barriers and how and why they exist. There is a need to have a detailed examination of the culture of the industry, to allow a benchmark to be taken from which specific areas for improvements can be identified. This work has used the cultural web as a mechanism to successfully carry out this process within the primary case study unit. This could be utilised by the industry.

- IBIS

The development of the IBIS is generic and therefore could be used in any business context. It has been trialled with an organisation from the leisure sector and has been successfully implemented. The system provides a detailed structure, which would ensure that all areas necessary to deliver business excellence are covered.

5.4 CRITICAL EVALUATION OF THE PROJECT

This work was initiated by a senior management member of the primary case study unit. It was his vision and leadership that ensured that action research could be undertaken effectively (see Section 3.4.2). His departure from the unit, had a significant impact on the project. This change occurred before engagement in the development of the final system for the IBIS was obtained. As such, unforeseen barriers were introduced by members of the case study unit, which prevented the initial implementation of the system. There is a need to ensure continuity of support in a changing business environment, by ensuring engagement from several key stakeholders who have the authority and the desire to deliver the project.

At the outset of the project, the primary case study unit was already engaged in the use of the EFQM Excellence Model. The author was trained as an assessor of the model and assisted the Head of Business Improvement on several innovative applications of the model. The model was chosen as suitable for the structure of the IBIS based on these experiences of the using of the model within the case study units and the experiences gained externally, as an assessor. The increasing use of the model by businesses from all sectors further supported it applicability to any business context. A detailed study of the appropriateness of use of the model as the structure for the IBIS was not undertaken prior to the development of the system. .

Other models were reviewed, but because the primary case study unit was already familiar with its structure, it was decided that the Excellence Model was the most appropriate. Due to the robustness of the model it was deemed unnecessary to create

another hybrid solution, to be added to the many models available. However, its overt use was rejected by the AGL (discussed in Section 5.1.4), although the completed system was reviewed against the criteria of the model. This must be researched further to ascertain the true appropriateness of the model to be used to help develop business improvement.

The requirement of the project to deliver internal benefits meant that the work was primarily undertaken within the case study units. The development principles were taken from external sources, and as such were intended to be applicable to other organisations (external validation). The validity of the system was only tested internally, but the system was designed for and expected to be used by other construction and non-construction organisations. The delay in the application of the IBIS by the primary case study unit meant that the extent to which the IBIS delivers results/effects has not been fully ascertained. However, the actions undertaken have started to impact on the business and therefore results (non quantified) have been achieved. The extent of the improvements will be ascertained once the result indicators have been recorded.

The portfolio of research methods ensured that the changes in the business context could be accommodated. It was felt that the ability of the research to be refined as the project continued, utilising the various methods, whilst maintaining alignment to the overall aim, enabled the completion of the project and the satisfaction of the sponsoring organisation.

5.5 RECOMMENDATIONS FOR INDUSTRY/FURTHER RESEARCH

The project has concluded with ten recommendations for further work. These are:

1. Review the appropriateness of the use of the EFQM Excellence Model as a framework for the structure of the business improvement system. A review is required of the effectiveness of using different frameworks for the structure of the system.

2. The key business processes within the overall ‘construction process’ need researching and defining. Once a framework of key business processes has been established, then leading performance indicators can be developed and benchmarks obtained (see Paper 1).

3. There is a need to establish a mechanism to validate the results submitted for national benchmarks. The use of these benchmarks as marketing material calls into question the validity of some of the data.

4. Research needs to be undertaken to firmly establish the drivers for the use of performance measurement systems within the industry. Is there a genuine desire to use the measures as part of the management system, or are they perceived to be an external marketing tool? Once this is understood, then the systems and how they are perceived, can be tailored accordingly.

5. There is a demand for a rationalisation of the industry KPIs. A single sourced suite of measures, from which organisations can select those that are appropriate for their needs should be created. The various competing organisations, with their own sets of measures, are indicative of the fragmentation within the industry. There is some alignment of the national measures. This needs to be developed further.

6. The industry needs to understand the implications of its current academic and institution structures on its culture. The current structures have been accused of introducing and reinforcing the inherent fragmentation of the industry. The industry also needs to identify a suitable model to capture and represent its culture. This would allow internal benchmarking of organisations and also provide information to challenge the structure of the industry.

7. 70 % of Balanced Scorecards fail (Neely and Bourne 2000). Research needs to be undertaken to establish the reasons for the success or failure of the implementation of performance measurement within the construction industry. This will inform the development of more appropriate systems

8. Practitioners have not yet accepted the benefits of using holistic performance measurement systems. There is a need to establish and demonstrate the benefits of their use. The demonstration projects have done this on an individual project basis, but there is little evidence of the overall business implications.

9. There is a need to understand the influence that different leadership styles have on the success or failure of the implementation of improvement systems. This would then enable guidelines to be produced to assist potential users in the decision making process.

10. The IBIS was set up to define causal/enabling actions with the intention of changing the results/effects. Due to the maturity of the system and the number of variables involved the cause and effect relationships have not been proven. The enabling actions have been selected based on 'managerial judgement', with the belief that these cause the desired effects. The effectiveness of the system needs to be monitored and the cause and effect relationships researched and where possible, proven. This information can then be given to managers to help them with their managerial judgements.

11. The IBIS has been set up as the front end and monitoring system of a business improvement system. Work is required to review the effectiveness of the process of delivering business improvement.

5.6 OVERALL CONCLUSIONS

The overall aim of this project was to develop an integrated business improvement system for a design and construction case study unit. Through investigation into the facets of the integration of design and construction and the use of the EFQM Excellence Model, it became evident that there was need to further understand the issues relating to the use of performance measurement and to the culture of the case study unit. The findings from this work demonstrated the need to have a process for the development of

a holistic performance measurement system and the need to ensure that the system, led and driven by senior management, is used to initiate 'Change Action driven by Results' (CAR). It is the use of the results, as a core component in the management decision-making process, which is critical to the successful implementation of any improvement system. This formed the basis for the innovative application of the EFQM Excellence Model as the structure for the IBIS. This application ensured that a holistic approach was undertaken and this coupled with the alignment of the three levels of the system, through the use of CSF and KPIs, to the objectives of the business, resulted in significant changes in the management practices of the primary case study unit and also the secondary case study units. The system is continuing to be used in all three units, although its format in each is different. This was due to the different contexts of the units and also the different barriers to its implementation. The intention is that the units will continue to use the IBIS and that demonstrable improved performance will be achieved. There is a need for this work to be extended and for the use, and the implications of the use, of the IBIS to be researched further.

The value of this research and its originality lies in the fact that it has utilised benchmarking concepts and the EFQM Excellence Model to create a business improvement system, that not only assesses business performance, but provides the required holistic approach necessary to deliver sustainable business improvement. The way that the system is used a part of the management system, ensures that change actions driven by results are undertaken to deliver improvements. This system, although developed within the context of a single organisation, is of wider generic applicability.

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APPENDIX A PAPER 1

The European Foundation of Quality Management (EFQM) Excellence Model: A Driver for Continuous Improvement

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Abstract
There is a growing recognition by many business organisations of the need for continuous improvement. It is recognised as a key driver for business success and recent changes in quality registration requirements have reflected this. The EFQM Excellence Model has emerged as a major tool in the development of business improvement. The Model allows businesses to assess themselves relative to others using a generic framework, suitable for any type of business. It provides a structured process to identify, prioritise and drive forward business improvement and excellence. It is now recognised by many leading clients and it is being used by the government. This paper examines the use of the EFQM Excellence Model over the last four years within a case study organisation. It explores how its use has developed, from an initial basic self assessment, identifying structured improvement projects, to being the fundamental tool used to define and shape a multinational engineering & construction company. It examines the issues involved in the adoption of the Model within various business contexts, identifying cultural and leadership issues, and also describes the different ways in which the Model can be used. It concludes that strong leadership, trained facilitation and committed engagement from employees are critical to the successful implementation of the Model leading to the deliverance of business improvement.

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1 INTRODUCTION

The construction industry has been accused of being, at its worst, very wasteful, inefficient and ineffective. In 1999 the industry wasted over £1billion due to errors and rework (Nicholson, 1999). The construction industry has long been recognised as having problems in its structure, particularly with fragmentation which has inhibited its performance (Latham et al, 1994; Egan et al, 1998). Competitive pressures from within the industry, as well as external political, economic and other considerations are forcing the industry to re-examine and improve its modus operandi (Anumba et al, 2000).

This paper examines, using a case study, how a major organisation within the construction industry has responded to these pressures by utilising the EFQM excellence Model to both examine its operation and drive improvements in its business performance. It details how the use of the Model has matured over its four years of use, progressing from an initial Model for self assessment and establishing development projects, to being the fundamental tool used to define and shape the business and its processes.

2 THE EFQM AND THE EXCELLENCE MODEL

The European Foundation for Quality Management (EFQM) was created in 1988, as a membership based, non-profit organisation. There were 14 founding members – all leading European Businesses. Currently there are over 850 members. The EFQM Excellence Model was derived from the Baldridge Award, America's response to the successes of the Japanese automotive and electronics industries. These successes originated in the early work of Duran and Demming, the proponents of the post-war theories of performance measurement.

The Model (Figure 1) is based on eight fundamental concepts of excellence and is a non-prescriptive framework, designed to allow companies to assess where they are on 'the path to excellence', understanding the gaps and stimulating solutions. It is a tool to help define and assess continuous improvement of an organisation. The Model is devised to be used as a self-assessment tool, which enables a comprehensive, systematic and rigorous review of an organisation's activities and results, referenced against criteria within the Model. The Model has nine criteria and starts on the left-hand side with Leadership. This is one of the five enabling activities that drive the four sets of results. The Model flows naturally from the left to the right. The arrow running through the centre of the Model describes how the Model flows naturally from the enablers through to the results and represents the inherent inter-relationships amongst the different criteria.

Any decision or action by an organisation requires leadership. This leadership decides the company's policy and strategies including defining the required results, drawing on the capabilities of its people and its partnerships and resources. Having decided upon its policy and strategy and ensured that its people, resources and partnerships are capable of supporting them, it then defines its processes which will deliver its customer results

and its own key performance results. In delivering these results it also affects the people it employs (people results) and also the society in which it sits (society results). The Model also requires continuous improvement through innovation and learning, so having achieved the results the leadership must review them, alter the policy and strategy accordingly, develop the people and resources to implement the changes required and ensure that the processes are adapted to deliver the desired results. The cycle is then repeated.

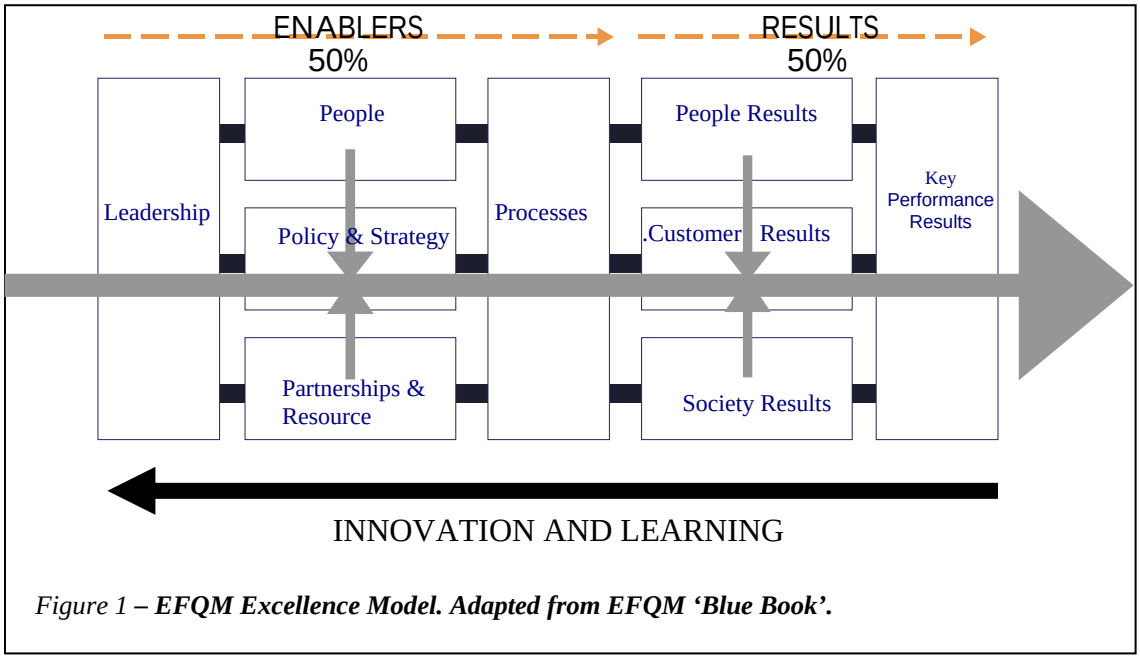

Figure 1 – ***EFQM Excellence Model. Adapted from EFQM 'Blue Book'.***

2.1 SELF-ASSESSMENT

The primary objective of the EFQM and its promotion of the use of the Excellence Model, is to improve performance. The numeric score that is achieved is only used as a benchmark against which future performance is assessed. The primary objective of self-assessment is therefore the identification of strengths and areas for improvement. The intent of the EFQM is that this process will create the energy to improve the organisation's performance.

2.1.1 APPROACHES TO SELF ASSESSMENT

There are five approaches to self-assessment (Figure 2). Depending on the level of maturity with the Excellence Model, the EFQM recommends the most appropriate method of assessment, ranging from the 'questionnaire approach' to 'award simulation'.

The questionnaire approach, which requires the least amount of time and resources, produces data that can be used to facilitate group discussions. It only delivers results with no appreciation of the drivers, and it will only provide internal benchmarks and a profile of people's perceptions not comparable with other scoring profiles.

The next approach is the matrix chart approach. This involves the creation of a specific achievement matrix within the framework of the Excellence Model. It typically consists of a series of statements of achievements against a numbered scale of 1-10. It is simple to use once the terminology within the matrix has been agreed, and is similar to the questionnaire approach in terms of its benefits.

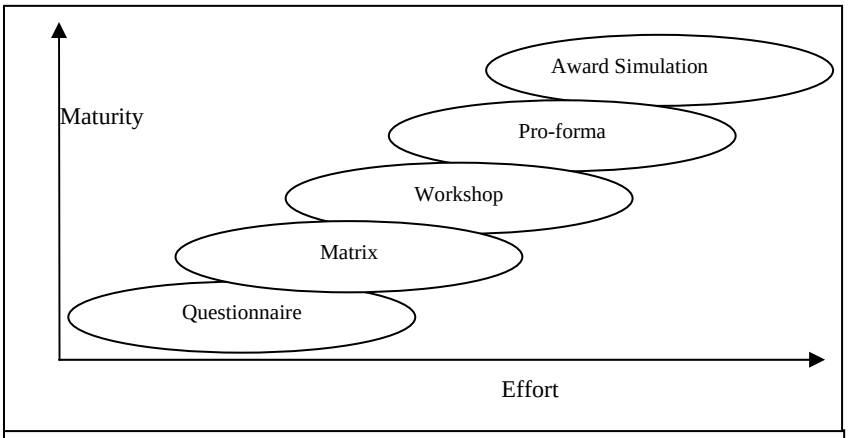

Figure 2 - Maturity of Excellence & Effort Required Adapted from EFQM 'Green Book' (1999).

Using the workshop method, the selected team presents its strengths, evidence of these strengths and areas for improvement. This method identifies the strengths of the organisation, areas for improvement (AFIs) and because it is workshop based, it ensures that all present are involved and empowered by the consensus reached. It does require a high level of facilitation, and the results are less robust than those from the pro-forma and award simulation approaches. A score is produced using the RADAR scoring matrix. RADAR is an acronym for Results, Approach, Deployment, Assessment and Review. The RADAR logic is shown in Figure 3. It works on the premise that to deliver excellence in business, results must be pre-determined. Once results are determined, then the approach of how to achieve these results must be planned and developed. The approach must then be effectively deployed and this deployment must be assessed and reviewed to determine not only the success of the deployment but also to identify changes that may be required. Once this has been reviewed then the cycle is repeated. The RADAR scoring matrix is split into the five areas (results, approach, deployment, assessment and review) and a mark is given for each area.

The pro-forma approach involves the completion of a pro-forma for each of the thirty-two sub-criteria contained within the Model. The approach identifies strengths, evidence of these strengths and AFIs. The evidence must be clear and admissible, which means that the results are factual and not subjective. The data gathering provides the opportunity for more personnel within the organisation to become involved in the process and the approach also produces score profiles close to those of award simulation.

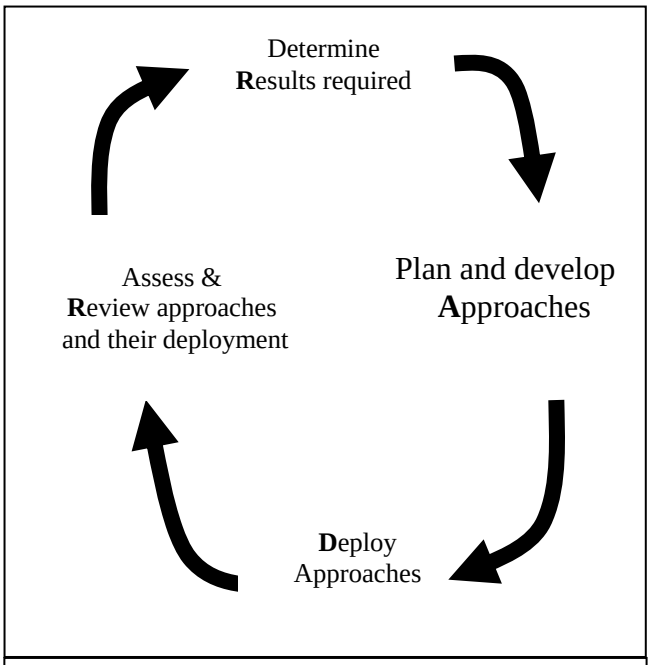

Figure 3 – RADAR Logic, EFQM 'Blue Book' (1999).

Award simulation is the most comprehensive self assessment approach, and effectively requires the same amount of effort and gains the same result as entering the European or the British Quality Award. It entails completing a full submission document in line with the award requirements and then having a team of assessors reviewing and scoring the report. For large companies the report is 75 pages long (35 pages for SMEs). The benefits of this approach are that it provides a powerful and concise way of reflecting the culture and performance and, due to the extent of the document, necessitates greater involvement of employees within the organisation. The document itself is excellent for disseminating and sharing good practice within the organisation, and gives an accurate score against the award schemes. It does however, involves considerable of effort and much more resource to complete. Thus the participants must be sure of the value the process will deliver before undertaking this approach.

2.2 EXTERNAL ASSESSMENT

There is also external assessment that can be applied for under the British Quality Foundation. Here the organisation prepares a seventy five page document as carried out in the award simulation self-assessment. This document is submitted and reviewed by a team of qualified assessors. They review the document, then visit the organisation before compiling a feedback report and awarding a score. The score provides a benchmark score against all the other organisations entering the award. The organisation will also benefit from the feedback from the external team, who will have assessed other companies and who will suggest specific areas for improvement.

3 CASE STUDY

3.1 BACKGROUND

The work included in the paper is part of a four-year engineering doctorate programme, investigating the barriers to the effective and efficient integration of design and construction, with particular reference to an integrated design and construction organisation. Elements of the research project centres around the use of the EFQM Excellence Model as a mechanism for improving integration. Part of the case study organisation has been involved in the use of the EFQM Excellence Model since 1998. In the interim period the organisation has undergone two restructuring programmes. This section examines how parts of this organisation have used the Model and also how the changes within the organisation have been affected by and has affected its use of the Model.

The part of the organisation, which is the focus of the study, involves both design and construction, and is capable of delivering total life of asset solutions. It employs over 4000 people and has a turnover of about £700m.

3.2 STAGE 1 : SELF ASSESSMENT OF AN AUTONOMOUS BUSINESS UNIT

3.2.1 OVERVIEW

In 1998 one of the autonomous business units within the organisation, agreed to undertake a two-day training and self-assessment exercise. The unit's senior management team was introduced to the Model by their Head of Continuous Improvement and undertook a full self-assessment of the business unit using the pro-forma approach with over 180 AFIs identified. They then carried out an assessment of their current research and development activity, using the criteria of the Model. From this assessment they decided to cancel £50,000 of research and development work and refocus this activity on assessed business needs. The 180 AFIs were then rationalised and 8 improvement projects initiated. These projects were unrelated; the rationale for their selection was based on prioritisation of actions by the members of the board involved in the self-assessment. From the Board of Directors, 8 project managers were selected, based on the projects identified and not the criteria of the Model. They were responsible for managing the development projects in the usual way. Progress was reviewed each month, as part of the monthly Board meeting and the projects were all concluded within 12 months.

3.2.2 OBSERVATIONS

This was the first business unit to use the EFQM within the organisation. The Head of Continuous Improvement had introduced the Model to the directors. They collectively agreed to engage in the process although it became clear as the process continued that the level of engagement varied considerably across the group. Some of the projects progressed extremely well and their results were integrated into business practice. One

example of this was the staff survey that resulted from one of the projects. However, other projects did not deliver against targets. On these projects, progress was not consistent and the work not seen as necessary to address the immediate business needs. Much of the work was done immediately prior to the monthly Board meetings, merely to satisfy the requirements of the meeting and not as part of the process of delivering real benefits to the business. At the debriefing session, held after the conclusion of all the projects, leadership and integration in normal business were highlighted as the two major issues necessary to deliver the improvements.

3.3 STAGE 2(A) : SELF ASSESSMENT OF DEPARTMENTS WITHIN A BUSINESS UNIT

3.3.1 OVERVIEW

Following the restructuring of the company, the directors that had engaged in the first self-assessment were redeployed to different business units. One of these units engaged in the process again, using a different approach. Instead of carrying out a top-down approach to the assessment, this business unit undertook a bottom-up approach, based on assessments carried out by the departmental departments within the unit. These results were then passed up to the management team of the unit for further consideration. This is discussed further in Stage 3. Each of the departments within the unit undertook a self-assessment, the methodology for which was dependent on the size of the departments. They utilised the workshop and pro-forma methodologies, and also a hybrid methodology involving a combination of the two. This was carried out by the one of the departments in a single session. Also utilised by two of the departments was a questionnaire methodology, called the 'Construction Performance Driver.' It was prepared by Performance Management Limited in conjunction with the British Quality Foundation (BQF) and the Construction Best Practice Programme. This is specific to construction organisations and provides a benchmark assessment within one session. It was then used in conjunction with the 'blue book' (the handbook for self-assessment) produced by the BQF and the EFQM to debate and agreed two AFIs for each sub criteria of the Model.

The results for each department were reviewed by the departmental management team and a prioritised list of AFIs to carry forward was agreed. Once the AFIs were agreed, a new classification and order to the AFIs was introduced. Rather than embarking on several concurrent but unrelated projects, four classifications and stages were identified.

These were: Quick Wins, simple improvements that will deliver value quickly to the business and also demonstrate the value of the process; Understanding; projects required to understand the current position of the business; Definition, projects to define the direction and scope of the business improvements; Delivery, projects that involve changing the delivery activities of the business. This provided clear focus and a staged delivery for the projects. It also meant that all AFIs chosen were encompassed in the matrix. There were nine departments involved in the process and they were all at different stages within the process. They all concluded their assessments and identified their prioritised AFIs. These were then submitted to the business unit management team for review. This is discussed in Stage 3.

3.3.2 OBSERVATIONS

The second use of the Model was driven by those directors that had previously been engaged in the process. The bottom-up approach, with each of the departments undertaking their own assessment, was successful in engaging and empowering over 100 people within the organisation. However, because this was carried out as a bottom-up approach there was substantial duplication in the work undertaken.

