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PROJECT FAILURES: A COMPARATIVE STUDY OF INFORMATION AND COMMUNICATION TECHNOLOGIES (ICT) AND CONSTRUCTION PROJECTS

By
Gordian Udechukwu Ojiako

A thesis submitted in partial fulfilment of the requirements for the degree of

Doctor of Philosophy

School of the Built Environment
THE UNIVERSITY OF NORTHUMBRIA AT NEWCASTLE UPON TYNE
September 2004

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ABSTRACT

In the ICT industry, since de-regulation business objectives have been closely linked to the lowering of prices and improvement in quality of service.

Unfortunately, the industry has arguably failed to deliver the majority of its projects.

This research examines this described failure and considers the reasons why it occurs. As a starting point, the research suggests that the ICT industry might be better off by comparing its progress against that already made by the construction industry, an industry involved in projects with similar characteristics such as complex relationships, detailed information and long delivery periods over many phases.

A framework demonstrating similarities and differences in project characteristics between construction and ICT was developed from available literature. The framework was examined and refined by carrying out in-depth interviews. It was then tested using data from a survey of professionals involved in Construction and ICT projects. The results of the analysis indicate that there are no fundamental differences either in the definition of projects or the application of project management systems, principles and methodologies between the two industries. Therefore this is not the reason for the failure of project delivery within ICT. The real problem appears to be in the method of project performance measurement, which is based on an approach to project success that is separate from progress measurement criteria.

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Acknowledgements

I will like to thank a number of people who provided me with assistance, guidance, and support during the time it has taken me to complete this PhD thesis. In particular are my supervisors, Dr. David Greenwood and Mr. Eric Johansen. Without their support, encouragement and direction this thesis would not have been possible. I will also like to thank Dr. Stuart Maguire of the University of Sheffield Management School on his contributions and interest in my work. I am particularly grateful for his time and for sharing insights on the latest management practices with me.

I acknowledge my employers, British Telecomm PLC for their generous support of this study through the BT Research Scholarship. Thanks to Mrs. Catherine Scott and Mr Steve White who first took interest in my work and ensured that I received corporate funding for this Research.

I would also like to thank all the participants during the interview stage, although due to confidentiality, I am prevented from mentioning names.

A personal thanks goes to my wife Ngozi for the emotional support during the numerous hours of writing. I also thank her for her constant love, patience, and support. Last but not least, a special thanks to my father Professor Gordian Udechukwu Ojiako for being a wonderful inspiration. Thanks Dad.

This thesis is dedicated to my mother, Georgina Uchenna.

Sponsorship

BT Research Scholarship (2000-2004),
Awarded for the study of PhD in Project Management at the
University of Northumbria, Newcastle upon Tyne
(Scholarship number 2200314557, 1080015151 and 1080020716).

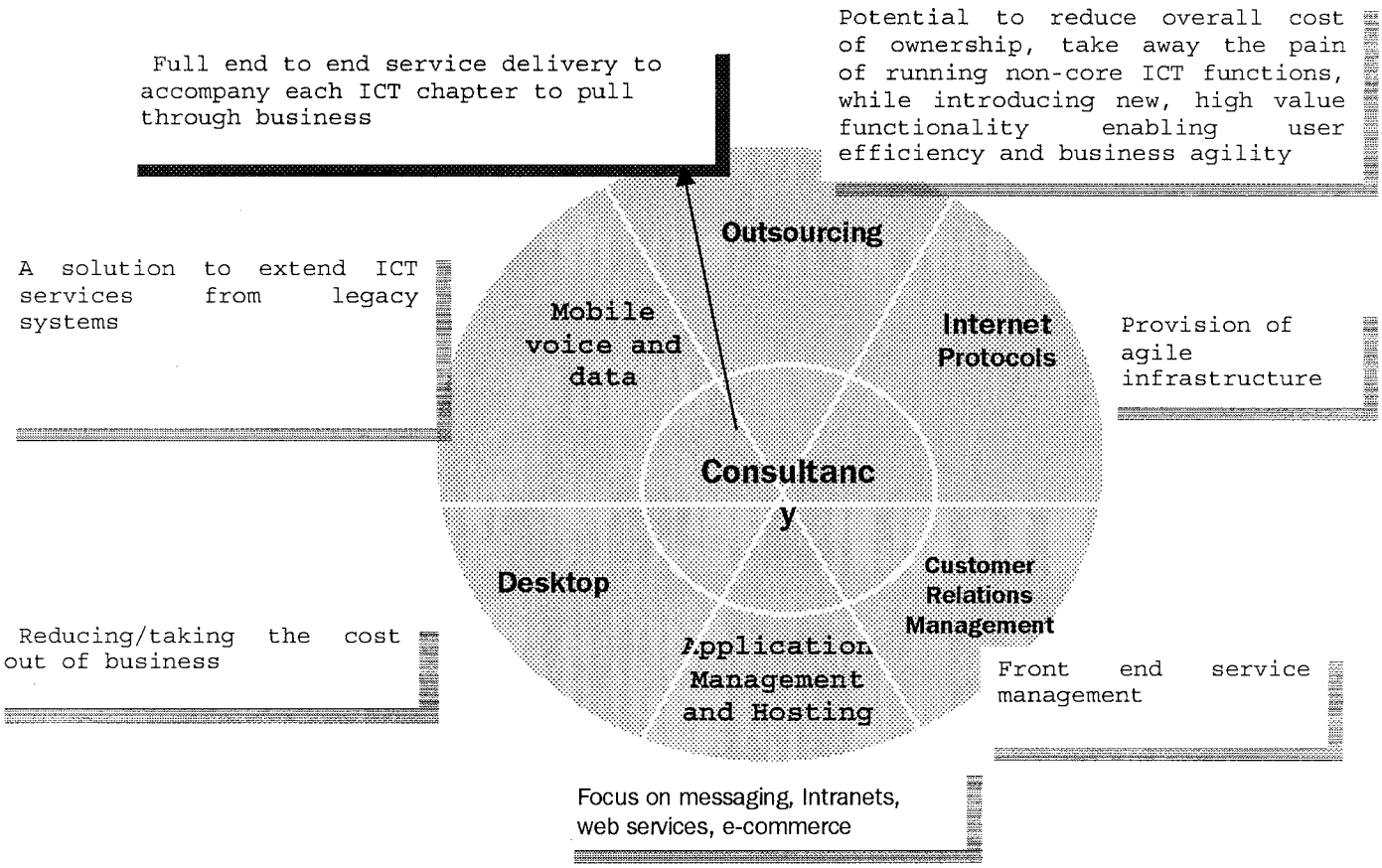
Chapter One- Introduction

1.1 Background and the need for the study

Information & Communication Technology (ICT) is about the convergence of the Information with the Technology and Communications industries.

Primarily, ICT is a set of products offering data and value-added services including remote access, desktop management and Public Switched Telephone Networks (PSTN). All these services help companies run their businesses more flexibly and serve their customers more efficiently and effectively. Fig 1.0, below is a diagrammatic representation of what makes up the ICT market.

Fig 1.0: The ICT Market



Source: BT, 2003

ICT can influence the change management process and business relationships among co-operating and competing entities in any market (Brancheau, 1996). For private businesses, when properly executed, ICT involvement in business process can re-design initiatives and enable companies to offer novel products, incentives and services. According to Konsynski (1993) and Broadbent et al (1993), ICT can also encourage companies to participate in new market programs. For the public sector, when successfully implemented, ICT enables government to respond to the needs and expectation of citizens quickly and effectively (House of Commons, 2000).

Generally, ICT is geared towards supporting or transforming business processes. It can also provide a strategic value to all parts of the business in addition to supporting the administrative infrastructure of the organisation (Fedorowicz and Konsynski, 1992). Therefore the failure of an ICT project may have a great effect on the ability of a business to deliver its objectives. In the private sector, such an outcome can be catastrophic. In some cases, loss of major business and commercial opportunities is an outcome. In extreme cases, collapse and economic ruin could be contemplated.

The demise of FoxMeyer Drug Corporation is a well-known example of collapse due to poor ICT strategy implementation.

Following a failed Enterprise Resource Planning system implementation in 1994, the company collapsed and in 1996, it filed for Chapter 11 bankruptcy protection. In 1998, the company's bankruptcy trustees filed a £300 million lawsuit against accounting firm Deloitte and Touche. German software giant SAP AG was also sued for £300 million on the basis that SAP's software helped bring about the company's demise. A related £300 million suit was also filed against Andersen Consulting, alleging that Andersen's recommendation of the SAP software installation played a role in FoxMeyer's path toward liquidation (CIO Magazine, 2002; Drug Store News, 1998). The company also alleged that Andersen as project implementers mis-represented their expertise, assigned inexperienced people to the project while at the same time concealed from FoxMeyer the limitations of the SAP R/3 software.

For government, inability to fulfil its obligations, confusion and inconvenience to citizens and poor value for money to the taxpayer is a typical outcome of failed ICT projects. An example of such a project is the Ministry of Defence's Project Trawlerman which was written off at a cost of over £41 million (House of Commons, 2000).

As business needs change and ICT develops in line with these changes, companies maximising the use of new technologies will find themselves dealing with projects that are difficult and expensive to implement precisely because they are innovative. Unfortunately the need to develop and deliver innovative ICT projects is hampered by the belief that ICT projects are always going on for longer than expected, failing to meet user requirements or a return on investment. At the same time, they end up more expensive than previously envisaged, thus failing to meet strategic needs of clients. The evidence of ICT implementation failure has been overwhelming with figures as high as a 75% failure rate being quoted by Gladden (1982).

Against this background, there have been reports about the high failure rates of ICT projects, which indicate that businesses need to be concerned. Such reports (Wilcocks and Lester, 1994; Cane, 1993; Gladden, 1982; Crescenzi, 1988; Pagoda Associates, 1994; Sabbagh, 1999) both in press and trade journals suggest that private and public sector ICT projects are increasingly not being delivered on time. They are also completed over budget and either fail to match specifications or require changes before being fit for use.

What is however needed before attempts to identify and address the research questions is to provide a clearer focus on the difference between measuring for project *progress* and measuring project *failure*. This differentiation is being conducted bearing in mind first Wateridge's (1995) suggestion that most articles and papers have traditionally concentrated their effort on factors that point to the way of project success. In this thesis, the term project success refers to the delivery of a specific functionality within budget, timescales and to the users *immediate* requirements and specification. Secondly, the question is usually asked as to whether an ICT project such as Kodak's Project Advantix system-Orion was a success

or not? From a project management perspective, there is no doubt that it was a success (it was recognised by the Project Management Institute as the 1997 International Project of the Year). The unfortunately reality is that since its successful deployment, Kodak's stock price has fallen 67% primarily because Kodak failed to anticipate the accelerating switch to digital photography (Bandler, 2003). Such occurrences within the ICT industry raise serious questions on what exactly success or failure means. It is being proposed that based on Kodak's experience, it is necessary to separate measures of progress and success.

Three questions are therefore considered within this thesis.

- Why do such high failure rates within ICT projects occur?
- Is the failure rate unusual? Is it as a result of poor project management practice within ICT, Do ICT projects exhibit any peculiarity that encourages such results?
- How can the failure be measured?

From available literature, it has been possible to identify various reasons that influence failure of ICT projects. These factors include current ICT practices of not linking business value to technical functionality at *requirement definition* stage, unresolved technical uncertainties and inadequate customer needs assessment. Other reasons identified include the use of poor and inappropriate success criteria within ICT industry for measuring success (Ojiako et al, 2004a) and the definition and initiation of ICT projects in technical terms instead of business terms. This often results in project lead-times that are often longer than the time requirements of the business they are supposed to serve. It is also accepted that to some extent the technical project manager, and not business development managers drives most ICT projects. As a result, it is possible that in trying to meet functionality requirements, the role of the project within the wider strategic objective of the organisation is being missed.

Lisburn and Baxter (1994) emphasise the second issue that needs to be considered, that is whether possible weaknesses in ICT project management have led to such high failure rates. Reports by the Public Accounts Committee of the House of Commons (2000) and additional work on project management maturity levels by William and Kwak (2000) and

Dooley (1998) sees such a link. Cooke-Davies and Arzymanow (2003) who assessed project management maturity levels across various industries also carried out additional research. In their research they presented evidence to show that based on an identification of nine domains including organisational understanding of multidiscipline project management and competency of project management staff, the construction industry exhibited a more mature project management practice than the ICT industry.

The third question raised in this research relates to the extent of the failure and how it can be measured and assessed. Is there a way that variances between the desired and produced ICT products can be measured, how is success or failure actually measured and whether measuring for project progress and measuring project failure actually refer to the same activity. The expectation is that if this is possible, perhaps another option towards addressing the high rate of project in the industry will emerge.

In order to answer the research questions, a comparison with the construction industry is to be conducted. The comparison is possible because the construction and ICT industries have sufficient similarities to make a comparison valid. There are also differences. For the construction industry, major initiatives set up in the mid 1990's geared towards improving the construction process and challenging existing management and organisational methods are now being positively implemented. Arguably, similar initiatives apart from the creation of an e-government unit and Chief Information Officer responsible for ensuring that IT supports the business transformation of government and the public sector, do not exist within the ICT industry. The construction industry is also developing theory and practice to address its failures. The question is whether these theories and practices might assist to overcome similar problems in ICT.

There is nothing new in comparisons between different industries. In fact, Green et al (2004), point out that such comparisons especially for industries that are so different allow for existing management assumptions to be challenged, thus better equipping managers to cope with change.

1.2 Aim of the Research, objectives, and methodology

In order to address the three research questions as set out in section 1.1, three main objectives were established. It was expected that by achieving these research objectives, the research questions would be answered.

The first research objective involved the examination of gaps in knowledge about failures of ICT projects. The second research objective involved a comparative analysis of ICT and construction project failure rates which supplemented work already done by Sauer and Cuthbertson (2003), William and Kwak (2000), Cooke-Davies and Arzymanow (2003) and Lisburn and Baxter (1994). The research also aimed to develop a method of project measurement based on approaches to project success that separates performance and progress measurement criteria.

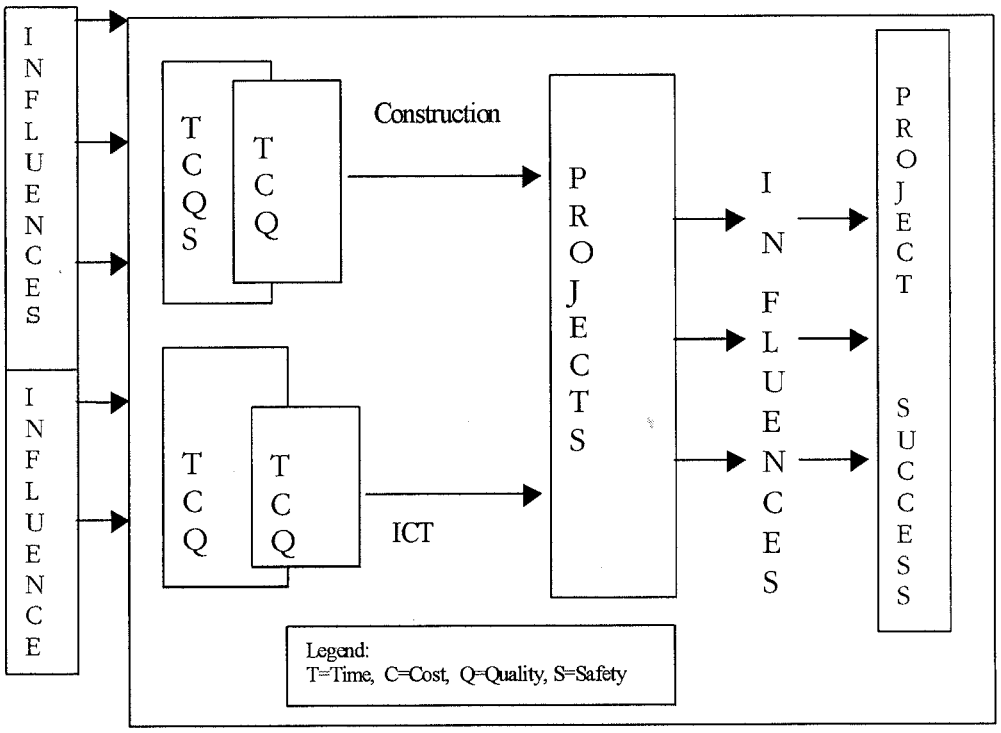
The research method was based on grounded theory as described by Pandit (1996). This process involved first identifying the critical success factors that affect delivery in both ICT and construction projects. Once this was done, relevant data on environmental uncertainty levels of both ICT and construction projects was collected and analysed thus enabling the creation of a research framework based on a high level of inter-related detail on project management from studies of both construction and ICT management. The main conclusion to emerge was that ICT projects had a much more narrow success variance. It was also demonstrated that project success (or failure) criteria differ from project progress. As a result, it is difficult to see any advantage the ICT industry will draw on if it decides not to adopt an approach to project performance that fails to separate progress and success criteria.

The decision to conduct this research based on a comparative analysis of the ICT industry and the construction industry was based on three identified reasons.

In the first place, the two industries have projects that share many characteristics including difficulty and complexity in project definition leading to substantial changes in requirement up to completion. The similarities are shown in more detail in Figure 2.0. This diagram forms

the basis for the research philosophy. It shows similar environmental and project influences affecting both industries.

Fig 2.0: Input-Output Framework for Project Success



Secondly, according to Belassi (1996) critical success and failure (CSF) factors in three key areas covering the need for preliminary estimates, availability of resources and the importance of top management support were also to a large extent similar in both sets of project environments. This approach allowed for the application of generic project management methodologies and processes as described by Hartman (2002) and Cooke-Davies and Arzymanow (2003) which are detailed in the Association for Project

Management Body of Knowledge (Dixon, 2000). The third reason is that with two industries appearing to exhibit different levels of maturity in project management practice (Cooke-Davies and Arzymanow, 2003; William and Kwak, 2000; Bushait, 1989; Dooley et al, 1998), there exist possible learning opportunities for ICT.

There were however a number of concerns with a comparative study of this nature. This mainly concerned using similar criteria for comparing two industries that although exhibited many sufficient similarities to make a comparison valid, did also have special and differing characteristics. However, by promoting detailed attention to distinctive features of the two industries, this concern was addressed.

Figure 3.0 and 4.0 explain in pictorial terms the research direction and objective. In Figure 3.0, the thought process behind the research is demonstrated. The direction of the research covering where the research is coming from, the initial research questions, what was required and the expected outcome from the research are demonstrated.

Figure 4.0 is a breakdown of the research objectives. It shows how the main objective of the research was achieved by carrying out a comparative analysis of ICT and construction projects.