The new process of classifying the AFIs helped those involved in the overall process to

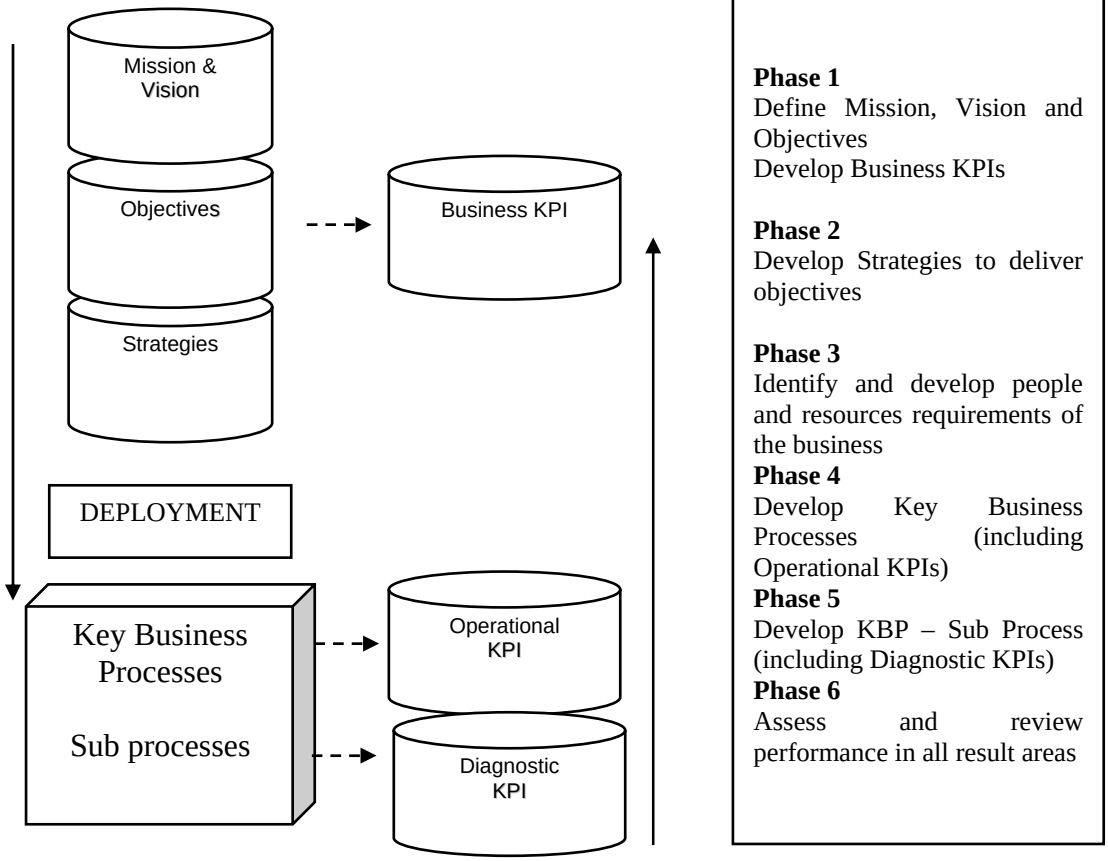

Figure 4 – ***Phased AFIs aligned to the Business Development Model***

better understand the issues and also see how the criteria within the Model are intrinsically linked. The different methodologies used in assessing the departments and generating the AFIs were successful. However, it was found that the learning from undertaking the longer workshop and pro-forma methodologies gave the participants a greater understanding of the Model and clearer focus in determining the AFIs. It is also important to understand the need for professional facilitation during the self-assessment exercise and the formulation of the AFIs. The Model is complex and people's understanding of it varies. It is therefore necessary to provide consultation on its proper use and ensure that the benefits can be delivered.

The departments proceeded at different speeds and the result was that, rather than bringing the departments closer together and using the Model to help define and integrate the business the unit, it actually began to more clearly define the boundaries of the departments and started to cause some fragmentation within the unit. This was recognised early in the process, but top management was unable to address this point at the appropriate time. The result was that actions had to be suspended to allow a senior management review. The impact of this on those involved has not yet been assessed.

3.4 STAGE 2(B): DEVELOPMENT OF A NEW PROJECT/ FRAMEWORK

3.4.1 OVERVIEW

Concurrently with the work being carried out within the Business Unit, two other exercises were undertaken. Both involved the use of the EFQM in setting up and developing project teams for long-term framework agreements. The government is the client on both occasions and the Model has been used to integrate the teams, including the supply chain. The RADAR logic was used to establish desired results and then the Model was used to develop what approach and deployment can be utilised to deliver the results. In this case, the Model was used to develop Key Business Processes (KBPs) for both of the teams and then to establish Key Performance Indicators (KPIs) within each of the KBPs and sub-KBPs.

3.4.2 OBSERVATIONS

The two projects both used the Model to help integrate new multi-organisational teams. The use of the Model successfully addressed the issues raised by the teams and provided a structured methodology to work through the issues and establish a common approach. The teams all engaged fully in the process and the Model proved effective in defining the KBP and also establishing aligned deliverables for the KBPs and sub-KBPs. However, it should be noted that a change in the client's time scale has meant that progress has been delayed on one of the projects. The implications of this on those involved in the process are not yet known. Another key observation for this methodology relates to the identification of KBPs. By identifying KBPs and arranging cross-departmental teams to address the issues of the KBPs, the traditional departmental silos inherent in the construction industry, no longer had total ownership of processes and therefore were forced to work together in an integrated way.

3.5 STAGE 3: DEVELOPMENT OF A NEW BUSINESS UNIT

3.5.1 OVERVIEW

As mentioned in Section 3.3, the senior management recognised the need to integrate the results of the assessment exercises carried out by the departmental units. Two AFIs were generated for each nine main criterion and were presented to the senior management team of the business unit for review. The AFIs were reviewed and it was agreed that each member of the business unit management team would become a criterion champion and establish a community of interest, to address the issues developed by the departmental teams.

It was also agreed that the AFIs proposed by the departmental teams be reviewed and consolidated wherever possible. Two trained assessors of the Excellence Model carried out this work, and it was discovered that there was a logical phasing of the consolidated actions. This phasing was mapped onto the business model that was being produced to demonstrate the alignment necessary for the KPIs within the business. (See Figure 4). The phases mapped perfectly with the business model that was being developed to show the relationship between KPIs and business objectives, and the business processes. The phasing of the AFIs was feasible because of the state of maturity of the business unit using the model. The phasing was established the previous year and therefore many of the issues identified were fundamental to the establishment of a new business. This approach is therefore relevant to new businesses or new projects and framework agreements.

3.5.2 OBSERVATIONS

The consolidation of the departmental units' AFIs was necessary to realign the actions of those involved in the process. As mentioned earlier, by having departments using the Model separately, further definitions of boundaries were becoming established. The need for consolidation and alignment across the business unit was therefore required. There was some resistance to continuing in this form and some of the departments involved were keen to pursue the use of the Model for their own area. This was because those involved saw the benefits for improving those aspects of the business over which they had total control. During the consolidation phase, all of the departmental AFIs forwarded from the previous exercise were used. The resultant AFIs were therefore the product of all that had been involved in the process. It was felt by the management team that this was extremely powerful for engaging and empowering its people in defining how the business was to move forward. It should be noted that before these phases could be implemented, the case study organisation restructured again and the business unit for which the assessment had taken place, was amalgamated into a new unit. .

The new business unit has fully engaged in this approach and has developed a full suite of measures at a business level and is current driving these down to develop measures for the key business processes and the sub key business processes.

3.6 STAGE 4: MAPPING OF KEY BUSINESS PROCESSES AGAINST PROJECT PROCESS GATEWAY DELIVERABLES.

3.6.1 OVERVIEW

The final use of the Excellence Model was to review the key business processes for a multiple project framework agreement. The client's project team had identified the KBPs and these were reviewed against the criteria of the Excellence Model (See Figure 5a). This allowed each of the processes to be reviewed holistically, addressing leadership, people, resources issues etc, using each of the nine criteria of the Model to establish and define the improvements for a mature process or outcomes for a new process, necessary within the process from a business perspective.

In this case it is a new organisation and therefore the Model has been used to identify critical success factors or desired outcomes for the business and for each of the KBPs. This has been done for each of the criteria of the Model. Business KPIs and Operational KPIs will then be developed to measure the success of the outcomes against the desired results. Once sub-KBPs are identified, diagnostic KPIs will also be developed.

This review was also carried out in conjunction with mapping the processes against the project stages. The Process Protocol (PP) has been developed to allow the mapping of processes against recognised defined stages, and is one example of how the processes can be reviewed.(Kagioglou et al, 1998). The PP can be used to map the KBPs showing the departmental involvement at the various stages of the overall project process. It identifies hard and soft gates between the phases of the project process and at each of these gates deliverables are identified for the processes. Measures for these deliverables, within the overall process, will form part of the suite of KPIs against which performance will be assessed. These will be the measured under the process criterion of the Model, Criterion 5 (See Figure 5b.).

The KBPs may involve several sub-processes. The softer issues relating to the KBP may be relevant across the different stages of the project, and may be issues that are related to multiple processes and not restricted to the processes identified by the PP. For example, Value Management may be identified as being a Key Business Process.

The PP maps the processes of VM against the project stages. It identifies the people involved in the different phases of VM. However, there are also soft issues that are important when using techniques associated with managing value within a project. The PP allows normal process improvement, but the use of the Excellence Model ensures that all issues relating to the business are incorporated in the review and ensures that process improvement is not done in isolation from the business requirements.

3.6.2 OBSERVATIONS

This development is still in its very early stages, however the methodology has been developed over time and the combination with the process protocol is a natural progression to facilitate hard process improvement or development. Much work is still required in this area, particularly identifying robust KBP for construction.

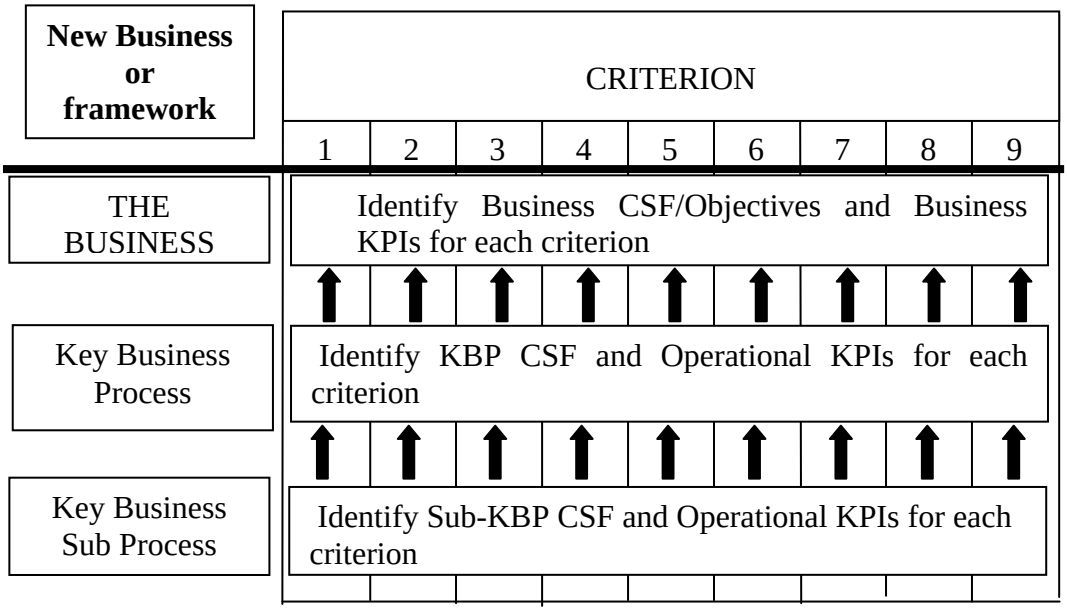

Figure 5a – ***Review of business objectives, KBP and Sub KBP using the EFQM Excellence Model***

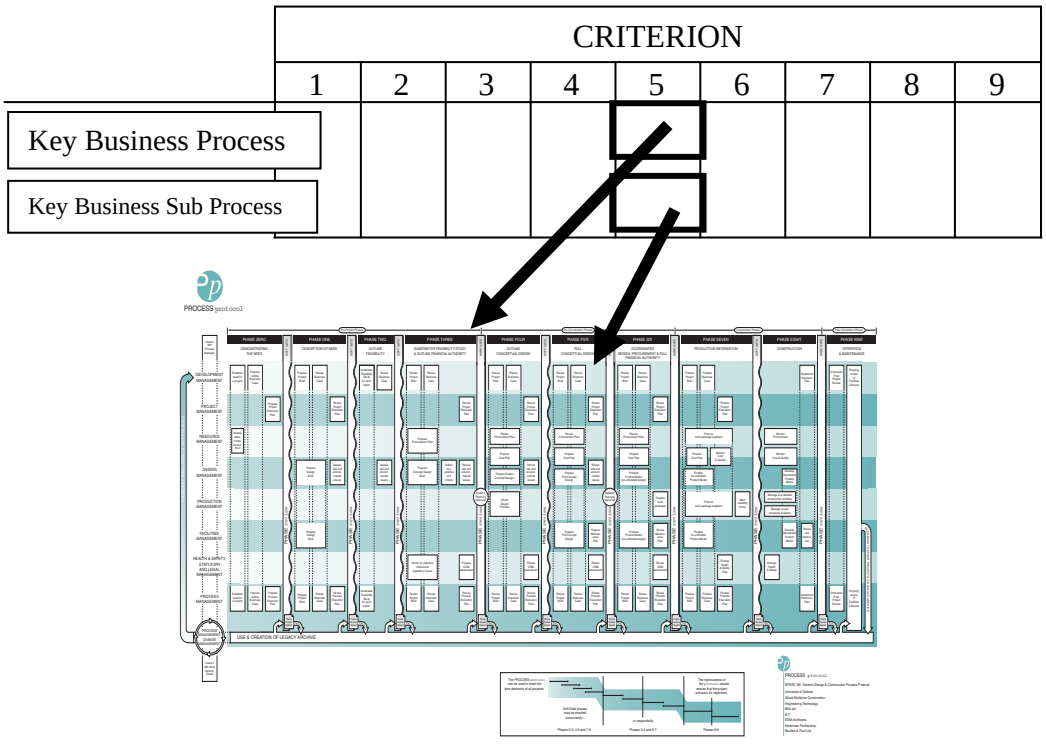

Figure 5b – Identifying Measures within Key Business Processes and Sub Processes using the Process Protocol

Note :

Criterion 1 = Leadership
Criterion 2 = Policy and Strategy
Criterion 3 = People
Criterion 4 =Partnerships and Resources
Criterion 5 =Processes
Criterion 6 =Customer Results
Criterion 7 = People Results
Criterion 8 = Society Results
Criterion9= Key Performance Results

4 CONCLUSIONS AND FURTHER WORK

Change is required by those who want to be involved in using the Model to deliver business improvement. For the implementation of the Model to be successful and for it to realise its full potential, the process must be driven by top level leadership. It must be accepted as the central part of core business development, critical to business and not just as another initiative that has little effect on business performance.

The use of the Model can be varied to suit the business situation. It can be used as a fundamental tool to define and shape a new business unit and it can be used to develop process improvement aligned to the needs of a business for more mature organisations. There is a need for trained facilitation to ensure that the use of the Model is consistent and to help deliver maximum benefit from its use.

There are barriers to getting people engaged in the assessment process. The value of the process against the commitment of time and resource necessary has to be demonstrated. Classifying and ensuring that some of the AFIs are quick wins, demonstrates the process to the users and also delivers quick improvement.

The Excellence Model is being used by businesses to deliver total business improvement. Companies like TNT and Nokia, both of whom have won the European Award, have recorded significant business improvement, not restricted to a single process, or financial result. The holistic approach of the Model ensures that all aspects of business are covered. This total business improvement is being recognised by investors. In a recent survey, stock prices of award winning companies engaged in using the Excellence Model or other similar Models of Total Quality Management, increased by an average of 114% over a five year period and out performed the benchmark companies in all the performance measures used. (Hendricks & Singhal, 2002). However, some people are still sceptical of its use and see it not as part of the core business. This must be addressed to ensure full and proper engagement from all involved in the process. Only when this happens will the total business benefits be achieved by the organisation.

The findings of this study have been incorporated into the development of an ‘Integrated Business Improvement System’ (IBIS). The IBIS is a performance drive, management improvement system based around the framework of the EFQM Excellence Model. It aligns the mission, vision and strategies of a company, through objectives and critical success factors to measures of performance. The results of these measures are then used to decide change action leading to continuous improvement. The Model distinguishes between Key Performance Indicators (indicators of associated future performance), Key Performance Outcomes (measures of completed events), and Perception Measures. It also clearly distinguishes between the different contexts in which these measures can be used. Used as leading measures they provide managers the opportunity to change future action. Used as lagging measures they only provide historical data which provides a benchmark. These results can only be used to change and improve the same activity the next time it is performed. The IBIS is reviewed periodically and the measures altered to reflect the current business strategies. This is a need for further work to identify key business processes and sub processes within the construction process. This would allow leading measures to be developed which could

be used to improve performance during projects and help achieve the desired project results.

5 ACKNOWLEDGEMENT

This work is part of an Engineering Doctorate programme being undertaken in conjunction with the EPSRC and AMEC Group Limited at the Centre for Innovative Construction Engineering (CICE), Loughborough University. Mr Phil Brown, Head of Continuous Improvement at AMEC has made a significant contribution to this work.

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APPENDIX B PAPER 2

Integration of Design and Construction – A Review

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Abstract
The construction industry has long been recognised as having inherent problems leading to inefficiencies in the services and products it provides. Dependent on collaborative working, the in2dustry has recognised that improved integration is one of the three main drivers for developing a culture of continuous improvement necessary to achieve the improvement targets set in the 'Egan Report'. This paper provides a current review of integration within the construction industry. It categories the facets of integration and reviews the drivers for improving integration. It identifies some of the current tools and techniques being used to improve integration and then explores the current barriers acting against them. It concludes that hard process improvement has been successfully developed and implemented. However, it suggests that much further work is required to address the inherent cultural problems which significantly reduce the effectiveness of the many tools and techniques available.

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Beatham, S, Murray, M, Anumba, C, Thorpe, T And Hedges, I (2003) Integration of Design and Construction - A Review. ***In:, 10th ISPE International Conference On Concurrent Engineering: Research And Applications,*** **Madeira Island - Portugal**

INTRODUCTION

The process of construction is project based, with each project being unique. The construction process has inherent problems. The industry has long since been recognised as having problems in its structure and with its fragmentation which has inhibited its performance (Latham 1994, Egan 1998). However, it has largely depended on collaborative working between a number of professional teams brought together in an ad hoc manner for the translation of its client's requirements into physical facilities (Anumba, Bouchlaghem and Whyte 2000). Within the industry there is often much distrust between the clients, architects, structural engineers, contractors, subcontractors, suppliers, and facility operators. There are often conflicts of interest and relationships are predominantly short term. (Luiten, Tolman and Fischer 1998). The fragmentation of the industry occurs within, and between the different stages in the construction process (Kamara, Anumba and Evbuomwan 1996). An adversarial environment therefore prevails and the fundamental ethos of collaboration is not fully evident. This has resulted in numerous problems for the construction industry with the result that the industry is highly inefficient compared to other sectors (Anumba and Evbuomwan 1995). Competitive pressures from within the industry as well as external political, economic and other considerations are now forcing the industry to re-examine and improve its modus operandi (Anumba, Bouchlaghem and Whyte 2000). The need for integrated teams, focused on the creation of value, is now clearly recognised as one of the three main drivers for the development of a culture of continuous improvement in the construction industry (Egan 2002).

7 INTEGRATION OF DESIGN AND CONSTRUCTION – A CURRENT REVIEW

Integration is defined in many ways: Fischer(1989) defines integration as, the continuous interdisciplinary sharing of data, knowledge and goals among project participants. The sharing of knowledge between construction and design, for example is one aspect of integration. Koskela (1992) defines the integrated construction engineering process design sub processes which cross over specialist functions and temporal phases in order to shorten iteration cycles and the whole design cycle and to move from local optima towards the global optimum. Vincent (1995) refers to integration as the term that is used to describe the desirable concept of freely exchanging information between different participants in the construction process. Betts et al, (1995) provide a generic definition of integration which is the sharing of something, by somebody using some approach for some purpose. For the purposes of this paper we will use this generic definition.

7.1 FACETS OF INTEGRATION

Integration can be split into many different facets and these facets are defined and described differently by different authors. Howard et al, (1989) identify vertical integration (between project phases) and horizontal integration (between specialists in a given project phase) in their discussion of vertical and horizontal fragmentation. Fischer

et al, (1989) introduce the differences between single and multi-project integration. Within single projects they define the following examples of integration:

1. Downstream use of data: Using data that was generated in earlier phases during later phases (e.g. CAD drawings).

2. Upstream use of data: Using data that was generated in later phases during earlier phases (e.g. Construction information on formwork).

3. Downstream use of Knowledge: Applying knowledge that was gained in earlier phases during later phases (e.g. use of knowledge applied during the design phase during the construction phase).

4. Upstream use of Knowledge: Applying knowledge that was gained in later phases during earlier phases (e.g. use of knowledge about maintaining a system during its design phase, lifecycle costing).

5. Sharing of Goals: Development of teams through partnering.

Within multi-project environments improved integration can achieve significant improvements in efficiency. Fischer et al, (1989) characterise integration in multi-projects primarily by individual and corporate memory and experience and that it is intimately associated with learning, individual and corporate.

Koskela (1992) and Evbuomwan & Anumba (1996) distinguish between technical (computer) and process (conceptual) integration. Technical integration could be described as the general facilitation of information transfer by means of standardised data structures (e.g. computer integration). It provides only infrastructure and potential for integration. Process integration on the other hand is what brings about process improvement. This should be within the framework (or should be supported by) the technical infrastructure (for example Information technology).

Betts and Ofori (1992) identify forward and backward integration. Kamara et al (1996) speculates that these probably refer to the integration of different stages (actors) in the construction process. Forward integration involves downstream activity or actor integration with an upstream activity/actor. Backward integration is the reverse. Anumba (1996) discusses functional integration in CAD systems, integrating all the aspects of the CAD system, modelling representations, data structure with the user-interface, and the drafting function and other engineering applications.

Betts et al, (1995) introduce four dimensions to integration; Who, What, When and Why. ‘Who’ involves integration of individuals, departments, entire firms and projects and ultimately, the entire construction industry. ‘What’ may involve the sharing of data (an initial step), models, knowledge and goals. ‘When’ may involve the integration of just a few applications within one phase or discipline, or all applications from all disciplines. The reason for integration (or increasing the level of integration), ‘Why’ may include the need to stay in business, increase profit, market share or create new markets. (see Figure 2.1)

Low Integration ⟷ High Integration					
Who?	Individuals	Departments	Entire Organisations	Whole Project life cycle	Entire Industry
What?	Data	Models	Knowledge	Goals	All project Information
When?	Islands of Automation	Multiple Applications in one discipline & phase	Multiple applications for multiple disciplines in one phase	Multiple applications for multiple disciplines & phases	All applications in project delivery process
Why?	Survival, stay in business	Increased profit	Increased market share	Enter new market	Create new market

Figure 2.1 – Four Dimensions of Integration (Betts et al, 1995)

7.2 INTEGRATION OF DESIGN & CONSTRUCTION

7.2.1 THE DESIGN AND CONSTRUCTION PROCESS – A NEED TO INTEGRATE

Figure 2.2 shows the project process, developed by AMEC, which shows its sequential nature. Kamara et al (1996) describe the two types of relationship that exist within this process. There are primarily functional and contractual relationships (see Figure 2.3). The two are interrelated as the way contractual relationships are defined affects the functional relationships between the parties. Informal and hybrid relationships also exist. The way these relationships are defined is determined by the overall procurement process, which is usually consists of a pre-contract and post-contract stage. The adoption of a procurement strategy depends on the specific project in question and the prevailing circumstances, which will affect these relationships and the outcome of the project (Naoum 1994).

Traditionally, construction has followed once design is complete, with a clear separation between the design and construction phases (Anumba and Evbuomwan 1996), although they do in general proceed sequentially (Alshawi and Underwood

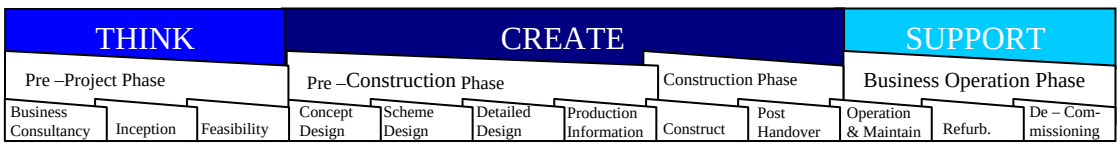

Figure 2.2: – AMEC's 'Total Life of Asset' Project Process

1996).

The design and construction process involves many activities, the performance of which involves a number of different disciplines. In carrying out these activities each discipline generally operates independently, whilst making design decisions that inevitably affect one another (Evbuomwan and Anumba 1996). Egan et al, (1998) claim that the separation of the design from the rest of the project process is a fundamental weakness in the industry, causing inefficiency in delivery. This is reflective of the

confrontational and contractual culture inherent in the industry. Evbuomwan and Anumba, (1996) describe the 'over the wall' mentality, which is adopted in construction and manufacturing (See Figure 2.4). Here the completed design is passed over the wall to the contractor, who takes responsibility for the completion of the structure(Ranky 1994). Anumba et al, (1996) state that the separation of the design and construction process is responsible for many of the problems of the industry including: increased design time and cost, the fragmentation of the design and construction data, disputes and litigation and lack of true life cycle analysis on projects.

Austin et al, (1998) iterate the fact that there is an increasing understanding that construction efficiency and cost are heavily dependent on the quality of the design

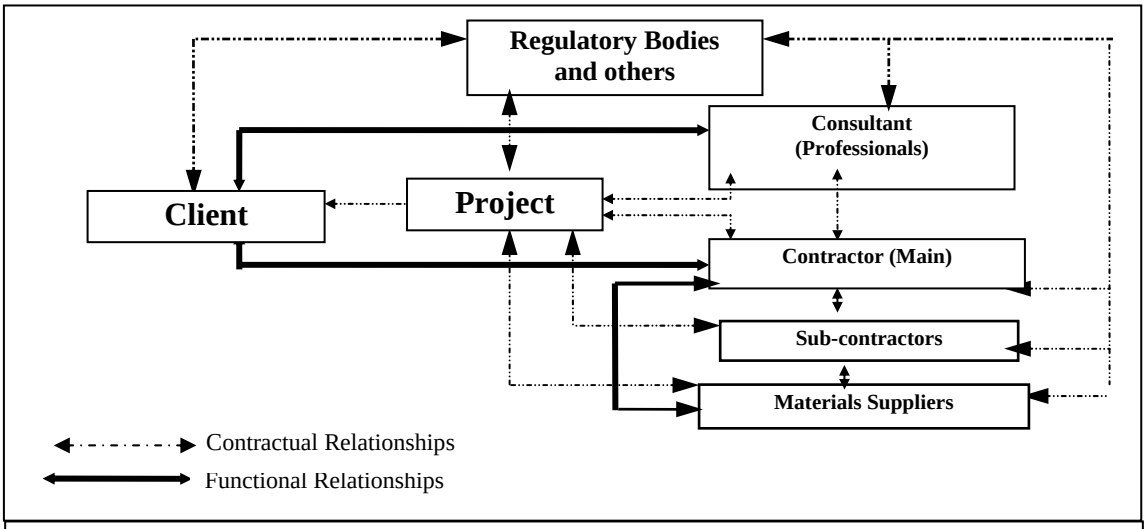

Figure 2.3: Relationship between parties in the construction process (Kamara et al,1996)

solution and information. The majority of construction delays and defects can be traced back to poor design performance (Josephson and Hammerlund 1996). Poor design information alone frequently creates problems that are more significant than those attributable to poor workmanship and site management (Baldwin et al. 1998). It is therefore critical that integration occurs with construction during the design phase to prevent problems in subsequent processes and select those alternatives that optimise the overall project performance (Mitropoulos and Tatum 2000). Designers now interface with many experts from within and outside their organisation (Hollins and Pugh 1990). Ferguson and Teicholz, (1992), have shown that there is a strong relationship between customer satisfaction and the degree of project integration.

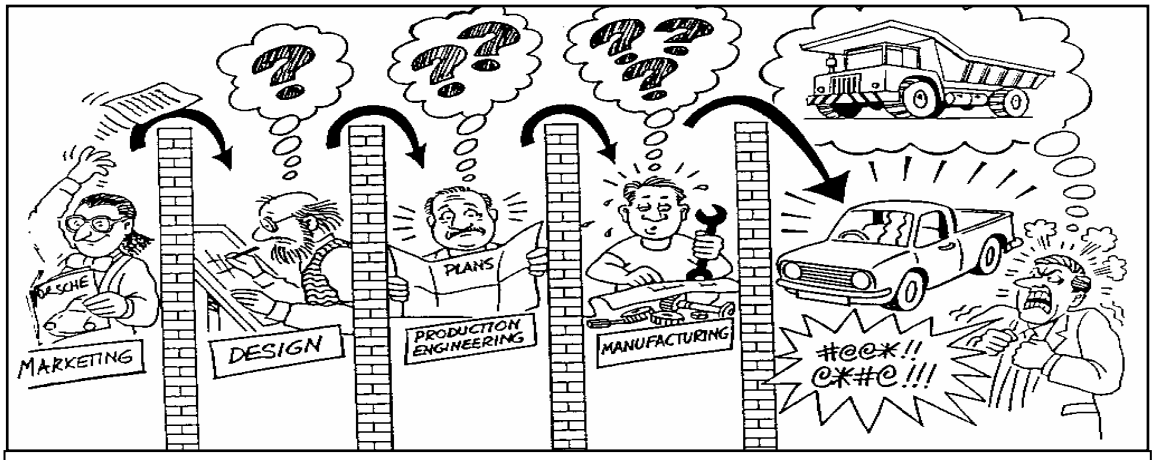

Figure 2.4 – 'OVER THE WALL DIAGRAM' (Ranky, 1994)

7.2.2 DRIVERS FOR CHANGE

Between 1990 and 1995 the industry witnessed an extended recession with job losses of around 500,000 across all professions. There was also a serious reduction in education and training within the industry. This lead to a period of reflection, analysis and action towards a cross-industry consensus to deliver better buildings, on time, on budget through improved teamwork and with greater focus on customer needs (Moir 1999). Owners of constructed facilities are demanding delivered projects in greatly reduced time frames (Strassman 1995, Tluazca and Daniels 1995, Koskela 1999, Songer et al. 2000). Clients are now starting to look at the delivery and operation of the facilities as a service rather than a product. This involves constructing the project, investing in the property and maintaining the facilities. (Luiten, Tolman and Fischer 1998). The market is requiring that design and construction should be dealt with by the same contractual partner, aligning the interests of designers and contractors. (Luiten, Tolman and Fischer 1998).

Other drivers include environmental issues and increased legislation such as the CDM Regulations are not forcing the functions to work in a more integrated manner.

7.3 CURRENT APPROACHES TO IMPROVED INTEGRATION OF DESIGN & CONSTRUCTION

The Design and Build procurement route is the most recognised response and attempt by the industry to integrate design and construction. Here the contractor accepts responsibility for both the design and construction of the building to meet the requirements of the client. The combining of the responsibility of design with that of construction is the most logical way to integrate design and construction (Kamara, Anumba and Evbuomwan 1996), and also it has perceived ability to bring the design and construction processes closer together in a cultural sense (Moore and Dainty 1999). There are various hybrids of Design and Build, all of which seek to improve the

process. Anumba and Evbuomwan (1997) state the following advantages of the D&B method of construction procurement.

- The potential for the use of a single contractual arrangement for the whole process
- Integration of design and construction expertise
- Shortened construction time
- Incorporation of buildability considerations and the opportunity to select construction materials and methods with shorter lead in times.
- Better co-ordination and communication
- Easier decision making
- For Clients, the risk of cost and time slippage is avoided
- There is usually no nominated sub contractors.
- Guaranteed cost of building and date for completion

The Private Finance Initiative (PFI), Public Private Partnerships (PPP) and Prime Contracting are all initiatives lead by the government aimed at facilitating the construction industry to deliver a better service. Longer-term framework agreements have been devised to enable integrated teams to be developed over time. The contracts have been extended to include the operations and maintenance of facilities, which increases the need for more integration between the professionals engaged in the projects.

There are many tools and techniques that are being developed to help achieve better integration, most relating to the harder process issues. These include AdePT, which is a tool for rescheduling design activities to produce decision-making clusters. Here the input of construction personnel can greatly enhance the design process(Austin et al. 1998). Others include Concurrent Engineering, which was developed in construction in response to the limitations of D&B. (Evbuomwan and Anumba 1996). They state that a radical review of existing procedures is necessary. This is to be taken with a view to integrating all the various functional disciplines involved in a construction project within a multi-functional matrix team so that all key issues can be addressed early in the project life cycle.

7.3.1 ROLE OF INFORMATION TECHNOLOGY (IT)

Fischer et al, (1989) explain that to complete their tasks, the many professionals involved in the construction process, spend a significant amount of time finding and retrieving existing project information, communicating and co-ordinating with other professionals. Providing accurate and timely access to project information for all concerned and relevant parties has always been the major communication challenge. Communication always takes place in a social context and is usually supported by some form of IT. Increasing integration among project participants is seen by many authors

as a solution to improving communication of, and access to information. The ability to introduce digital data structure models and use project models to exchange information is increasingly being seen as vital to integration (Brandon, Betts and Wamelink 1998, Tarandi 1998, Anumba, Bouchlaghem and Whyte 2000).

7.4 BARRIERS TO THE INTEGRATION OF DESIGN AND CONSTRUCTION

Mitropoulus and Tatum (2000) suggest four categories of barriers to integration: Contractual, Organisational, Behavioural and Technological

7.4.1 CONTRACTUAL

Faulkner and Day, (1986) stated that traditional forms of contractual arrangement and fee scales, underpinning professional isolation on projects, are still attractive to the majority of practitioners in the industry and their client's. Unless change occurs to produce a wide ranging flexibility in these factors which structure relationships between the construction professionals, the development of interdisciplinary understandings and improved communication will be severely limited. The use of D&B procurement is thought to allow contractors to tune the design to their individual or organisational methodology constraints, irrespective of the client's requirements. (Ashworth 1996) Articles in the New Builder (1993) support this concern, claiming that insensitive and unnecessary cost cutting methods are introduced by the contractor. However, Ashworth, (1996) suggests that this concern should be balanced against the positive perception that contractors use their specialised knowledge and methods of construction to evolve the design. Evbuomwan and Anumba, (1996) identified limitations of the D&B approach based on the client retaining consultants at the early stages of the design process, much of which centres around the constraints of the outline design, produced prior to construction involvement, and lack of clarity in the brief.

7.4.2 ORGANISATIONAL

Mitropoulus and Tatum, (2000) comment that the lack of joint responsibility, lack of decision making authority to lower organisational levels, and lack of co-operative organisational culture, are the main barriers to the integration of design and construction. Antagonistic attitudes and competitive behaviour reduce motivation and capability to co-operate. Functional difference and self-protective problems can make it difficult for designers to accept criticism or suggestions for improvement from each other or the contractor. A culture that values co-operation and teamwork as a means for achieving a super-ordinate goal is needed to promote goal congruence and voluntary co-operation. Further barriers include the fact that each discipline focuses on developing their own processes, with little energy being devoted to the development of the process as a whole (Karhu and Lahdenpera 1999). They also cite the lack of knowledge of other disciplines within the process. Although the large number of participating companies involved in the design and construction process are involved at some period of time or another while the project is being carried out, not all are involved in the process simultaneously or at all times (Kalay, Khemlani and Choi 1998). The actions and decisions of others however are highly dependent on each other. Designers do not often

anticipate the implications of their design on construction, and contractors' interpretation of the design solution often does not meet designers' intentions. This separation of design and construction processes has led to the decay of integration and to a growing misunderstanding of the role of each profession (Alshawi and Underwood 1996).

Research into the process of design management also shows areas of concern for integration issues. Alshawi and Hassan (1999) commented that the lack of integration between planners and other disciplines means that decisions made by the disciplines, which might have a direct impact on the construction plan, are not propagated into the plan. The lack of integration leads to scope uncertainty, ambiguity, unclear priorities, and unidentified needs and constraints, which in turn causes changes, rework and delays (Mitropoulos and Tatum 2000). Coles (1992) and Sawczuk (1992) noted that the design process relies upon construction project feedback for its effective management. However such feedback takes a long time to be obtained and tends to be ineffective (Formoso et al. 1998). Kalay et al, (1998) suggest that professionals from different categories, have different goals, leading to supposedly collaborating specialists to effectively compete for the priority of the values or criteria associated with their specialities (Ballard 1999).

7.4.3 BEHAVIORAL

The cultural differences within construction often lead to conflict. Kumaraswamy, (1994) observed that where there is a proliferation of human relationships, as in the construction industry, then there is a potential for conflict. Any process such as construction, which involves a multitude of activities, some occurring serially, others in parallel, provides ample opportunity for conflict to arise. (Gardiner and Simmons 1992)

7.4.3.1 The Inherent Culture of the Construction Industry

Bodely (1994) claimed that culture has several properties: it is shared, learned, symbolic, transmitted cross generationally, adaptive and integrated. Such a definition of culture implies that it is defined and ingrained by the professional sphere in which its members operate. In construction this is often with coupled with possible competing allegiances, as observed by Faulkner and Day (1986), where the fragmented nature of construction is characterised for the individual practitioner by several different, if not competing, allegiances – to an organisation (company, practice), to an occupation and to a particular project. Powell and Newland (1994) state that each category of professional has a distinct background, culture and learning style, and even goals (Kalay, Khemlani and Choi 1998). Eraunt (1990) pointed out that there are deep rooted differences in attitudes, outlook and ways of working between professions that make it difficult to bring them together, and that permeate the education system. Gale (1992) suggests that these differences originate in the higher education departments, where lectures bring such attitudes with them in the classroom, and begin to define the interfaces between those involved within the construction process. Students can then be seen to adopt these diverse attitudes based on professional territories (Moore and Dainty 1999). If not in the classroom, then new recruits to professions quickly adopt the same attitude as their fellows (Muir and Rance, 1995). The existence of professional institutions acting as arbiters of education curricula and as gatekeepers of professional practice, guarantees a high concern for the social standing of members (Faulkner and Day 1986).

From the above it is clear that conflict is inherent in the culture of the industry. It is also recognised that an organisation's success hinges, to a great extent, on its ability to set up and operate mechanisms for dealing with a variety of conflict phenomena or sequence of unlocking conflict (Pondy 1969). Conflict resolution will often lead to change. If we accept that conflict between groups in construction is inevitable (Bowditch and Buono 1990) then there is a need to acknowledge and plan ahead for project conflicts and admit openly that change for whatever reason is always likely and control it honestly (Cornick 1991)

7.4.3.2 A Relationship Based Industry

Mitropoulos and Tatum, (2000) comment that behavioural barriers relate to a lack of interpersonal, communication and negotiation skills which reduce team members' effectiveness and ability to perform joint problem solving. Faulkner and Day (Faulkner and Day 1986) comment about the different groups and occupations coming together in order to pursue the primary goals of an organisation. They describe the types of relationships involved ranging from those where one party has formal authority over another to those where only informal interaction occurs between equals. How members perceive each other is dependent not only upon experience of working relationships, but also on ideas current in wider society and on dispositions acquired during the socialising process of occupational education and training. Within construction the historical development of the industry has led to the existence of a large number of interdependent occupations each laying claim to is own distinct body of knowledge. In project based organisations where there are high levels of interdependence of occupations and areas of overlapping skills, attitudes between occupational groups assume special relevance.

7.4.4 TECHNOLOGICAL

Anumba et al, (2000) highlighted peculiarities of the construction industry that impinge on the communication requirements of construction project teams. These peculiarities have lead to a greater need to improve technology to overcome the barriers Figure 2.5 identifies the barriers to IT applications in. Tarandi (1998) cites the fact that the 'integration of the construction process through electronic sharing and communication of information is not widespread at present (Doe 1995) as one of the reasons for the problems within the industry. The role of IT in construction has failed to achieve the levels of integration that have enabled IT to be used so purposefully in other sectors. This is because the phases of design are dealt with in fragmented way for organisational, legal and economic reasons (Brandon, Betts and Wamelink 1998).

Luiten et al, (1998) state that a technological hurdle is the paper based communication, which is still common in most building projects. To support integration of design and construction electronically, software should represent information in an open (independent), high level (no interpretation required) computer interpretable format.

Brandon et al, (1998) explains that project management theories are much more developed in construction than they are in manufacturing. Construction professionals are trained and experienced to solve unexpected project specific problems. However this improvisational skill also leads to an improvisational attitude for the whole sector. The

fact that construction projects are unique, is not a good basis for a fundamental approach to subjects like production control and the use of IT. They go on to argue that the level of technological advancement is already far in advance of our (construction's) ability to be able to apply and implement effectively, and as such the issue is how is IT managed in construction to overcome the managerial and organisational prerequisites to integrate systems. Luiten et al, (1998) reiterate this. The technological opportunities are there, but there must be a will to change towards more co-operation and integration.

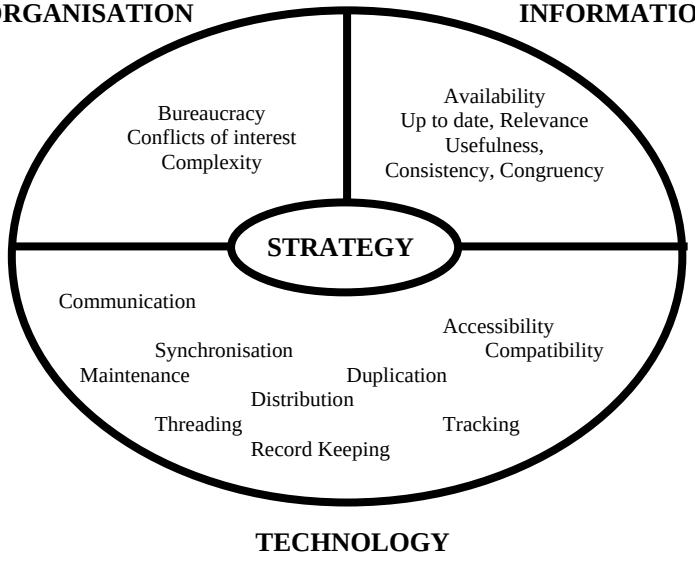

Figure 2.5 – Barriers to IT Application in Construction (Brandon et al, 1998)

8 CONCLUSIONS AND RECOMMENDATION

The industry has agreed that, in order to achieve the improvement targets set out in the 'Egan report'(Egan 1998), it needs to change and remove the fragmented and adversarial culture that exists. Improved integration is agreed as being crucial to this. The number of parties involved and the sequential nature of the construction process means that they need to work in an integrated fashion to be more successful. Much work is being carried out looking at the harder process and technical issues relating to improved integration. New procurement routes and process models are available. However, the attitudes that prevent integration are still inherent in the structure of industry, its professions and are further promulgated by academia. These, softer cultural issues, are preventing the successful alignment and achievement of goals within the industry. Until these are properly understood the success of the process and technical improvements will be restricted.

8.1 FUTURE WORK/ RESEARCH AREAS

Much work is required on the softer issues of integrating design and construction. How and why people interact in the way they do and why integration is not being achieved, when the benefits are very clear and attainable. As mentioned earlier in the report, most of the definitions of integration relate only to the sharing and exchange of information.

They do not cover the alignment of goals, working as teams; all of which are extremely important yet are not being achieved due to the inherent adversarial nature of the industry. A suggested definition for the integration is "The agreement and commitment to work towards a set of aligned objectives enabling the effective and efficient sharing of information and knowledge by all parties involved throughout the project process." The tools and techniques that will improve the effectiveness and efficiency of this are being developed. It is this softer cultural issues that need addressing, and where there is currently very little work being carried out.

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APPENDIX C PAPER 3

THE CULTURAL WEB – AN INDUSTRIAL CASE STUDY

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Abstract

The culture of the construction industry has long been recognised as being adversarial in its nature, with competing allegiances for an individual – to an organisation, to an occupation and to a particular project. There is an increased understanding of the importance of people issues and culture in achieving business success. Changes in management theory have reflected this, with the increased use of holistic models such as the EFQM Excellence Model. Some companies within the industry are trying to address the inherent cultural programmes as part to their change programme. This paper reports on an organisation's attempts to capture its current culture using the 'Cultural Web', compare this to its desired culture and initiate a change programme to address the gap. It details the methodology used and concludes that adversarial attitudes are still inherent within the organisation. It also concludes that in order to address the issues, an industry recognised model needs developing to allow proper benchmarking and comparison between different organisations, different projects and different occupations. This will then lead to an industry wide appreciation of where the issues lay.

Keywords: Cultural Web, Change, Design and Construction, Organisational Culture

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1 INTRODUCTION

This study is part of an Engineering Doctorate programme looking at the integration of design and construction. Initial findings of this work have identified a need to understand and address the inherent adversarial culture that exists within the industry (Anumba and Evbuomwan 1995). Within construction there are different and often competing allegiances for an individual – to an organisation, to an occupation and to a particular project. There are deep-rooted differences in attitude between the various occupations within the industry. This commences in the higher education establishments (Moore and Dainty 1999), and then reinforced by the professional institutions (Faulkner and Day 1986). There is clearly a challenge for the construction industry to manage and influence its culture. For this to happen, it is first necessary to define and then develop a conceptual model of what culture is. It is typical of many soft issues, that a single accepted definition or model of culture does not exist (Riley and Clare-Brown 2001). Riley (2001) cite many authors who have researched the number of different definitions, including Kroeber and Kluckholn (1952) who identified 164 separate definitions of culture. 50 years later and there is still no accepted single definition of culture. This coupled with the small amount of research being undertaken with the construction industry means that comparison to associated work is severely limited.

2 CASE STUDY

2.1 OVERVIEW – A NEED TO CHANGE

The case study business unit is a large multi-national design, engineering and construction company, employing about 800 people. Its structure represents its belief that, having integrated teams spanning the occupations within the industry, reduces the barriers between different groups and provides for better services for its customers. It has two main offices; one in the midlands and one in the north-west. 2/3rds of the business unit's employees are based out of the Midlands office, although some are site located. The case study business unit and its parent organisation have undergone significant restructuring over the previous two years, with the latest changes occurring one year before the study took place. It is accepted that cultural change is necessary within the construction industry (Egan 2002) and within the business unit. This is driven by current economic pressures and specifically for the business unit, its parent organisation striving to change the way in which it works and how it is perceived. It is endeavouring to move away from being perceived as a low margin construction contractor to a perception as a high-value professional services provider. Significant reduction of overhead had been achieved in the year leading up to the study. The case study business unit has successfully utilised the European Foundation of Quality Management (EFQM) Excellence Model over the past five years to help deliver business improvement. The Excellence Model consists of nine criteria, with strong emphasis on people and people results (EFQM 1999). Its increasing use by businesses from all sectors, reflects the current shift in management philosophy, encompassing a more holistic view of a company, with an increased understanding of the importance of people and cultural issues. This study was undertaken as a response. The aim of this

study was to assess the current culture of the business unit, compare this to the desired culture of the 'new organisation' and to carry out a gap analysis. The results of this study would then be used to initiate a change programme to address this gap.

2.2 METHODOLOGY

A steering committee was established to review the proposed methodology, the results and decide on actions to be carried forward. It included the principal author, the Operations Director (OD) and a senior manager from each of the offices. The programme was divided into 6 phases. Phase 1 - Toolkit Design, Phase 2 – Validation of Toolkit (Pilot Scheme), Phase 3 –Data Collection, Phase 4 –Results Production, Phase 5 – Results Analysis and Phase 6- Final Report.