Fig 3.0: Diagram showing the Research Direction and Initiation

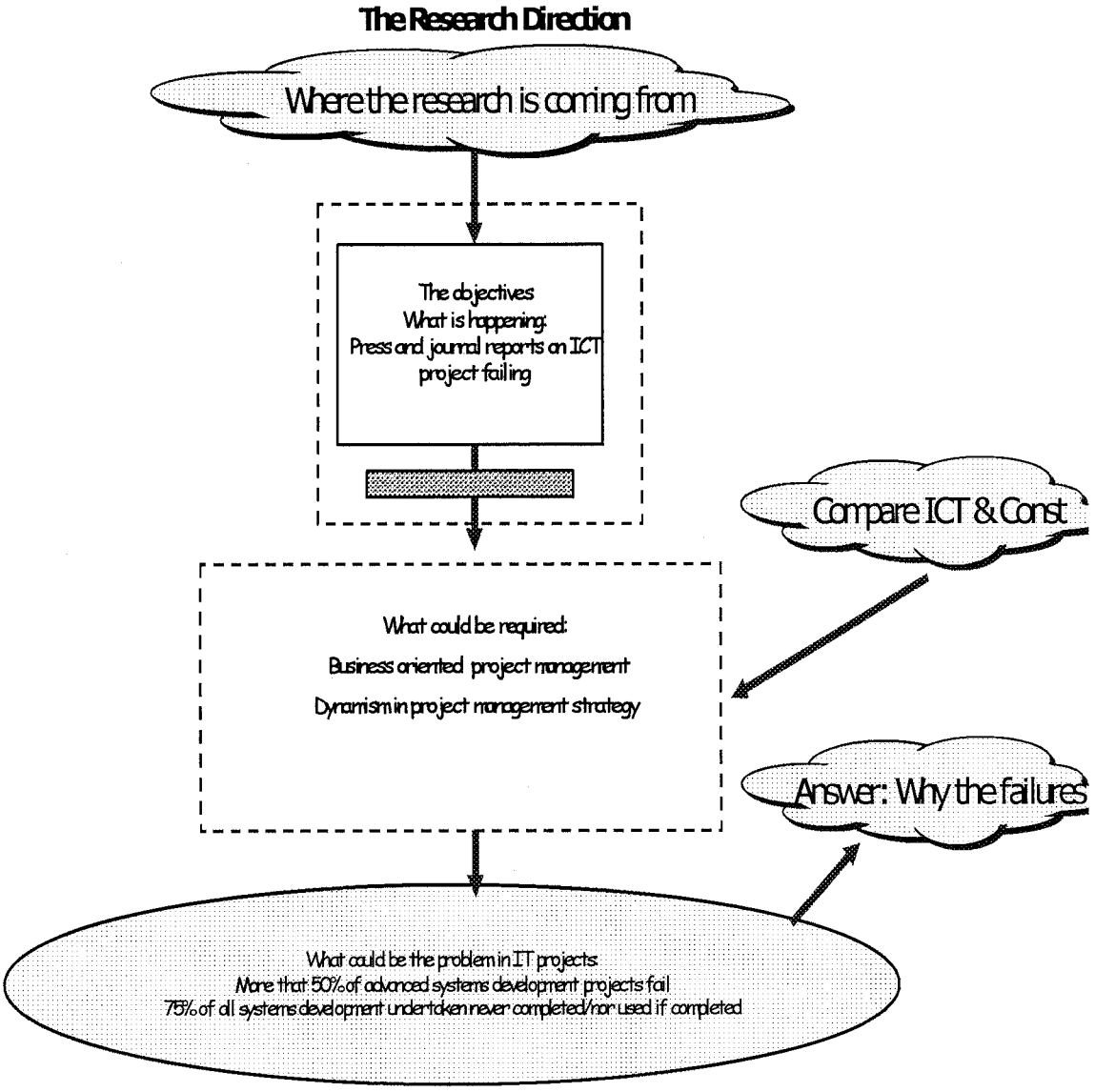
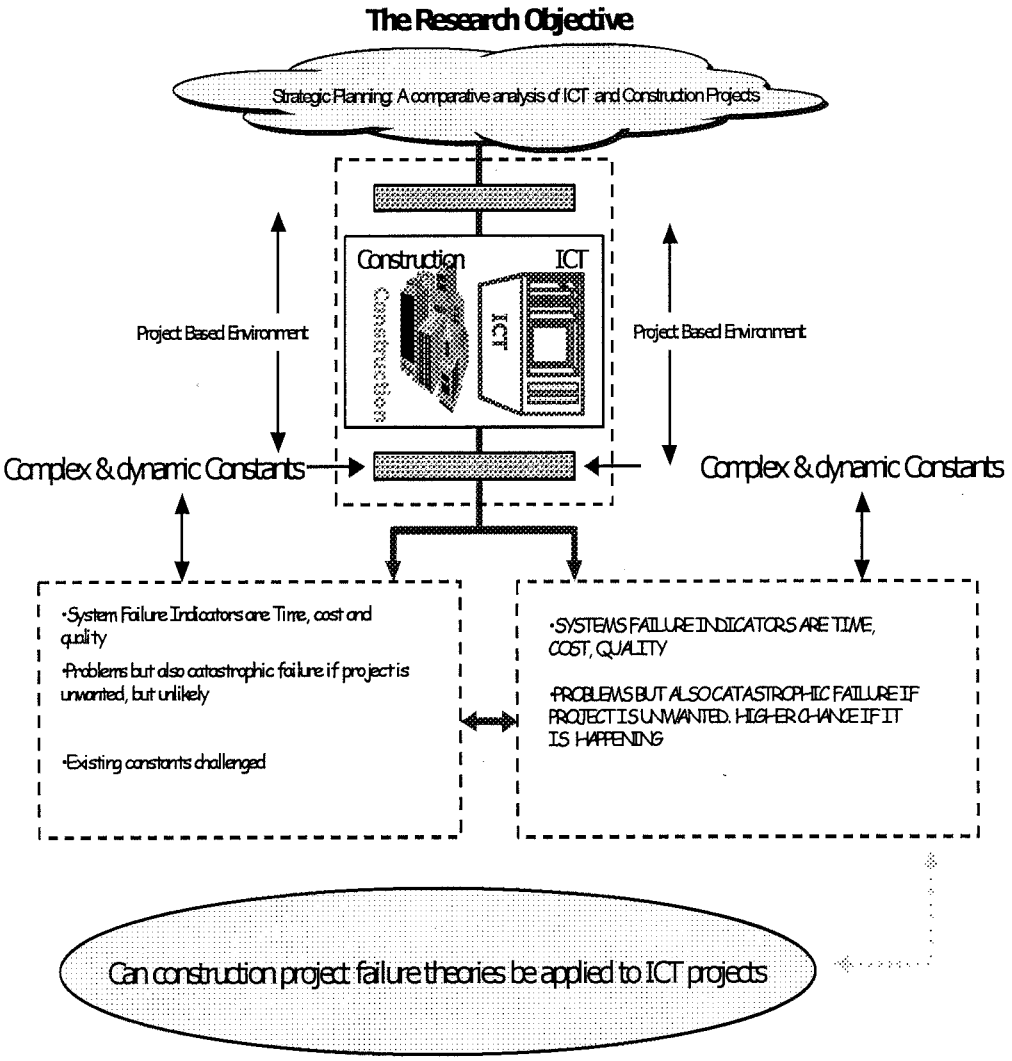


Fig 4.0: The Research Objectives



1.3 Framework Building

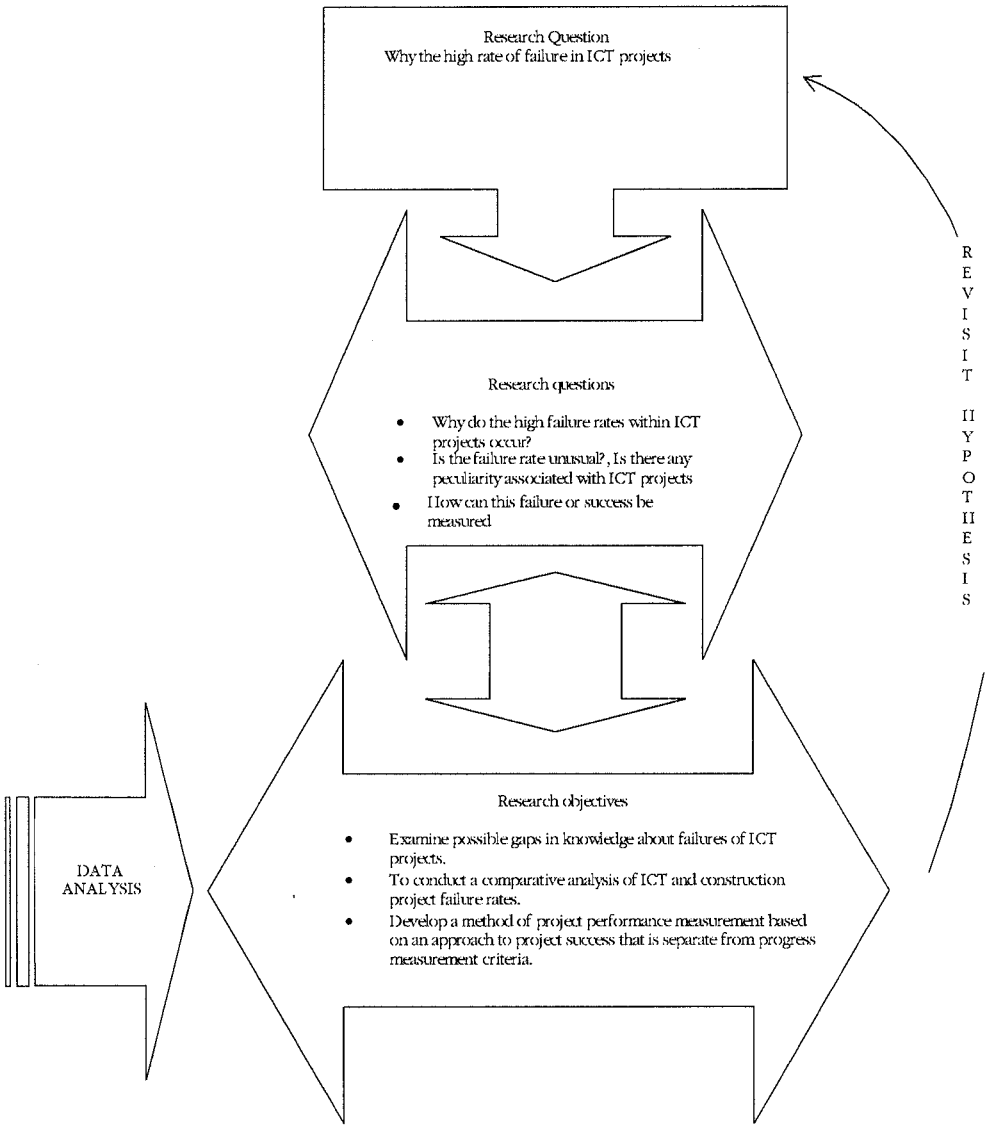
Prior to the presentation thesis outline, it is first appropriate to re-visit the earlier stated research questions (*section 1.2*) which include: -

- Why do such high failure rates within ICT projects occur?
- Is the failure rate unusual? Is it as a result of poor project management practice within ICT, Do ICT projects exhibit any peculiarity that encourages such results?
- How can the failure be measured?

In order to answer these research questions, the thesis identified three objectives that had to be met.

- Examine possible gaps in knowledge about failures of ICT projects.
- To conduct a comparative analysis of ICT and construction project failure rates.
- Develop a method of project performance measurement based on an approach to project success that is separate from progress measurement criteria.

Fig 5.0: Link between Research Questions and Objectives



A qualitative technique based on Grounded Theory was identified as the preferred method of research. This methodology was seen to be most suitable to provide explanations to social phenomena such as processes and the abstract idea of failure being studied via a systematic collection and analysis of data. This enabled the collection of relevant data that could facilitate the analysis of specific issues and assumptions made during the earlier part of the thesis.

Considerable attention was also given to the issue of research validity. This meant that the chosen research methodology had to be both appropriate and well conducted in such a way that its results were seen to be no less accurate than the '*scientific* ' quantitative methodology.

Semi- structured interviews were identified as the preferred data collection methodology for the research. This was in order to avoid any difficulties in capturing such an extensive amount of data by mail or telephone questionnaires. By adopting this approach, it was anticipated that it would be possible to clear up any misunderstanding or misinterpretation of some of the research questions due to the variety of terminology in the field of project management. This was especially important as the interview was to be directed towards two different industries. One fundamental area that this issue emerged was the term and definitions used during the interviewing stages for project managers in the construction industry. Historically, project managers within the construction industry who work for the contractor has been referred to as Construction Managers. It is recognised that within the construction industry, there are project managers who work for the client and do look at design development. At the same time, there are construction managers in Design and Build roles who also carry out similar functions. However for the purpose of this research, the construction manager's role was classed as project management.

The main approach to the structure of the interviews was to be designed based on Yin (1994) and Strauss and Corbin's (1990) framework. The interview, which was based exploratory and descriptive questions, would involve walking through the proposed ICT- Construction framework. The sample size was regarded as appropriate to satisfy requirements of informational redundancy and saturation.

This was based on the fact that there is no mathematical formula for justifying qualitative sample sizes.

For the build of a proposed measure framework, the analysis carried out to meet the study's objectives provided a thorough basis for framework building. This was to be achieved based on information in available literature captured in Chapters Three, Five, and Six. Using such literature, it is anticipated that the study will be able to demonstrate the similarities and differences in environmental and project influences that affected both industries based on three propositions. First, there was a description of the enhanced use of project management methodologies in project related work deliveries and deployments within both industries. Secondly, there was general acceptance that unlike ICT, the construction industry *did* have a mature and effective feedback mechanism established over many years. Finally, the influences exerted by industry similarities such as discontinuity of project phases and environmental turbulence and peculiarities such as high transaction cost (for construction) and ICT (focus on technology research and development) were also to be described.

The framework was to be examined and refined by carrying out in-depth interviews of project management (and related professionals) involved in Construction and ICT projects. It is expected that the interview will demonstrate the study's desire to stretch the data analysis technique that was adopted. It is expected that this will encourage the development of an appropriate comparative analysis of both sets of projects with the overall objective of establishing whether a method of project performance measurement can be developed for ICT based on the application of proven criteria that existed within construction. By adopting this technique, limitations within the initial ICT-Construction Framework were to be identified (hence the need for the research to develop a new framework). The paradigm, which is expected to emerge, is thus based on a more simple and flexible capability and as such will be regarded as more appropriate to be applied to everyday project environments. The expectations is that this framework will be able to find a ready resonance with the literature on project failure and at the same time more capable in describing the wide range of issues affecting both industry projects in terms of factors and variables. It is believed that this

framework will demonstrate is a robust picture of variables that not only influence project performance outcomes, but also defines the need for its measurement.

1.4 Outline of thesis

Chapter One seeks to satisfy a number of objectives stated in section 1.3. In the first instance, it shows the need for the study. Statements and diagrams showing the research aims, objectives, and strategy are produced.

In the second chapter, a review is conducted of ICT deployments. Reasons for ICT project failures are also presented. A historical overview of the telecommunications industry, one of the biggest sponsors of ICT projects is carried out. The value of ICT and its alignment for corporate success is also examined.

Chapter Three provides an overview of the UK Construction Industry, and within this chapter, similarities and differences in characteristics between the UK Construction Industry and ICT industry are examined. This chapter also looks at the state of the industry and innovation in construction. The roles of government and the private sector in UK construction are also appraised.

Chapter Four reports on the concept of project success and failure, the causes of project failure and ways of ensuring project success. This chapter also expands on current knowledge on project success and the idea of failure.

Chapter Five of the thesis presents frameworks for the research strategy. A data collection exercise via qualitative semi-structured interviews was also conducted in this chapter. The interviews are coded and theory is built using grounded theory procedures. This chapter is particularly important as it emphasises the main characteristics and industry peculiarities between Information & Communication Technology (ICT) and Construction project failures. It also emphasises propositions of the lack of a universal reason for project failure that is based on work carried out by Green et al (2004), who point out that the universal applicability of managerial practices is not feasible. In the same way, the research is based on assumptions that reasons for project failure are rarely universally similar.

Table 1.0: Research stages and chapter mapping

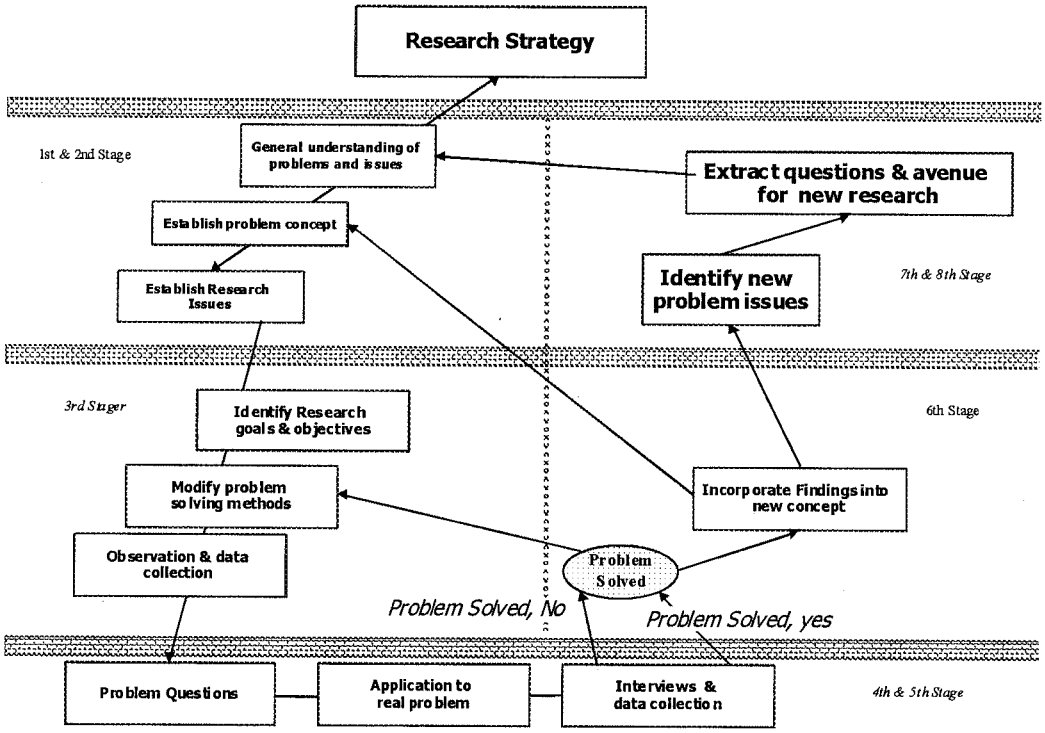
Stage	Contents	Mapped to Chapter	Contents
First stage	Project failure in ICT projects. This is shown in trade journals and press reports. The question: Is this unusual. Is the rate of ICT project failure peculiar?	Chapter One.	Summarises the current state of knowledge on failures within the ICT project. Shows the need for the study.
		Chapter Two.	Conducts a historical overview of the telecommunications industry. Reviews ICT deployments, implementation and reasons for ICT failures. Discusses value of ICT and its alignment for corporate success.
Second stage	In order to answer the question on whether the rate of ICT failure Is unusual, construction projects are chosen as a means of comparison.	Chapter Three	Provides UK Construction overview. Similarities and differences between ICT and construction.
Third stage	Using the research Input-output framework for project success, the research suggests that the construction and ICT industries are similar and comparable.	Chapter Four.	Reports on project success and failure. Causes of project failure. Ways of ensuring success. Discusses state of the industry. Innovation in construction.
Fourth stage	The question is then asked. If both industries are similar? Why is the rate of ICT project failure higher than that of construction? The ICT-Construction framework is developed in the research that looks at the difference between the two industries.	Chapter Five.	Presents the research strategy via modelling. Conducts data collection exercise.
Fifth stage	The ICT-Construction framework is tested using A qualitative analysis technique of interviews and analysis.	Chapter Six.	The research analysis.
Sixth stage	Possible research conclusion that higher rate of project failure in ICT could be as a result of many factors. Failure Concepts.	Chapter Seven.	Discusses research findings. Revisits the concept of failure. What outcome emerges from current industry thinking? Revised research strategy framework
Final stage	What are the implications for industry and future research?	Chapter Eight.	Reviews research limitation. Recommendations for further research.

Chapter Six covers the analysis of the collected data. In Chapter Seven, discussions on the research findings are conducted. In Chapter Eight, a re-examination of the failure concept is carried out in order to produce a model for measuring ICT success. Interviewing a targeted sample of ICT project managers was used to validate this model.

Table 1.0 above shows the research road map. It explains how key issues in the research are systematically addressed to reach a research conclusion.

Figure 6.0 (below) on the other shows the research strategy and the relationships between the various stages of the research

Fig 6.0: Research Strategy Relationships



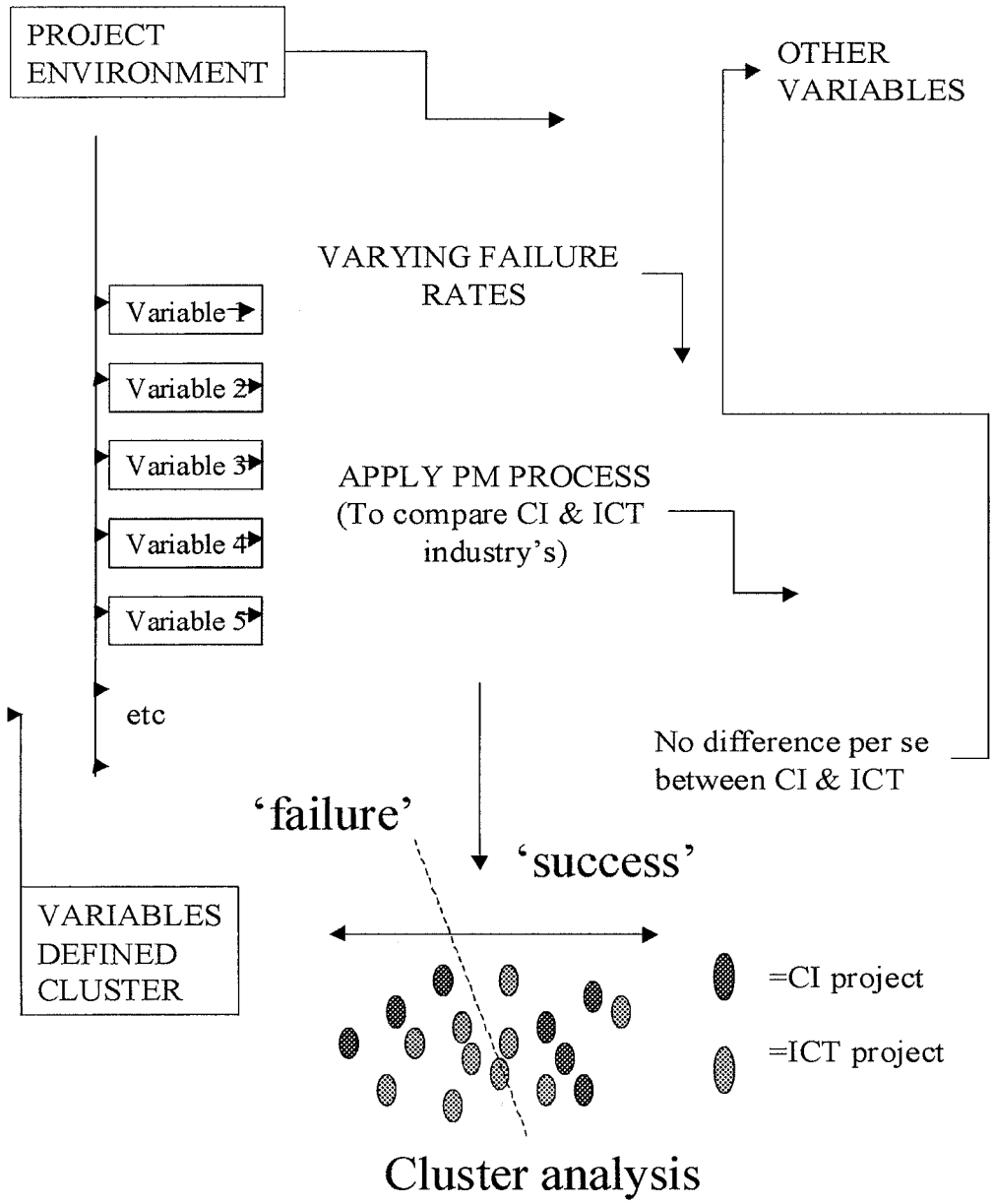
1.5 Current state of knowledge

Consideration of the current state of knowledge on project failure concepts indicates that there has been little or no attempt to establish actual criteria for measuring success or failure variations in ICT projects.

Work on variations and criteria for project success have been carried out by Ojiako et al (2004c; 2004d), who suggested the establishment of dynamic and flexible measures of success. Such measures are to be based on consideration of ICT industry peculiarities, the role of strategy and strategic measures of *project* success as against project progress over time.

Wateridge (1998) and de Wit (1998) have also carried out additional studies. In his paper, "*Measurement of project management success*" de Wit questions how the required level of performance for success can be specified and suggest adopting measures which include assessing cost over-run as a percentage of initial budget when establishing performance variance for cost. For time measurement, he recommends the assessment of current progress relative to the initial project plan. In this thesis, it is being pointed out that irrespective of the work done by de Wit, no directed effort has previously been made to establish a performance variances framework based on a comparison of two industries that reside at different levels of the project management maturity spectrum. The research is thus conducted based on the view that using successful application of project management principles, it might be possible to compare project performance of construction and ICT projects. It is anticipated that this will help establish not only the reason why quite a lot of ICT projects are believed to fail, but also assist in developing a method of project performance measurement which is based on an approach to project success that is separate from project progress.

Fig 7.0: The Research Direction



The research will use current knowledge to re-affirm the concept of generic project management processes and maturity in application within both the Construction and ICT industries. This comparison is expected to be employed within the research strategy and will form the basis of developing a revised ICT-Construction Framework that explains current measures of project success across the two industries. It is expected that basic analysis of this framework will be conducted. Any outcome from this exercise may produce a revised framework for ICT project success measure that is based on the separation of project performance and progress measurement criteria.

Chapter Two- ICT Failures

2.1 ICT Deployment

With one of the largest ICT sector markets in Europe, the UK has a large and thriving market that accounts for 22 per cent of the European total (Barclays Bank, 2002). It also is one of the UK's fastest growing marketplaces, at around 9 per cent per annum. Estimated total sales of ICT products at 2001 figures stood at about £88 billion representing 5.2% of national Gross Domestic Product (GDP).

ICT has continued to change over the last few decades. For example, the physical hardware of computer systems is evolving so fast that it can become obsolete within months. Often, ICT systems become insufficient to deal with the newest hardware and software in only a couple of years.

ICT is of vital importance (Ives and Learmonth, 1984; Parsons, 1983; Wiseman, 1985). It also plays a prominent part in many modern businesses (Ives et al, 1993) and like other technologies, it is a resource for companies to use when striving for organisational excellence. As a result, it is safe to assume that successful ICT capabilities are based on doing well what rivals cannot do readily. This, in Somogyi's (1993) view, means that while the importance of ICT to any business and organisation comes from its ability to support regular and important business activities, it is information that increasingly produces competitive advantage for business.

ICT could help implement re-engineering programmes, support new business strategies. It also supports the delivery of new products and services when tapping into emerging markets. ICT can also influence the change process and business relationships among co-operating and competing entities in a market (Brancheau et al, 1996). When properly deployed, ICT involvement in the re-design of business processes enables companies to offer novel products, incentives and services, while at the same time participate in new market programs (Konsynski, 1993). The application of ICT within organisations can also make small companies reach customers once beyond their grasp. At the same time it can enable big companies target and service custom markets (Broadbent et al, 1999).

Much of the work on the competitive application of ICT originated within the Harvard Business School and was undertaken by researchers such as McFarlan (1983), who emphasised the strategic potential of ICT by developing categories for describing existing applications. From this study, four specific aspects of business have emerged to make the application of ICT particularly relevant for any business. These include its ability to assess past performance, control current activities and plan for the future. In addition, ICT has an ability to bring about regular interaction and communication, thus making activities more effective, efficient, and viable.

For industry, with improved ICT provisions, the potential for economic and ongoing efficiency gains are considerable (Liebmann, 1998). In fact, the development of ICT for creative business processes is expected to result in the creation of commercial opportunities for most business. A further demonstration of the importance of ICT to industry is that major business issues with an ICT component such as the Y2k upgrade did become major business issues in their own right.

ICT has the potential for wide use and application in business improvement (Somogyi, 1993). Its alignment to business strategy and goals are also critical to the success of most organisations. According to Orlikowski (1992) and Stephenson (1987), this is because such an alignment will provide for increased competitiveness and organisational flexibility for organisations competing in highly volatile markets such as telecommunications. In King's (1984) view, this will ensure that technology and ICT imperatives link to business goals at the early conception and planning stage. The need for a proactive approach to any such alignment has also been emphasised by Reich (1996), Conrath et al (1992) and Earl (1987) especially as evidence does exist that success rates in attaining alignment is quite poor among various organisations. Although, there is an increasing recognition of the significance of ICT to the telecommunication organisation, there is still a lack of fundamental frameworks within which to understand the potential of its successful deployment to organisational strategy. Applegate et al (1996) believes that this is because ICT initiatives offer an opportunity for competitive advantage, while at the same time increasing strategic vulnerability. Such

issues have led researchers such as Gongla et al (1989) to develop *knowledge based system facilitator models* that could help business and ICT managers identify competitive ways to apply ICT.

2.2 ICT Retail Uses (UK Telecommunications)

With expenditure by telecommunications companies in the UK on licenses and network development alone estimated as high as £20 billion, UK telecommunications is one of the substantial users of ICT (Barclays Bank, 2002).

Effective use of telecommunications can bring down geographical boundaries and bring communities' closer in terms of global economic systems. In the UK, telecommunications plays a central role our economic, social and political life. It also represents one of the most dynamic industrial sectors of the national economy (Ojiako et al, 2004d).

Telecommunications is a significant and growing sector in the UK economy. In 2002, UK telecommunications revenues were £48 billion compared to £15 billion in 1984 (BT, 2003).

According to existing data (Barclays Bank, 2002), net capital expenditure by the UK telecommunications industry was on average over £10 billion per year (at 2002 prices). This represents 11% of all the capital expenditure in the UK economy as a whole over the same period. By contrast, in 1984 net capital expenditure in telecommunications was just £3.6 billion (2002 prices) which represented around 7% of all capital expenditure.

These figures confirm the importance of telecommunications to the UK economy and similarly explain why telecommunications has become a critical component and driver of economic growth and development.

As a result, it is safe to suggest that the importance of the telecommunications industry derive not only from its size and rapid growth, but also from its impact on virtually all industries. According to Lipsey (2001), although considerable uncertainty hangs over the world economy at present, the telecommunications industry has

continued to experience growth in performance over the past decade.

The growth in UK telecommunications performance has also coincided with acceleration in investment in rapidly advancing ICT and the uptake of the Internet (Goldsworthy Report, 1997). New ICT projects have considerable potential to raise organisational economic performance. In the opinion of Brynjolfsson and Hitt (2000), this means that for the telecommunication company, technologies that are of general application can provide a platform for many other innovations while at the same time having pervasive economic effects on the organisation's ability to provide products and services. For successful ICT projects in the telecommunications industry, it means that contribution to organisational performance can come from its ability to reduce the costs of storing, accessing and exchanging information.

For most telecommunications companies, whatever the role of ICT, the potential for economic gains and ongoing efficiency gains are considerable. ICT allows for the reduction of hierarchical structures within firms. It also encourages greater empowerment and capabilities for employees. It is also expected to support and also allow for more lean and timely inventory management. This transforms relations between firms and their supplier's by providing increased scope to tailor products to individual requirement's (North, 1990). Hence, in order to ensure that telecommunications companies are achieving gains in productivity, Goedvolk (1995) emphasises the need to ensure that their ICT projects are managed in an efficient and effective manner.

2.3 Overview of UK telecommunications

The origins of the UK telecommunications industry can be traced to the introduction of commercial telegraph service in the early nineteenth century and the establishment of telephone companies to run these services. As these companies (such as the Chartered Submarine Telegraph Company, The Central Telegraph Office, Electric and International and the British and Irish Magnetic Companies) were amalgamated, taken over or collapsed, the survivors were eventually transferred to state control under the Post Office.

In 1868 the government passed the first of the Telegraph Acts, giving the Post Office then a government department a monopoly over UK telecommunications and postal services. This action consolidated the government's control over telecommunications, resulting in service providers requiring licences to operate. By 1913, most local telephone systems were under government control with the exception of Kingston Communications, which operated within the Hull area and retained its independence (Harrison, 1994). The first step towards de-regulation of the telecommunications industry, with the ultimate aim of introducing competition, started with the introduction of the Post Office Act of 1969. Following this act of parliament, the Post Office ceased as a result to be a government department. Subsequently on 1st October 1969 it was established as a public corporation.

In the UK, British Telecommunications PLC (BT) is the company that is the benchmark for the telecommunications industry. It is the largest operator in the telecommunications market comprising of approximately 170 public fixed telecommunications providers, 5 mobile providers, 59 mobile service providers and 700 internet service providers (Harrison, 1994; DTI, 1996).

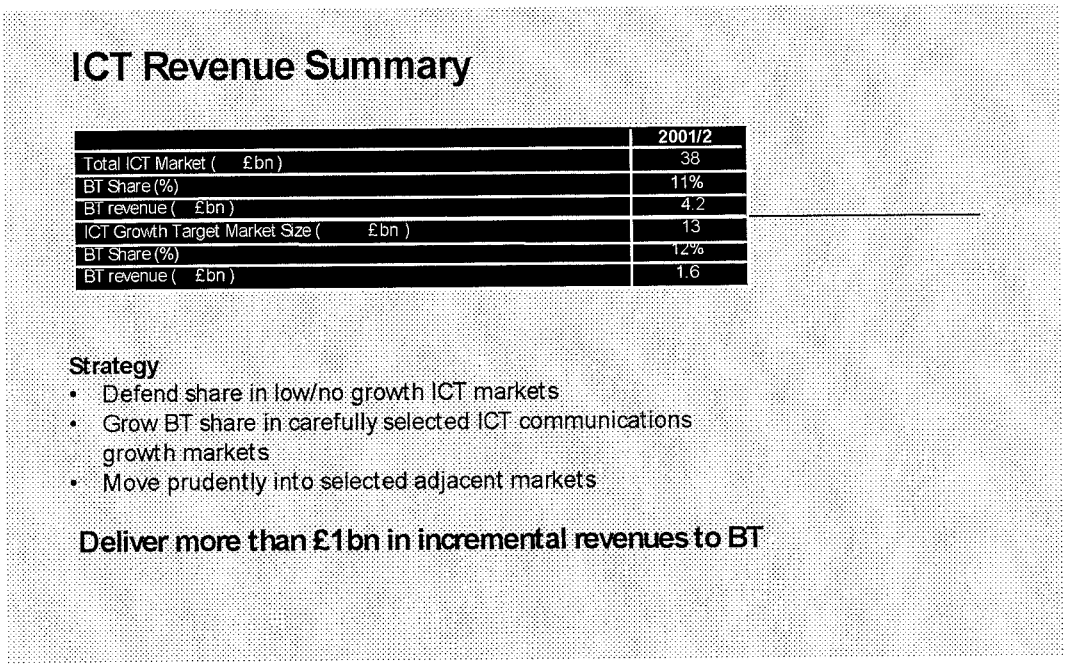
BT as an organisation has extensive local facilities and a surplus of transmission capacities. It is the only telecommunication provider to offer exchange lines across all UK locations (BT, 2003). It also offers analogue private circuits across the country and has a percentage market capitalisation of 60% of all UK voice and 30% of all UK international calls. Based on this statistics, BT is regarded as possessing significant market power (DTI, 1996).

Along with Broadband and Mobility, Information & Communication Technology (ICT) is one of the BT Group's key growth areas. From this, the company expects to achieve new revenue growth of at least £1 billion (BT, 2003). The transformation of BT's business since privatisation has been achieved against a background of ever-increasing competition and close regulation. Within these years, BT's revenues have more than doubled and profits trebled. According to Ingram (1988), this transformation has been founded on varying factors. This included " *British*

Telecommunications approach to total quality and the formulation of company strategy through effective scenario planning, use of the European Business Excellence models and the implementation of balanced scorecards".

The figure (Fig 8.0) provides details of British Telecommunications (BT) ICT Revenue.

Fig 8.0: BT Revenue Strategy, 2001/2



Source: BT, ICT Strategy 2003

Privatising BT and introducing competition provided the company with the driving force to improve its services after years of state control had failed to encourage efficiency (Harrison, 1994; DTI, 1996). The company had inherited an extensive and obsolete telecommunications network in addition to an extremely over manned and inflexible staffing structure. In order to remain competitive it moved fast by modernising its network. It introduced digital exchanges and at the same time cut its costs by disposing of thousands of staff. The company publicity indicates that it believes that privatisation has

improved the quality of service provided to its customers. In order to measure these improvements, BT first piloted the use of self-assessment within selected business units in 1991, using the US Baldrige Model while the EFQM (European Foundation for Quality Management) model was being developed. This period was then followed by self-assessment using the now fully developed EFQM (European Foundation for Quality Management) model at Corporate, Divisional and Unit level. This process has been an annual exercise at Corporate level since 1992. Success with quality of service has been further demonstrated at Corporate BT level. In 1996 and 1997 BT won the European Quality Award. The deployment of self-assessment in BT was also further reflected throughout the organisation with both BT Northern Ireland and BT Business Division winning the UK Quality Award in 1997 (Ingram, 1988).

2.4 Overview of UK telecommunications regulation

According to Edmonds (OFTEL, 1999a), the key issues facing UK government and telecommunications regulators is the need to integrate current and future telecommunications regulations within the principles of existing and future government legislation. OFTEL (1999b) believes that there is a need to ensure coherent and consistent economic regulation across the converging sectors within ICT such as CRM (Customer Relationship Management), CCC's (Customer Contact Centres) and Applications Management and Hosting (AMH). This means that the regulatory regime should be able to reflect the importance of competition as a means of providing what the consumer wants. In addition, it must secure the independence of the regulator, ensure that transparent and accountable procedures are established and also promote consistency and coherence in their application.

In the UK, the current approach to regulation emphasising liberalisation and competition within the telecommunications market, has improved productivity, lowered prices, and stimulated innovation. However, Scott (1997) argues that regulatory law in telecommunications is fragmented, leading to the development of sometimes non-transparent, ill- consistent guidelines and rules. This is contained in varying legislation and in other instruments such as licences. There has also been a marked shift away from detailed licence conditions towards competition rules

(Scott, 1997). Lying behind these changes are concerns within the regulatory office that ever more detailed licence conditions are making the rules over-specific and unmanageable. In addition, there is uncertainty about the scope of the existing rules and marked unwillingness to engage in the development of time-consuming procedures necessary to introduce specific new rules to address new forms of conduct.

According to Pitt (1997), in order to address these concerns, new general competition rules modelled on Articles 85 and 86 of the EC Treaty are now incorporated in the licences of all UK telecommunications operators.

Lying behind this change was a concern from most telecommunications companies that there should be mechanisms to promote consistency in regulation. As such, if such consistency were credible, firms would be able to interpret the new licence conditions for themselves on the basis of EC competition law, rather than be guided by the interpretation of licences by the regulator (Scott, 1997). A further aspect of this generalisation of rules is a shift from highly specific instruments, such as the detailed conditions contained in individual licences in the UK, towards rules of more general application.

OFTEL (1999b) has also expressed uncertainty about the scope of the existing rules, and its unwillingness to engage in the time-consuming procedures. These were necessary to introduce specific new rules to address new forms of conduct, and a concern that regulated firms looked to the regulator for authoritative guidance on the interpretation of the rules, rather than develop their own capacity to interpret and implement their requirements.

OFTEL believes that the existing UK regulatory framework is not sustainable in the long term due to two, inter-related reasons. In the first place the successful application of many of the existing rules relies on the ability to control service delivery by attaching conditions to the operation of, or access to, the delivery system. However, this will only be successful if the system operator controls the service(s) running over the network. Secondly, licensing is generally based on individual licences and on a prohibition approach making it unlawful to run a telecommunications system without a licence. OFTEL's suggestion is that any

new framework for regulation should be directed at encouraging competition, diversity and innovation, while delivering an agreed set of social objectives. What is required is a flexible regulatory system capable of adapting fast when necessary. The present legislation does not allow for this.

Highlighting the importance of flexible decision making, Criuckshank (OFTEL, 1995) suggested that "*The UK framework raises arguments over the discretion of the regulator, the effect is to defer the impact of effective competition by limiting and slowing the regulator's discretion to act*".

In conclusion, it can be highlighted that the major driving forces for change and advances in supply within the telecommunications industry have come from varying sources. This includes industry organisations and the rapid convergence of technology and strategy, which enables CRM (Customer Relationship Management) and CCC's (Customer Contact Centres) applications to be delivered. Other contributors for change include the decline of the monopoly operator and the introduction of competition within the telecommunications industry.

While the debate on the role and appropriateness of regulation policy is an old one and dates back to the issue of whether the state should intervene in the economy, more recent interest has been fuelled by the experiences of regulatory agencies here in the UK and in the US. These rapid changes have been characterised in the UK by a regulatory policy that provides for a different treatment of operators depending on their position in the market (Perrucci, and Cimatoribus, 1997).

The convergence of computing, telecommunications, and entertainment facilitated by the digital revolution has created new opportunities and threats for telecommunications companies.

The implications of these developments are far reaching. Convergence is not just about technology. It is about services and about new ways of doing business and of interacting with society.

2.5 ICT deployment and influencing factors

As business needs change and ICT develops in line with these changes, telecommunication companies maximising the use of new technologies will find themselves dealing with projects that are difficult and expensive to deploy precisely because they are on the forefront of technological innovation. These large ICT projects such as 3G mobile technology (*in the UK, five companies paid a total of £21 billion for 3G operating licenses alone*) will be expected to be more time consuming, costly and resource demanding than those previously deployed. Although it is currently difficult to alter the perception that ICT implementations take time and money, it does not mean companies should resign themselves to allocating too much time and money on ICT (Crescenzi, 1988). Instead, for such large and complex integrated projects, covering multiple sites and multiple companies, careful planning will become vital in order to maintain effective control.

Unfortunately the perception of ICT projects is they always go on for longer, and end up more expensive than previously envisaged (Ojiako et al, 2004a).

In many cases these are unavoidable symptoms of progress. The evidence of ICT deployment failure has been overwhelming. Investigations by Gladden (1982) suggest that up to 75% of all ICT development undertaken is either never completed or is not used if completed. Crescenzi (1988) actually claims higher ICT failure rates and suggest that 83% of ICT project fail of which 31% are cancelled. Reports by Wood (1991), also indicate that while 91% of ICT projects are not deployed on time and within cost, 31% of new ICT projects are cancelled before completion at an estimated combined cost of £50 billion. Furthermore, 52.7% of the projects completed are 189% over budget at an additional cost of £37 billion.

Statistics also shows that at least 22% of ICT investment is wasted, while approximately 40% of ICT project realise no business benefit however this is measured (Wilcocks and Lester, 1994). Perhaps the most crucial data on ICT project failure provided by KPMG in 2003 (KPMG, 2003). Based on a review of project failure rates in 134 listed global companies, data was presented which indicated that

approximately 56% of firms have had to write off at least one ICT project between 2002 and 2003 as a failure.

Examples of major ICT deployment failures also exist. They include the Microsoft 95 delay, software defects with Intel's Pentium Chip (Applegate et al, 1996), the failure of the London Stock Exchange's Tarus System (Harper, 1993), the failure of the Siemen's UK Passport Agency system and the £1 billion Post Office Pathway Project. Other projects include the United States INTRICO consortium project-Confirm. Perhaps the most notable ICT project failure is that by the US based company FoxMeyer in 1994. In 1996, the company ceased business trading. In its application for US bankruptcy protection, it cited the impact of the failed ICT deployment of its Enterprise Resource Planning systems as the main reason for the company's inability to continue trading.

ICT deployment is a complex process that covers all of the activities performed after a product has been designed and developed (Ambler, 1999). Its deployment also covers all post-development activities such as configuring, releasing, installing, updating, adapting and reconfiguration. ICT deployment usually requires the careful co-ordination and interaction of multiple factors.

According to McGolpin (1996), in order to ensure the successful delivery of a set of requirements, the deployment and implementation of an ICT project involves the use of various tools, techniques, methods and processes.

Deployment and implementation is also not simply a matter of using a technology that works, it involves a process of organisational change that requires conscious management attention (Keil, 1991). Implementation in Srinivasan and Davis (1987) view can also encompass creating an environment in which a diverse array of users have convenient access to the necessary training and support needed in order to carry out task.

Generally, ICT projects may be deployed in either of the following ways depending on depending on how robust the sponsoring organisation seems the ICT system.

- Parallel Running. Regarded by Avgerou and Conford (1988) as perhaps the safest method. It involves running a new or amended system simultaneously with the old system to confirm that it functions correctly before going live. Parallel Running allows for testing in a real environment but it is expensive, as the organisation has to pay for the running of the old and new system (Ernemann et al, 2002; Aberdeen Group, 2001).