2.2.1 PHASE 1 - TOOLKIT DESIGN

The model chosen to map the culture of the business unit had been pre-selected by the OD. The 'cultural web' is '*a representation of the taken-for granted assumptions, or paradigm, of an organisation and the physical manifestations of organisational culture*'(Johnson and Scholes 1999). The cultural web maps the culture of the sample group under seven criteria: (1) Control Systems (focuses on what is important to monitor in an organisation, and are used to influence behaviour); (2) Power Structures, (not just based on seniority); (3) Rituals and Routines, (routines define how an organisation's people behave towards each other. Rituals reinforce the way things are done within the business); (4) Organisational Structures, (reflects the power structure and delineates important relationships and also what is important); (5) Symbols, (portray the image of the company and the individuals within the company both internally and externally); (6) Stories, (embed the present in its organisational history and flag up important events and personalities); and (7) Paradigm, (clearly identifies the key aspects of the culture of the overall company).

Investigation was undertaken to help in the development of a toolkit for the data collection. Various techniques were considered. Significant restrictions were placed on the time involvement of the sample group, limiting individual participation to one hour. Initial work concentrated on the production of a closed questionnaire, which was to be web enabled, based around a similar model used for the CIRIA Design KPIs (CIRIA 2001). However, early tests with the pilot group showed this to be too prescriptive, with meaningful results not able to be ascertained without significant development and testing. Individual interviews were also considered but, due to the time scale of the overall project, these were rejected. It was decided, in conjunction with the steering committee, that a group workshop should be utilised, with each participant given the opportunity to contribute in an open ended questioned environment in front of their peers. Guidance notes on the cultural web, including suggested open questions to answer and an example of a cultural web from a non-construction company, were produced and issued prior to attendance.

It was agreed that an existing questionnaire, 'The Organisation Climate Questionnaire'(OC Questionnaire), developed by a consultancy firm, that had been used previously by the case study organisation, should also be used.

2.2.2 PHASE 2 - VALIDATION OF TOOLKIT

A small pilot group was selected to trial the workshop methodology. Post participation comments were collected, then fedback into the process. As a result of this, additional material was provided to the participants to assist in the formulation of their outputs.

2.2.3 PHASE 3 - DATA COLLECTION

The sample group was chosen as a random representative sample group. The sample group was to be sub divided firstly by location, (the two main offices) and secondly by level of seniority (Level) – Heads of Department (HOD), Principals, Seniors and Graduates. It was an anonymous sample group; identification was by Level and location only. Eight workshops, four in each location, were set up with between 4-13 people invited to attend each workshop. The guidance notes were issued to each participant one-week before the workshop. A letter from the OD, inviting participation, was issued to the sample group confirming that all results would be anonymous. At each workshop, the facilitator gave a brief explanation of each of the criteria. Two examples for each criterion were also given to the group. These were not included in results. The attendees were then invited to write down their perceptions and capture these under each of the criteria. The facilitator prompted the group throughout this period with pre-determined new focal areas to consider, offering opposing scenarios for each area. During the period the facilitator grouped the responses, mechanical content analysis (Krippendorf 1980) and in each session the final 15 minutes were allowed to review these groupings and gain consensus. Each participant was given the opportunity after the workshop to add comment on any issues that had not been recorded. These comments were incorporated into the results.

The OC Questionnaire was mailed electronically to a different sample group. A demographics sheet was attached to each OC Questionnaire. The representative sample group was again anonymous, identified by location and Level. The participants were asked to complete the OC Questionnaire in their own time.

2.2.4 PHASE 4 - RESULTS PRODUCTION

A mindmap or tree diagram was created for each group immediately after each workshop. The language was not changed. Where there were similar responses, these were grouped under new headings - interpretative content analysis (Krippendorf 1980). The results were then combined by Level and also by office location. A desired cultural web was also produced. This was compiled from a document issued by the parent company entitled " Vision, Values, Goals and Roles & Responsibilities". This clearly defined the desired culture of the organisation. A previous study had been undertaken by employees (including the OD) on the parent company's Executive MBA programme. They had produced a cultural web of the desired culture of parent company. These results were incorporated into the desired cultural web. The business unit had produced its own vision and objectives document. Issues from this document were also included in the desired cultural web.

The OC Questionnaire has an analysis programme that maps the results and identifies cultural characteristics of the sample group under eight criteria. The criteria are Formal

Control, Initiative, Recognition, Communications, Personal Contact, Team Identification, Goal Clarity and Work Standards. The sample data was inputted into the programme, which produced a profile of the culture of the organisation.

2.2.5 PHASE 5 – RESULTS ANALYSIS

The results were initially presented to the steering committee. It was agreed that further analysis be undertaken and re-presented to the steering committee. This was split into two areas. Firstly, a qualitative content gap analysis was carried out for the combined cultures of the two offices against the desired culture of the business unit. Secondly the difference between the two office locations. The results of the analysis were reviewed and agreed at the next steering committee meeting.

2.2.6 PHASE 6 – FINAL REPORT

A presentation of the results was prepared and presented to the senior management team. It was suggested that this team needed to agree the desired culture. Each member was issued the document and given the opportunity to comment if there were any disagreements. No comments were received. The final report included suggestions on a process on how to address the gap. This was accepted and agreed to be part of the next change programme.

2.2.7 VALIDITY OF METHODOLOGY

Ford *et al* (2000), cite Guba and Lincoln (1982) when offering criteria for evaluating and strategies for assuring the rigor of qualitative research projects. They argue that the data collected must satisfy four characteristics: Internal Validity (truth value); External Validity (applicability or transferability); Consistency, reliability or dependability; and Objectivity. Internal validity was gained through the anonymity of the attendees, voluntary attendance, the consensus process, the opportunity for further comment and the two methods of data collection. External validity was fostered through the researcher's long term involvement with the organisation, and current position as a full-time research engineer. The large sample group that was engaged, and the same facilitator being used in all workshops assisted in achieving consistency. Objectivity was improved by research of the subject area prior to the study by all members of the steering committee. Initial results were grouped but the language used by the attendees was not changed. These results were discussed and reviewed by the committee and agreement reached.

2.3 RESULTS

2.3.1 OC QUESTIONNAIRE RESPONSE RATES AND DEMOGRAPHICS

The total sample group was 66; 46 (70%) from the Midlands and 20 (30%) from the North-West. The response rate for the Midlands was 48% and for the North-West 20%. Eleven functions were represented in the sample group. 77% of the total sample group had been with the company for over 3 years. The remaining 23% had been with the company less than six months.

2.3.2 WORKSHOP ATTENDANCE

	Midlands Office				North -West Office				*TOTAL*
	Work-shop	**I**	**ii**	**iii**	**Work-Shop**	**i**	**ii**	**iii**	
HOD	A	9	8	89%	E	7	3	43%	69%
Principles	B	13	9	69%	F	12	6	50%	60%
Seniors	C	12	7	58%	G	11	7	64%	61%
Graduates	D	8	6	75%	H	4	2	50%	67%
TOTAL		42	30	71%		34	18	53%	

Table I – Attendance Analysis of Workshops

i = number invited to workshop, ii = number attended, iii = % attended

At each workshop, after the facilitator had concluded the introduction, all attendees were asked whether or not they were happy to participate in the session. Three attendees at separate workshops expressed that they were uncomfortable in taking part. The first was because the person felt that their perceptions were not relevant. After a brief discussion, the attendee agreed to take part although prompting was necessary to gain active participation. The second was a representative from the Human Resources Department who thought that some of the outcomes would be as a direct result of their department's actions. They asked to stay in the workshop to observe initially and take part if she felt comfortable. This was agreed and full participation followed. The third was a Head of Department who was aware of new changes in structure that had not yet been announced. They were distinctly uncomfortable with this scenario although he did stay and participate fully in the workshop.

For both the OC Questionnaire and the workshops the participation rates from the Midlands office were significantly higher. In discussions with the steering group this was thought to be the fact that the OD was based in the Midlands office and had limited interaction with the North-West employees.

OC Questionnaire Results – Organisation Profile

Table II shows the cultural profiles for each of the offices as produced by the OC Questionnaire programme. As can be seen the offices report to have similar cultures (within 15%) for six out the eight criteria. The programme offers two extreme profiles for each criterion (as shown for Formal Control and Work Standards) and calculates and score based on the results and this positions the organisation between the two extremes. The score is not shown in Table II. Table II shows the percentage difference in the scores between the two offices.

	Midlands Office	North West Office	Deviation *
Formal Control	Telling Style Hierarchical, Too much written communication	Involving style, Trusting management, Values delegated responsibility	+30%
Initiative	Don't listen; Withhold information; Conformity; Systems; Policies; Procedures.		+5%
Recognition	Non expressive; Values loyalty		-5%
Communications	Reactive communications; Need to know basis, Formal style Hierarchical circulation		+5%
Personal Contact	Low, Formal, Benefits geared to money, Task orientated		+15%
Team Identification	Focuses on individual, Talks about weaknesses, Values, power/influence		-10%
Goal Clarity	Reactive communications,Need to know basis, Formal style Hierarchical circulation		-5%
Work Standards	Imprecise work direction Low profile management Peaceful life, no complaints	More precise delegation More focus on results and method	-20%

Table II – Profile of Offices produced from Organisation Climate Questionnaires
* North – West Office is the benchmark

2.4 RESULTS ANALYSIS

2.4.1 GAP ANALYSIS 1 - DESIRED CULTURE AGAINST ACTUAL CULTURE

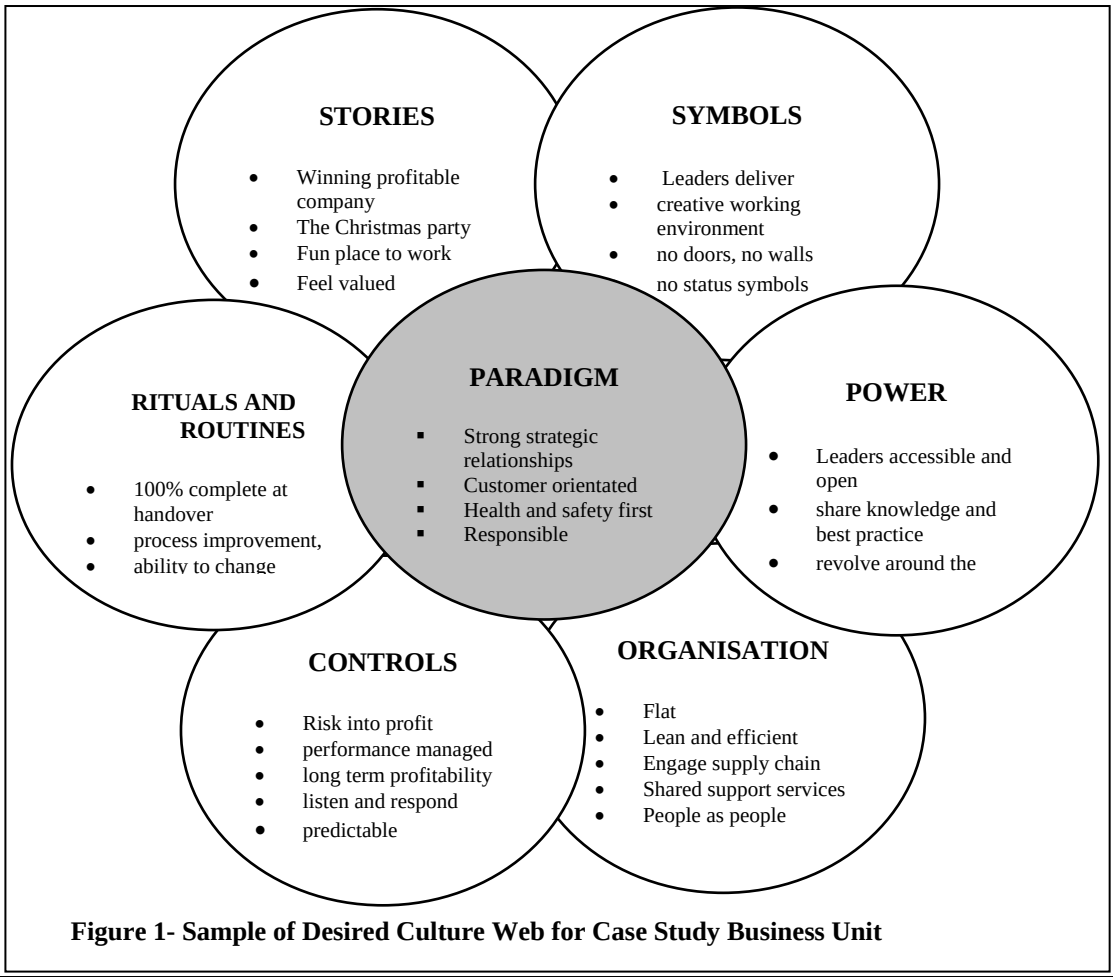


Figure 1- Sample of Desired Culture Web for Case Study Business Unit

FOR BUSINESS UNIT

As discussed above, the desired culture was produced and the gap analysis carried out prior to being presented to the Senior Management Team. Post presentation, the desired culture was formally accepted. Figure 1 shows part of the desired culture. Following the gap analysis of the results fourteen areas requiring change were identified and presented to the Senior Management Team. These were:

1. Supply Chain
2. Reward and Recognition
3. Structure
4. Risk
5. Attitude
6. Team working
7. Feedback, Learning and Improvement
8. Communication
9. Social Activity
10. Training
11. Health and Safety
12. Inductions
13. Alignment of Offices
14. Empowerment

For each of the areas, the desired cultures were mapped against the perceived cultures. A pro-forma has been developed for the next stage of the change process. It is suggested that, for each area, a project team is chosen to deliver the expected results. The pro-forma is based around RADAR logic used for the EFQM Excellence Model (EFQM 1999). RADAR is an acronym for Results, Approach, Deployment, Assessment and Review. It works on the premise that to deliver excellence in business, the results must be pre-determined. Once results are determined, then the approach of how to achieve these results must be planned and developed. The approach must then be effectively deployed and this deployment must be assessed and reviewed to determine not only the success of the deployment but also to identify changes that may be required. Once this has been reviewed then the cycle is repeated. The RADAR logic is cyclical and continuous, and can be applied to most business situations that involve a process. The pro-forma provides a structure to the process stages through which the identified area can be addressed.

2.4.2 GAP ANALYSIS 2 – DIFFERENCES BETWEEN EACH OFFICE LOCATION

The underlying culture within each office is consistent, with over 60% of the same issues being identified in both offices. However, there are some significant differences between some of the areas.

- **Controls**

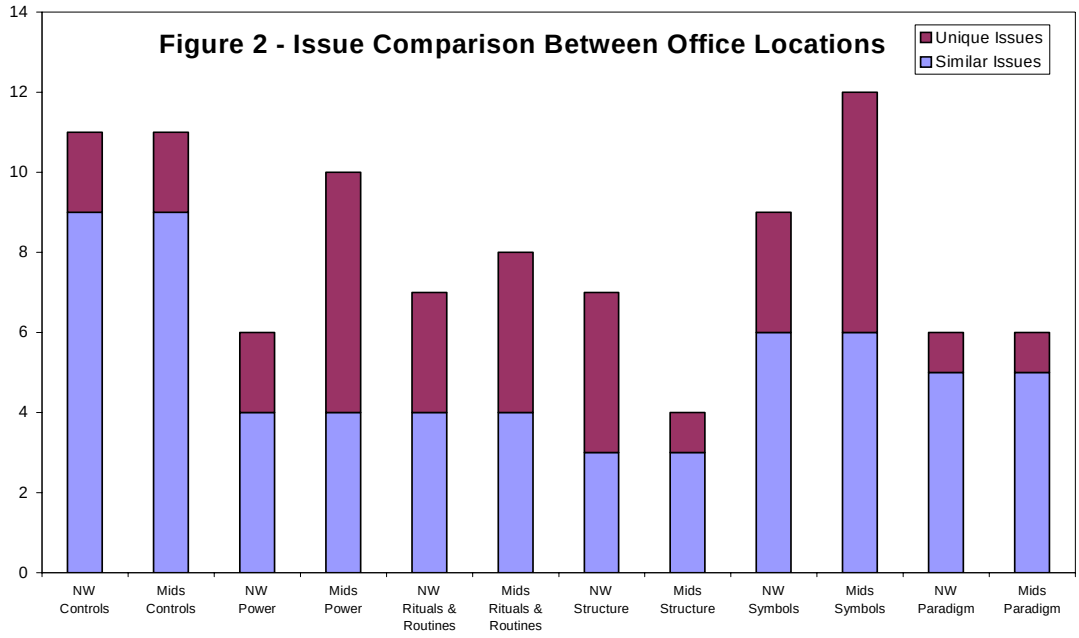
The Midlands office appears to be more autocratic, with comments such as ‘ a form for everything’. There appears to be a clear understanding of the control mechanisms although some resistance is apparent to some of these mechanisms. The North West Office appears to experience some confusion as to where the authority lies. This is thought to be because most of the senior managers reside in the Midlands Office.

- **Power**

Clear differences occur between the two offices with regards to power. The power base is very much centred around the Midlands office; there is some resentment to this from the employees of the North West office. The same issues are apparent in both offices regarding the distribution of power between the functions. The inherent culture within the industry.

- **Rituals and Routines**

The office locations are very different. The North West Office is positioned on a business estate next to the motorway. The employees mainly commute to office. The Midlands office is in a town with many of the employees living in or around the town. There is therefore a large difference in the social interaction that takes place within each office. This lack of social interaction could account for the issues identified with communication. Within the North-West office there is perceived to be 'whispering communication' with small groups holding information. The other significant difference appears to be in the meetings culture between the two offices. There is a perception that there are more meetings in the Midlands Office with comments such as 'Meetings, everywhere, everyone'.



- **Structure**

The main differences in structure relate to sales focus and integration. There is a new perceived focus on sales within the Midlands Office. This is as a result of the appointment of a new Marketing Director, based in the office and also a clear push by all the leadership team. This is not perceived to be matched in the North West office. The perception of the employees in the North-West office was that there appears to be a significant move towards becoming an integrated company, especially within the overall parent organisation. Within the Midlands office there was a lack of 'buy in' to this philosophy, with a desire to be more focused on themselves as an autonomous unit.

- **Symbols**

There is significant difference between the two locations. One is a new modern, high specification office block with heating and ventilation systems. The other is a 1960's

office block of low specification and provides for a poorer working environment. Both offices are now open plan although, at the time of the study, five of the main Directors had their offices on the top floor of the Midlands office. This was known as 'the ivory tower' and was resented by many of the employees. Since the study, some of the Directors have moved onto the floor plates.

- **Stories**

The history of each office is very different. One has been on the same location for over thirty years, and has changed name and ownership several times during that period. Many of the current employees have been with the company for a significant time. Seven years ago the Midlands office was very successful and was at full capacity. Since then, major changes have occurred with new top level management employed. This office is now at approximately 60% capacity. The other is a new office in a new location and has come about by the closing of two separate offices. The stories are therefore particular to each office. The changes have had significant impact on both groups of employees, with uncertainty being expressed by both.

- **Paradigm**

The paradigm for each office is very similar, the main difference being in the perception that the power and decisions are all made in the Midlands Office.

2.4.3 ADDITIONAL ANALYSIS

Additional analysis was carried out using the same techniques. This included looking at the differences between each Level within an office environment, combined Levels across the offices, and also differences between the same levels across the offices. The detail of these results was deemed to be too specific for this paper and therefore have been omitted. These results have, however been prepared for submission to the members of the project teams tasked with delivering the change programmes.

3 DISCUSSION

When presenting the results to the senior management team, the current economic situation of the business unit was discussed. It was felt that due to downsizing of operation and redundancies being made, including some made between the penultimate and last workshop, this had had a significant impact on the results. It was stated that in all the workshops, positive as well as negative perceptions had been requested. The extent to which the current circumstances prevented the 'true underlying' culture being captured could not be assessed. The results however were used to identify gap areas between the perceived and the desired cultures. These areas once identified were then used to initiate further investigation within the change programme. It was thought that although there may be implications in some of the micro results, the macro areas were still representative of the underlying culture.

The sample groups were split by Level, with individuals asked to record their own responses in front of their peers. In all sessions, the trained facilitator endeavoured to ensure that all attendees were able to capture their own perceptions without being influenced by the group. It could be argued that because the sample group was divided by level then the overriding 'group culture' should be captured. Is the culture of an

organisation the sum of the individuals' perceptions or a collective response? This has particular relevance for the consensus process that was utilised. Clearly in the workshop sessions, there was strong alignment between the responses, which enabled consensus able to be achieved. An alternative approach could have been to hold the workshop over two sessions, with analysis undertaken between the sessions. Individuals could be asked to review the analysed data, feedback comments and then attend a second consensus meeting to review and agree the results. Another process improvement could have been for trained observers to assess the group dynamics within each workshop. These observations could then be recorded and used to provide additional data to assist in the analysis process. This happened for the first two workshops, before the trained person was unable to continue with the process. A substitute was not available. This data was not included in this report.

There was no ranking of importance for the issues identified. This would have improved the quality of the data, but in the time available this could not be achieved.

4 CONCLUSION

The underlying adversarial culture of the industry still exists within an integrated design and construction company. The belief is that this is of a lesser extent than exists between non integrated companies. This study looks at culture only within an organisation. The competing cultures, from the project and from the occupation, all have an impact on the individuals when considering the organisation's cultures (Riley and Clare-Brown 2001). The implications of these competing allegiances required further investigation and are thought to be critical in understanding the adversarial nature of the industry culture. There is a need for an industry-recognised model for capturing and representing culture. This would enable benchmarking to be used, which would provide the opportunity for greater understanding between different organisations, projects and occupations. The cultural survey based on the NEDO model of culture (NEDO 1990) has been used to compare construction companies and also companies within other industries(Riley and Clare-Brown 2001).

Location and history have a significant impact on an organisation's culture. The offices within the case study organisation have the same processes and procedures, the same terms and conditions and the same senior management team, yet they have major differences in their cultures.

The results of this work have been used in development and implementation of the Integrated Business Improvement System (IBIS) which has been developed as part of the engineering doctorate programme. The IBIS uses the EFQM Excellence Model as a framework to ensure a holistic approach is undertaken in the management philosophy of a company. It is based around Change Action driven by Results (CAR) which uses objectives, critical success factors and performance measurement to focus and drive business improvement (Beatham, Anumba, Thorpe *et al.* 2003). Having engaged in the study it is critical that the organisation is seen to be acting upon the results.

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APPENDIX D PAPER 4

KPIs – A Critical Appraisal of their Use in Construction

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Abstract

Traditionally businesses have measured their performance solely in financial terms. This limited approach has been challenged, with the introduction of the concept of Key Performance Indicators (KPIs) for non-financial results. In response, to the Latham and Egan reports, the UK construction industry has developed its own set of KPIs. However, their effective use has been limited. This paper reviews these and other construction KPIs and concludes that most of the KPIs used are post event, lagging measures that do not provide the opportunity to change. Their results are not validated and thus are open to interpretation. The result is that KPIs are being used within the industry as a marketing tool, and not as an integral part of business management. This paper distinguishes between three types of measure and suggests a framework for their effective use within an overall performance measurement system based on Change Action driven by Results (CAR).

KEY WORDS: Performance Measurement, KPIs, Continuous Improvement, Construction, EFQM Excellence Model.

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1 INTRODUCTION

The construction industry has been accused of being, at its worst, wasteful, inefficient and ineffective. In 1999 the industry wasted over £1billion due to errors and rework (Nicholson 1999). The construction industry has long been recognised as having problems in its structure, particularly with fragmentation which has inhibited its performance (Latham 1994, Egan 1998). Competitive pressures from within the industry, as well as external political, economic and other considerations are forcing the industry to re-examine and improve its modus operandi (Anumba *et al.* 2000). The government, as the largest client of the industry, has led the drive to change, with clear targets for improvement being set following the 'The Egan Report' in 1998.