- Modular implementation. Saeki and Watanabe (1999) regard this technique as a cautious approach whereby the change implied by a new system is extended incrementally in manageable steps over a period of time. This approach allows for a phased delivery of the system, spreading the work over a longer period. The process involves dividing a project into several modules. Each module is designed and implemented individually, yet managed as a component of the complete system. As modules are completed, the project is re-evaluated and its goals re-assessed. Modular project management provides a natural process to review a project and lets users directly participate in system design.

- Pilot implementation. This provides a way to test the system in practice and to commit the organisation gradually to a new system.

- Cut- Over implementation. Regarded as a risky way to start the operations of a new system. To choose this approach requires good confidence in risk assessment and the robustness of the new system.

The nature of the implementation techniques to be used during ICT deployment depends on various factors and features. These include organisational culture (Morieux and Sutherland, 1988), end user participation and expectation, political prioritisation (Markus and Pfeffer, 1983; Howard, 2001), design (Keen, 1981a) and technology being employed. Other factors include an organisation's approach to risk, project timescales and funding available to the project.

Traditionally, ICT projects focused and placed more emphasis on development activities (software specific), such as source code control especially as early business applications were oriented towards the basic operational level of firms. This meant that ICT products could be

deployed without the aid of explicit ICT deployment methodologies (Whitfield, 1996), especially as they were seen as short-term exercises or one-off solutions to sort out problems rather than long term, well-planned implementation strategies for new applications (Avison, and Fitzgerald, 1988).

Treating ICT deployments as short-term or one-off exercises meant that until recently few standard mechanisms were in place to support its deployment activity. In fact, studies by Button (1997) shows that a consistent and universal process for initiating, approving, managing and implementing ICT projects simply does not exist in most organisations'. This is seen to be due to the characteristics of ICT projects such as the tremendous rate of technological change.

Solutions to the common deployment activities have however seen the most effort especially as the contribution of successful ICT deployment to organisational strategy becomes more recognised. These efforts have however failed to generate a satisfactory project management methodology specific to the ICT industry (Luftman et al, 1993). This is possibly due to the growing complexity of the systems. The growing complexity of ICT systems has not been the only reason for the need of a standard deployment process. Another reasons has been that in order to enhance working relationships and reduce conflict in large collaboration projects especially large public sector ICT deliveries, there is a need for standard deployment and implementation methodologies to be adopted by organisations involved in collaborative working. This is particularly relevant as most of these organisations have working practices based on different traditions and emphasis of success criteria. For example bidding for a large ICT project such as the £4.2 billion Defence Information Infrastructure project involves the Radii consortium made up of four companies including CSC with a tradition of quick to market software delivery and BT with a high emphasis on quality and longer term project objectives. Other members of the consortium includes Cap Gemini Ernst & Young, an Accountancy based technology consulting services company and Thales, Established in France more than a century ago, Thales a global electronics company serving Aerospace, Defence, and Information Technology markets worldwide.

Table 2.0: Selection of major government ICT project failures

Project	Problems experienced	Impact of problems
UK Passport Agency (1999)	Over-specified and sophisticated software and technology	Extended processing times for passports to 50 days. Unit cost per passport increasing to £15.50 instead of reduction to £12 as originally planned for. The Agency's telephone service being overloaded and subsequently being unable to deal with telephone enquiries.
MoD -Defence Logistics Organisation's Business Change Programme (2000)	Weaknesses in the scrutiny and approvals process. The DLO lacked effective change management support and co-ordination. Project failed to meet MoD's requirements on affordability and benefits management. The MoD had no framework to assess and manage delivery once projects were launched. The project suffered from poor financial governance, weak benefits management, poor communications and a failure to establish an effective programme management organisation.	£118.3m investment was written off as a loss.
National Insurance Recording System Phase 2(1999)	Consultants realised that systems size and scope much bigger than originally thought. System had more than 1500 unresolved system problems.	Delays in implementing the system led to the calculation of benefits on an interim or emergency basis, while payment to personal pension holders was delayed. Compensation of £10 paid to all pensioners, war widows and incapacity benefit recipients who had experienced delays with payments
MoD Project Trawlerman(1993)	Specification did not include main requirement for end users that is the Defence Intelligence Agency to be able to link to other computer systems.	Contractor entered claims for additional cost. Completion dates extended by 2 years Project at cost of £41m was written off. New systems was purchased at cost of £6m
CS2 Child Support Agency (CSA) system (2004)	Volume of payments (13 million every year) to be processed by the system had been under-estimated. Integration with legacy systems in the department had been unsuccessful. A large number of cases (120,000) could not be amended due no functionality being built onto the system that allowed for case records to be update with new information EDS, the main supplier had a poor reputation of implementing large scale public sector projects. For example, the Inland Revenue on a previous project had invoked penalty clauses 100 times (reaching a cumulative value of £2.5m) during the first five years of project life.	Project under construction since July 1999 (and by November 2004 was already 2 years later) but still needed further testing. Committee of MP's had called for the abandonment of the project if still not working properly by 1 December 2004.

Table 2.0 above show details of some failed public projects examined by the Committee of Public Accounts. An impact of the various problems experienced by these projects on their end customers is also listed.

The lack of existence of standard deployment processes might be a possible reason why some organisations are failing to realise the benefits of strategic ICT systems (Vowler, 1990). According to Abdel-Hamid and Madnick (1990), a contributing factor to the inability of a standard ICT deployment methodology is that the information required to establish such standards is generally not accessible, complete or accurate. This is because most failed projects are never studied by the organisation that experienced the failure. Having wasted so much on a fruitless venture, few organisations will invest more time or money to collect and analyse additional data, whereas any data that had been collected may be massaged or hidden to protect careers or reputations. Thus, information about project failures often relies heavily *on subjective assessments*. Secondly, because the most important lessons that need to be extracted from any project review are not available, lessons cannot be learnt. Nath (1992), King (1985) and Madhav and Willborn (1985) all agree that the lack of such information makes the evaluation of success levels against expectations extremely difficult. For Fitzgerald (1998), it is the lack of such data that makes ICT evaluation totally unsatisfactory. Abdel-Hamid and Madnick (1990) further point out that the frequent practice of viewing project failures as embarrassing moments to be quickly forgotten and not as opportunities to learn must be discarded if ICT is to make significant progress in addressing concerns about its ability to deliver customer or client requirements.

The failure of an organisation to document their projects failures and use that information to avoid a repetition of similar problems attest more than any single fact to the continuing problem of ICT project abandonment in organisations (Hedberg, 1981; Boddie, 1987). In fact as has been suggested by Wiegers (2000a), even when the information is available, non-standard methods of deploying ICT projects make it difficult to document learning points that could help improve existing deployment processes.

2.6 ICT Deployment problems and failures

So much of business focus has concentrated on how profitable organisations need to be. Yet in Howards (2001) view many organisations are continuing to neglect the impact of poor ICT deployments on their business strategy. The impact of poor deployment on the total cost of ICT ownership has also been discussed in additional research by Liebmann (1999), Minasi (1998; 1999), and the Gartner Group (1997).

Researchers such as Wilcocks and Lester (1994), Galzer (1993), and Strassman (1997) have also presented evidence that there is little or no positive relationship between investment in ICT and overall financial performance of most organisations.

The question then emerges. What does project failure mean and why the high rate of ICT projects failures?

ICT project failure can be defined as the inability of an information system to meet a defined stakeholder group specification and requirement (Kling and Iacono, 1984). As an individual judgement and non-objective state, Belcher and Watson (1993) and Lauer (1996) refer to failure as the inability of the project to achieve scheduling, budgetary and systems capabilities as promised in the systems specifications. Project failure although difficult to measure, cannot be established until all stakeholders cease to support its progress of the project (Ahn and Skudlark, 1997). Most notably for ICT projects are that project success or failure must involve consideration of approaches that separates performance and progress measurement based on *strategic* criterion. This is because a *project* being delivered can be regarded as a success although the delivered *product* fails. Kodak's Project Orion provides an example of such an occurrence within ICT.

The Kodak Project Orion was a massive effort by Kodak to develop a new *Advantix* photographic system. The project was reputedly very well managed from a project management perspective that it was recognised by the Project Management Institute (PMI) as the 1997 International Project of the Year. The project was also selected as Business Week best new products of 1996 (Adams, 1998). However since its deployment, Kodak's stock price has

fallen 67%, in part because it failed to anticipate the accelerating switch to digital photography (Bandler, 2003).

From available literature and press reports, the problems of ICT deployment failures are generally recognised as a major issue with various reasons being listed as causes (McFarlan, 1981; Coates, 1991; Glaser, 1984). For example, Ewusi-Mensah (1997) believes that unique attributes such as being subject to volatile group dynamics, requirements for intense collaboration between stakeholders and its conceptual and high capital intensive nature make ICT projects susceptible to problems. Ackoff (1967), Hirshchheim and Klien (1989) and O'Brien (1992) are of the opinion that ICT deployment problems can be traced all the way back to the design of the systems. They point out that if systems developers fail to accurately visualise how a new system should be best designed in order to benefit its users, designers will make wrong assumptions that will result in systems with major deficiencies being produced. These design deficiencies often to lead to situations where systems that may have proved to be successful in a research and test setting cannot be replicated commercially because of the requirements and constraints of the business environment (Jamieson and Szeto, 1981). Applegate (1996), suggest that not assessing project risk at time of funding and not determining managerial approach can cause ICT deployments to fail. Button (1997) and Keil (1995) see managers dealing with too many projects, over-assigned development resources and a lack of resource prediction capability as a major reason for ICT deployment failure. Wilson (1989) found difficulties in recruitment and resources for user education hampering successful ICT implementation. Ives et al (1993) on the other hand point to long development cycles and the risk that gaps will emerge between the business strategy and the ICT system that it was designed to support, if the development cycle is too long. Radmacher (1989) and Lyytinen (1988) mention serious budget overruns as examples of an unsuccessful implementation of ICT systems. Other factors that could lead to a failure of ICT deployment includes a lack of commitment (Tait and Vassey, 1988; Nicholas, 1989; Kydd, 1989), inadequate appreciation of business needs (Prager, and Overholt, 1994; Gellman, 1990) and poor project structure (McKersie and Walton, 1991). Phelps (1996) points out that further research by Beath and Ives (1989), Kearney (1990), Scott-Morton (1991), Wilcocks and Margetts (1993)

indicates that reasons for ICT failures includes failure of integration between the development process and the larger organisational system. Wood (1991) also points to constant changing business demand as the major obstacle to the success of ICT projects primarily because requirements become unmanageable.

Table 3.0: ICT Failure Drivers

Authors	Drivers
Ewusi-Mensah, 1997	Volatile group dynamics
	Requirements for intense collaboration between stakeholders
	The conceptual and high capital intensive nature
Ackoff, 1967	Poor design
Hirshchheim and Klien, 1989	
O'Brien, 1992	
Jamieson and Szeto, 1981	Not assessing project risk at time of funding
Applegate, 1996	
Jamieson and Szeto, 1981	Not determining managerial approach.
Applegate, 1996	
Button, 1997	Managers dealing with too many projects.
Keil, 1995	
Button, 1997	Over-assigned development resources and a lack of resource prediction
Keil, 1995	Over-assigned development resources and a lack of resource prediction
Ives et al, 1993	Long development cycles and the risk that gaps will emerge between the business strategy and the ICT system that it was designed to support, if the development cycle is too long.
Wood, 1991	Constant changing business demand.
Tait and Vassey, 1988	Lack of management commitment
Nicholas, 1989	
Kydd, 1989	
Prager and Overholt, 1994	Inadequate appreciation of business needs.
Gellman, 1990	
McKersie and Walton, 1991	Poor project structure
Beath and Ives, 1989	Failure of integration between the development process and the larger organisational system.
Kearney, 1990	
Scott-Morton, 1991	
Wilcocks and Margetts, 1993	
Lyytinen, 1988	Serious budget overruns

The role of technology in ICT project failure has also been discussed by researchers such as Matherly and Matherly (1985), Baronass and Louis (1988) and O'Connell (1994) who are all of the opinion that this is the one major obstacles impeding the effective implementation of ICT. One particular reason related to ICT project failure from a technology perspective are on occasions where there has been an over-emphasis on the technology to the exclusion of human, social and organisational aspects associated with technological change (Kaddah, 1990).

From the above review of literature on project success and failure, it is clear that there is no single and clear statement on the definition of failure. This research also shares the opinions expressed by Belassi and Tukel (1996) on the existence of ambiguity in the definition of project failure. This is seen to be a very important cause of difficulties in the measurement of success or failure variance. The basic question still remains for ICT projects. How can success or failure be measured if a single definition on what constitutes failure or success does not exist?

2.7 Ensuring successful ICT deployments

As the key to ensuring the successful deployment of ICT products by any organisation may reside in its ability to understand the role ICT plays in its strategy, organisations should be encouraged to view ICT products from a long-term benefits perspective. Such long-terms views of ICT, unlike seeing it as a frustrating, if unavoidable, drain on resources, means that Chief Information Officers (CIO's) and other executives charged with implementing company ICT strategy should be encouraged to view the time and money needed to undertake ICT projects as a worthwhile investment. Organisations may also be able to appreciate the strategic potential for considerable economic and ongoing efficiency gains, especially as any well deployed ICT products are expected to bring about regular, effective, efficient and viable interaction and communication between product vendors and customers (North, 1990).

Successful ICT deployment may also depend on an understanding by key decision makers within the organisation, of the need to proactively deploy ICT

products that are flexible and can be aligned with specific strategic objectives of the organisation. In addition, at an early stage in defining a new system, the systems analyst may need to have a clear understanding of the objectives of the design and be in a position to balance the various success factors and key issues of ICT design and management (West, 1990; Cerullo, 1980). Such understandings could be achieved by the use of prototyping and incremental development strategies that can reduce risk (Tate, and Verner, 1990). One way such products can be identified may be to ensure that the process of ICT product requirements does involve not only the technical community, but also business user's (Parker, 1982).

The need for careful and proper project planning, dynamic strategic planning, and co-ordination of project activities in ICT deployment has also been raised as an area of concern especially as the complexity of ICT projects increases. This is especially relevant to companies competing in the increasingly volatile markets such as telecommunications where traditional strategies and resultant products based on already tried and tested competencies may not be expected to drive organisational growth or in the worst case scenario, protect market share. This is because what in effect has been yesterday's core strategy and competency may in fact become tomorrow's core rigidity (Hamal and Prahalad, 1994; Barton, 1995).

Successful ICT deployment may also involve employing deployment methodologies that are compatible with corporate culture (Morieux and Sutherland, 1988). Attitude to issues such as risk, also need to be reviewed via an expanded understanding of project success criteria such as cost duration, and performance to issues such as overall strategic objectives (Powell and Klein, 1996). At the same time, it is important to ensure a that clearly defined starting point and specific goals are set at project definition stage (Korunka et al, 1997). The need for appropriate deployment methodologies is also emphasised and as much as possible, these methodologies should be based on standard organisational philosophies that are easily understood by all professional groups involved in the project. These methodologies must also be expected to ensure that projects are deployed in such a manner that strategic objectives are achieved. Any effort to create complete, unified and standard ICT deployment technique

must also put some effort into standardising what is being deployed and how it is represented (Howard, 2001). In order for this to happen, it is first important to conduct an evaluation to characterise what capabilities a standard ICT deployment solution should possess. These characteristics are not meant to imply a specific approach, rather they are meant to illustrate capabilities that are required in some form to create completion in the process. Further, it is necessary to understand the overall vision from which these characteristics and capabilities are being derived. Successful ICT deployment also depends on using an appropriate technology that works. By this, the organisation must accept that any ICT project however straightforward, well managed and defined will fail to meet expectations if there has been an over-focus on the technology at the expense of user and business requirements (Kaddah, 1990). Thus, in order to ensure that ICT projects are deployed successful, a diverse range of business users needs to be involved in the initial requirement capture stage. This basically means that companies with best practices including collaboration across business functions will benefit from more successful ICT deployment's (McGee, 1998). There also needs to be a realisation and acceptance that there are significant costs associated with the implementation or acquisition and installation of modern ICT products due to the complexity of the technology. In order to gain the most benefit from that technology, it is important that ICT deployment and implementation are done in a cost-effective manner (Howard, 2001). This is because no matter what deployment strategy is chosen, some choices have a more significant impact on the cost of implementation without providing any additional efficiency for that cost. According to Gallagher (1998), other functional areas such as return on investment, suitability for desktop and network management and an appropriate problem resolution mechanism should also be considered when choosing a deployment strategy for any ICT project.

2.8 Conclusions

The perception of project failure and success in Belcher and Watson's (1993), opinion is usually based on unspoken and personal prejudices. As its definition is dependent on a particular organisation's criteria (Mochal, 2003), project failure can be regarded as a judgement and not necessarily an objective state. Rad and Levin (2002),

suggest that this explains the reason why different stakeholders will provide varying interpretation on their criteria of project performance based upon different data and evaluation methods.

Due to the role of ICT in organisational success, it is critical for management to control ICT as a vital corporate resource just as the financial, manufacturing and personnel resources of a company are managed (Tom, 1987; Stephenson, 1987). This means that ICT products must be flexible and can be easily adapted (Oei et al, 1994). Whatever the current thinking about the role of ICT in corporate success, there is one clear fact, corporations are spending millions of pounds on ICT, and would prefer to spend less. This is not unexpected especially as less than one-fifth of all corporations have a process in place by which to cost-justify long-term corporate benefits in ICT investments (Taninecz, 1996). As expenditure on ICT continues to increase rapidly (projected to exceed £1 trillion by 2005), it becomes more crucial for senior management to target funds to ICT projects that will achieve the most benefits for the organisation (Bryan, 1990). One reason why this has not happened is that it is difficult to calculate the absolute value of ICT to an organisation. This is because ICT is too integrated into most businesses to be isolated as a variable. The danger of course is that parochial management of ICT due to its integrated nature can be a serious liability and limiting factor to any chances of strategic success. This can occur in instances where ICT is not fused with business at the stage at which basic strategic commitments are made (Keen, 1981a) or in cases where organisations fail to cope with rapid and continuous change brought about because of continuously improving and increasing complex technology (Mansell-Lewis, 1996). As a result, it is imperative that ICT projects are integrated into the normal business planning process.

Integration also means that ICT and business unit staff must work together to develop a plan for ICT that can become part of the business unit plan. Out of this planning process should come a prioritised list of ICT investments. Ultimately, the implications of this chapter is that organisations need to be more careful about which ICT projects they implement, rather than seeking to invest in ICT across the board.

Chapter Three- Construction Failures

3.1. Introduction

The construction industry had suffered from inward-oriented management problems which had according to Seymour and Rooke (1995) had been a major reason why implementation of contemporary managerial technologies and philosophies that were widely recognised and adopted in other industries previously were not implemented in construction. The good news for the industry is that this is changing, especially with the increasing influence of the private sector in process and policy making within the industry.

3.2. Industry Overview

The UK Construction industry is one of the largest industries in Europe and represents 11% of European Union (EU) Gross Domestic Product (European Construction Institute, 1994). Construction involves some 2.7 million enterprises in Europe employing directly or indirectly about 30 million people.

In the EU, Construction provides for 8.8 million jobs representing 7% of the working population. Every job created in the construction sector represents the creation of two further jobs in related sectors. Thus in addition to the 8.8 million jobs in the sector itself, plus the 0.8 million jobs in design, and the 2.5 million jobs related to construction products, it has been claimed that the sector gives rise indirectly to 14.3 million jobs in other service sectors. More than 26 million workers in the EU can thus be said to depend, directly or indirectly, on the construction sector (Harvey, 1997).

The UK construction industry provides a tenth of the UK's gross domestic product and employs 1.4 million people (DTI, 2004a). UK construction output is 12% of total European output. It also represents the 3rd largest construction output in Europe and is the 5th largest in the world. Exports are of the order of £10 billion. Domestically the construction industry is at the heart of the UK economy and remains a major deliverer of key government programmes such as housing, hospitals and roads.

Construction is an extremely diverse industry composed of contractors, consultants and building materials and product producers. It is an industry dominated by SME's with a relatively small number of large companies.

The industry is investment-led and therefore susceptible to economic downturns. However, although it suffered badly during the recessions in the mid 1980s and early 1990s, announcement in the 2000 Budget (HM Treasury, 2000) have promised a greater emphasis by government to substantially increase construction spending.

Construction activities are mainly concerned with the planning, regulation, design, manufacture, and maintenance of physical structures. The construction industry comprises all those organisations and persons concerned with the process by which buildings and civil engineering works are procured, produced, altered, repaired, maintained and demolished (Hillebrandt, 1974). Construction projects can vary from work worth a few hundred pounds to major schemes costing million pounds. It also involves a wide variety of different activities and the professional and trade skills that are required. Like that of the ICT industry, the performance of the construction industry is of vital importance to the overall economy, however for construction, it is because it produces the infrastructure necessary for other sectors of the economy to function (Ibrahim, 1995).

As Arditi (1988) reminds us, the UK construction industry is essentially a service industry in which SMEs (Small and Medium Enterprises) and craftsmen play a key role. It is also characterised by a constantly changing market place, such as the development of more permanent relationship between clients and suppliers manifested in the increased use of turn-key/design-build procurement methods, many of these increasingly being customer driven.

The UK Construction industry faces the same problems often encountered by other service industries such as ICT. These problems include discontinuity of project phases, long contract duration and environmental turbulence. Along with ICT, The industry has also had to deal with the problems of failed projects and how the perceived performance of a project should be measured. The construction industry has also had to deal with the implications of perception in

success and failure criteria and the resulting need to develop a method of project performance measurement based on an approach to project success that is separate from progress measurement criteria. Examples of major construction projects which failed either *progress measures* or success criteria but still been classed as a successful project includes the London Millennium Bridge (detailed in Table 4.0, below) and the £758 million London Millennium Dome. Other notable construction projects which have fallen into this category includes the Thames Barrier Project (Morris and Hough, 1987) and Sydney Opera House, which was completed 10 years late with cost overruns of nearly £58 million. Although from a project management perspective the Sydney Opera House was a major failure, however considerations of not based on standard time, cost and quality propose that this project can be regarded as a success.

Table 4.0: Success Criteria, London Millennium Bridge

Standard Criteria	Time	The bridge opened in June 2000, but had to be closed immediately afterwards due to quality problems. Finally re-opened in February 2002.
	Cost	Bridge cost £18m, but a further £4m spent installing 90 movement dampers.
	Quality	The bridge opened and within three days closed after swaying caused by synchronised pedestrian footfall.
Non Standard Criteria	Collaboration across industry and disciplines	Successful creative collaboration between architecture, art and engineering. Multi-disciplinary collaboration across nine European countries.
	User and customer experience	It is London's only bridge solely for pedestrians and the first new Thames crossing since Tower Bridge in 1894. Creates new routes into Southwark. A windscreen shelters pedestrians crossing the bridge, thus allowing them to pause comfortably and enjoy London from a new vantage point, free from traffic and fumes.
	Social and economic impact	Contributes to the regeneration of the Southwark - and encouraging new life on the embankment alongside St Paul's.
	Technology capability	Regarded as a structural statement of technological capabilities Spanning 320 metres, it is a very shallow suspension bridge. Steel transverse arms clamp onto the cables at 8-metre intervals to support the deck. This means that the cables never rise more than 2.3 metres above the deck, a distance ten times less than that of any other suspension bridge - allowing pedestrians uninterrupted panoramic views of London and preserving sight lines from the surrounding buildings. It has a uniquely thin profile, forming a slender arc across the water. It spans the greatest possible distance with the minimum means.

Source: http://www.fosterandpartners.com

Both industries also share a common characteristic of long production timescales spanning several years and many phases (Tan and Lu, 1995; Keen, 1981b). Similar to ICT projects, construction projects are by their nature complex undertakings in which the design must generate large amounts of detailed information to describe what is to be deployed (McDonald, 2002; Scott and Harris, 1998). Available literature (Dimancescu, 1995; Cleland, 1968; Mahaney and Lederer, 2003; Cooke-Davies and Arzymanow, 2003; Carretta, 1992) also demonstrates that both industries use similar project management principles for the implementation of projects.

3.3 Peculiarities of construction

Although the construction industry does have similarities with the ICT industry, it does at the same time exhibit some unique characteristics. These include its unique structure, production process, physical characteristics, composition and output (Yisa et al, 1996). Construction is also characterised by its cyclical and seasonal nature with high levels of uncertainty and risk. This uncertainty can have the effect of deterring companies from adopting expensive technology such as automation or implementing quality management and control even if such investment may eventually be beneficial to the project. Eighmy and Magee (2001) also point out that unlike ICT projects, construction products are known for their durability and unlike the majority of ICT products can be re-cycled, re-used, or re-deployed for other functions. Again, unlike ICT products, construction product life expectancy and lifecycle is not difficult to establish in advance (Ince, 1992).

Another fundamental difference between the two industries is their rate of change. Both industries exhibit discontinuities between the participants in the delivery process (Tan and Lu, 1995). It is however noted by Cooney (1993), that changes within the construction industry have been drawn over two centuries. On the other hand, for the ICT industry, this has happened over a shorter period of time (40 years) and at a more rapid rate. This accounts for ICT's high turbulence and uncertainty compared to the construction industry.

3.4 Changes in the UK Construction Industry

Whatever the contribution of construction to the UK economy, concern about the level of productivity from within the industry and representatives of major customers, in particular the UK Government have been expressed. These concerns became more persistent and intense during the last 20 years as statistics showed construction had the lowest productivity growth out of seven major sectors of the UK economy (Cooney, 1993; Matthews and Feinstein, 1982). In another study, by National Economic Development Council (1991) and Gale and Fellows (1990), the cost of construction activity in continental Europe and the US are on average 30% less than that of the UK.

Pheng and Tan (1996) suggest that construction demand is inherently unstable because of its sensitivity to credit for two main reasons. First, loan credit to builders may be curtailed when the flow of funds into the lending institutions slows down because of higher returns elsewhere. With a smaller pool of capital to lend, banks tend to restrict loans to builders who are not their best customers and are often considered risky. The risk is due to poor collateral and the instability in demand that may make construction firms fail. In addition, due to its market sensitivity, credit may also be curtailed as a small increase in interest rates results in a relatively large downsizing in construction demand. Another source of instability in Pheng and Tan's (1995) view is the fact that price has often the sole determinant for the selection of a contractor by the client or customer. Winch (1989) believed that the unique characteristic of the construction industry led to its rather high rates of transaction costs. According to Seymour and Low (1990) and Low and Goh (1994) this has led to a reduction in construction productivity and the quality of its product.

It became obvious that continual downturn in UK construction output if not addressed quickly, would result in serious consequences on long-term competitiveness and effectiveness of the industry. Indeed, World Bank figures (World Bank. 1990) showed that for reviewed projects completed between 1974 and 1988, time overruns varied between 50% and 80%. Average time overrun for UK Government construction projects between 1993 and 1994 was 23.2%(HMSO,

1995). Overall, Onyango (1993) found that 52% of all UK construction projects ended up with a claim of some type.

The globalisation of construction and pressures on resources against rising expectations for improved quality has created a situation where construction companies need to adopt strategies that will ensure that measures that will support their successful activities are planned and implemented.

3.5 Innovation in Construction

As a whole, the construction industry has hardly been static with the early 1970s seeing major volatility in its business environment (Yisa et al, 1996; NEDO, 1984). In addition, clients were driving for improvements in areas such as cost inflation, disharmony among construction team members, excessive project times, and poor quality characteristics of some of its products. Lansley et al (1975) are of the view that these problems gave rise to the need for control, boundary regulations, organisational models, and management styles that incorporated new production and corporate orientation. In addition, changes in attitude among major construction clients were observed. This was greatly influenced by their desire to exercise greater control over the construction process (Gale and Fellows, 1990).

The fluctuations in UK construction output were inevitable because of changes in economic fortunes that affected both internal and external events in the industry. With the downturn in the British economy and global recession, questions were constantly being raised on how turnover and profitability were to be improved by the construction company. As a result of the realisation that continuous survival depended on securing an adequate workload through appropriate marketing strategies, most construction companies now began to adopt marketing strategies traditionally associated with Japanese production companies (Pearce, 1992; Moore, 1984; Morgan, 1990). These Japanese marketing strategies includes Lean which focuses on delivering value to the customer faster by eliminating waste and *Kanban* which seeks to not only to link the manufacturers to their suppliers, but also seeks to provide opportunities for customers, using just-in-time inventory management.

Another way the UK construction industry tried to address the concerns of profitability and business survival was with innovation (Atkin and Flanagan, 1995). Innovation in construction required close co-operation between design and construction and has been exemplified in management approaches adopted by many Japanese firms. It's main objective being to provide for significant savings in cost and time and measurable improvements in quality.

Lansley (1987) has reported on how the ability of the UK construction industry to innovate and manage change has been widely debated over the years. It has also been greatly influenced by changes in a whole range of factors within its environment. These factors include increased demand for performance by customers and the effect of new legislation. Other key stimuli for change have encouraged construction firms to move away from their traditional modes of operating. One of the consequences of these changes is that designs for most construction projects are under pressure to become more standardised (Kumaraswamy and Chan, 1995). With poor design accounting for 78% of quality problems experienced in construction projects, Kerridge (1993) suggest that proposals for the standardisation of components is based on recognition that savings or better quality can be realised when the number of variations of components is kept to a minimum.

Table 5.0 below is taken from Murray and Langford (2003). It provides a list of Government reports over the last 50 years. These reports represent significant effort by government to improve the construction process.

Table 5.0: Construction Reports, Themes and Drivers

Report	Year	Theme	Driver
Simon	1944	Placing of public contracts	Constructors want less bureacratic tendering in Government contracts. Escape from comppetitive tendering
Philips	1950	Organisation and efficiency of the building industry.	Public clients seek better performance from the industry through improvements in labour productivity and the management of the construction process.
Emmerson	1962	Greater integration of the design and construction process	Constructors want a continious stream of work less dependednt on open tenders anmd incomplete design information.
Banwell/ Crossman	1964	Management of the building process	Constructors look to Government to regulate the placing of contracts. Public contracts negotiable.
Crossman/ Amery	1970	Industrial relations on large sites	Clients want better control of projects and industrial relations in particular
Wood	1975	Placing of public contracts via package deals	Constructors want more negotiated work anfd final contracts. Architects alarmed.
Heseltine/ King	1983	Productivity in building factories and warehouses	Property developers (clients) want US-type construction times for UK
Ridley	1988	Productivity in commercial construction	Property developers (clients) want faster construction times for office blocks
Latham	1994	Relationship between the parties to the construction process	Both clients and constructors gain: Cleinets through better performance, constructors through better cash management.
Technology Foresight	1995	Return to an industry planning model not seen since the 1960s	Political, social and technical alignment of a changed agenda set by Government. Prepares the ground for Egan.
Egan	1998	Performance and productivity of the industry	Clients want and get greater authority over the constructors

Construction firms have moved closer to their clients who are themselves becoming more sophisticated and are often now the driving force for improvements in the construction process (Gale and Fellows, 1990). At the same time, the industry is under scrutiny by professional institutions and government, which has used its power both as a regulator and as a major client to seek to improve the way construction works.

The government works closely with research councils in the development and management of research programmes relevant to the construction industry. It is also building links with the industry. These research councils include the Engineering and Physical Sciences Research Council (EPSRC) and the Economic and Social Research Council (ESRC). The government also commissions various reviews and work-studies. For example, on 22nd October 1997, the Construction Industry Board published "*Partnering in the team*". This report sought to promote the practice of partnering, where appropriate, in both private and public sectors by establishing best practice benchmarks, facilitating the widest dissemination of good practice, and ensuring the development of appropriate training and education packages. Other reports commissioned by government include "*Rethinking Construction*" by Sir John Egan (1998) and before this Sir Michael Latham's "*Constructing the Team*" (Latham, 1994). In addition, the government supports quasi-governmental bodies, which seek to disseminate improvement messages such as the Construction Best Practice Programme and Movement for Innovation. These bodies are now under the umbrella title of Constructing Excellence with aims to achieve a step change in construction productivity by tackling the market failures and selling the business case for continuous improvement through focused programmes in innovation and best practice knowledge.

Perhaps the one of the most influencing innovations in construction has been the role of the Achieving Excellence in Construction initiative. This initiative whose key thrust is the delivery of best value for money, was launched in March 1999 and set out to improve the performance of central government departments, their executive agencies and non-departmental public bodies in their roles as clients of the construction industry. Primarily, the initiative was set up by government which

recognises that too many construction contracts have been awarded on the basis of lowest price tenders, only to see the final price increase significantly through contract variations, failure to meet quality standards or time deadlines. The initiative recognises that construction contracts need to be awarded on value for money grounds, not lowest price tenders. Here value for money means achieving at the end of the construction project, something that is fit for purpose, fulfils user needs, and achieves a balance between quality and costs throughout its life (Office of Government Commerce, 2003).

Other groups apart from government have also championed change in the industry. They include the private sector and the European Union through agencies such as the European Council for Construction Research, Development, and Innovation [ECCREDI]. Created in December 1995, the aim of ECCREDI is to contribute to the competitiveness, quality, safety, and environmental performance of the construction sector. In addition, it is also involved in overall sustainability of the built environment, by increasing the extent and effectiveness of construction research, technical and process development as well as innovation through the research studies such as its innovation report. Improvements to the construction process, it has been suggested, could also be brought about by a renewed focus on the development of committed leadership and commitment to people (ECCREDI, 1996). This approach is expected to decrease the likelihood of delays, contract change orders due to unforeseen site conditions, and legal entanglement and claims in construction projects.

The UK Construction Industry has had to face a period of intense introspection. This has been driven partly by unfavourable performance comparisons with industries of other countries. This has become especially widespread as stakeholders and bodies representing corporate clients are increasingly challenging the methods by which the industry operates (National Economic Development Office, 1975), as they aim to drive improvements in the delivered outputs. This has prompted researchers (Smith and Love, 2001) and government (see Table 5.0, above) to consider what type and structure of the Construction Industry is most appropriate to meet the challenges posed by our market driven economies.

3.6 The role of the Private sector

The Private Finance Initiative (Stewart and Barrick, 20/11/92; Lamont, 1992) forms the basis of government's attempt to increase private sector investment in infrastructure projects.

With public sector spending on construction at approximately £22 billion (Meikle, 1997), the PFI (Suzman, 1996; Hoare and Fennell, 1997; Batchelor, 1996) is a manifestation of the government's desire to bring the private sector into the funding of major construction projects and schemes traditionally funded directly by government. These projects include the construction and maintenance of power stations and roads, ports, airports and rail networks. The scheme challenges the private sector to use its capital and management skills to bid for the work involved in designing, building, financing, and operating of traditional public funded services and projects (HM Treasury, 1996).

3.7 Lessons from Construction

The present day construction industry is characterised by the need to cope with change. Greater demands from clients for a better quality product delivered on time and within budget is now part of the service ethos. Time, cost, quality, and safety now form an integral part of industry culture. However, the industry still has a long way to go before many clients are satisfied with its performance. Continuous changes and improvements in the construction industry means that old hierarchies are being rejected while professional management including the management of risk is becoming more recognised within the industry (Macpherson, 1995). In this increasingly dynamic business situation, literature from Benjamin (1984) and Levitt (1983), suggest that uncertainty caused by increased global competition means that construction companies will need to be more vigilant and forward looking in order to survive, let alone do well. The basic view at this stage is that tactical considerations will need to be replaced by strategic ones, if UK construction organisations are to meet the new challenges of industry (Betts and Ofori, 1992).

3.8 New developments in the UK Construction Industry

The UK construction industry compared to ICT exists in a non-volatile situation in which demand does not fluctuate. As a result, the industry does not encourage either a highly competitive contractual market or require firms to be flexible. This lack of flexibility in organisational structure and method of operation and a lack of control over costs are unique characteristics, which sets the UK construction industry apart from other service industries. Variability in the construction product, flexibility in location, scope for management discretion at site level and the need to accommodate unexpected difficulties in the construction process are also identified as unique characteristics of the UK Construction Industry.

The importance of construction to the UK economy is quite significant (Docherty, 1994; Hillebrandt, 1984; Langford, 1991). Hence due to the fact that the public sector is the biggest customer of UK construction, spending over £9.2 billion in 2003 on new construction orders (DTI, 2004b), it has been government rather than the industry which has attempted to set standards for construction customer-supplier interactions and greater client value. These standards have been seen as a means of reducing the transaction cost within the industry. Ultimately it is expected that this will improve the performance of the industry (Santos et al, 2000).

Innovation and research in UK Construction has been championed by the Department of Environment, Transport and the Regions which continues to support the work of the Construction Research and Innovation Strategy Panel. The department on behalf of government also spends around £23 million per year commissioning construction-related research and supporting innovation.

Government has also set about regulating the industry because of its importance in the economy especially as it produces investment goods. This means that its products are wanted not for their own sake, but on account of the goods and services that they can create or help create (Harvey, 1997). According to Hillebrandt (1974), the government has used construction to regulate the economy not only because of its contribution to the economy, and the fact that it is

an extremely labour intensive industry. This intervention has usually been manifested both by legislation and the provision of construction activity via the award of contracts and finance in the form of taxes, grants and benefits. This use of the construction industry as a regulator for the economy has unfortunately meant that the industry is the first to go into general economic recession and the last to come out of it. Giles (1997) is of the opinion that the need for such controls or standards by the government over construction has also been driven by the requirements for health and safety. There is however a concern within the industry that despite major advances in construction research, innovation and technology, high cost and low productivity that exist in the industry today are little different from those of 20 years ago. This implies that whatever the industry has done over that period, success may have been limited. This has led to the adoption of various concepts such as concurrent engineering (Khalfan et al, 2001; Ngowi, 2000) from other industries such as manufacturing.

Other processes now adopted include lean construction, which has come about from observation of best practice within the manufacturing industry (Betts and Ofori, 1993). This means that it is anticipated that solutions for construction's problems are found in adapting a combination of Japanese and western manufacturing philosophy (Koskela, 1992; Lahdenperra, 1995). In addition, new construction processes have supported increases in partnering and collaboration, closer involvement of clients in research and appropriate learning, safeguarding of government investment in construction research and development (Barlow, 1998). There has also been an increase in the tightening of legislation relating to the activities of *cowboy* builders and also an increase in environmental awareness such as energy-efficiency in buildings which means that finer tolerances between components and use of substituted materials is now encouraged. In some areas, this has meant greater pre-engineering and prefabrication of building elements because the required higher standards cannot be achieved on site. The result has been a shift in the kind of work done on site and that done in a factory. These changes have had knock-on effects on the organisation of construction projects and, especially, the roles and responsibilities of participants in the process.

3.9 Conclusion

The construction process, which was once driven by labour intensive methods, requiring many small, specialised firms to co-operate is now changing. Its traditional practices, which had limited the use of advanced technologies, reduced quality measures and typically resulted in costly litigation disputes, are now being addressed. Change in the construction process and relationships between the various suppliers are expected to enable the reduction of construction cost.

The construction process spans the entire process of briefing, design, fabrication, construction, commissioning and occupation of constructed facilities. As a result, it is expected that efficient management of the construction process will ensure that customers achieve best value for money and are totally satisfied by what they receive. For this to happen, construction products must exceed or at least meet increasing customer requirements and expectations especially as clients and end-users demand better quality and faster delivery at cheaper cost whilst incorporating increasingly complex technology.

In this chapter the role of the construction industry in the UK economy has been examined. Based on literature evidence, it was demonstrated that the UK construction industry faces similar problems such as discontinuity of project phases as other service industries such as ICT. Other similarities between the two industries were also demonstrated; for example, both industries were shown to regard the application of project management principles as important.

In addition to similarities between the two industries, key differences in environmental characteristics were demonstrated although this had previously been highlighted did not invalidate any results of a comparison between the two industries.

A key factor was the physical nature of construction against what could be described as the mainly conceptual nature of ICT products and services. Differences in the application of legal regulation were also identified. It is suggested that in order to achieve its business objectives, the ICT industry needs to support and encourage research on

innovative approaches to process improvements as is the case of the construction industry. Such well targeted research, development and dissemination of process improvement information is vital to turn the ICT business and project challenges into opportunities. This means that key initiatives and consideration for new ways of working already established in the construction industry can be fully embraced by the ICT industry. Schemes such as Lean Construction techniques, Concurrent Engineering, and partnering come to mind. Of particular importance is the fact that no major initiative has yet been initiated within the ICT project industry that address industry wide concerns (Ojiako et al, 2004b).

The nature of ICT project activity usually means that valuable knowledge is generated in the course of projects. This means that efforts that succeed on one project are lost if they are not carried forward on to the next project and the ones after that. Unfortunately, unlike Construction, there is no evidence that project knowledge captured is being applied to follow-on ICT projects especially as one-off improvements for particular projects have always been a feature of the sector. As a result, ICT companies are unable to apply themselves effectively on future projects. The absence of repeat order customers also means that there is little inclination in most quarters to invest in methods of capturing knowledge generated in the course of a project for application on the next.

With a study of this nature there is the inevitable question of how the ICT industry compares with other industries such as construction and more importantly, how capable the ICT industry is in terms of enabling changes and improvement in its project deployment processes. The challenge for ICT companies lies in their capacity to adopt new process and methods of deployment in order to deliver better products at lower cost.

Chapter Four- A framework for project success and failure

4.1 Introduction

In the previous chapters, the UK Construction and ICT industries were discussed. It was pointed out that the two industries shared similar characteristics including long periods of production and constantly changing requirements. Both industries also involved the generation of large amounts of detailed information during the design stages. According to available literature (Raz, 1993; Blaney, 1989; Larson and Gobeli, 1989; Roetzheim, 1988; Whitten, 1990; Hoffnagle and Beregi, 1985), both also industries shared similar application of project management principles based on the Association for Project Management (APM) Body of Knowledge. It was also argued that both industries regard the APM Body of Knowledge as the ensemble of activities concerned with the successfully achievement of a set of goals, which includes planning, scheduling and maintaining progress. While both industries shared similar characteristics, they also exhibited differences, which include the physical nature of construction against the mainly conceptual nature of ICT (mainly software) projects.

It was also recognised that there are serious consequences in both industries if project objectives are not met. The seriousness of this situation is demonstrated by available research results (Onyango, 1993; Lisburn and Baxter, 1994; Gladden, 1982; Crescenzi, 1988; California Department of IT, 1997), which show high levels of project failure in both Construction and ICT projects. Although failure has been reported in both industries, ICT projects appear to be worse (Coates, 1991; Glaser, 1984; Lyytinen and Hirschheim, 1987; Ewusi-Mensah and Przasnyski, 1994; Watson et al, 1991; Zmud, 1993). This is despite the enormous amount of resources devoted to their implementation. Generally, ICT projects commonly experienced times over-runs, were often over budget and did not perform in the way expected. They also involved severe financial strain on participating institutions (CIO Magazine. 01/06/00), and on many occasions were cancelled prior to their completion after the expenditure of considerable amounts of money (Collingridge, 1992; Morris and Hough, 1987).