> *" The industry must replace competitive tendering with long term relationships based on clear measurement performance in quality and efficiency..(by) producing its own structured, objective performance measures agreed with clients.…Construction companies must prepare comparative performance data and share it with clients and each other without compromising legitimate needs for confidentiality." (Egan 1998)*

The RSA (Royal Society of Arts, Manufactures and Commerce) said about the role of tomorrow's company: "To achieve sustainable business success in the demanding world marketplace, a company must…use relevant performance measures" (RSA 1994). Neely, (1999) gives seven reasons why performance measurement is now on the management agenda. All of the points are relevant to the construction industry: the changing nature of work; increasing competition; specific improvement initiatives; national and international quality awards; changing organisational roles; changing external demands; and the power of information technology.

This paper presents a brief overview of performance measurement and performance measurement systems, before appraising the use of KPIs within the construction industry. Having appraised the current use of KPIs, the paper discusses the key aspects of performance measurement and suggests using the criteria of the EFQM (European Foundation of Quality Management) Excellence Model as a way of differentiating between the three different types of measure: Key Performance Indicators, Key Performance Outcomes and Perception Measures. It then comments on five principal criticisms of the use of KPIs within construction before concluding and making recommendations.

2 METHODOLOGY

Fellows and Liu (1997), highlight five research styles: experiment, survey, action research, ethnographic research and case study. Steele (2000) extends this and includes process modelling. This study is based upon a combination of research methodologies. A detailed literature review, including a Web-based search and a review of academic and industrial literature, was undertaken. Action research was carried out by the first author through participation as the project manager for EFQM-based development projects within the case study organisation and as member on the steering group for the development of the CIRIA Design KPIs toolkit. Ethnographic research was carried out as a senior assessor for EFQM Excellence Awards. Informal discussions were also

conducted with in-house experts, representatives on benchmarking clubs, business unit representatives and leading industry practitioners. A survey on the use of the CIRIA KPI toolkit was undertaken using a questionnaire to assess the qualitative perceptions of the sample group and an open ended interview with the Head of Design Management within the case study organisation. This enabled a detailed understanding of the use of KPIs within the industry and also ascertained the industrial requirements. A gap analysis was then undertaken to establish the differences between current industry practice and the characteristics of an effective performance measurement system. The findings of this work have informed the development of a clearly defined structure for the use of performance measurement within the industry, the identification of weaknesses in the current practice and highlighting areas of further work necessary to ensure the use of performance measurement is sustained and adds value to the industry.

3 PERFORMANCE MEASUREMENT SYSTEMS

Traditionally businesses have measured their performance in financial terms, profit, turnover etc. These financial measures of performance have been the sole measures of a company's success. Performance measurement that has been based around financial measures has been deemed to be out of step with recent changes in industry, particularly relating to new technologies and increased competition (Kaplan and Norton 1992). Performance measurement is furthermore criticised because it often focuses narrowly on easily quantifiable criteria such as cost and productivity, while neglecting other criteria important to competitive success (Sink 1985). Bourne et al (2000), having conducted a review of the literature, cite examples where traditional performance measures, developed from costing and accounting systems, have been criticised for encouraging short termism (Banks and Wheelwright 1979, Hayes and Garvin 1982), lacking strategic focus (Skinner 1974), encouraging local optimisation (Hall 1983, Fry and Cox 1989), encouraging minimisation of variance rather than continuous improvement (Johnston and Kaplan 1987, Lynch and Cross 1991), not being externally focused (Kaplan and Norton 1992) and even for destroying the competitiveness of the US manufacturing industry (Hayes and Abernathy 1980).

The subject of performance measurement is vast and numerous authors continuously add to the body of literature on the subject. Between 1994 and 1996 alone, one new paper or article on the topic appeared every five hours of every working day (Neely 1998).The amount of literature on the subject demonstrates the problems that exist with performance measurement and its importance within the business community. Most authors agree that managers measure for two main reasons. Either they want to know where there are and what they have to improve; or they want to influence their subordinate's behaviour (Neely 1998). Strategic control includes both of these reasons. Initially strategic control was seen as enabling managers to see if their chosen strategies were being successfully implemented (Lorange *et al.* 1986). This view has since been extended. Humans can be seen as 'calculative receptors', their behaviour can be influenced by a strategic control system. They receive a stimulus, interpret this, assessing the perceived costs and benefits of various responses and are likely to chose whichever course of action will maximise their gain. Control through measurement and feedback follows action. Rewards or sanctions are then used to reinforce or modify behaviour depending on the employee's performance and on the appropriateness of the action pursued (Hrebiniak and Joyce 1984). A broader view is that strategic control systems

will: co-ordinate the efforts of employees; motivate individual managers; and alter direction dependent on circumstances (Goold and Quinn 1990). Another view is that strategic controls can be used as a means of:

1. Clarifying what good performance is;
2. Making explicit the trade-offs between profit and investment;
3. Introducing individual stretch targets;
4. Ensuring that corporate management knows when to intervene because business performance is deteriorating.

(Bungay and Goold 1991)

Neely, (2000) summises that strategic control systems have multiple roles to play and given that many authors argue that performance measurement is part of the strategic control process then it follows that performance measures also have different roles to play. Table I shows some of the multiple reasons why organisations measure performance. According to Neely, (1998) these reasons can fall into one of four distinct categories:

Checking Position

Establishment of current status and monitoring of progress over time and against benchmarks.

Communicating Position

This can be a requirement, quoted firms must release annual reports, safety statistics must be submitted in construction, they may be expected by customers or employees, and also as a means of marketing themselves.

Confirm Priorities

Performance data provides insights into what is important to a business, exposing shortfalls allowing organisations to rationalise and focus on what the priorities should be.

Compel Progress

The measures can help the organisation focus on specific issues and encourage people to search for ways to change and improve performance. The measures communicate the priorities and can form the basis for reward.

It is clear from the research that performance measurement is only part of the business improvement process. Unless action is taken based on the results attained then the measures are meaningless, costing money to obtain and not adding value to business (Bourne *et al.* 2000, Neely and Bourne 2000). Performance measurement must therefore be part of a system, which reviews performance, decides on actions and changes the way in which the business operates. It is widely recognised as a mechanism whereby business performance can be enhanced by developing and implementing a balanced set of measures, (Hall 1983, Kaplan and Norton 1992, Neely *et al.* 1996, Lantelme and Formoso 1999) This is backed by a survey of more than 200 executives, which concluded that measurement managed companies exhibit better performance compared to other companies that do not use performance measurement as a key management tool. (Schiemann and Lingle 1999). It is the translation of the results into action that is crucial to achieving to improved performance.

WHY MEASURE ?	Check Position	Communicate Position	Confirm Priorities	Compel Progress
To establish position	✓			
To monitor progress	✓			
Because the organisation has to	✓	✓		
Because the organisation wants to communicate performance to shareholders or customers		✓		
Because the organisation or others want to be able to benchmark performance		✓	✓	
Because measures stimulate interest		✓		✓
Because measures can be used to communicate priorities		✓		✓
Because measures provide a means of motivating people to look for ways of improving performance				✓
Because measures provide a basis for reward				✓
Because measures provide a means of management control	✓			
Because measures provide a means of cost control	✓			
Because measures provide a an insight into what is important for the customer	✓		✓	
Because measures provide a an insight into what the business is doing well	✓		✓	
Because measures provide a an insight into what the business is not doing well	✓		✓	
Because measures provide a an insight into what the business needs to focus on			✓	✓
Because measures provide a an insight into where the business should invest			✓	✓

Table I – Why Companies Engage in Performance Measurement. (Neely 1998)

3.1 BENCHMARKING

A key part of a Performance Measurement System (PMS) is the use of results to aid the decision making process. Benchmarking and continuous improvement are current

buzzwords within the construction industry and are often considered synonymous with performance measurement. Alarcon et al (1998), state that " performance measurement and benchmarking is the cornerstone of challenging any industry to become world class. A strategic benchmarking initiative has most to contribute towards their change culture, process, improvement of performance and productivity. Benchmarking enables an organisation to identify its performance gaps and opportunities, and develop continuous improvement programs for all stages of their process" (Alarcon *et al.* 1998). Benchmarking is defined as:

> *A process of continuous improvement based on the comparison of an organisation's processes or products with those identified as best practice. The best practice comparison is used as a means of establishing achievable goals aimed at obtaining organisational superiority. (McGeorge and Palmer 1997)*

McGeorge and Palmer (1997), suggest that there are three levels to benchmarking. Level 1 is internally, within the company, which allows comparisons between different departments and also progressive reviews to measure attainment of targets set. This can be used to identify areas of best practice within the company, which could be transferred throughout the company. The challenge to the company is to identify the best practices that are transferable. Level 2 focuses on organisations' competitors, i.e. other companies within the industry. This comparison attempts to compare the organisation's processes with organisations that produce and sell the same products or services, particularly those with commercial advantage. Level 3 is the comparison with other industries, often referred to as functional/generic benchmarking. This type of

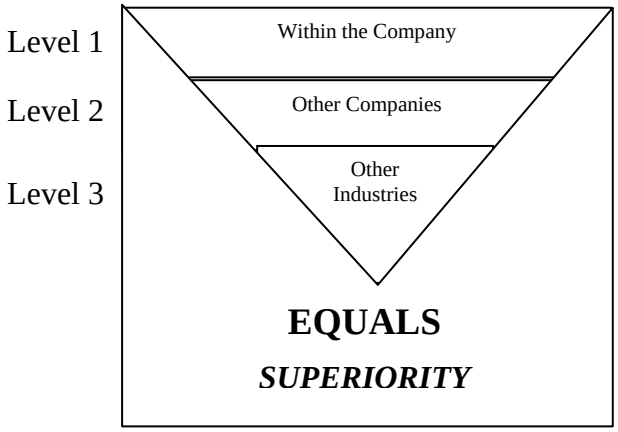


Figure 1-The Objectives of Success Using Benchmarking. Adapted from McCabe (2001).

benchmarking is thought to lead to the most change in an organisation's process. This is because it involves comparisons with those that are best in class. Also, because the organisations involved are not in competition, they are more likely to be prepared to share the secrets of their success. This provides the greatest opportunity for superiority. See Figure 1.

Benchmarking is key to adding value to performance measurement. Results are compared to benchmarked data and decisions are taken based on this comparison. As mentioned previously companies have traditionally measured themselves with financial measures. Companies have used these financial measures both as internal benchmarks -

Level 1 and also as competitive benchmarks - Level 2 & 3 (e.g. Share Price). Financial measures are often externally audited and therefore they can be confidently used in benchmarking.

4 PERFORMANCE MEASUREMENT MODELS

Dr W Edwards Deming and Dr Joseph Juran are credited with enabling the post war recovery of the Japanese industry (McCabe 2001). Their theories on performance measurement, continuous process improvement and the importance of the cultural context of the firm, are accepted as being the catalyst that led to the Japanese dominating the electronic and automotive sectors. The Deming prize was the first major quality award, instituted in 1951 by the Union of Japanese Scientists and Engineers (JUSE). Its purpose was to recognise the use of 'Company-wide quality control' within organisations (Porter and Tanner 1996). This company-wide approach underlined the importance of a holistic approach to improvement and the importance of the cultural context of the firm in delivering its business objectives. Over recent years companies in Europe and North America, as a result of the success of Japanese companies, have begun to take a wider view of performance measurement, with various quality awards and theories being introduced during the 1980's. The Malcolm Baldridge National Quality Award, devised in America as a direct response to the threat that was being perceived with regard to the quality of Japanese imports and the European equivalent, the European Foundation of Quality Management (EFQM) Excellence Award are both derivatives of the Deming prize. They embrace the concept of Total Quality Management (TQM) and are becoming increasingly recognised as being vital to the continued success of companies. The key point to note is the shift away from solely financial measures and indicators and the incorporation of the measures into a performance measurement system.

> *" 1f senior managers place too much emphasis on managing by the financial numbers, the organisation's long term viability becomes threatened". (Kaplan and Norton 1996)*

There are many types of performance model, for the purposes of this paper we will briefly consider two of the better known; the EFQM Excellence Model and the Balanced Scorecard.

4.1 THE EUROPEAN FOUNDATION OF QUALITY MANAGEMENT (EFQM) EXCELLENCE MODEL

The EFQM Excellence model is a non-prescriptive framework, designed to allow companies to assess where they are on 'the path to excellence', understanding the gaps and stimulating solutions. It is a tool to help define and assess continuous improvement of an organisation, and is based on their eight fundamental concepts of excellence:

(1). Results Orientation

(2). People Development and Involvement

(3). Customer Focus

(4). Continuous Learning, Innovation and Improvement

(5). Leadership and Constancy of Purpose

(6). Partnership Development

(7). Management by Process and Facts

(8). Public Responsibility

4.1.1 OVERVIEW OF THE EXCELLENCE MODEL

The Excellence Model has been developed to enable the assessment of excellence against the above fundamental concepts. The model has nine criteria and starts on the left-hand side with Leadership. This is one of the 5 enabling activities which drive the 4 sets of results. The model flows naturally from the left to the right. The analogy of an arrow going through the centre of the model starting on the left, can be used to explain how the model works and how the different criteria are intrinsically linked. Any decision or action of an organisation requires leadership. This leadership decides the company's policy and strategies, drawing on the capabilities of its people and its partnerships and resources. Having decided upon its policy and strategy and ensured that its people, resources and partnerships are capable of supporting them, it then defines its processes which will deliver its customer results and its own key performance results. In delivering these results it also affects the employees (people results) and also the society in which it sits (society results). The model also requires continuous improvement through innovation and learning, so having achieved the results, the leadership must review them, alter the policy and strategy accordingly, develop the people and resources to implement the changes required and ensure that the processes are adapted to deliver the desired results. The cycle is continuously repeated.

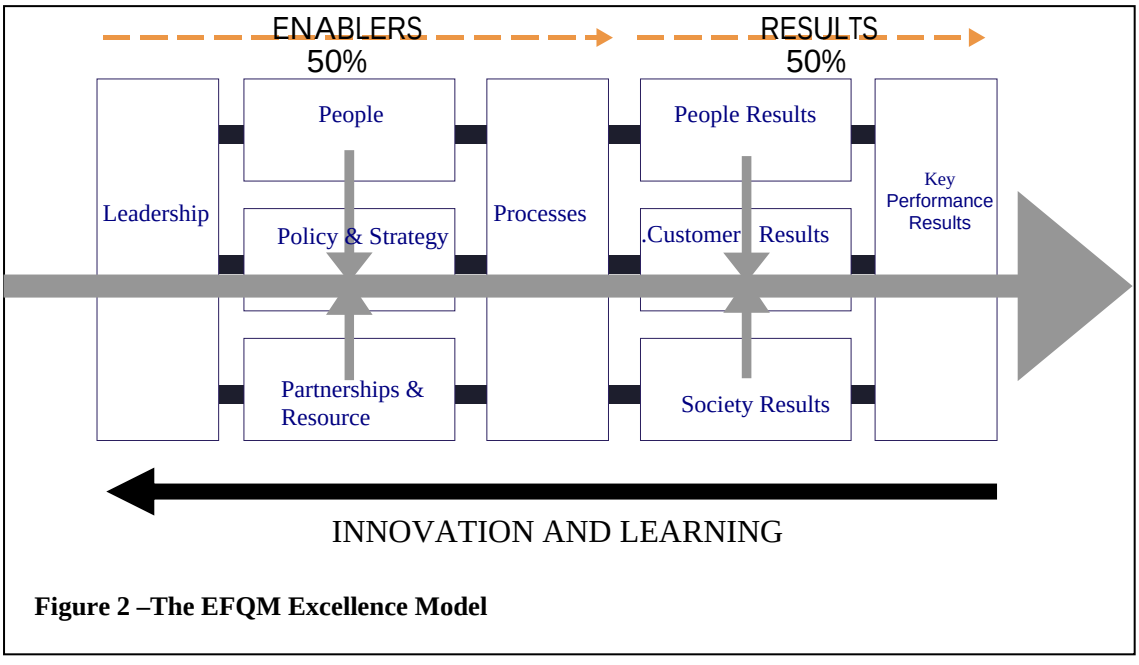


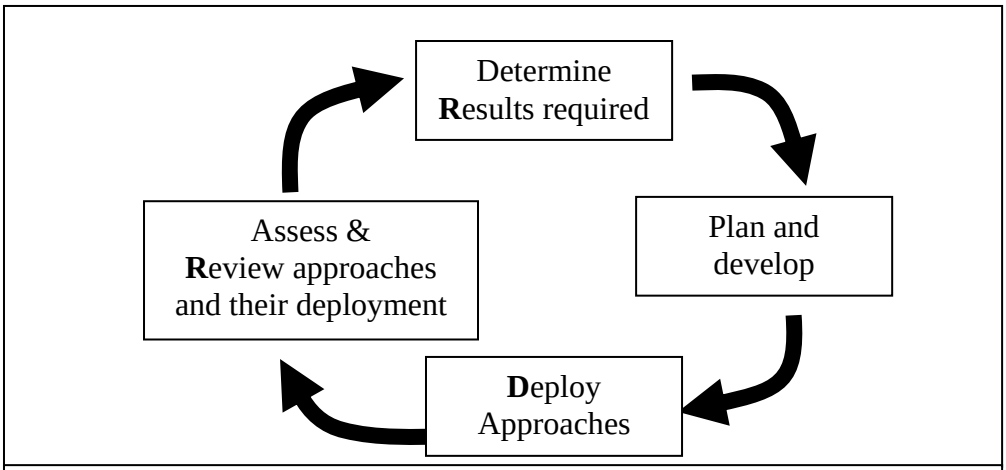
Figure 2 –The EFQM Excellence Model

4.1.2 THE EFQM EXCELLENCE MODEL AND SELF ASSESSMENT

The model is devised to be used as a self-assessment tool, which enables a comprehensive, systematic and regular review of an organisation's activities and results referenced against criteria within the model. There are 5 different approaches to self-assessment recommended by the EFQM. Dependent on the level of maturity with the excellence model, then the EFQM recommend the appropriate method of assessment. All the approaches deliver a score although only the more robust methods produce a score, which is comparable with those of the Quality Award Schemes.

4.1.3 RADAR LOGIC

The primary objective of the EFQM and their promotion of the use of the excellence model is to improve performance. The numeric score that is achieved is only used as a benchmark against which future performance is assessed. The primary objective of Self-Assessment is therefore the identification of strengths and of areas for improvement. The hope of the EFQM is that this process that will create the energy to improve the organisations performance. The EFQM have developed the RADAR® Scoring matrix, which is used by Assessors for assessing applications to the EQA and the BQA. The RADAR logic is cyclical and continuous, forms the areas of assessment on the matrix and is at the core of the EFQM Excellence Model It can be applied to most business situations that involve a process.



Fig**ure 3 – RADAR® Logic**

4.2 THE BALANCED SCORECARD

The Balanced Scorecard is a framework in which to understand the relationship between objectives, activities and results and integrate the management process. It can aid precise articulation of the organisation's objectives, the formulation of strategy, the generation of plans and budgets, and the setting up of an information system for performance monitoring and management (Smullen 1997). It also leads to a cascading set of indicators which will enable the units within the organisation to co-ordinate their targets and behaviour with the overall strategy of the organisation. The Balanced

Scorecard uses specific KPIs to assess the companies' performance. They must measure KEY strategic mechanisms for implementing and judging strategy for business.

4.2.1 SCORECARD PERFORMANCE INDICATORS

There are four areas where indicators are developed. These are:

1. The Financial Perspective - How do we look to our shareholders?
2. The Customer Perspective - How do our Customers see us?
3. The Internal Perspective - What must we excel at?
4. The Innovation and Learning Perspective - Can we continue to improve and create Value?

4.2.2 PRACTICAL ISSUES IN IMPLEMENTING SCORECARDS

There are key practical issues that are necessary for effective change within an organisation. These include top management support, and Smullen (1997) also recommends that a pilot project is used to develop the scorecard, suggesting that one is produced for a particular business unit and one for a critical business process. The other key issue is the development of and understanding of the strategy. The senior management must clearly identify the goals and how they are attempting to achieve these goals and also what are the constraints of the business in achieving these goals.

4.2.3 KEY POINTS FOR A SUCCESSFUL SCORECARD

Smullen (1997), refers to Rick Anderson of BP who identified five attributes for any performance measurement system:

acceptable - they can be understood

suitable - they measure important things

feasible - they are easy to collect

effective - they concentrate on encouraging the right behaviour

aligned- non financial measures must link to financial goals

Other key attributes include:

It must be the subject of a learning process

Must be balanced

Cascading Scorecards

Embody strength

Not over financial

It must be able to be implemented

5 THE USE OF KPIS WITHIN CONSTRUCTION

It is clear from above that performance measurement is only part of a system and that the various models, awards and theories have been developed over the years to assist managers in the use of measures as part of an overall system. These have been developed to assist in the production of the measures and also the translation of the results into improved activity. Within the construction industry KPIs is the collective terms for performance measures. Following the 'Latham Report' and the 'Egan Report', it has developed its own set of KPIs to measure its performance. The Egan Report set specific targets for improvement and based on this report the Movement for Innovation and the Construction Best Practice Programme (CBPP), both government-funded, were launched. The CBPP is recognised as the leading organisation involved in the production of KPIs within the industry, and this has been very successful in introducing many companies to the subject of performance measurement.

There are numerous other organisations with their own agenda for KPIs, including representatives from the Government Construction Clients Forum, Movement for Innovation, Housing Forum, Major Contractors Group, National Contractors Federation, Design and Build Foundation, Association of Consulting Engineers, Architectural Practices Benchmarking and the Construction Round Table. It is evident, that there is very little, if any, sharing of information between the groups with over twenty organisations developing their own KPIs. Some of the main examples are discussed below.

5.1 THE CONSTRUCTION BEST PRACTICE PROGRAMME CONSTRUCTION INDUSTRY KPIS – (CBPP)

The CBPP launched its ten headline KPIs in 1998. These are : Client Satisfaction - Product & Service, Profitability, Productivity, Defects, Safety, Predicatability –Time & Cost, Construction Time and Construction Cost. These headline KPIs were benchmarked within the construction industry sector and have been used by many companies within the industry. In January 2000, in the 'KPI Report for the Minister of Construction' (Raynsford 2000), these were broken down into KPIs at operational and diagnostic levels (Figure 4).

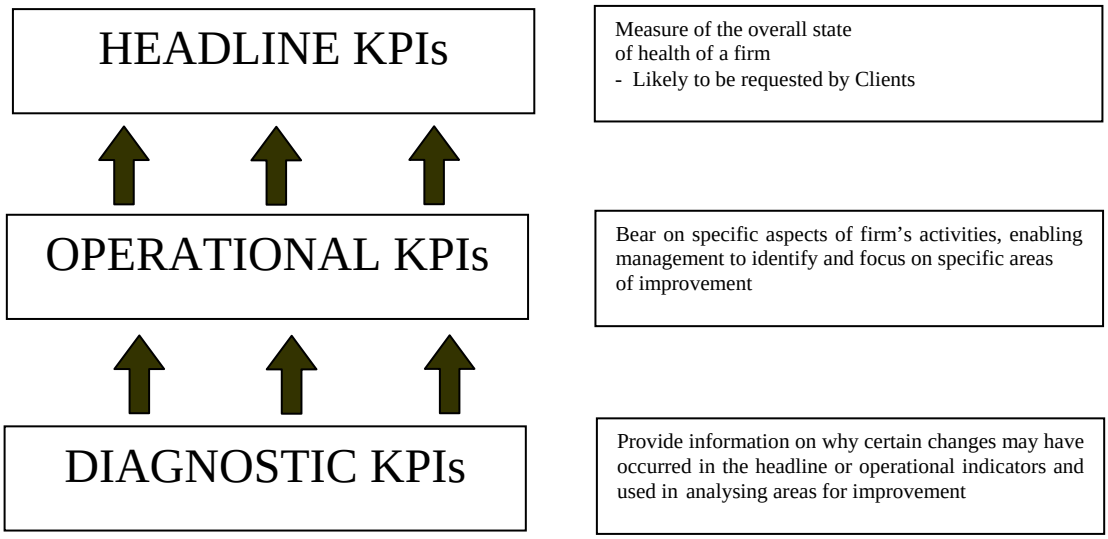


Figure 4 – CBPP KPI Diagram

Currently, there are in total 38 defined CBPP KPIs, within 7 criteria, across five stages of a project. The criteria are time, cost, quality, client satisfaction, change orders, business performance and health and safety. The KPIs are measured across different stages of a construction project. The stages were identified to provide definition of the data required to be used in the calculation of the KPIs. The report also takes into account the diversity of procurement methods available in the industry and attempts to rationalise the stages for each type of procurement. This was established to enable benchmarking to take place. The CBPP produces a wall chart each year showing 10 graphs, one for each headline KPI. These show the benchmark scores and allow an organisation's score to be benchmarked against a large sample across the industry. Other KPIs have all been developed around the original CBPP Construction KPIs. These include the Mechanical & Electrical Contractors KPIs –(M&E) and the Construction Products Association KPIs, both of which have similar measures to the CBPP Construction KPIs. To assist organisations in the implementation of KPIs, the CBPP have launched 'KPI Business Solutions'. This is a scheme whereby a trained advisor goes into an organisation and helps the organisation select the KPIs that meet the business needs, helps the organisation collect, calculate and present the results of the KPIs. They also advise in the analysis, action and review and re-measurement of the KPIs. The advisor acts as a normal consultant for a fixed fee.