Why the higher rate of reported failure in ICT projects?

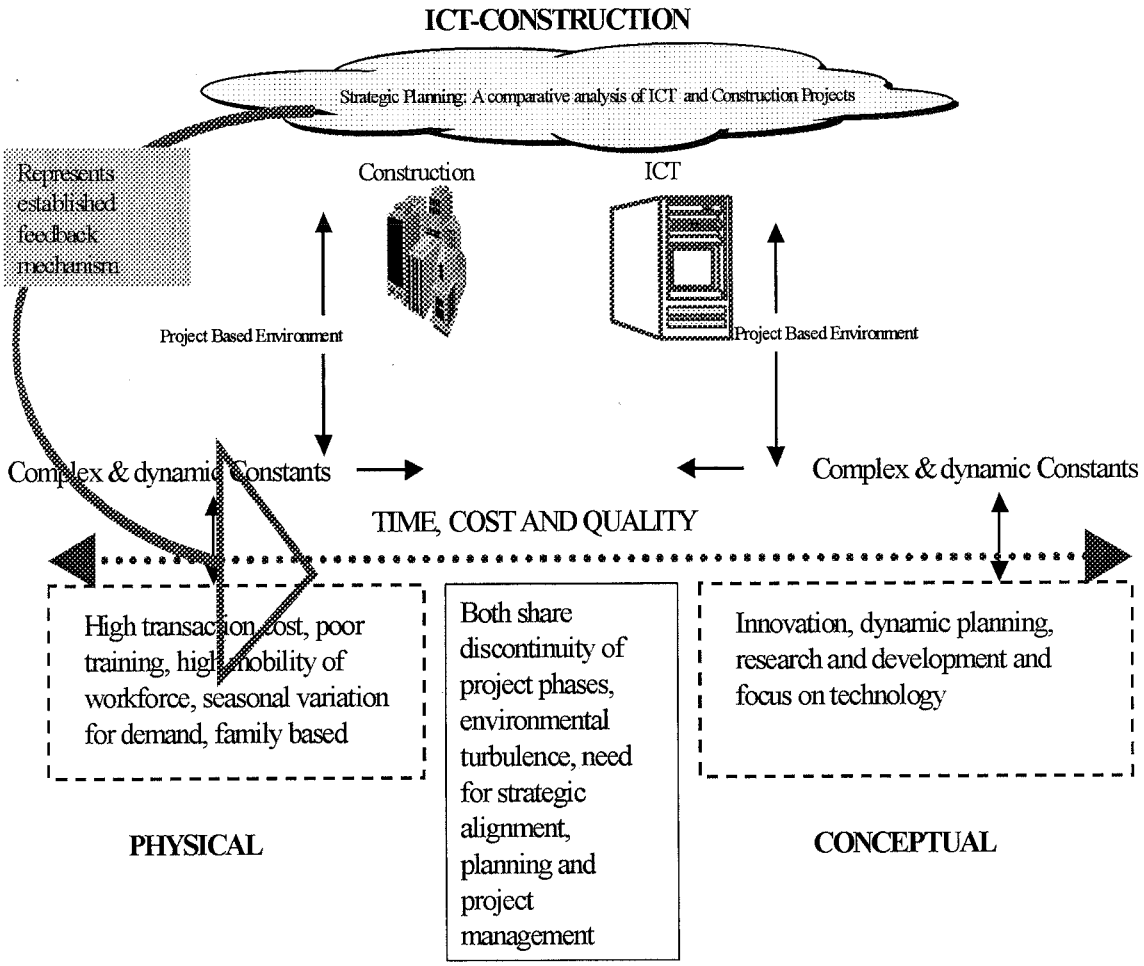
According to Gooch (1997), this is because ICT projects typically have peculiar characteristics that present particular management challenges. Some examples of the peculiarities of ICT projects are that they are less tangible and as a result difficult to pre-define in concrete terms, thus bringing about inherent risk and uncertainties. Being based on group-oriented activities also means that ICT projects require intense collaboration between stakeholders. Their capital-intensive nature (Ewusi-Mensah, 1997) also means that they require the investment of substantial capital and human resources.

ICT projects are also difficult to quantify, design and conceptualise. ICT project teams also require a particularly diverse range of skills and experience that can often create serious resource integration problems. Also, technological change occurs at such a pace in ICT it can make original assumptions about deployment principles and methodologies obsolete in a short space of time.

Similarly, both construction and ICT projects require intense collaboration between stakeholders and expenditure of substantial capital and human resources. However unlike ICT projects, construction projects are physical in nature.

Figure 9.0 below shows a detailed representation of the ICT- Construction environment. This diagram seeks to summarise peculiarities of environmental influences for both industries. It also presents an argument that unlike ICT, the construction industry does have an effective feedback mechanism.

Fig 9.0: Diagram Showing the ICT- Construction Environment



4.2 Project Success

Project success is a multi-dimensional construct that inevitably means different things to different people (Wideman, 2000). As a concept it refers to the ability of a product or service to meet key objectives of the project. This might involve business objectives of the sponsoring organisation. As a result, to ensure project success, most projects should be deployed to meet specific sets of business and technical requirements. Meeting business requirements is particularly important because it is the business requirements such as an increase in efficiency and reduction of operational and business costs which are perceived by management to contribute to organisational functional success. Hence, the challenge of successfully deploying and implementing any project is to ensure that the main business objectives that will be delivered have been identified. At the same time, issues, which can threaten project success such as inappropriate technology choices, are identified, isolated and managed (Shenhar et al, 1995).

Table 6.0: Construction Industry Success Criteria

Success Criteria	Definition
On Budget	The project is completed at or under the contracted cost.
On Schedule	The project is completed on or before the contracted finish date.
Meets Specifications	The completed project meets or exceeds all technical performance specifications provided by the owner.
Conforms to User's Expectations	The completed project meets or exceeds the user's envisioned functional goals (fitness for purpose).
High Quality of Workmanship	The completed project meets or exceeds the accepted standards of workmanship in all areas.
Minimises Construction Aggravation	The construction process does not unduly burden the owner's project management staff.

Table 6 above which provides a list of six success criteria for construction projects. The table is taken from Songer et al (1997).

A successful project is expected to continually demonstrate what is has delivered, what it is delivering, and how it intends to continue to deliver expected business value. At the same time, it produces specified outcomes within agreed budget or investment constraints. This is done according to specifications and at a quality level that serves business needs and management's expectations. The project's customer and stakeholders community will usually base the success of a project on general acceptance and satisfaction with the project's deliverables. It is also necessary for a set of criteria for baseline acceptance or rejection criteria to be set, possibly at project commencement. Such baseline criteria present the client, the customer and the service provider with a clear statement on the minimum criteria for success. It is also important to note that success criteria can change with time. This means that certain objectives if not achieved at a particular time do not necessarily mean that the project should be regarded as a failure.

Table 7 below, which is taken from Wateridge (1995) and Milis (2003), shows the three project criteria most frequently mentioned by ICT users and service providers.

Table 7.0: ICT Success Criteria

Criteria for Users	Criteria for Service Providers
Successful projects	
Meets user requirements	Meets user requirements
Meets budget	Commercial success
Management happiness	Meets quality requirements
Project team happiness	
Financial and Commercial success	

The measure of project success, in terms of both progress measurement and project success, should be defined at the beginning of the project as a basis for any project management decision-making and post-project evaluation. Project success also needs to be defined in terms of the acceptability of project's deliverables such as scope,

time, cost, and efficiency. Hence, without agreement on the project's success criteria, it will not be possible to measure its success. Classical project management principles suggest that success and how it is measured after the project has been signed off does need to be defined at the beginning of the project especially as such criteria provide a continuous basis for management decisions during the course of the project.

Icmeli-Tukel and Rom (1997) suggest that the criteria for defining project success need to be established in terms of easily measurable factors such as time, quality, and cost. They also highlight the importance of ensuring that the priority given to these objectives should not be allowed to change during different stages of the project. According to Turner (1993) and King (1988), any change if it does have to be incorporated within the project requirements, needs to be managed using pre-arranged change control mechanisms agreed by all parties during the project initiation stage.

Ojiako et al (2004c; 2004d) disagree with Icmeli-Tukel and Rom's (1997) criteria for measuring success by suggesting that such measures are too simplistic. Instead, *dynamic and flexible measures of success based on a separate performance and progress measurement criteria* are seen to be more appropriate. *In order words, a clear distinction between the measurement of project progress and project success* is recommended. There are other things that can be done to ensure success in any project. These include making sure that the project maintains top management support and user involvement in the planning and design stages of the project (Cerullo, 1980), ensuring that appropriate management and planning (Buchanan and Connor, 2001; Attran, 2000) mechanism are put in place. Other issues that need to be addressed to ensure project success include an understanding of the technology design requirements. In addition, the complex inter-relationships between law, finance, and people involved in the project need to be fully appreciated by the project manager in charge of delivering the project (Pheng and Keong, 1999). Pinto and Slevin (1988) also expect the project manager to be extremely customer focused throughout the implementation of the project. Perhaps the most important part of ensuring successful project implementation and deployment is recognising the paramount importance of quality in project success (Love et al, 1998). Reworking can occur because the

task is not meeting customer or technical specifications (Cooper, 1993). That means doing the job right the first time and as a result, eliminating the reworking of tasks, which in turn reduces the time and cost of project implementation. One of the main objectives of customer focused companies should be to minimise the reworking of non-conforming tasks and to control the amount of rework. Project managers are therefore encouraged to use the magnitude of re-work as a performance measure.

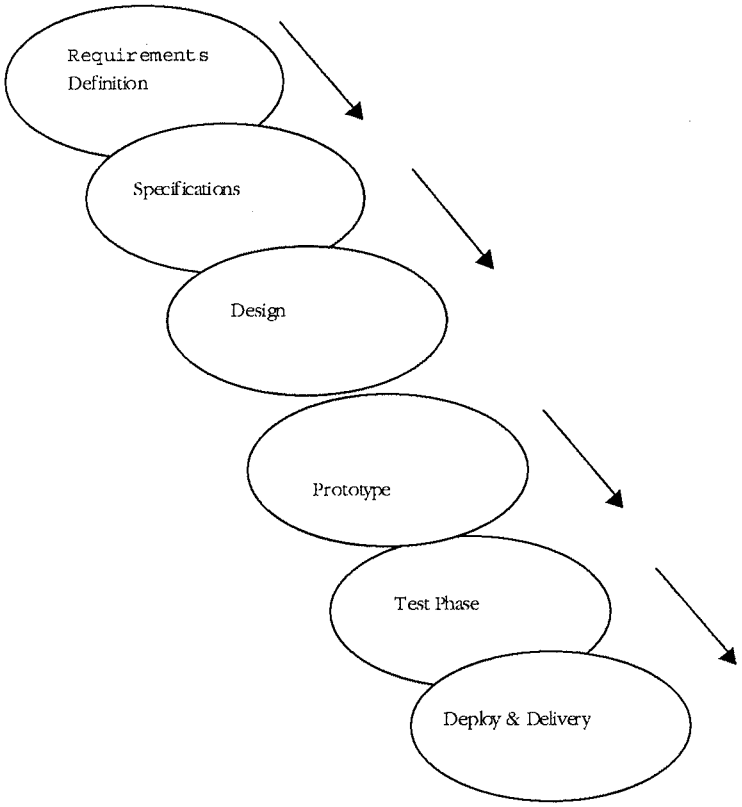
4.3 The concept of Project Failure

By definition, a project is a temporary endeavour with a specified start and finish goal. It is usually characterised by constrained resources hence decisions are sometimes made under stress. The environment surrounding a project can also change and dramatically impact the project plan which reduced to its simplest, is the discipline of maintaining the risk of failure at as low level over the lifetime of the project. For this reason, it is expected that the goal of project management is to ensure the successful delivery of requirements (Newbold, 1998).

Modern project management can to some extent be traced back to Proctor and Gamble's Brand Management principles, which was established in the 1920's. This approach enabled the company's product management unit to give overall responsibility to a single manager for all functions. With the coming of the second world war, planning for operation *"Overlord"* - although missing real use of tools and techniques, took a more *"project"* nature as it had a clear overall objective and an overall *"project manager"* in the person of the Supreme Allied Commander. More recently, the demand for project management as a technique has greatly increased across many industries due to an acceptance of its benefits to project success (Cooke-Davies and Arzymanow, 2003).

In the past, the traditional waterfall approach (Fig. 10.0, below) to project implementation and deployment has been the most popular approach for major projects (Veryard, 1998).

Fig 10.0: The Waterfall Approach



Under this approach there were a series of steps that had to be achieved from project concept and inception to final delivery and signoff (Newbold, 1998). Transition from each step only progressed after successful completion of a very structured review process of previous steps. As such, the principle that true progress in a project happens only when the work completed by one resource allows another resource to start, prevailed (Jacob, 1998). Such processes in modern projects are now regarded as unrealistic and less efficient. This is because response to changes to a traditional system can no longer be regarded as an

effective response to the current commercial environments most organisations have to operate within.

Project failure can be defined in a number of ways and measured using numerous factors. These can include failure of a product or solution to meet objectives of time (Cannon, 1994; Kerzner, 1998; Shenhar et al, 1997), budget (Lauer, 1996), quality (Kerzner, 1998), technical specifications (Shenhar et al, 1997) and scheduling or systems capabilities usually promised in specifications (Lauer, 1996). Risk of failure in project implementation often arises primarily from the presence of uncertainty, poor planning, lack of senior management support, and poor capture of project requirements. A re-occurring definition that resides when defining project failure is that its assessment must *depend on perceptions of the client or customer* (Bussen and Myers, 1997). This is now changing as it is now recognised that systems may be regarded as a failure to one group, yet to another it is a success (Ahn and Skudlark, 1997; Sauer, 1993). As a concept, project failure is about an inability to fully realise the expected benefits of a project to stakeholders (Kling and Iacono, 1984). This means that for a project to be regarded as successful, it must meet specific stakeholder requirements and specification (Kling and Iacono, 1984).

4.4 The causes of project failure

The challenge for most ICT service providers and construction suppliers when implementing or deploying a project is to achieve compliance between the initial requirements and the final product or solution that is produced. Generally speaking, because there is no clear-cut method of measuring success and failure, project failure is a difficult issue to discuss because most organisations find it difficult to admit that key projects they are involved in are failing (Abdel-Hamid and Madnick, 1990). Table 8.0 below is taken from Shenhar et al (1996) and shows a cross selection of success criteria for projects.

Table 8.0: Non Industry Based Success Criteria

Success Category	Measurable Success Criteria
Internal Project Objectives (Pre-completion)	Meeting schedule - Within budget Other resource constraints met
Benefit to Customer (Short term)	Meeting functional performance Meeting technical specifications & standards Favourable impact on customer, customer's gain Fulfilling customer's needs Solving a customer's problem Customer is using product - Customer expresses satisfaction
Direct Contribution (Medium term)	Immediate business and/or commercial success Immediate revenue and profits enhanced Larger market share generated
Future Opportunity (Long term)	Will create new opportunities for future Will position customer competitively - Will create new market Will assist in developing new technology - Has, or will, add capabilities and competencies

But what is a failure and what are the crucial factors that influence it? Project failure will usually involve a quality problem or severe cost or schedule overrun. This may eventually result in either project postponement of deliverables or outright project cancellation. Project failure involves what the project stakeholders think it should be. This is because in their opinion, conclusion on project failure is strongly biased by the stakeholder's area of expertise and interest. A project can also be considered a failure if it deviates too far from original specifications. Project failure is evident in both the

construction and ICT industry, and although not necessarily to the same degree, is usually caused by similar factors that are historically well defined and documented. These factors include over ambitious design, bad planning, and poor people management and project team composition (Ewusi-Mensah, 1997). Other key factors include ineffective communication (Edstrom, 1977; Kennedy, 1994), poor requirements capture (Weiser, 1997; Yourdon, 1997) and non-sustainable corporate interest and management commitment (Liebowitz and Khosrowpour, 1997; Liang and Teo, 1994). Additional factors listed include no end user support and poor implementation techniques (Ives, 1993). Project failures can also be caused by poor project management practices, which involves not having an appropriate road map in which details on how the project will be managed from conception to completion are stated. As a result, the project instead of following a well thought-out project route adopts an unstructured approach, which could lead to unsuitable project results.

The main issue to be aware of is that the most project failure can be traced back to the preliminary and pre-design stages of a project. This is because it is at this stage that significant decisions, which can result in project failure, are made. Often this is caused by unclear and unrealistic project targets (Clark and Wheelwright, 1994; Ackoff, 1967). Other reasons will include unsuccessful risk identification (Powell and Klein, 1996), poor product definition and over-optimistic project estimates (Keen, 1987a). According to Smith and Wyatt (1998) because once these significant decisions have been made, they cannot be readily deleted or dramatically altered, it is important that those project decisions are properly considered, while their planning and management are sufficiently and conscientiously implemented. At the same time this is happening, known project factors that cause failure need to be addressed appropriately, usually by initiating appropriate risk management procedures.

Baronass and Louis (1988) and Yardley (2003) suggest that what has emerged from available literature is that the most important factors that influence project failure are not necessarily technology-specific or technical issues. Instead, literature has demonstrated that "*soft*" issues with project management such as poor partnering, business planning, visioning, and networking play a very important

part in project outcomes. In addition, as projects are never isolated from their organisational environment, success or failure will be determined by the customers from the project's ability to contribute to business value. Hence if there is no connection between the project functionality and its business environment, the project will fail to meet expectations.

4.5 Conclusion

This chapter has re-examined the various factors that affect project success within the construction and ICT industries (A summary list is provided in Table 9.0, below).

In the course of doing this, it was shown that both industries share similar characteristics. At the same time, the also demonstrated fundamental industry differences. Both industries however are known to apply generic project management methods that are fundamentally similar. The case however still remains that the reported rate of project failure in ICT projects remains higher than that of construction projects.

The review of literature has so far shown that quite a few reasons might have contributed to this situation. In the first place, it is generally acceptable that ICT projects are less tangible and quantifiable than construction projects. Secondly, ICT projects are accompanied by significant volatile technological changes, which means that requirement definition is particularly difficult. In addition, although there is a realisation that the key to best practices in project management lies in the execution via repeatable standard processes, difficulty still exist with attempts to establish a consistent and standard project management methodology specific to the ICT industry.

Table 9.0: A cross section of various success criteria used for assessing projects

Author	Criteria	Criteria	Criteria	Criteria	Criteria	Criteria
Duncan (1987)	Meeting budget objectives	Meeting required timescales	Meeting user requirements and specifications			
Blaney (1989)	Meeting budget objectives	Meeting required timescales	Meeting user requirements and specifications			
Redmill (1990)	Meeting budget objectives	Meeting required timescales	Meeting user requirements and specifications			
Morris and Hough (1987)	Delivers functionality	Delivered to budget, on schedule and to technical specification	Profitable to the contractors	Terminated reasonably and effectively if it needs to be cancelled		
Turner (1993)	Project achieves its purpose	Provides satisfactory benefit to the owner	Satisfies the need of the owners, users and stakeholders	Meets pre-stated objectives	Produced to specification , within budget and on time	Satisfies the needs of the project team
Turner (2004)	Success criteria agreed with stakeholders at the start of the project	Meets collaboration working requirements	Allows the project manager flexibility to deal with unforeseen circumstances in the way he best sees fit	Owner shows interest in the success of the project		
Geddes (1990)	Clearly defined objectives					

What emerges is that ICT projects may be failing because of an inherent weakness in project management application within the industry. This is certainly not the case in the construction industry where evidence exist from measures of demonstration projects that the impact of innovations on the sustainability of construction processes, enhanced levels of competence in management, supervisory and craft skills are having positive effects on project implementation.

Chapter Five- Research Design

5.1 The Research Strategy

In order to provide answers to the main research questions (*see section 1.1*), two points were raised when establishing a research strategy. In the first place, it is accepted that review of literature on its own could not move knowledge claims closer to the truth without the appropriate and concise collection of data. Secondly, the interpretation of data was regarded as a critical part of the research process. This is because it involved applying background theoretical knowledge gathered from literature to the data collected.

At this point, the need for identification of the most appropriate research method to adopt was addressed. This was done based on work by Yin's (1994). In his book *Case Study Research: Design and Methods*, which was published in 1994, he carried out comparison between the most common research strategies. These comparisons were based on the type of research question posed, required control over the actual behaviour of elements and the degree of focus on historical or contemporary events, the research strategy based on a qualitative survey approach was chosen.

Table 10.0: Research Strategy Comparison

Strategy	Form of research question	Requires control over behavioural events	Focuses on contemporary events
Experiment	How, why	Yes	Yes
Survey	How, why, where, how many, how much	No	Yes
Archival analysis	How, why	No	Yes/No
History	How, why	No	No
Case study	How, why	No	Yes

Table 10.0 above is taken from work carried out by Yin (1994). It shows common research strategies matched into appropriate forms of research question. This formed the basis for deciding on the appropriate research strategy.

Based on the above comparisons, the qualitative survey research approach was seen to present the best means of meeting the research objectives while at the same time ensuring that the key issue for social research that is obtaining results that satisfied the research questions, was achieved. The reasons for this decision are explained in the following section 5.2.

5.2 Qualitative Research Methodologies

Quantitative research is all about quantifying relationships between variables. Its designs are usually either descriptive (subjects usually measured once) or experimental (subjects measured before and after a treatment). Using techniques such as graphs and statistics, it may be used to describe and produce objective data, however with less detail on behaviour, attitudes and motivation.

Strauss and Corbin (1990) on the other hand describe qualitative research methods as any research that produces findings not arrived at by means of statistical procedures. As a methodology, it is based on dealing with the mass of words generated through techniques such as observation. The basic aim of qualitative research is to seek explanations to *"why"* or *"where"* questions, when explaining social phenomena. Jones (1985) sees qualitative methodologies as being designed to provide subjective and value-laden accounts of events.

Although project management research has historically relied heavily on quantitative methods, the important contribution of qualitative methods has been argued by researchers including Loosemore et al (1996), Edum-Fotwe et al (1996) and Dainty et al (2000). In their work, they suggest that project management research requirements cannot be achieved through the sole use of quantitative research. This was seen as particularly relevant to this research because of the need to understand the project management concept and its relationship to project failure by refining the theoretical-propositions obtained from the research analysis.

The adaptation of a qualitative survey approach to collect data was made for a number of reasons.

In the first place, such an approach produces data whose strength resides in reconciling complexity with detail, flexibility and context (Seymour, 2001; Mangen, 1999). As a process, qualitative research is committed to contextual understanding. It also involves a constant questioning and refinement of phenomena (Bryman, 1984). At the same time, it is concerned with the validity, meaningfulness, and insights generated from rich information (Patton, 1990). According to Amaratunga et al (2002), this explains why it is generally advocated as the best strategy for discovery and exploration of new ideas. This fact was the main driver for adopting qualitative options as the primary research strategy.

As qualitative research employs interpretative, rich narrative descriptions of events, these characteristic were seen as particularly useful especially since having a straightforward, closed, right or wrong answer was not seen to be a requirement of this research. In addition, because the research objective was not about finding only one answer, the adoption of a qualitative approach more directed at the development of explanations for social phenomena was seen as more appropriate.

5.3 The Research Requirements

Once the use of qualitative research methods had been decided on, examination and discussion of the limitations of qualitative research strategies such as ethnography, kinetics, short-term observation, and grounded theory was conducted.

For example, the ethnographic approach was reviewed, but was regarded as unsuitable for practical reasons associated with conducting repeat interviews.

Another research methodology that was considered was the widely popular case study approach (Yin, 1989 and 1993; Milley, 1979; Hamel, 1993; Armisted, 1984; Feagin, 1991; Fidel, 1984; Gilgun, 1994). This methodology was however seen to have numerous characteristics, which made it unsuitable for this research. These characteristics include its long timescales in the collection, organisation and description of data (Minnis, 1985; Davey, 1991; Welch, 1981). Ethical difficulties were sometime encountered

especially because they often involve the active participation of respondents.

Another reason for discounting the case study approach was that the tasks involved in project management although based on similar principles are so diverse that it was virtually impossible to link all issues relevant to the study when studying a few particular projects.

After considering the limitations of qualitative research approaches such as the ethnography, kinetics and short-term observation, the interview technique for data gathering was adopted. The use of grounded theory as a method of data analysis was also adopted. The reasons for adopting this data analysis technique are discussed in the following paragraphs.

Grounded theory is a qualitative research method. According to Glaser and Strauss (1967), it is covered, developed, and provisionally verified through systematic data collection and analysis of data relative to the phenomenon being studied. As a methodology, it can be used regardless of the way data is generated, the granularity of analytical focus, or the coding method used. It is based on a rigorous empirical research that uses explanations to develop new theories in order to contribute to knowledge in a particular research area (Glaser and Strauss, 1967). It is seen as well suited for qualitative research especially in areas where there is a limited knowledge.

Grounded theory is best regarded as a general theory of scientific method. It is concerned with the detection and explanation of social phenomena, which can come from personal interaction with the data question and existing theory. This ensures that patterns emerge from the data that are related back to the existing theory.

At the heart of grounded theory analysis is the coding process, which involves breaking down, analysis, comparison, and the categorisation of data (Babchuk, 1997).

Data collection for a grounded theory approach can be either via observation or interviews (Hancock, 1998). Observation as a data collection technique was not seen as appropriate to the research due to a number of reasons. In the first place, observation is a time demanding procedure

that requires interaction with the observed entity for long periods of time. In addition, there was no guarantee that a sufficient level of access to some organisations could be achieved due to issues of commercial confidentiality.

Based on these limitations, the most appropriate approach to collection of research data was seen to be the interview method.

5.4 Interviews

A total of fifteen interviews were conducted. Each interview lasted between one and two hours. Five of the interviews were conducted with project management professionals working for three main construction companies with annual turnovers of more that £500 million. The other ten interviews were with project management professionals working within the ICT industry.

As all organisations carry out work on a national basis, it was possible to carry out majority of the interviews in the Newcastle upon Tyne area.

The interview process is based on verbal communication between an interviewer and respondents. According to Denzin (2001), for more than a century it has been a popular information-gathering tool for the social sciences. Generally, according to Amaratunga (2002), interviews are regarded as the most widely used qualitative method in social science research. As a data collection method, interviews can be regarded as the central resource through which contemporary social science engages with issues that concern it (Rapley, 2001; Briggs, 1986). Interviews can be structured, unstructured or semi-structured. As a process, it seeks to collect information on attitudes. Hence, it are seen to be particularly useful for non-experimental descriptive designs that aim to demonstrate reality (Mathers et al, 1998a). Interviews are also usually seen as particularly suitable for research aimed at capturing and describing processes where variations could exist.

Table 11.0: Summary of organisations interviewed

Organisation	Annual turnover	Industry	Sector	Date of Interview	Location of Interview	Job title of interviewee
A	£600M	Const.	Private	21/01/03	Newcastle upon Tyne	Senior Poject Manager
B	£2bn	Const.	Private	27/03/03	Newcastle upon Tyne	Senior Site Manager
C	£1.4b	Const.	Private	14/04/03	Newcastle upon Tyne	Project Manager
C	£1.4bn	Const.	Private	20/05/03	London	Project Manager
B	£2bn	Const.	Private	20/05/03	London	Construction Manager
D	£2.02bn	ICT	Private	21/11/02	Newcastle upon Tyne	Operation Cost Control Manager
D	£2.02bn	ICT	Private	04/12/02	Shrewsbury	Senior Project Manager
D	£2.02bn	ICT	Private	04/12/02	Shrewsbury	Programme Manager
D	£2.02bn	ICT	Private	11/12/02	Nottingham	Senior Systems Control Manager
D	£2.02bn	ICT	Private	11/12/02	Nottingham	Technical Project Consultant
E	£882	ICT	Private	16/12/02	Glasgow	Senior Consultant
D	£2.02bn	ICT	Private	16/12/02	Glasgow	Software Project Leader
F	£100M	ICT	Public	03/01/03	Newcastle upon Tyne	Software Development and Project Manager
G	N/A	ICT	Public	17/01/03	Newcastle upon Tyne	IT Manager
H	£300M	ICT	Private	21/01/03	Newcastle upon Tyne	IP & Data Networks Delivery Manager

Semi structured interviews were regarded as the most appropriate form of data collection because of the flexibility of its approach. For example, it allows not only for adaptation to varying context, but also encourages pursuing unexpected paths (Correia and Wilson, 1997).

At the most basic level, interviews are conversations, which Kvale (1996) defines as '*attempts to understand the world from the subject'* point of view. Unlike conversations in daily life, which are usually reciprocal exchanges. Professional interviews involve an interviewer who is in

charge of structuring and directing the questioning. With its emphasis on intellectual understanding, using interviews as a means of qualitative data collection involves open-ended responses to questions that are the main source of raw data.

For the purpose of this study, the semi-structured interview approach was adopted as the most appropriate data gathering technique. This was done after consideration of the three basic types of interviewing (structured, semi-structured and unstructured), their constraints and a review of data collection and analysis (Patton, 1990). The use of semi-structured interviews also allowed the infusion of key cultural specifics and terminologies of the two individual industries into the questions. This would have been difficult to manage if, say, a questionnaire approach methodology was used.

Information concerning interviewees' personal beliefs, considered opinions and insights was also seen as important to the research strategy. This was regarded as information not easily obtained if say structured interviews were used. This is because structured interviews can involve tightly controlled questioning which prevents the exploration of opportunities or interesting angles. It can also limit any call for elaboration. The semi-structured interview technique also has the ability to build into questioning. It also ensures sufficient flexibility thus capturing insights that may otherwise be lost to the imposition of the '*next*' structured question.

Hitchcock and Hughes (1989), Barnard (1988), Mathers et al (1998a), and Simister (1993) have a view on the semi-structured interview technique, on which the decision to conduct the data gathering exercise within this thesis has been based. In their work, they all point out that the semi-structured interview allows the opportunity on the part of the interviewer to probe and expand the interviewees' responses. By doing this, it is possible to follow up a line of enquiry introduced by the interviewee during the course of the interview.

For the purpose of this thesis, two groups of semi-structured interviews were conducted. The interviews were carried out over a six-month period between November 2002

and May 2003. The first group of interviews was directed at ICT project managers.

The aim of these interviews was in the first place to gain an understanding of the definition of projects and the project management methodologies currently in use within the ICT industry. It was also necessary to address the second research question. As a result, the construction sample was regarded as being used to *confirm* assumptions underlying the initial research proposition. A bigger sample of ICT project managers was also chosen because it was seen as the focus of the study, which was directed at finding out whether: -

- ICT project managers were actually using similar project management methodologies to their construction colleagues. If so, whether they were adhering to best practice as recommended in the APM body of knowledge. In order words that project management within the ICT industry was mature.

- Whether there were any factors not covered within construction project management practice, which had to be considered within ICT project management (such as strategy) that could provide help separate performance and progress measurement criteria.

These three assumptions included that *construction project managers did use well established standard project management methodologies* and that *construction and ICT project managers fundamentally used similar approaches to project management methodologies based on processes detailed by the APM Body of Knowledge*.

The second aim was to establish the basic driver for these projects and finally to identify factors most likely to influence project success or failure. The second group of interviews aimed at construction project managers acted as basis for comparison for the views expressed by the ICT project managers in earlier interviews.

A total of five project management professionals working for the three of the top ten UK Construction companies (Corporate Watch, 2004) were conducted. Between them, they worked for three of the top ten UK construction companies with combined turnover in excess of £4.5 billion (2002

figures). The samples were identified using non-random purposive sampling technique sometimes referred to as the *'snowball approach'*. This approach led to the construction interviewee's being targeted on the basis of professional contacts with the researcher's supervisors. There was however an appreciation that such an approach will result in limitations especially as the data sample was to be drawn from people within a specific network. One possible result could be the emergence of shared themes during the interview stage.

A decision on an appropriate sample size was also based on previous work carried out by Lincoln and Guba (1985) and Holsti (1969). From their work, it is accepted that sample size depends upon the kinds of questions being asked of the data, the degree of precision with which they must be answered and the nature of the data. As a result, *"a dozen or so interviews, if properly selected, could exhaust most available information"*. In their opinion, *"to conduct as many as twenty interviews will reach well beyond the point of information redundancy"* (Lincoln and Guba, 1985).

A total of fifteen interviews were conducted as part of the data collection phase of the research. This overall sample was justified as appropriate bearing in mind already mentioned literature (Lincoln and Guba, 1985; Holsti, 1969). It was also seen as more important to identify a sample size that satisfied any need of information redundancy and saturation as against establishing statistical significant results. Thus as in the case of most qualitative studies, the justification for choosing the sample size rested on the notion of establishing a sample size above which no new insights from interviewees were likely to be obtained. Justification on the number of interviews conducted for the ICT project management professionals (ten in total) and project management professionals in the construction industry (five in total) again based on the point of information saturation.

The sample study was also as a result of initial access problems experienced especially as a random selection of ICT (covering telecommunications and computer) and construction organisations had been identified. The various Personnel and Human Resources departments had been contacted with enquires about project managers as possible contacts to be interviewed. Responses were generally

negative possibly because the researcher was an employee of BT, a competitor in the ICT market. As a result, the ICT sample was identified using similar non-random purposive sampling technique as in the case of the construction sample. Contact was however based on professional contacts with the researcher. To compensate for this limitation, the research sample was obtained from several levels of the management chain across the project management practice.

The interviews were based on recommendations by Mathers et al (1998b) and involved moving from generalised to factual question. An interview guide was used which began with questions of the 'grand tour type' (Spradley, 1979). These were aimed to discover background detail on the individual, to relax the participant by easing them into the interview situation, and to establish the need for personal responses.

Table 12.0: Basic Interview Framework

Basic Question	Further detail
Who	Project manager involved
What	Project management role involved
Why	Project management role involved
What	The basic driver for projects within the two industries
Why	Any degree of similarity in the definition of projects
What	Management systems and methodologies
When	Availability of appropriate alternatives to these methodologies
What	Availability of appropriate alternatives to these methodologies
What	Impact of project characteristics on management style
How	Factors most likely to influence project success or failure
When	Factors most likely to influence project success or failure
What	Factors most likely to influence project success or failure
How	Project success or failure measured

The second stage in the interviews involved establishing the type of project being managed by the interviewee, average budget for projects, and a description of the project drivers.

The final stage of the interview was based on very direct questions on project management methodologies used during the management of projects the respondents were working on. Specific questions on sponsorship of these methodologies within the respondent's organisation, the appropriateness of this methodology and the availability of alternative methods were also raised during interview.

Table 12.0 above details the framework adopted during the interview stages of data gathering. It is based on a questioning framework proposed by Yin (1994) and Strauss and Corbin (1990).

This approach is seen to have allowed the interviewees freedom of expression while at the same time produced data.

Based on work by Fontana and Frey (1994), which support the recording of interviews, the majority of interviews where possible were recorded. However some of the respondents were not comfortable about possible use of tape recorders and at least on five occasions, there were specific requests that the interviews were not taped. It was also noted that insisting on taping the interviews against the wishes of the interviewee could either result in their refusing to take part in the exercise. There was also according to Mangen (1999), the possibility that this could inhibit interviewee responses during interview.

Although taping all interviews was generally preferable, in order to enable concentration on listening and responding to the interviewee, the use of a mixture of recorded and non-recorded interviews was adopted. This decision was reached after consideration of research carried out by Roberts and Renzaglia (1965) which indicates that there was no evidence that recording of interviews influences interview responses.

Table 13.0 below shows the interview question categories. This is based on a description of the questions and the main reasons why the questions were asked during the interviews.

Table 13.0: Interview Question Categories

Question	Descriptions	Reasons for asking
1 and 2	Categorisation of interviewees roles	To provide background information on interviewees and to ensure right interviewee sample chosen. Questions confirm interviewee's position, organisations core business, type of project he/she manages, average budget for projects and best description of these projects are established.
3, 4, 5 and 6	Role of project management in current responsibilities described in questions 1 and 2	Seeks to clarify interviewee's understanding of the work of a project manager, confirm that the interviewee's role is project management based. Establishes whether there a formal project management system or methodology being used by the interviewee when carrying out this role, is this recommended by his/her organisation? , Is this methodology ever inappropriate. Circumstances recommended methodologies inappropriate. Are they alternative methodologies available to be used?
7 and 8	Management style	These questions seek to establish any management style being exhibited by the project manager, influences and possible effects on the project team
9 and follow-up questions 1 and 2	Factors that influence project success and failure	These questions sought to establish what factors are most likely influence project success or failure, clarify how these factors affect project delivery outcomes. Issues to do with confirming the role of project complexity and technology in project failure was also confirmed.
10 and 11	What happens at the completion of a project	Confirmation on the application of customer feedback, in-life project and post implementation reviews. Overall success or failure of projects, How is this measured?

Request to review any documentation such as letters, meeting minutes or process documents were not made during the interviews.

5.5 Transcription

The next step in the research involved transcribing the taped interviews and written notes. The main aim of this procedure was to help in the management of data taken during interviews.

As recommended by Lapadat (1999) and Alexiadou (2001) the transcript texts were put together to ensure that data gathered from the interviews was presented in such a way that coding and content analysis could be conducted without a loss of accuracy.

All interview transcripts were presented in a formal, structured, coherent and non-repetitive form. This ensured consistency in the transcripts.

5.6 Computer assisted data analysis

Over the last two decades there has been a proliferation of computer software packages designed to facilitate qualitative data analysis (Morison and Moir, 1998).

This recent increase in the use of computer software in the analysis of qualitative data has been driven by the perceived need to addresses the issue of transparency of data analysis strategy which has previously been one of the suggested limitations of qualitative research (Kvale 1996).

As a tool, Smith and Short (2001) suggest that computer software can offer an immense improvement in the efficiency and ease with which qualitative data analysis can be conducted.

According to Van Hoven and Poelman (2003) there are known advantages and disadvantages of using computer software in qualitative data analysis of which any researcher must take into consideration.

In the first place, among the advantages was the ability of software to server as a tool for ease of enhanced coding, data retrieval and the conduct of all-inclusive text

searches (Macksnsen and Wille, 1999; Miles and Huberman, 1994).

Computer software was also seen as a tool to facilitate a faster exploration of interrelationships between data that would have been too obscure if manual techniques are used (Dainty et al, 2000).

Van Hoven and Poelman (2003) agree that the analysis of the results of in depth interviews has always been a problem in qualitative research. They suggest that the use of computer software package for identifying themes during data analysis as a means of ensuring the vigorousness of data analysis. This is usually achieved by freeing up time for creative thinking (Gerson, 1984).

It is however, important to highlight that notwithstanding the advantages of using computer software for quantitative data analysis, their use also has disadvantages.

Among these disadvantages includes a possible loss of overview with a mechanistic approach to data analysis (Van Hoven, and Poelman, 2003) and over simplified descriptive results (Becker, 1993).

After an examination of the advantages and disadvantages of computer software in qualitative data analysis, the use of computer software for data analysis was decided.
This approach was chosen because it was seen that the thesis must embrace the techniques and expansive possibilities presented by computer software in qualitative data analysis.

It was however accepted for the purpose of the research that use of such software cannot be expected to replace natural intuition or make judgements which is a key naturalistic characteristic of qualitative research (Dainty et al, 2000).

Based on its flexibility and ability to handle large quantities of text (Beard and Easingwood, 1989), and recommendation from research staff within the University of Northumbria, the ATLAS/ti software package was adopted as the preferred data analysis tool.

The ATLAS/ti program offered flexibility in use because its functionality often includes two modes of data analysis. The first focuses on raw data and includes activities such as text segmentation, coding and memo writing while the second functionality focuses on framework building activities such as interrelating codes, concepts and categories utilised to form theoretical networks.

5.7 Interview and data analysis

The main aim of the interview data analysis was to dis-assemble and rebuild the originally proposed ICT-Construction framework. This framework had been established based on a review of available literature. In order to achieve this objective, a five-step approach to data analysis based on framework analysis (Bryman and Burgess, 1998) and grounded theory (Macksnsen and Wille, 1999; Glaser and Strauss, 1967) was adopted. The five-step approach included data familiarisation, framework identification and coding, data indexing, data mapping and theory building.

5.7.1 Data Familiarisation

'Data familiarisation' involves gaining a total view of all material relating to the research (such as available literature and the interview question) that was to be examined. Part of this exercise involved ensuring that a total overview and understanding of the issues raised during the interview stage was maintained.

5.7.2 Framework Identification and Coding

This process involved the identification of key issues, concepts, and themes by means of content analysis of the data. According to Fetterman (1998), content analysis is used to discover significant patterns on various concepts while at the same time testing for consistency. Using content analysis, a textual investigation based on presenting and categorising the data was conducted. This approach suggested by Easterby-Smith (1991) and Silverman (2001) involved key phrases or words being selected.

In order to identify phenomena, using techniques recommended by Morison and Moir (1998) and Conniss et al, (2000), each interview transcript was broken down into

units of analysis and then examined, compared and categorised. These codes and categories emerged from reading through the interview transcripts. This was done based on advice from Jones (1985) and Glaser and Strauss (1967) of the need to ensure that no firm preconceptions dictating relevance in research concepts was held beforehand. In order to ensure that the code name provided a good fit for the data being scrutinised, single coding was adopted as recommended by Calloway and Ariav (1995) and Turner (1981).

Coding of the data was carried out using a line-by-line analysis approach. This process recommended by Beard and Easingwood (1989) and Strauss and Corbin (1990) involves a close examination of phrases and single words/keywords. These are analysed to extract word sequences about the subject of interest along with their contexts.

The final part of framework identification and coding involved putting together notes regarding issues as were made important by the interviewees. This approach is recommended by Conniss et al (2000) and it ensures that follow-up interview transcripts are coded by applying codes already applied to previous transcripts.

5.7.3 Data Indexing

The next stage in the analysis process involved the indexing of data. Within this phase of data analysis, the codes identified were systematically applied to the rest of the interview data and transcripts. New codes were also being constant updated with indexed data. This process ensured that coding incorporated responds to additional information raised by other interviewees.

5.7.4 Data Mapping

Once the coding was complete, the next stage in the process was to bring the results together using summary diagrams. According to Jones (1985), by using these diagrams and comparing content labels, a picture of the data according to the appropriate thematic reference can be built.

Data Mapping is usually employed to present a person's beliefs and explanations of theories using diagrams. As a methodology, it is used to make explicit thinking about a

particular issue in order to devise ways of handling it (Jones, 1985).