5.2 THE ASSOCIATION OF CONSULTING ENGINEERS CONSULTANTS KPIS – (ACE)

The Association of Consulting Engineers (ACE) launched its own set of KPIs in May 2001, in association with the erstwhile Department of the Environment, Transport and Regions (DETR), The Institution of Civil Engineers (ICE), Royal Institute of British Architects (RIBA), Royal Institution of Chartered Surveyors (RICS) and the Construction Industry Council (CIC). These KPIs are an extension to the CBPP KPIs, and included: Client Satisfaction – overall performance, value for money, quality, time delivery, health and safety awareness; training; productivity; and profitability. The ACE also introduced a new term – 'additional indicators' *(AIs)* - which are equivalent to the diagnostic or operational KPIs of the CBPP. The results are presented in the same way as the CBPP KPIs on the same graphs.

5.3 RESPECT FOR PEOPLE KPIS – (RFP)

Another set of measures is known as Respect for People 'People Performance Indicators' (PPIs). The Rethinking Construction's Respect for People Working Group developed the PPIs as a direct response to the realisation that to achieve the targets set out in the Egan Report, improvements are required in how the industry treats its people. They launched their People Performance Indicators in May 2002. These indicators could be considered leading indicators (see Discussion) and cover the following areas: employee satisfaction; staff turnover; sickness absence; safety; investors in people; working hours; pay; training; diversity and travelling time. These indicators can be used to benchmark companies' performance internally within the industry and also across different industries. As discussed before this offers the greatest opportunity for change and improvement.

5.4 THE CONSTRUCTION INDUSTRY RESEARCH AND INFORMATION ASSOCIATION (CIRIA) DESIGN KPIS

In December 2000, CIRIA launched a KPI Assessment Tool for Performance Measurements in Design Organisations. This was based on CIRIA's work on developing a framework for the management of technical excellence in design organisations (CIRIA 2001), which indicated that an organisation's ability to assess and measure the performance of its design activities has a marked impact on its overall performance. The KPIs developed follow the same structure as the CBPP KPIs, with a suite of lower level KPIs feeding into headline KPIs. The CIRIA KPIs are divided into 8 criteria: Understanding Clients Needs, Design Process, Integration of Design with Supply Chain, Internal Cost /Time Management, Risk, Re-Use of Design Experience, Innovation and Client/User Satisfaction. Under each criterion, there are between five to eight sub-KPIs whose scores are amalgamated to form the Criterion KPI score. The tool is used for self-assessment and is based on the same methodology as the European Foundation of Quality Management Excellence Model. This uses a scoring system based on unipolar scales. The companies using the toolkit score each project separately, adjust for any anomalies, and amalgamate the scores to produce results for the company. The 11 companies that were involved with CIRIA during the development of

these KPIs all submitted data to allow competitive benchmarking to take place. This was completed and the scheme then extended in the form of a benchmarking club. Some 22 companies took part in the scheme and the final results were published in October 2002.

5.5 THE MAJOR CONTRACTORS GROUP BENCHMARKING CLUB – (MCG)

The MCG benchmarking club was formed in January 1999 to facilitate performance measurement. It consisted of 18 members, including AMEC, Carillion, Skanska, and Bovis Lend Lease. In January 2001, it issued its own set of KPI results. There were 13 KPIs all of which are headline KPIs, 4 of which are directly comparable with the CBPP KPIs published in April 2000.The MCG KPIs were: Mobilisation Period, Predictability – start on site, Predictability – construction time, Predictability – Practical Completion, Extension of time index, Final Account index, Certificate of making good defects, Predictability – construction cost, Change orders – CO Value/weeks to date, Change Orders – CO Value/Contract Cost, No of snags at practical completion, No of defects during defects liability period and Accident frequency ratio. The members of the club supplied information monthly on all the above and specify the type of client, project, procurement method and location to allow detailed analysis to take place. The MCG Benchmarking club has now stopped. This was because the majority of those involved claimed that the measures were not influencing their business decisions and therefore not adding value to their businesses.

5.6 DESIGN QUALITY INDICATOR – (DQI)

This is the latest set of measures to be launched within the industry. The Design Quality Indicator is an assessment to evaluate the design quality of buildings. It focuses specifically on assessing and managing the value of the product – the complete building, and has been developed to complement the existing CBPP KPIs for Construction. It is a questionnaire-based measure, using a range of indicators under three main headings; Build Quality, Functionality and Impact. It is designed for use throughout the development process and aims to enable clients, developers and project teams to specify their design quality intentions for a building. It then tracks this through the total project process, from inception to when the building is in use. Its main purpose is as a comparator and as an indicator, by allowing different respondents to compare and contrast their results, and by enabling the quality of different projects to be compared with each other. Currently companies and clients across the industry are being asked to trail the toolkit under the Trailblazing Scheme.

5.7 SATISFACTION OF SERVICE KPIS – (SOS KPIS)

A new consultancy group has developed a new set of KPIs specifically aimed at being ‘Customer Focused’. This results from this being recognised as a key ‘Driver for Change’ both in ‘Rethinking Construction’ (Egan 1998) and ‘Accelerating Change’ (Egan 2002). The SoS KPIs have been developed with the assistance of some repeat private and public construction clients, including BAA, Defence Estates, BT, Transco and

Railtrack. It follows the standard industry recognised CBPP format, using 10 criteria. The criteria are: cost management and reporting; programme management and reporting; planning; flexibility; communication; team working; innovation; managing the environment; managing safety and after care service. This set of KPIs is being marketed as offering real time benchmarking within an organisation. It is also claimed to have an independent validation process – which has been a strong criticism of the CBPP KPIs. How this is achieved is not understood.

6 DISCUSSION

6.1 TYPES OF PERFORMANCE MEASURES

As mentioned previously, for KPIs to be used successfully, they need to be part of a Performance Measurement System. When developing the measures for a Performance Measurement System a clear understanding of the different types and applications of measures is required. At a recent conference held on the subject of performance measurement, a panel of leading representatives from an array of design and construction companies, concluded that the most significant problem with the CBPP KPIs (in their current format) was that they do not offer the opportunity to change. They are designed to be used as post result 'lagging' KPIs (BQF/CPN 2001). Lagging Measures are used to assess completed performance results. They do offer the opportunity to change performance or alter the result of associated performance. They are used only as a historic review. Leading measures do offer the opportunity to change. They are measures of performance whose results are used to either predict future performance of the activity being measured and present the opportunity to change practice accordingly, or to enable future decisions to be made on future associated activities based on the outcome of previous activities.

The EFQM Excellence Model identifies 3 specific types of measures. They distinguish between Key Performance Indicators, Key Performance Outcomes and Perception Measures.

6.1.1 KEY PERFORMANCE INDICATORS

KPIs are measures that are indicative of performance of associated processes. For example if the temperature gauge on an engine shows an unusually high temperature, this could be indicative of other problems or potential problems which need corrective action. An industrial measure of absenteeism within companies is also a KPI. A high level of absenteeism could be indicative of problems with morale, which may have been caused by a number of different reasons, poor leadership, lack of work, poor working conditions etc. If this measure is used as a leading indicator, then it can be used to give an early warning, identify a potential problem and highlight the need for further investigation. This provides an opportunity to change and to take appropriate corrective action. The 'cause and effect' relationship between the result being measured and the associated cause may be difficult to establish in a business environment. This is why a KPI can only be indicative of future performance. For all types of measures benchmarking is very important. It is particularly important for KPIs because they are only indicative of associated performance. It is therefore the understanding that the KPI

is indicative of predictable performance. For the performance to be predictable then benchmarked data, through experience is required. If benchmarked data is not available then the decisions based KPI data, are based only on intuition. In the example of the temperature gauge above, the warning light will come on when the temperature reaches a certain level. This level has been set based on benchmarked data either through experience of use or through testing. Once the temperature goes above the level this is an early indication of possible problems with the engine. The user therefore knows that action needs to be taken to prevent the problem occurring.

6.1.2 KEY PERFORMANCE OUTCOMES

Key Performance Outcomes (KPOs) are results of a completed action or process. They therefore do not offer the opportunity to change. As shown in Table II most of the CBPP headline KPIs are in actual fact KPOs. Business KPOs include measures of profit, share price, market share etc. They can also be used to measure the results of processes and sub processes, whose results in themselves cannot be altered. However the results could be used to make decisions to change how the next processes are carried out. For example, if one of the sub processes finished late by two days. The sub process KPO would indicate a two-day overrun. This sub process is complete and the result cannot be changed. However in order to achieve the overall result, additional resources could be utilised on the next processes to address this overrun. In this way the sub process KPO can be seen as a leading measure in the context of the overall result. The measure is of an enabling activity, a leading activity which will deliver a business result. This is demonstrated in Figure 5.

6.1.3 PERCEPTION MEASURES

Perception measures can be used at any stage. They require direct feedback on past performance. They can be leading or lagging measures. With the CBPP KPIs, ‘Client Satisfaction’ is measured after the completion of the project. This is therefore a lagging measure, which cannot be changed. However, if ‘Client Satisfaction’ is measured at various stages during the project then these can be described as being leading indicators, ones which provide the opportunity to change future actions to affect the overall desired end result. Perception measures are usually carried out by direct question or survey. There is a danger that because employees and especially clients will become increasing asked for feedback, the results could become negatively influenced. Some companies are starting to use employees to anticipate the perceptions of their clients. Further research in this area is required

The construction industry does not distinguish between these three types of measures and refers to all measures as KPIs. For the purposes of this paper when referring to an organisation’s measures such as the CBPP or CIRA we will refer to the suit of measures as KPIs. When discussion the specific characteristic and applications of the different types of measures these will be referred to by their type as described above.

6.2 APPLICATION OF MEASURES

Figure 5 shows how the different type of measures should be applied to 'The Business Process'. It uses the EFQM excellence criteria as a framework to distinguish between the types of measures and against which criteria the measures are applicable. The 5 enabling criteria are divided into two groups. Processes in one group, and Leadership, Policy and Strategy, People and Partnerships and Resources in the other group. These enabling criteria deliver the business results. KPOs of processes or sub processes are measures of enabling activity and as such are leading measures. These deliver the results criteria measures, which are lagging measures. The same is true for the KPIs and the perception measures.

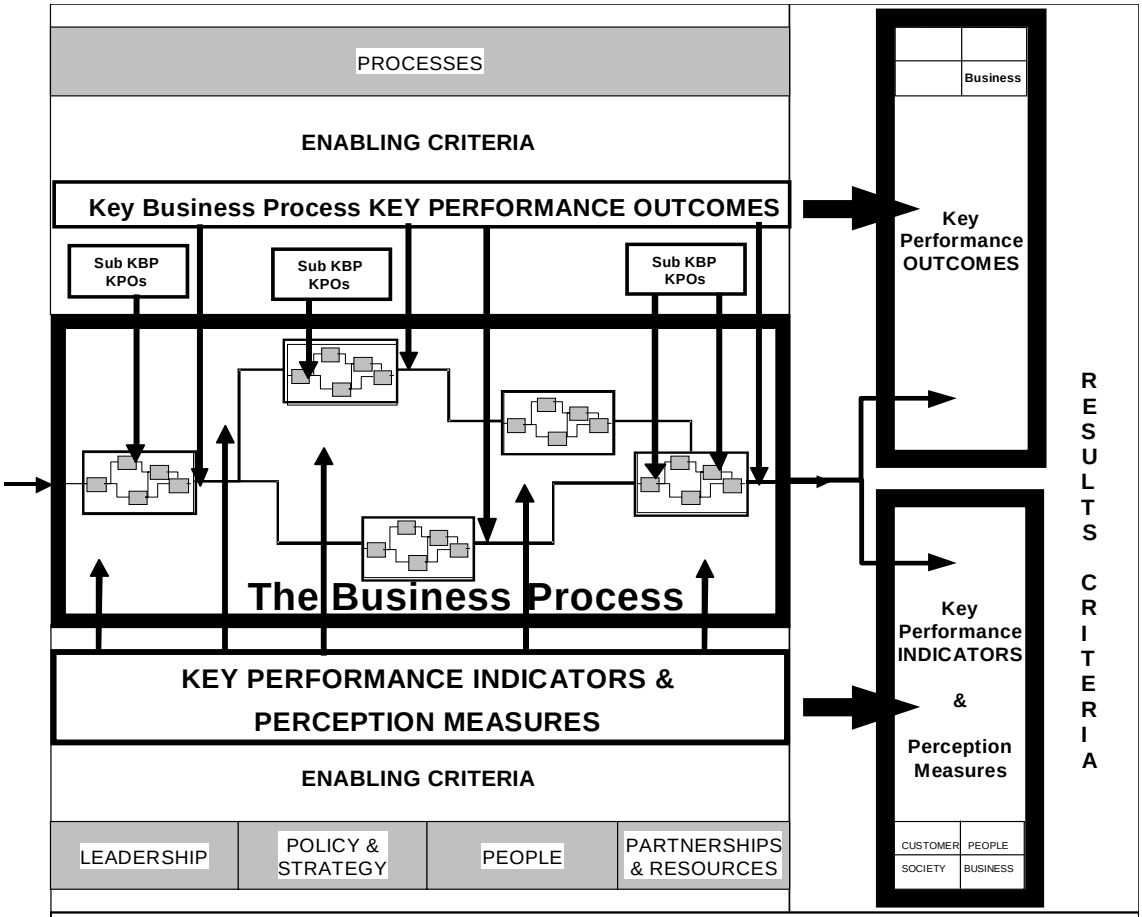


Figure 5- The Application of Different Types of Measures referenced to EFQM Excellence Model Criteria

6.3 CRITICAL APPRAISAL OF THE USE OF KPIS WITHIN THE CONSTRUCTION INDUSTRY

From the research carried out, it is evident that there is a shift in the way in which KPIs and performance measurement are being used within the industry. Initially the KPIs were designed to allow benchmarking and it was very much focused on industry wide comparison. There is now a growing understanding that for KPIs to be successful they

need to be part of a performance measurement system, and initially need to concentrate on internal improvement. The initial attempts to introduce measures across the industry had five fundamental problems:

1. They focused on post-event lagging KPOs at a very high level which offered little opportunity to change and were not used by businesses to influence managerial decisions. Table II summarises the attributes of the measures and specifies which offer the opportunity to change. The table categorises individual measures as designed and intended by the originators. Most of the CBPP, CIRIA, ACE, MCG and M&E are lagging result measures, based on outcomes. These measures do not offer this opportunity during the period for which the measure has been taken. The only measure that does is safety. This is because this is a legal requirement and is measured continuously throughout the project. There is a need to understand the difference between leading and lagging measures. Construction companies and representative bodies are now beginning to understand this concept. For example, the CIRIA design KPIs could include leading KPIs. This was the intention of the CIRIA working party, however the toolkit they produced is designed to be used for completed projects and as such the measures become results and again do not offer the opportunity to change. Some of those involved in the CIRIA benchmarking club have realised this and use the toolkit on a regular basis throughout the life of a project. The measures therefore give an indication of the leading, enabling activities, offer the opportunity to change and also provide trend information. Other KPIs such as those contained within the Respect for People set also include leading KPIs (such as training, absenteeism). Companies are now designing their own sets of measures. These are all attempts at trying to give early warning of problems that may occur later in the process. However, this is still not clearly understood. Table II also identifies where measures could be used as leading measures. For most measures this is applicable. If the KPOs are measured and recording during the project or the process then leading measures can be ascertained.

2. The KPIs were not aligned to the strategy or business objectives of construction companies. They tended to be a complete suite of KPIs, which may or may not be aligned to an organisation's business needs. Although they are generic and it could be argued that they are relevant to nearly all companies, they have been seen as external to the business needs of many organisations. Much of the literature from other industries concludes that measures should be developed from the business objectives of an organisation (Kaplan and Norton 2000). This is also becoming better understood with companies such as AMEC, Wates and Mace clearly aligning their performance measures to their business strategies.

Measure	Source	Enabling Criteria - Leading	Results Criteria - Lagging	KPIs	KPOs	Perception Measures	Level of Bench-marking	Opportunity to change during project
Defects	CBPP, M&E, MCG	(✓)	✓		✓		1	NO
Client Satisfaction	CBPP, M&E, SoS, DQI, CIRIA, ACE	(✓)	✓			✓	3	NO*
Predictability	CBPP, M&E, SoS, MCG	(✓)	✓		✓		1	NO*
Time	CBPP, M&E, SoS, CIRIA, MCG	(✓)	✓		✓		1	NO*
Cost	CBPP, M&E, SoS, CIRIA, MCG	(✓)	✓		✓		1	NO*
Profitability	CBPP, M&E, ACE	(✓)	✓		✓		2	NO
Productivity	CBPP, M&E, ACE	(✓)	✓		✓		2	NO
Environment	Construction Products Assoc, SoS	(✓)	✓		✓		1	NO*
Employee Satisfaction	RFP	(✓)	✓			✓	3	NO
Integration of design with Supply Chain	CIRIA	(✓)	✓		✓		2	NO
Risk	CIRIA	(✓)	✓		✓		2	NO
Reuse of design	CIRIA	(✓)	✓		✓		2	NO
Understanding Client needs	CIRIA	(✓)	✓		✓		2	NO
Design Process	CIRIA	(✓)	✓		✓		2	NO
Mobilisation	MCG	(✓)	✓		✓		2	NO
Final Account	MCG		✓		✓		1	NO
Change	MCG	(✓)	✓		✓		1	NO
Extension of Time	MCG		✓		✓		1	NO
Safety	CBPP, M&E, SoS, RFP, MCG	✓		✓			3	YES
Sickness	Construction Products Assoc, RFP	✓		✓			3	YES
Training	Construction Products Assoc, ACE, RFP	✓		✓			3	YES
Qualifications	Construction Products Assoc	✓		✓			3	YES
Communication	SoS	✓		✓			1	YES
Teamworking	SoS	✓		✓			1	YES
Innovation	SoS, CIRIA	✓		✓			2	YES
Staff Turnover	RFP	✓		✓			3	YES
Investors in People	RFP	✓		✓			3	YES
Pay	RFP	✓		✓			3	YES
Travelling time	RFP	✓		✓			3	YES
Working Hours	RFP	✓		✓			3	YES
Diversity	RFP	✓		✓			2	YES

Note : NO* - The SoS KPIs reported offer real time benchmarking which if successful will offer the opportunity to change.

✓ - Type of measure as prescribed by the originator
(✓) - Type of measure that could be utilised by the user if measured during the process

Table II – Analysis of Industry KPIs

3. Figure 6 demonstrates how the measures should be aligned with the vision, mission and strategies of the business, and also how different levels of measures need to be used to address different aspects. It also demonstrates the alignment of these measures.

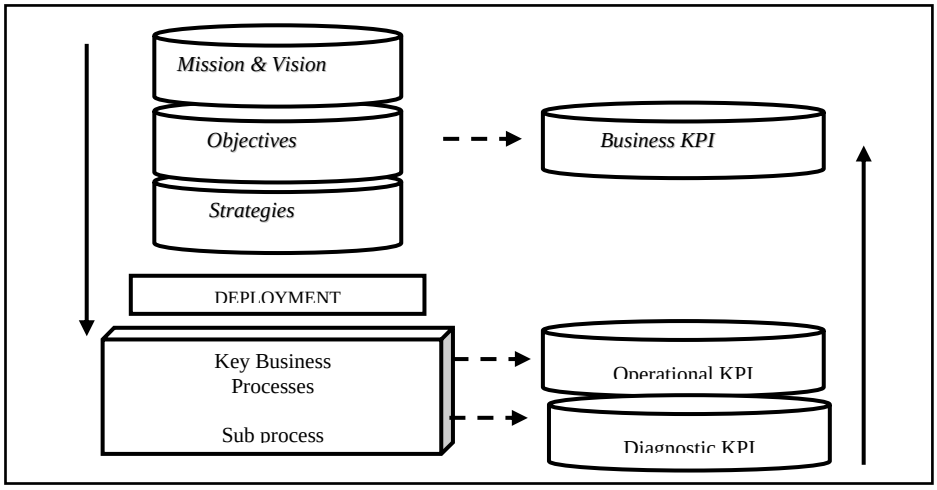


Figure 6 – Alignment of KPIs (Adapted from Beatham et al, 2002.)

4. They were designed for cross-industry benchmarking purposes, but due to a lack of certainty in the data, problems with different procurement routes and lack of validation of results, this level of benchmarking is not thought to be viable. Their use was not seen as an integral part of business management. They were used more as a marketing tool than an improvement tool. The initial driver was the need to supply comparative data for clients across the industry. This is the fundamental weakness in the use of KPIs. One problem lies in the plethora of procurement and contractual arrangements that exist within the industry. The project stages outlined by the CBPP are acceptable for traditional procurement routes, but with increases in the use of other contractual arrangements, they become difficult to define. For example, one of the measures is about predictability, both in terms of cost and time. The CBPP stage of 'Commit to Construct' can often happen in a design and build contract when design is only about 75% complete. The remaining 25% of the detailed design is then completed during the construction phase. This is when significant changes can occur. Those using the KPIs as a benchmark are left with a choice. Do they use the 'Commit to Construct' date as the end of the measure of design for the purposes of the KPI or do they include the time until the design is complete? This is a simplistic example but emphasises the point. There is significant difference in these two approaches. The problem is compounded because there is no validation of the results submitted. The different approaches chosen are represented on the same graph and form part of the same benchmark data. They are, however, fundamentally different and as such should not be compared. The lack of validation of the results means the results cannot be used to compare data for clients' benefit. They should not be used as a league table (CIRIA 2001). This understanding has then driven companies to look at developing their own set of KPIs. They have therefore been able to benchmark themselves only internally which offers the least opportunity for improvement (McGeorge and Palmer 1997). The only data which appears to be successfully used for benchmarking across the industry requires a third party independent authority, backed by legislation (such as Inland Revenue or the Health and Safety Executive) to validate the information. Table II shows that only KPIs relating to people results, safety and client satisfaction can be used to benchmark with other industries. All of the CBPP KPIs are

designed for cross-industry benchmarks, which is only acceptable as long as the information is supplied on the basis of improvement and not competition.

5. The KPIs do not provide a holistic, company-wide representation of the business. As can be seen in Table III, the KPIs do not cover all the criteria identified within the EFQM excellence model. It has been established that the criteria identify key areas necessary for business excellence. (EFQM 1999). Criterion 1 (Leadership) and Criterion Two (Policy and Strategy) are not covered by any of the industry KPIs. Furthermore there are very few process or sub-process measures. The clear focus is on business, people and customer results. The Respect for People KPIs, the SoS KPIs and the CIRIA KPIs are more recent and demonstrate attempts to address some of the areas not previously covered.

	Enabling Criteria - Leading					Results Criteria - Lagging			
6.3.1.1.1 Source	1	2	3	4	5	6	7	8	9
CBPP						✓	✓		✓
MCG					✓	✓	✓		✓
CIRIA			✓	✓	✓	✓	✓		✓
RFP			✓				✓		
SoS			✓	✓	✓	✓		✓	✓
ACE			✓						✓
Construction Products			✓			✓	✓	✓	
M&E						✓	✓		✓
DQI						✓			

Table III – Holistic Nature of Industry KPIs

5. The KPIs are not incorporated into a performance measurement system which includes review and action. Figure 7 shows the two cycles which must be engaged in if performance measurement is to be successfully implemented.

There are two cycles within a performance measurement system. These are:

- *Cycle 1 - Implementation of Measures*
- *Cycle 2 - Change Action driven by Results (CAR)*

It is based on the RADAR logic. Organisations can engage in performance measurement and can use the data in marketing documentation if they have completed Cycle 1. This is what the MCG did. They recorded the data and produced benchmarking information. However the benchmarking club faltered because many of the companies using the measures failed to enter into Cycle 2. They used the information to compare themselves with each other, but they failed to initiate 'Change Actions driven by the Results (CAR)'. In the USA, it is claimed that 70%

of Balanced Scorecard implementations fail (Neely and Bourne 2000). Failure to initiate change is a significant reason why this type or any type of performance measurement fails. Cycle 2, as demonstrated, sets out the process necessary to implement change. If the measure outcome fails to achieve the desired target then change is necessary. The causes of the outcome must be reviewed and changed with a view to improving the result in the future. Measures used in this context are lagging. The same measure could also be seen to be a leading measure for future activity. In this context the result is used to implement changes to future activity with a view to still achieving the overall desired result. For the use of any PMS to be sustained, Cycle 2 must be entered into by the organisation using the system.

7 CONCLUSIONS AND FURTHER WORK

The CBPP KPIs have been extremely successful in introducing the subject of KPIs to the construction industry. There has been significant uptake and involvement from all types and sizes of organisations within the industry. However, for the use of KPIs to be sustained within the industry, their use must add value. For this to happen, a clear understanding between the different types of measures is needed. Managers need to be able to differentiate between Key Performance Indicators (indicative of associated future performance), Key Performance Outcomes (measures of completed events), and Perception Measures (individuals' judgements) and ensure that the measures developed include all types of measure. The measures must give a holistic, company-wide view including a mixture of leading and lagging indicators. They must also give managers early information to assist in the decision making process. The measures chosen must be aligned to the objectives and strategies of the business and not necessarily a suite of pan-industry KPIs. The measures must be used as part of a system, in which Change Action is driven by Results (CAR). The measures must be incorporated into the processes of the organisation. This will allow KPOs to be used as leading measures. Employees need to be engaged in the development of the measures. If the measures are to be used as external benchmarks (Level 2 or Level 3 benchmarking, see Figure 1), the results need to be able to be audited and to be validated. Companies should only use the industry KPIs as indicative of industry performance and use their own measures for internal benchmarking and improvement. There is significant need within the industry to better understand 'the processes' of design and construction. Measures need to be developed for the processes and for sub-processes that are consistent and that can be benchmarked across the industry. The CIRIA Design KPIs Toolkit is an attempt to address this need but further work is required. In order to allow appropriate benchmarking to take place across the industry, the results of measures need to be able to be validated. Current benchmarks are being used as marketing material against competition.

The increased competition, the complexity of the process and lack of validation of results means that benchmarking can only be used as an indication of performance and should therefore only be used as an internal improvement tool and not as an external marketing tool. There is a need, driven by clients, to develop a way by which results are transparent and can be validated across the industry. This will allow comparisons of individual company performances to be made.

Finally, there is also a need for the industry to develop a framework for a performance measurement system which includes all types of measures, aligned to the individual company's objectives and strategies and which is use to initiate 'Change Action driven by Results' (CAR). An Integrated Business Improvement System (IBIS) is currently being developed to address this need. It is intended to provide organisations with an effective holistic tool for proactive business management and improvement. The IBIS approach builds on Figure 7 and utilises the EFQM Excellence Model criteria.

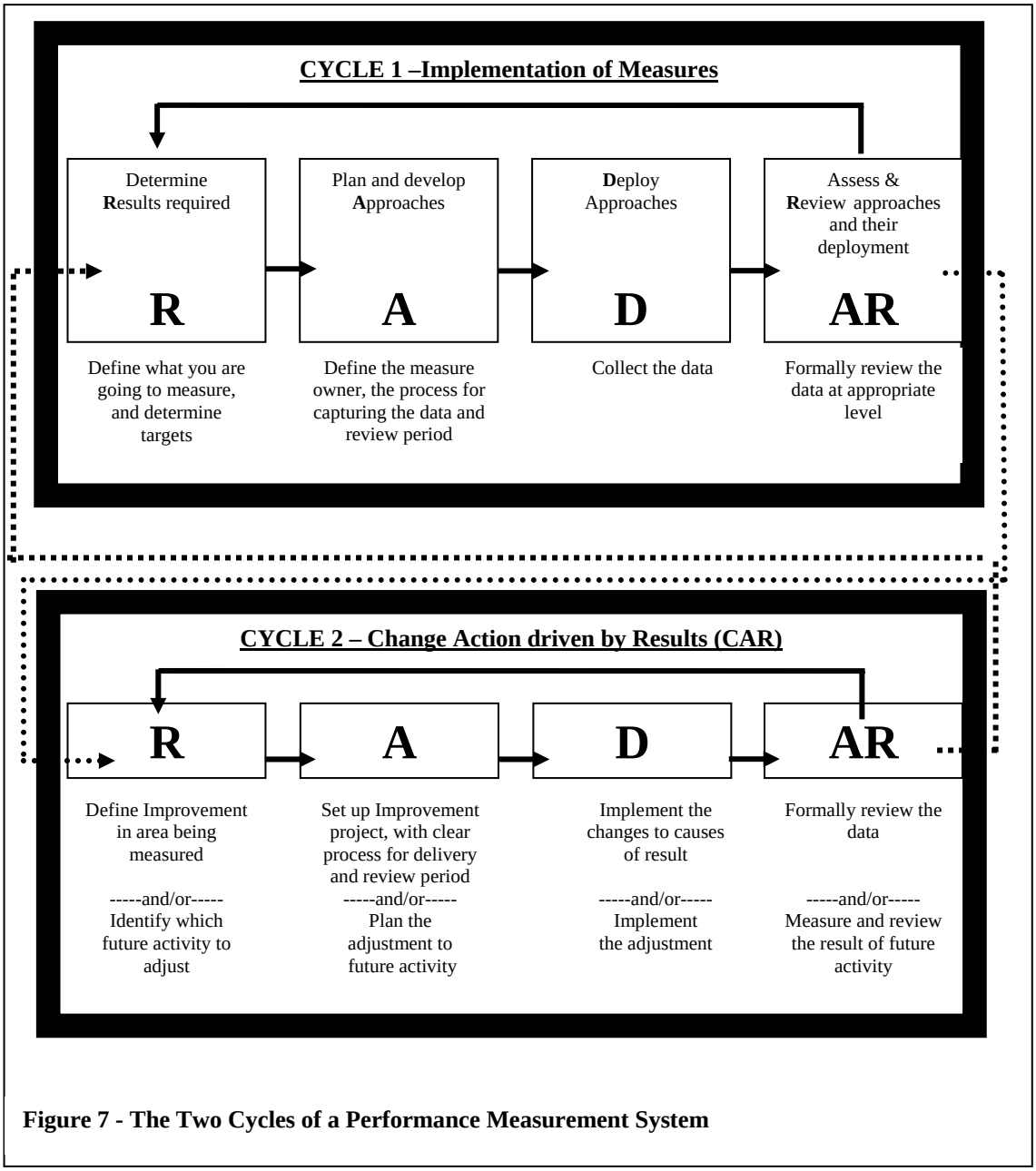


Figure 7 - The Two Cycles of a Performance Measurement System

8 ACKNOWLEDGEMENTS

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APPENDIX E PAPER 5

An Integrated Business Improvement System (IBIS) for Construction

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Abstract
Businesses have traditionally measured their performance solely in financial terms. This limited approach has recently been challenged by performance models such as the Balanced Scorecard and the EFQM Excellence Model. Most involve the concept of Key Performance Indicators (KPIs) for non-financial results, and use a holistic approach to assess a company's performance. In response to the 'Egan Report', the Construction Best Practice Programme developed the industry set of KPIs. The use of KPIs within the construction industry has since developed but there is still little evidence to suggest that KPIs are being used as a systematic part of an overall Performance Measurement System (PMS). This paper reviews the key facets of a PMS and reports on the development of a new model for an integrated PMS based on the framework of the EFQM Excellence Model. The new model has been developed for, and is being implemented, within an international integrated design and construction organisation.

Keywords

Performance Measurement, KPIs, EFQM Excellence Model, Balanced Scorecard, Continuous Improvement, Integration.

REFERENCE

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1 INTRODUCTION

The construction industry has been accused of being, at its worst, wasteful, inefficient and ineffective, wasting over £1billion in 1999 due to errors and rework (Nicholson 1999). The government, as the largest client of the industry, has led the drive to improved performance, setting clear targets in 'The Egan Report' in 1998. For example :

> *" The industry must replace competitive tendering with long term relationships based on clear measurement performance in quality and efficiency..(by) producing its own structured, objective performance measures agreed with clients....."* *(Egan 1998)*

The Construction Best Practice Programme (CBPP) was set up following the publication of 'The Egan Report' and introduced ten high-level Key Performance Indicators (KPIs) for pan-industry comparison and demonstration of performance improvement on completed projects (DETR 2000). Many authors criticise traditional performance measures for being too financially biased and too narrowly focused on easily quantifiable criteria such as cost and productivity, while neglecting other criteria, such as leadership and client satisfaction, important to competitive success (Skinner 1974, Sink 1985, Crawford and Fox 1990, Lynch and Cross 1991, Kaplan and Norton 1992). The CBPP KPIs initially focused on the traditional measures of time, cost and quality but also included Client Satisfaction in their original 10 Headline KPIs. These have since been extended and include the 'Respect for People KPIs' (incorporating measures of training and absence) and the 'Environment KPIs' (incorporating measures of energy use and waste) (DTI 2003). The CBPP KPIs have been criticised for being too narrowly focused, comprising post event measures which do not offer the opportunity for change (BQF/CPN 2001). They have, however, been acclaimed for promoting and ensuring that a culture of performance measurement to demonstrate change and improvement is firmly on the 'industry agenda' (Crane 2002).

This paper is concerned with the response of an international integrated design and construction company (case study unit) to this need for improved performance and the requirement to demonstrate this, both internally and externally. It is important that companies clarify why they want to initiate performance measurement. Neely (1998) suggests four categories as to why organisations undertake performance measurement: checking position, communicating position, confirming priorities and compelling progress. The case study unit wanted a solution that provided results under all four categories. Recognising the limitations of the CBPP KPIs, the case study unit commissioned research to develop a bespoke performance measurement system, aligned to their specific business needs. The resulting system is presented in this paper.

1.1 PERFORMANCE MEASUREMENT SYSTEMS (PMS).

The literature relating to performance measurement is wide-ranging and increasing. Between 1994 and 1996, one new article or paper on this subject appeared every five hours of every working day (Neely 1998). This is indicative of the importance and also the complexity of the subject. Many companies initiate performance measurement programmes, but the majority fail (Neely and Bourne 2000). Performance measurement is only part of the process. Unless action is taken based on the results attained then the measures are non-value adding (Ghalayini and Noble 1996). This distinguishes performance

measurement from a performance management system. Beatham et al (2003), introduced the concept of Change Action driven by Results (CAR), and identified the two cycles for the implementation of any performance measurement system (see Figure 1). The first cycle concludes with the review of the results of the measures. In the second cycle, decisions and actions are taken based on the results of the performance measures with the aim of delivering improvements. To emphasise this need for action, the PMS developed in this study is called the 'Integrated Business Improvement System (IBIS)'.

2 THE DEVELOPMENT OF AN INTEGRATED BUSINESS IMPROVEMENT SYSTEM (IBIS).

This work has been carried out within the case study unit, which employs approximately 800 people and has a turnover of circa £250 Million. The management structure is hierarchical, and, for reporting purposes, is divided into three layers; Business Management Team, Operations Management Team and Team Leaders. Initially, an appraisal of performance measurement within the construction industry was completed. The process of developing a PMS is considered as important as the performance measures themselves (Kaplan and Norton 2000). The three main stages in the development of a PMS are: Performance Measures System Design; Implementation of Performance Measures; and Use of Performance Measures (Bourne *et al.* 2000). Prior to commencing the system design, an appraisal of the use of performance measurement in the construction industry was undertaken. This enabled a greater understanding of the key issues relating to the subject matter (see Table 1).

STAGE 1 UNDERSTANDING	STAGE 2 SYSTEM DESIGN	STAGE 3 IMPLEMENTATION	STAGE 4 USE
Phase 1 Appraisal of Performance Measurement within Construction	**Phase 2** Development of Concept Design of IBIS **Phase 3** Buy-in from Business Management **Phase 4** Pilot Scheme	**Phase 5** Engagement from the Business Management Team **Phase 6** Roll out with Business Management Team	**Phase 7 – Planned** Assessment and Review **Phase 8 – Planned** Improvement Programmes

Table 1 - Four Stages of Development of a Performance Measurement System (adapted from Bourne et al, (2000)).

2.1 STAGE 1 – UNDERSTANDING

2.1.1 PHASE 1 – APPRAISAL OF PERFORMANCE MEASUREMENT WITHIN THE CONSTRUCTION INDUSTRY

This phase included a literature review, involvement in national benchmarking clubs, consultations with the CBPP and other leading organisations, attendance at several

conferences and workshops on the subject of performance measurement, semi-structured interviews and action research within the case study unit during previous improvement projects (Beatham *et al.* 2002, Beatham, Anumba, Thorpe *et al.* 2003). Below is a summary of some of the main findings.

Bourne et al, (2000) conclude that measures should be derived from a company's business strategy. The development of a system needs to have a more holistic appraisal of a company's performance than traditional systems. It must also introduce measures that offer the opportunity for change (Kagioglou *et al.* 2001). Performance Measurement Models, such as the European Foundation of Quality Management (EFQM) Excellence Model (EFQM 1999), and the Balanced Scorecard (Kaplan and Norton 1996), have this more holistic view of business management and have been established to help organisations develop strategies and translate these into measures. Measures in turn, provide the feedback to inform senior management whether their strategies are being implemented as planned (Lorange *et al.* 1986). If a performance measurement system (PMS) is to become an integral part of management practice within an organisation, then it must have engagement from senior management (Beatham *et al.* 2002).

Commitment from senior management is built through participating in the decision making process. This gives the participants the opportunity to contribute and gain an understanding of 'why' a particular set of objectives and performance measures have been chosen (Kaplan and Norton 2000). By participating, ownership is transferred to those involved. Further commitment can be gained by linking the PMS and the results achieved to the reward system within the business. This decentralised control enables decisions to be made at an operational level (Lantelme and Formoso 1999). The act of deciding what to measure forces the management team to clarify their language and define precisely what their strategy encompasses (Neely and Bourne 2000). The system design also needs to identify the means of communicating the results. This can lead to improved transparency within the organisation.

2.2 STAGE 2 – PERFORMANCE MEASURES SYSTEM DESIGN

2.2.1 PHASE 2 – DEVELOPMENT OF CONCEPT DESIGN OF IBIS

Appreciation of the structure and types of measures is essential in delivering value from any PMS. The EFQM Excellence Model describes five 'Enabling Criteria' (Leadership, Policy and Strategy, Partnerships and Resources, People and Processes) and four 'Results Criteria' (Customer Results, People Results, Society Results, Key Performance Results). It differentiates between Key Performance Indicators (KPIs) and Key Performance Outcomes (KPOs) (EFQM 1999). Results are derived as a product of the enabling activities. KPIs, which include perception measures, are indicative of performance or associated performance, and can be used to provide the opportunity to change the current activity or subsequent activity. KPOs are measures of completed processes or sub-processes and therefore do not offer the opportunity to change the current activity. In this respect they are lagging measures (Beatham, Anumba, Thorpe *et al.* 2003). Most of the industry-recognised measures are lagging measures and are results focused. If however, they are measured during 'the process' (as leading/enabling measures) they can provide the opportunity for subsequent activities to be changed to achieve the overall desired result (Kueng and Krahn 1999, Mitropoulos and Howell 2001). Figure

2 shows how the Excellence Model can be used to establish enabling and results measures across any 'business process' (Beatham *et al.* 2002). It should be noted that 'KPIs' is the industry-recognised term that encompasses all three types of measures and is used as such for the rest of this paper.

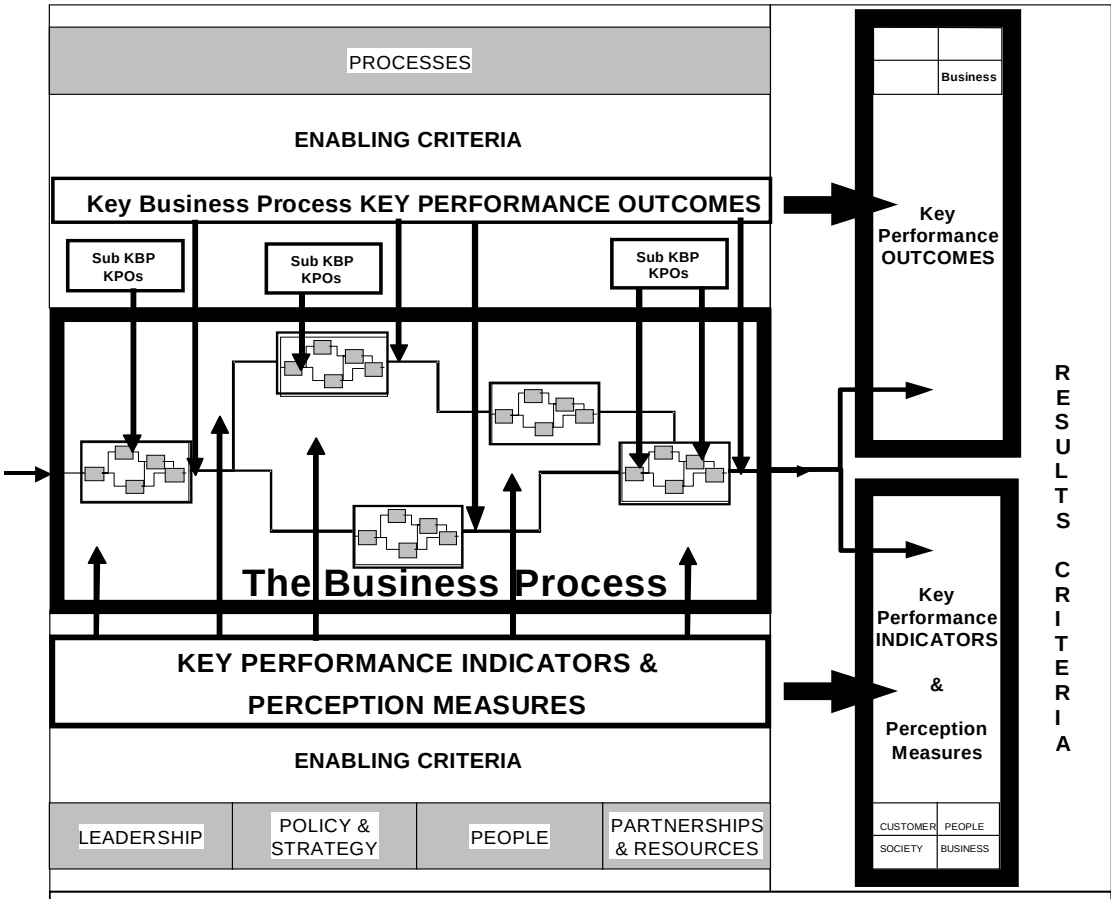

Figure 2- The Application of Different Types of Measures referenced to EFQM Excellence Model Criteria

The system design of the IBIS utilised the framework of the EFQM Excellence Model to provide a structure for all types of measures. The system design allowed high-level business objectives to be broken down into critical success factors (CSFs). For each of these CSFs, measures were developed. Achievement of the desired result of these measures was considered indicative of achieving the CSFs and therefore of achieving the business objective. Business objectives would be developed for all nine criteria of the model. This ensures a holistic review of business performance. These objectives should be aligned to the overall business mission and vision. The CBPP identified three levels of measures. These are referred to as Business, Operations and Diagnostic levels (DETR 2000). The business objectives, CSFs and measures can also be drilled down into operations and diagnostic levels (see Figure 3).

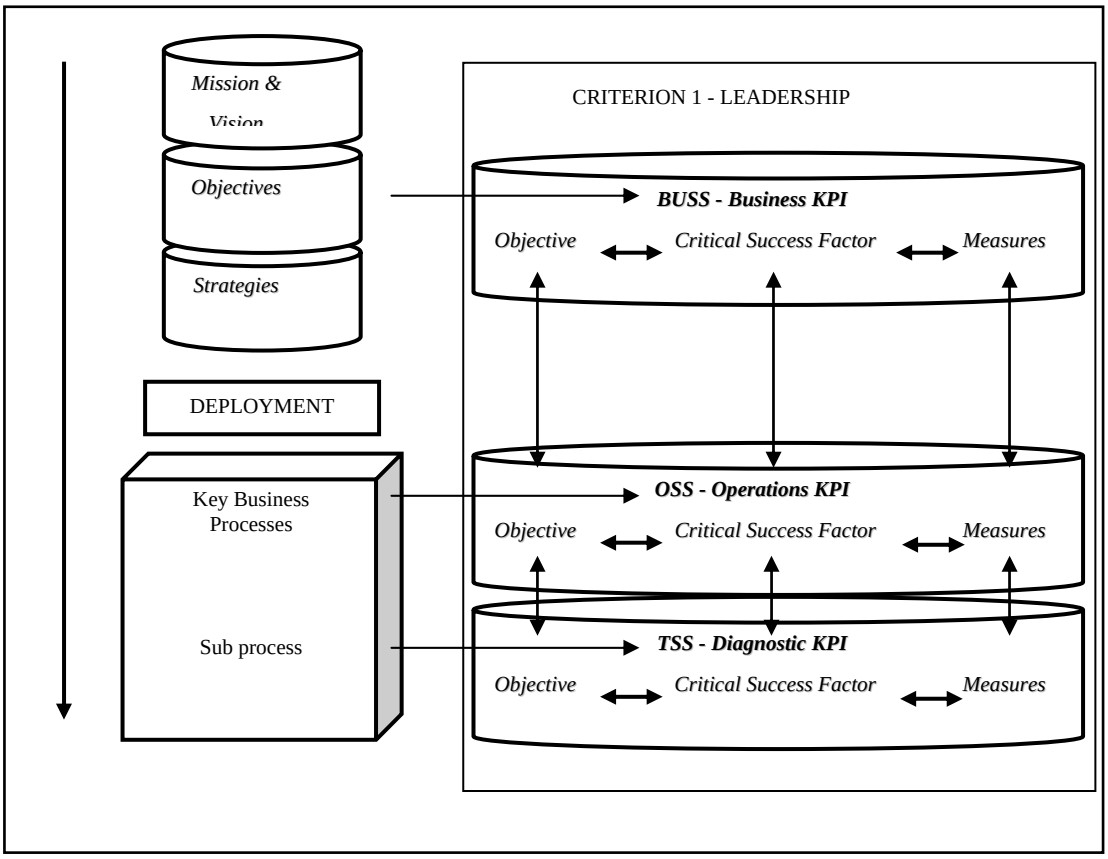

Figure 3 – Alignment of Objectives, CSF and Measures within the IBIS for each criteria of the EFQM Excellence (adapted from Beatham, 2002)

2.2.2 PHASE 3 – BUY IN FROM BUSINESS MANAGEMENT TEAM

Having developed the IBIS framework, buy in from the Business Management Team was required to populate the framework. The Managing Director and Operations Director had already identified objectives for the business unit and also objectives for the Operations leaders within the business. The business unit objectives had been cascaded down from the parent organisation and were based on the four criteria of the Balanced Scorecard.

These, coupled with the Operations Management Team objectives, were amalgamated and entered into the top two layers of the IBIS at the Business level and the Operations level. A third layer was also agreed. This was for individuals and would demonstrate alignment from individual objectives, through Operations objectives to Business objectives. For each measure, a KPI data sheet was completed. The sheet included information about the owner, the measure, how the data would be collected, who was responsible for collecting and analysing the data, the calculation of the measure, and the review period. (See Figure 4).

The Business Unit Summary sheets, one for each of the nine criteria of the EFQM Excellence model, were completed with objectives and critical success factors identified. Whilst transferring the objectives from the Business Unit Balanced Scorecard and the Operations Management Team objectives, a gap analysis was carried out, resulting in additional measures being included in the IBIS.

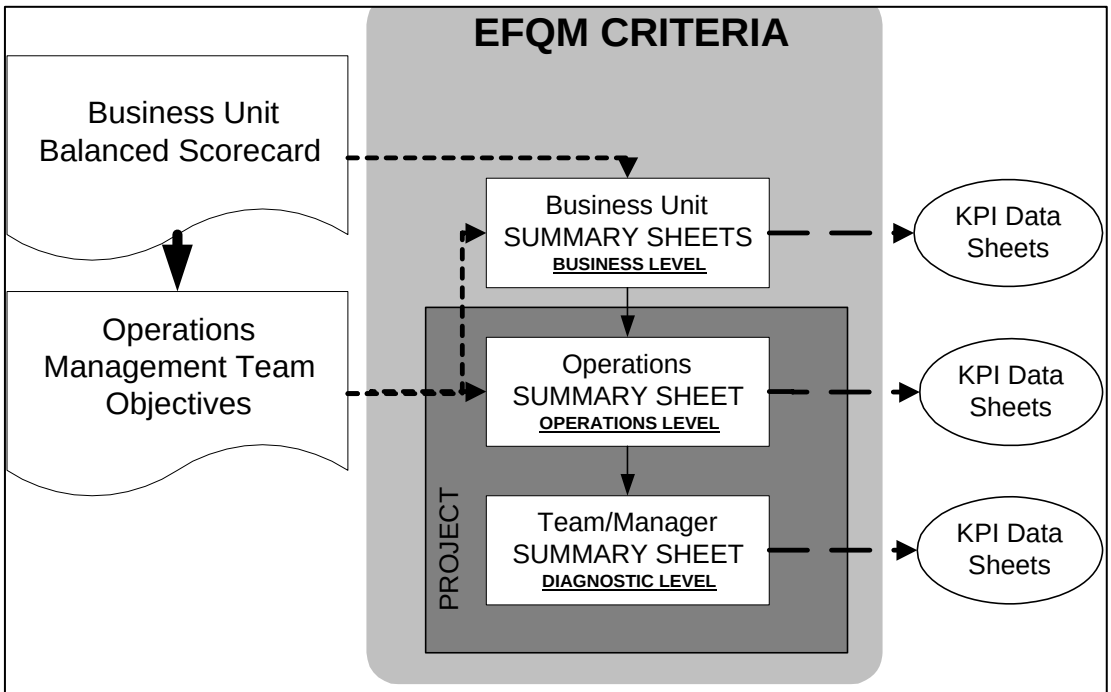

Figure 4 - The Development of the Summary Sheets within the IBS

2.2.3 PHASE 4 – PILOT SCHEME

A detailed programme for the pilot scheme was drawn up and agreed with the Business Management Team. Five of the Operations managers were identified to be used as test cases in the pilot scheme. A meeting was arranged for each manager to review their Operations Summary Sheet (OSS) as aligned to the Business Unit Summary Sheets (BUSS). Each manager received an introduction to the IBIS and then reviewed their own objectives against their Operations Summary Sheet. All of the individual's objectives are reviewed annually as part of the appraisal system. Achievement of objectives is directly related to the bonus scheme. Having reviewed and agreed that the IBIS contained all their objectives, discussion was held about the development of measures for each CSF. The measures were to be designed by each manager. It was for them to identify the processes that deliver the results for the CSFs.

One example used in the pilot scheme was the Bid Process:

CRITERION 5 -PROCESESS

Objective : Clarity of Core processes to deliver our business

Critical Success Factor : Our Core Processes are improved

Measure : Bid Process Improvement

The bid process was identified as one of the core processes. The manager was responsible for mapping the process and developing measures at key stages of the process, including both leading and lagging measures. These measures would then be amalgamated to provide the business level measure for this CSF.

2.3 STAGE 3- IMPLEMENTATION OF PERFORMANCE MEASURES

2.3.1 PHASE 5 – ENGAGEMENT FROM THE BUSINESS MANAGEMENT TEAM

Barriers to the Successful Implementation of PMS

As the majority of performance measurement initiatives fail, engagement from the users of the system is critical for successful implementation. In order to achieve engagement a detailed understanding of potential barriers is necessary. The barriers to this engagement can be divided into three headings: Political Barriers, Infrastructure Barriers, and Focus Barriers (Neely and Bourne 2000).

Political Barriers

Significant resistance to measurement has been witnessed during the design and use phases. Personnel, whose outputs are monitored, can feel threatened by the measures. They see them as part of a mechanism to 'score points over other managers and to illustrate why they are failing to perform.' (Neely and Bourne 2000). If employees perceive that the measures are part of centralised control, part of the blame culture within an organisation, then they will either react and not participate or satisfy the measurement requirements above the business objectives. (Lantelme and Formoso 1999). For example, operators in call centres have been known to deliberately hang up on customers, before even talking, to achieve their KPI targets: these are referred to as deviant activities. Managers may also question the process that has been undertaken to develop the measures. If they are not fully engaged in the process then this could lead to a lack of confidence in what is being measured and whether the measures can represent satisfactorily the process or results they refer to (Lantelme and Formoso 1999). Resistance can be experienced if the measures are imposed by a third party 'expert' (Bourne *et al.* 2000). The introduction of a PMS could be seen as "changing the rules of the game" and as such people may see this as not being in their best interest and will therefore actively or passively resist the implementation (Zairi 1996). These relate back to the suggestion that humans can be viewed as "calculative receptors" and that they will choose the course of action that will maximise their own personal gain (Hrebiniak and Joyce 1984).

Infrastructure Barriers

A clear process for the capture and distribution of the results data is needed for all Performance Measurement Systems. Data may exist in several formats, spread throughout the organisation. It is often held in unrelated, unlinked databases, often in inconsistent formats. The amount of time and effort taken to process the data is one of the main causes of failure for PMSs (Neely and Bourne 2000). Small construction firms often lack the minimum organisation required for basic data collection and processing (Lantelme and Formoso 1999). If automated results are not available then the time taken to produce the results will be significant and impact on the value of the measures. This time is easily quantifiable and this cost can be used by managers to challenge the use of the measures. A survey by the Hackett Group found that the average organisation spends 25,000 person days on performance measurement and planning for every $1

million worth of sales (Neely and Bourne 2000). The information provided by the measures should arrive in time to take action (Samson and Lema, 2002). The more automated the collection of data, the more efficient the process. Within the IBIS, KPI Data sheets were produced which clearly identified the process for the capture and distribution of the results data. The results included both electronic and manually recorded information.

Focus Barriers

For decision making and problem solving, managers will tend to rely more on their intuitive and experiential knowledge rather than on a structured set of tools and data that can help in understanding the problem (Lantelme and Formoso 1999). They tend to look for quick results from the PMS. The whole process involved in the design, implementation and use of a PMS takes time and the benefits of measurement usually cannot be perceived in the short term. As a consequence, managers may lose motivation, and become distracted by 'more important' issues. In this situation, they perceive the costs of measurement as higher than the benefits obtained (Lantelme and Formoso 1999). Senior managers have to recognise that the introduction of a PMS is a long, slow process. There is a real need to boost energy levels regularly to ensure the process continues through to completion (Neely and Bourne 2000). A study of the construction industry in Brazil found that only a small number of companies were able to apply performance measurement on a continuous basis. In most of them, managers pointed out the lack of people and time to do the job as the main cause for not implementing measures. Devising a performance measurement system in the construction industry is a relatively difficult task because construction is project-orientated, with the product usually unique in terms of design and site conditions, and a temporary organisation needs to be created for each project (Lantelme and Formoso 1999).

For the implementation of the IBIS, three of the five managers completed the pilot scheme. It was agreed that the results should be presented to the Business Management Team. However, due to other influences, this presentation did not take place. As a result an alternative engagement strategy was devised. It was recognised that time constraints would be a significant factor in the ability to get engagement in the system for the Business Management Team. It was therefore agreed that prioritisation of the Objectives, CSFs and measures was required. The measures were prioritised into three sections: Short term; Medium Term; and Long term. Another meeting was arranged however again due to external factors this meeting was cancelled. The need for engagement was understood by the Business Management Team, however due to the constraints the project was placed on hold until the company underwent and completed an internal restructuring. Having completed the restructuring, it was again reviewed by the team and significant resistance was encountered. It was agreed to move the system forward using two teams to address two key areas, (people and customers) to be improved.

Concurrently with the development within the case study unit, three other units of the parent company were also engaged in the use of the IBIS. All three units obtained engagement from business management and progressed as planned.

2.3.2 PHASE 6 – ROLL OUT WITH THE BUSINESS MANAGEMENT TEAM

This phase required the Business Management Team to agree Objectives, CSF and Measure owners for all criteria. Targets were set for each measure, the review period agreed and each owner to be made responsible for the analysis and delivery of improvements in their respective areas. The case study unit is presently carrying out this phase for the two key areas identified. This work is currently ongoing. The other three units utilising the IBIS are commencing the roll out phase.

2.4 STAGE 4 – USE OF PERFORMANCE MEASURES

2.4.1 PHASE 7 – ASSESSMENT AND REVIEW (PLANNED)

1. Using Measures to Challenge Strategic Assumptions

A PMS should also have an effective mechanism for reviewing and revising targets and standards (Ghalayini and Noble 1996). It should have a process for developing individual measures as performance and circumstances change (Maskell 1989). This should be done to coincide with changes in either the competitive environment or strategic direction (Dixon *et al.* 1990, Wisner and Fawcett 1991, Lingle and Schiemann 1996). The IBIS allows for periodical review and revision of the complete set of measures in use. These review processes are part of challenging the strategic assumptions. Once consistent performance is achieved then the measures need changing to maintain focus, giving new challenges and goals for improvement (Lantelme and Formoso 1999).

Benchmarking of Results

A single measure, unless it is relatively positioned to other results, tells nothing about the level of performance. Benchmarking positions results relatively and allows assessment of performance to be made and is defined as:

> *A process of continuous improvement based on the comparison of an organisation's processes or products with those identified as best practice. The best practice comparison is used as a means of establishing achievable goals aimed at obtaining organisational superiority.*
>
> *(McGeorge and Palmer 1997)*

McGeorge and Palmer (1997), suggest that there are three levels to benchmarking. Level 1 is internally, within the company, which allows comparisons between different departments and also progressive reviews to measure attainment of targets set. This can be used to identify areas of best practice within the company, which could be transferred throughout the company. Level 2 focuses on an organisations' competitors, i.e. other companies within the industry. This comparison attempts to compare the organisation's processes with those of organisations that produce and sell the same products or services, particularly those with commercial advantage. Level 3 is the comparison with other industries, often referred to as functional/generic benchmarking. This type of benchmarking is thought to lead to the most change in an organisation's process. This is because it involves comparisons with those that are best in class (Figure 5). For the IBIS, most of the specific measures aligned to objectives and CSF for the case study organisation preclude Levels 2 and 3 benchmarking. However Levels 2 and 3

benchmarking can be used for some of the measures. Benchmark information from the CIRIA Design KPIs (CIRIA 2001) has been included in some of the Processes (Criterion 5) and Partnership and Resources (Criterion 4) measures. Benchmarks for people measures can be taken from within the industry from the CBPP KPIs and also from other industries. There is however a distinct shortage of process benchmarks within the industry and therefore only internal trends can be used.

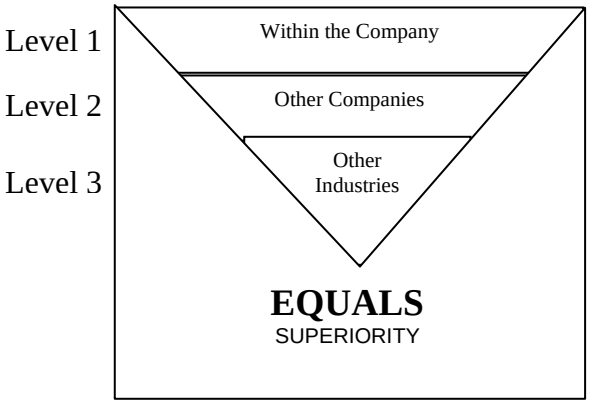

Figure 3-The Objectives of Success Using Benchmarking. Adapted from McCabe (2001).

Consideration also needs to be given to how the results are going to be communicated to the employees. It is suggested that the results are published following each periodic review. The Operations Team currently publishes some results after each of their monthly reviews.

2.4.2 PHASE 8 – IMPROVEMENT PROGRAMMES

Once results have been ascertained and reviewed the second cycle of the PMS can be undertaken. The flexibility of the IBIS means that improvement projects can be run concurrently with their results used as input to the IBIS. One current improvement programme involves a cultural assessment of the case study unit (Beatham, Anumba and Thorpe 2003). Objectives were set against the benchmark results of the assessment and an improvement programme initiated. The steps initiated under the programme and the end results will be inputted into the IBIS. The intention is that by having the results of the improvement programmes as part of the IBIS, then the programmes become part of the normal working practice and not as a side initiative as they currently are. This has yet to be tested within the case study organisation.

3 DISCUSSION

Throughout the process, review sessions were held with the top Leadership team and the Head of Business Improvement in the case study unit. Semi-structured interviews were also held with some of the managers involved. This information was presented and discussed in the review sessions. Below is a summary of these findings:

3.1 THE DESIGN OF THE IBIS

- There were issues regarding the use of EFQM Excellence Model within the structure of the IBIS. Many of the Business Management Team were confused with the language and complexity of the model, and felt that it was too much 'consultancy speak' and not applicable to their situation. A lack of understanding relative to 'experts' of the model was also cited as a barrier to its use. Several of the Business Management Team had been trained in the use of the model, whilst many had no experience. All of the Business Management Team were more familiar with the Balanced Scorecard, and the view was expressed that less understanding was required to use this effectively compared to the Excellence Model.

- The IBIS was developed for use in the case study unit. It was also used in several parts of the parent organisation of the case study unit. There was a desire in these parts to change the structure and have a bespoke solution unique for their part of the organisation. It was not determined whether this was due to the complexity of the model or the need to ensure that it was 'their' solution, and not a just a generic model solution. The need to have nine criteria was also questioned on several occasions.

- With two of the groups that were utilising the IBIS, the question of benefits realised from achieving the objectives/CSF was raised. This was initiated because of the perceived need to demonstrate the benefits to top management. This caused some debate, with various headings being suggested. This requirement was not envisaged when developing the system. It was assumed that by using the criteria of the model, which ensured a holistic approach was undertaken, managers would be satisfied that all areas would be covered and that the achievement of individual objectives/CSF would achieve the desired results. However, those involved in the development and population of the IBIS determined that the benefits or impact of the measures against the traditional headings of time, cost etc was required (see Table 2). This was a driver to such an extent, that in one situation, these benefits were used as the main objectives (see Table 3). In this case, the same measure could be used against more than one objective. It was suggested that this duplication would cause confusion for management when reviewing the results. Each measure is shown by a unique reference in the table.

- It was recognised that to achieve each objective a process with several step achievements may be necessary. This could be presented in the structure of the IBIS by having the step achievements of the process being the measures against each CSF, or by having the CSFs as the step achievements. It was agreed that both approaches were appropriate in the system.

TABLE 2 - Benefits derived from achievement of measures against criteria

CRITERIA				BENEFITS				
	Objective	CSF	Measure	Cost	Time	Behaviour	Value	Position
LEADERSHIP	1	1.1	1.1.1	✓				✓
			1.1.2	✓				✓
	2	2.1	2.1.1	✓	✓		✓	✓
			2.1.2				✓	
		2.2	2.2.1			✓	✓	
POLICY & STRATEGY	3	3.1	3.1.1		✓			
			3.1.2	✓		✓		✓
PEOPLE	4	4.1	4.1.1	✓		✓		✓
			4.1.2	✓	✓	✓		✓
		4.2	4.2.1			✓		
			4.2.2					✓

TABLE 3 - Multiple Use of Measures aligned to Benefit Objectives

			BENEFITS				
Benefit Objective	CSF	Measure	Cost	Time	Behaviour	Value	Position
COST	1.1	1.1.1	✓				✓
	2.1	2.1.1	✓	✓		✓	✓
	3.1	3.1.1		✓			
TIME	1.1	1.1.1	✓				✓
	2.1	2.1.2				✓	
	3.1	3.1.2	✓		✓		✓
BEHAVIOUR	1.1	1.1.1	✓				✓
	2.1	2.1.3			✓		
	3.1	3.1.3			✓		

3.2 THE IMPLEMENTATION OF THE IBIS

The structure of the IBIS was developed in isolation from the new Business Management Team of the case study unit. When the objectives of the business unit were developed, the structure of the IBIS was not considered. Initially the top leadership team had developed objectives under the four headings of the Balanced Scorecard. Testing these against the EFQM Excellence Model identified significant gaps. In this respect, the Excellence Model provided a more robust and holistic approach to the establishment of the objectives of the business. Proposals to address the gaps were produced by the facilitators, however, these were not presented back to the Business Management Team and were therefore not accepted by them. If the IBIS is to be used effectively, then its structure should be considered during the process of developing objectives and strategies. It is suggested that experienced facilitators are required to assist this process. This ensures that the process is undertaken only once, and that full agreement is achievable by all those involved. The structure of the IBIS identifies three levels of

measures, business, operations and team/individual. It is important that understanding and engagement is achieved at all three levels within the system.

There was significant resistance to the IBIS by some members of the Operations Team, which sits below the Business Management Team in the case study unit. The original intention was to get all managers involved in all phases of the population and implementation of the IBIS. However, due to the resistance the process failed and had to be revisited. Four steps were proposed to ensure the successful implementation of the IBIS (see Figure 6).

1. Separate understanding from the process. Ensure that everyone has an understanding of IBIS and the measurement process.

2. Empower all managers by getting agreement to the objectives and areas to measure. This empowerment may or may not be successful for everyone. This does not affect the overall process.

3. Offer engagement (in the development of the measures) to those that want it (early adopters) by agreeing with the team who has ownership for developing the measures. This ownership ensures that the measures are consistent and transparent for chosen levels across the business. Those not engaged must be in agreement with the delegation of authority for the development of the measures/CSF for the chosen objectives. They must also understand their mandatory requirement to engage in the process once the measures are developed.

4. Using the senior managers, enforce engagement from the rest (laggards) by using the measures as a key management tool to drive performance, by linking them to individual objectives and using the system as the management review tool.

This process was successfully utilised by the two improvement teams, chosen to address the two key areas.

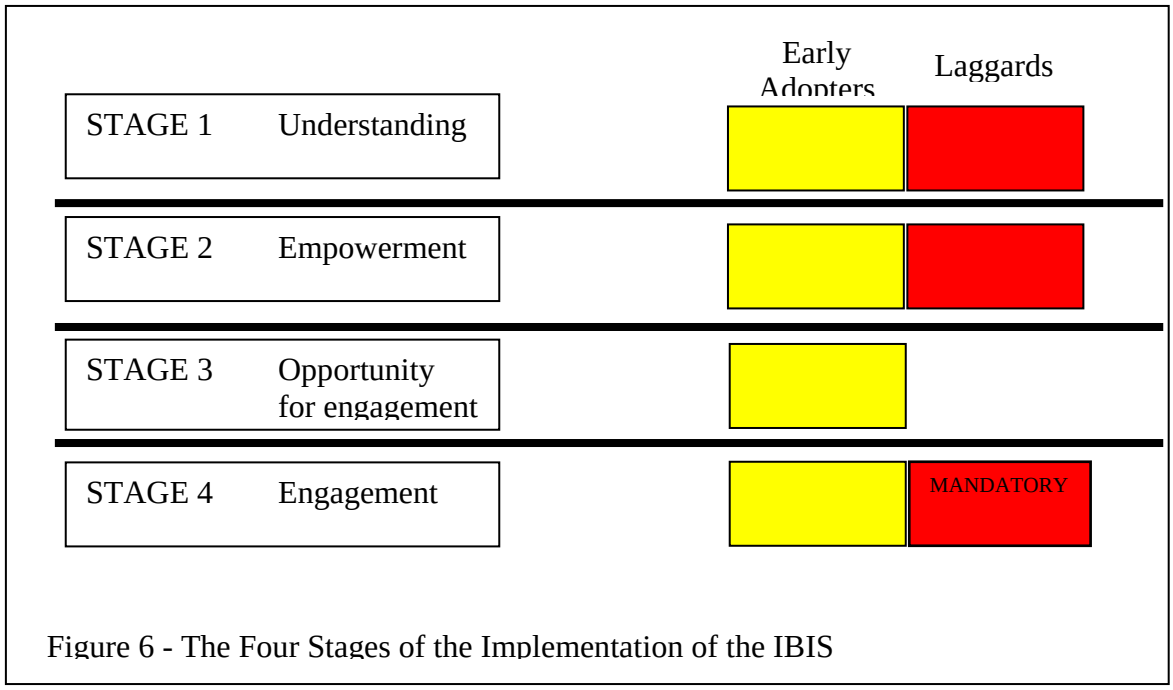

Figure 6 - The Four Stages of the Implementation of the IBIS

3.3 THE USE OF THE IBIS

Having populated the IBIS with CSF and measures, it was agreed that the actual measures should be developed by those who were closest to, and who had the most experience of, the particular process or aspect to be measured. Some of the managers were comfortable with this but others were reluctant to delegate this responsibility. As mentioned earlier, it is critical to engage in the second cycle of any PMS. The intention was to engender a performance measurement culture initially and use the results to then drive the change process in the second cycle. If managers perceive that the measures are not adding value then they will not be fully incorporated into core business practice and their use will not be sustainable. An example of this is the Major Contractors Group (MCG) in the UK. This private club, involving many of the biggest companies in the construction industry, undertook to benchmark themselves using several KPIs. It was discovered in interviews with participants, that this measurement has now stopped because the measures were not seen as adding sufficient value to some of the participating companies. Many of the measures cover new areas, not measured before. Managers need to have confidence that there are strong causal relationships between the measures being reviewed and the achievement of the objective. The stronger the perceived relationship the more confidence the managers will have in the measures and the more likely they are to use the system as an integral business management tool to influence decisions. Further research needs to be undertaken in this area.

4 CONCLUSIONS

The most important aspect for the successful implementation of a PMS is leadership. The leadership needs to engage the leaders of the business fully in the process of the design, implementation and use of the system. The leadership must have conviction in the validity of the system and ensure that the system's integrity is maintained throughout the process. Significant barriers exist to the implementation of a system, and these barriers increase with increased work pressure. For the system to become an integral part of a business, it must be seen to add value and be used as a key management tool in the successful delivery of the business improvement. The use of the EFQM Excellence Model ensures a holistic approach to the structure of the IBIS and provides the opportunity for all three types of measures to be used. The three layers of the IBIS can provide alignment of objectives throughout the organisation. The development process of the system is as critical as the design and use of the system, and should be used to obtain engagement in the system from the users. Zairi (1996), concludes that it is the human component that is critical for the successful implementation of any PMS. The IBIS is just beginning to be used by the case study unit. It is expected that this will help to deliver improvement across the business. Further research needs to be carried out to assess the long term effectiveness of the IBIS.

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