5.7.5 Theory Building

The identification of the core concept and the completion of the data mapping exercise facilitated theory generation. This involved a picture of the data according to the research theme being built.

The theory building process involved drawing out categories to become major labels and themes. Categories with similar labels were then put together into same topic/conceptual theme labels.

A narrative was developed that explained the properties and dimensions of the categories, and the circumstances under which they were connected. This explanation of the phenomena under investigation became the theory developed.

Chapter Six- Results and Analysis

6.1 Introduction

In the previous chapter (*Chapter Five*), a research strategy and methodology was proposed in order to address the primary research question. Chapter Six involves testing the research questions (*see section 1.1*). In order to conduct this test, interviews were conducted. Analysis of data will show and support the assertion that both industries share similar application of project management principles based on the Association for Project Management (APM) Body of Knowledge.

Analysis of the interview framework gave a total of 24 variables. All variables were regarded as important for the analysis of data and as a result during the analysis, all were rated at the same level. A breakdown of the code hierarchies is however shown in Appendix A.

It is important to note that although the normal research approach would demand a separate chapter for results (non-interpretative) and conclusions, the nature of the data and the method of analysis employed demands that they are presented together. Although unconventional, this approach aligns closely with principles of grounded theory as recommended by Glaser and Strauss (1967), who refers to grounded theory as a process that involves *a systematic collection and analysis of data*.

6.2 Review of the variables

A total of 24 independent variables were identified during the data analysis stages of the research. These were Job Title, Grade, Involvement, Task, Understanding, Project Type, Budget, Description, Methodology, Management Style, Resource, Time, Quality, Requirements, Phase/ Milestone or stage, Qualification, Size, Quantity, Constraint, Influences, Outcome, Feedback and Review.

6.3 Interviewee Profile

The first set of data analysed related to the interviewee's profile. This was aimed at establishing whether any major differences existed between the type of people found to be

involved in construction projects as against that of ICT projects.

Table 14.0: Interview Protocols and Associated Variables

Overview	Further Detail	Secondary question	Variables
Interviewee Profile	What does the interviewee do?	Position in his/her organisation	Job Title Grade Involvement

6.3.1 Job Title:

An examination of the interviewee's job title showed the following codes to be associated with the responses from both the Construction and ICT industry samples.

Role: Job Title: Client/Customer Project Manager
Role: Job Title: Contract Manager
Role: Job Title: Project Manager
Role: Job Title: Site Manager
Role: Job Title: Team Leader

The following relationships were suggested to exist for the construction codes.

Job Title: Project Manager <is associated with> Job Title: Contract Manager
Job Title: Site Manager <is associated with> Job Title: Project Manager
Role: Job Title: Client/Customer Project Manager <is part of> Role: Project Involvement: Client/ Customer's Organisation
Job Title: Project Manager <is not associated with> Job Title: Team Leader
Job Title: Project Manager <is not associated with> Job Title: Client/Customer Project Manager

A review of the ICT industry transcripts however indicates some slight different set of relationships: -

Role: Job Title: Team Leader <is associated with> Role: Task: Responsible or decision
Job Title: Project Manager <is not associated with> Job Title: Contract Manager

Job Title: Project Manager <is associated with> Job Title: Client/Customer Project Manager
Job Title: Site Manager <is not associated with> Job Title: Project Manager
Role: Job Title: Client/Customer Project Manager <is not always part of> Role: Project Involvement: Client/ Customer's Organisation
Job Title: Project Manager <is associated with> Job Title: Team Leader
Job Title: Project Manager <is associated with> Job Title: Client/Customer Project Manager

The above code relationships seems to illustrate that in the construction industry, the project manager's job title is associated with that of both a contract manager and a site manager. It was however difficult to establish a direct link between the project manager's job title and that of a team leader and client/customer project manager (*as established in ICT*). Further analysis of available data and a review of the interview transcript did indicate strongly that the client/customer project manager's job does not necessarily reside within the client and customer's organisation.

It appears that in the ICT industry, the role of looking after client and customer concerns and issues is sometimes separated under the title " *client and customer project manager*" whose *primary role is that of managing the relationship or softer issues between the project management suppliers and the client/customer.* This role has become more important due to the increasing need to support corporate strategy through product customisation, quality, and differentiation. The client and customer project manager's *main objective is thus to create a situation where the project manager does have more time to spend on directly impacting project issues. This means that all service in-life issues are managed* separately by the "*client and customer project manager*" who will usually be linked into the project team by matrix managed approaches.

6.3.2 Grade

The second question related to establishing the grade of the respondents and whether there were any similarities within the two industries.

An examination of the relationships showed no significant information on the grades of the various respondents. Both sets of respondents were either of middle or senior management grade.

6.3.3 Job Involvement

This section provided an opportunity to establish whether the *"project management role"* as established earlier, involved similar practices in both industries. Based on the responses of the interviewees, substantial information was provided to propose the following codes as associated with the responses from both construction and ICT industry samples.

> *Role: Project Involvement: Client/ Customer*
> *Role: Project Involvement: Non Project Manager*
> *Role: Project Involvement: Project Manager*
> *Role: Project Involvement: Sub- contractor*
> *Role: Project Involvement: Technical Management*

The only significant result was that many of the construction interviewees associated their role with that of *"Role: Job Title: Client/Customer Project Manager"*. This was not particularly expected as no relationship had previously been established between the construction industry and the variable *"Role: Job Title: Client/Customer Project Manager"*.

As interviewee C2 stated,

> *" My role is that of a co-ordinator of change events primarily put in place to meet client requirements, as such I will take the role of the client's project manager. This ensures that all requirements as agreed and priced within the bill of quantities are built to exact specifications laid down by the architect"...C2*

There was general agreement on the following relationships across both industries.

> *Role: Project Involvement: Project Manager <is associated with> Role: Task: Co-ordinator*
> *Project: Management: Methodology: Formal <is property of> Role: Project Involvement: Project Manager*

Project: Review: Regularity: Entire project life-cycle <is part of> Role: Project Involvement: Project Manager
Budget: Any price <is property of> Role: Project Involvement: Project Manager
Role: Task: Conflict Management and Resolution <is property of> Role: Project Involvement: Project Manager
Role: Project Involvement: Project Manager <is associated with> Role: Task: Management
Role: Task: Conflict Management and Resolution <is property of> Role: Project Involvement: Project Manager
Role: Task: Monitoring <is property of> Role: Project Involvement: Project Manager
Role: Task: Project and Change Control <is property of> Role: Project Involvement: Project Manager
Role: Task: Risk Management <is property of> Role: Project Involvement: Project Manager
Role: Task: Work Package Agreement <is property of> Role: Project Involvement: Project Manager

For the construction industry in particular, the following relationship's emerged: -

Role: Task: Security <is property of> Role: Project Involvement: Project Manager
Role: Task: Safety <is property of> Role: Project Involvement: Project Manager
Role: Project Involvement: Project Manager <is not associated with> Resource: Personnel: Matrix Management
Role: Project Involvement: Sub- contractor <is associated with> Role: Task: Management

On the other hand, the ICT industry results seemed to display the following relationships.

Role: Project Involvement: Technical Management < is part of > Role: Project Involvement: Project Manager
Role: Project Involvement: Project Manager <is associated with> Resource: Personnel: Matrix Management

These relationships were established through a content analysis of the interview transcripts. It is important to

highlight some of the key statements made by the ICT industry interviewees,

> *"My role will usually involve taking a customers requirement and formulating an IT infrastructure to facilitate the requirement. This normally involves either hardware or software requirements"* ...T3
>
> *"I have responsibility to development and support IT and computing services"* ...T5
>
> *"My projects usually involve cost reduction exercises and processes on behalf of Organisation D's Retail Division. I also manage maintenance projects. My role is more or less providing a project management process in order to help reduce the cost base for most of Organisation D's Retail Division owned products* ...T6
>
> *"My job involves programme managing the end to end and full project lifecycle delivery of IP services to the Organisation D's Wholesale product lines covering systems, processes and all technical network elements. I am involved in IT projects, but providing network solutions to meet customer and product line requirements which includes the overall programme responsibility for all operations, systems and processes"*...T10

An examination of these statements seems to confirm that although the construction interviewees had similar roles to their ICT colleagues in terms of monitoring, cost control and financial management, their role as project managers did not cover basic requirement definition. On the other hand, this seems to be a key part of the ICT project managers role.

This major difference in role is in line with the general ICT project environment, which involves lower details of planning. This means that from the ICT perspective in order to avoid a situation where key requirements are missed, the ICT project manager is fully engaged in owning all issues from inception to full completion, including the project definition and requirements capture stage. This has long been established as not being the case in construction where a clear division existed between design and construction process. There has also been indication that

there has been for some time an equally important split in construction between the pre-design and design stage. This is supported by numerous research. This includes work by Chappell (1991), Saxon (1991) and also that of Blyth and Worthington (2000), who suggest that in construction, there is an "*inception and feasibility stage where outline design is developed*". On face value, this does not appear to be the same within the ICT industry. These findings are consistent with traditional work systems (Ichniowski et al, 1996), which assert that functional demarcation of responsibilities does in fact promote improve performance. In addition, the outcomes are consistent with the fundamental proposition of this research, which suggest that construction and ICT project managers fundamentally used similar approaches to project management methodologies.

6.4 Work Profile

The second set of questions was designed to seek a more detailed view of the actual roles the various interviewees performed. This stage of the interview began with questions on the type of projects the respondent managed and what this involved. The questions then moved to issues of the amount of budget controlled by the interviewee. This phase of questioning concluded with the interviewees being asked to provide a best description of the projects that they were involved in. This approach allowed the interviewees freedom of expression, and at the same time produced information seen as essential to the research. This related to establishing what exactly the interviewees work involved and what element of project management was key to their success within this roles. Additional information on what type of projects within their industries they involved in and, the average cost and size of these projects was also sought.

Table 15.0: Interview Protocols and Associated Variables

Overview	Further Detail	Secondary question	Variables
Work Profile	Does his/her work involve	Type of project he/she manages and average budget for projects he/she is involved in. Best description of these Projects	Project Type Budget Project Description

6.4.1 Project Type

The general point to note is that majority of the construction interviewees responded with the project type as "*Project: Type: Construction: General Construction*". A few of the respondent's did at the same time use other descriptions such as "*Civil Engineering*" or " *Commercial Construction*".

Based on the ICT and Construction respondent's replies on the issue of project type, the following variables were established.

Project: Type: Construction: Civil Engineering
Project: Type: Construction: Commercial
Project: Type: Construction: Factory
Project: Type: Construction: General Construction
Project: Type: Construction: Hospitals
Project: Type: Construction: Industry
Project: Type: Development, Delivery and Implementation
Project: Type: Private Sector
Project: Type: Public Sector

For majority of the construction interviewees, the confirmation of work types was seen as clear and not requiring any detailed elaboration.

The majority of the responses involved comments such as.

"I manage construction and civil engineering projects" …C2

"My project can be best described as a Building Construction Project" …C3

Based on an analysis of the comments made by the various construction respondents, the following key relationships were established.

Project: Type: Construction: General Construction <can be> Project: Type: Private Sector
Project: Type: Construction: General Construction <can be> Project: Type: Public Sector
Project: Type: Public Sector < is major customer of> Project: Type: Construction: General Construction

Project: Type: Construction: Building <is part of>
Project: Type: Construction: General Construction
Project: Type: Construction: Civil Engineering <is associated with> Project: Type: Construction: General Construction
Project: Type: Construction: Factory <is associated with> Project: Type: Construction: Civil Engineering

The transcripts of the ICT interviewees suggest that the ICT interviewees were unable to clarify what exactly their projects involved. This impression was again based on some of the ICT interviewee's remarks. The impression created from an analysis of the respondent's statements was that ICT projects were very diverse and might be difficult for someone without an understanding of the industry to appreciate what most ICT projects actually involved.

> *"My work is primarily IT and computing consulting. I am involved in small and large IT solution design and implementation. This usually involves taking a customers requirement and formulating an IT infrastructure to facilitate the requirement. This normally involves either hardware or software requirements"* …T3

> *"I focus on mid range systems (Unix systems rather than mainframes). These projects can be described by their technology to involve Sun Unix systems, NT/2000 and Compaq based products and technology platforms. Also deployed mainframe servers. In terms of software, I have also dealt with Oracle"* …T5

> *"I am involved in projects that cover providing network solutions to meet product line requirements"* …T6

> *"I am involved in programme managing the end to end whole-lifecycle delivery of IP services to the Organisation D's Wholesale product lines covering systems, processes and all technical network elements"* …T8

The following key relationships were established from the responses of the ICT interviewees.

Project: Type: ICT: Infrastructure <is part of>
Project: Type: ICT
Project: Type: ICT: Software Deployments <is associated with> Project: Type: ICT: Infrastructure
Project: Type: ICT: Systems and Solutions Delivery <is associated with> Project: Type: ICT: Infrastructure
Project: Type: Private Sector < is major customer of>
Project: Type: ICT

Having explored the issues and referred back to earlier literature in chapters 3 and 4, emerging evidence from the data analysis seemed to confirm that the ICT industry still viewed its projects as short-term exercises rather than long term implementation. It is however believed that the ICT industry views these short-term projects not as a process for creating a required product but rather a process of organisational change that requires managed tools, techniques and methods in order to meet customer requirements.

This notion supports the comments made by the various ICT respondents. It also explains why ICT projects could involve varying exercises ranging from cost minimising exercises and systems development to exercises directed at ensuring the robustness of design and security of systems.

6.4.2 Budget

The data gathered from interview was used in establishing from the two sets of respondents what the average budget for projects that they were involved with were.

From the interviews, it became clear that approaches to budgetary issues were regarded from different perspectives within the two industries. On one hand, the construction respondents were able to provide overall cost of their projects. However, in a slightly different perspective, ICT respondents seemed to provide detail of work package cost rather that overall project cost. For example, two construction industry respondents noted that: -

> *"For the current project I am managing, the basic construction budget is about £42 million, however over the years, I have been involved in construction projects costing from about £500,000 which is about*

the minimum cost of projects Organisation A will be involved in" …C1

"This project is worth around £3.5M to Organisation C. Organisation C are involved in a wide range of construction projects from £500,000 to more than £70 million" …C3

Comments from some of the ICT respondents providing more detail on work package cost included.

"My estimates will cover about 5-15 man-days for each individual customer requirement, so say for each piece of code within a software package will cover about £30,000. So if two different sets of code within a software package being developed, then cost will be about £60,000 to the customer. I am not involved in the costing of support or maintenance for these software packages" …T2

"Roughly an average of £0.5 million. This will cover about £150,000 for manpower, capital expenditure of about £200K" …T5

"My programme budget is about £1.5 million per annum covering resource, software development, testing, and design in addition to process and network design and testing" …T8

"Annual first year budget is about £2 million. This includes spend (capital and manpower cost) over the first year of these projects. Over the next 5 years, these projects average another £5M in total spend" …T10

"About £500,000 for delivery of the project, covering both time and for materials but excludes capital purchases for equipment" …T6

Both industries were involved in capital intensive projects varying from a few hundred pounds to major projects and exercises costing several million pounds. There was also evidence that both industries were experiencing a reduction in capital expenditure.

As one of the ICT interviewees working for a major computing vendor mentioned: -

> *"It does seem that majority of our contracts for hardware/software are usually of around this mark. This is certainly the case of two of our major clients who I cannot name for confidentiality reasons. Certainly, our opinion is that most customers are no longer going for the high cost/ high financial layout IT projects. There seems to be a general trend for projects geared towards improving already existing infrastructures rather than creating/designing brand new infrastructures and supporting architectures. But this might be only my (our) perspective"…* T9

It is suggested that the downturn in ICT expenditure have been caused by a number of factors. These include an economy characterised by lower demands for products, uncertain interest rates, large 3G-mobile license fees, absence of any *"special events"* stimulating growth in the industry such as the millennium readiness project and the knock-on effect of US economic downturn due to the unfortunate events of September 11, 2001. These characteristics make borrowing unattractive thus discouraging huge expenditure projects. As a result, there has been an emergence of numerous small ICT projects with overall cost of less than £5 million.

Based on earlier links established between project size and project cost, it is a safe assumption to make that with majority of the ICT projects coming under the £5 million margin, most ICT projects can be classed as small projects. As will be demonstrated in later stages, this definition seems appropriate knowing that ICT projects usually exhibit another key characteristics of small projects that is the ability to share labour and equipment resources with other projects.

6.4.3 Project Description

The issue of project description was raised during the interviews in order to establish what best describes the various projects the interviewees were involved in. This question was raised based on information gathered during the literature stage of the research which suggested that *"project planning could be best enhanced by the provision*

of documentation, which includes descriptions of the prevailing technological environment in addition to an overview of current and future project situations". With such information being clearly available, it is expected that a logical build (for construction) and deployment (for ICT) sequence would be implemented.

By assessing information provided in the interviews, the following propositions were put forward as established relationships within the construction industry relating to project description.

> *Project: Type: Private Sector <is associated with> Project: Description: Easier to innovate with private sector clients than public sector i.e. government*
> *Project: Description: Highly skilled <is associated with> Project: Type: Private Sector*
> *Project: Deliverables: Time: Long <is associated with> Project: Description: Complex*

For the ICT industry, the following relationships were established after further analysis of the various interview transcripts.

> *Project: Outcomes: Influences: Technology: Appropriate <is associated with> Project: Description: Innovation*
> *Project: Description: Complex <is associated with> Project: Outcomes: Influences: Technology and Techniques: New*
> *Project: Characteristics: Transparency <can improve> Project: Description: Complex*
> *Project: Description: Innovation <Requires> Project: Characteristics: Transparency*
> *Project: Description: Complex <is associated with> Project: Outcomes: Influences: Technology and Techniques: New*
> *Project: Outcome: Influences: Failure: Success/ Failure Acceptance Criteria Not agreed <is associated with> Project: Description: Complex*
> *Project: Outcomes: Influences: Technology: Appropriate <is associated with> Project: Description: Innovation*
> *Project: Description: Complex <is associated with> Project: Outcomes: Influences: Technology and Techniques: New*

Apart from relationships identified as specific to either of the two industries, relationships most likely to exist within both the ICT and construction industries were identified. These relationships include: -

Training <is associated with> Project: Description: Highly skilled
Project: Deliverables: Time: Long <is associated with> Project: Description: Complex
Project: Description: Business Driven or Strategy <is associated with> Project: Deliverables: Uncertain and Unknown
Project: Outcome: Influences: Failure: Success/ Failure Acceptance Criteria Not agreed <is associated with> Project: Description: Complex
Project: Description: Innovation <can improve>
Project: Outcomes: Influences: Design

On reviewing the relationships established for both industries, it was thus possible to identify the following as key variables affecting the description of projects.

Project: Description: Business Driven or Strategy
Project: Description: Client/Customer driven and facilitated
Project: Description: Complex
Project: Description: Controlled Derivatives
Project: Description: Easier to innovate with private sector clients than public sector i.e. government
Project: Description: Highly skilled
Project: Description: Innovation
Project: Deliverables: Uncertain and Unknown

A review of the relationships and variables did confirm no unexpected information for either industry.

The review did support evidence that in the construction industry, innovation was much easier to implement and in fact was actively encouraged by private sector clients rather than public sector organisations. Further evidence was provided of an increase in the use of client focussed design-build procurement methods.

For the ICT relationships, the majority seemed to confirm the role of technology in ICT projects. The influences of new technology and techniques on project complexity was

also established in addition to the role transparency can play in improving the management of complex projects.

6.5 Project Management

The original basis of studies for this research has been formed on the contention that with both the construction and ICT industries using similar project management methods based around classic Project Management theories. It was possible to present a reason for the perceived higher rate in project failure within the ICT industry as against that of the construction industry.

Table 16.0: Interview Protocols and Associated Variables

Overview	Further detail	Further Detail	variables
Project Management	What is respondent's appreciation of the role of project management?	What is this based on	Any formal project management system, methodology recognised in your work? Is this methodology recommended Can the methodologies be inappropriate

So far, results from the interviews and available literature have indicated that in fact, the ICT industry unlike construction is based on a decentralised project and organisational structure involving lower level of details in planning. With this key point in mind, a review of project management practice within the two industries at project level with a view to identify similarities and peculiarities commenced.

6.5.1 Using formal project management methodologies

For a few years now, it has been generally accepted that some form of project management will be required and used within the ICT industry because it encouraged a structured approach to reasoning and problem solving. This was seen as especially useful within an industry with majority of its projects being described as conceptual in nature.

Taking this into consideration, it became important to establish the interviewees appreciation of the role of project management. This requirement was established by first identifying the key project management variables.

> *Project: Management: Methodology: Alternative: Yes/No*
> *Project: Management: Methodology: Formal*
> *Project: Management: Methodology: Framework and Flexible*
> *Project: Management: Methodology: Not used/Use*
> *Usage: Not Recommended/ Recommended*

In order to achieve this objective, the interviewees were asked whether *"Any formal project management methodologies were used and whether these methodologies were recommended by their employers"*.

The interviews revealed the facts that there were no peculiarities or unexpected results in the responses either construction or ICT project managers gave on the issue of *"Whether there was a formal project management system, methodology, or role that the respondents recognised in their work"*.

In particular, on the issue of usage of project management methodologies, the majority of interviewees agreed that their organisations did have recommended methodologies.

Both sets of project managers generally accepted that either: -

> *"There is an established project management framework being used"* … C1

Or that: -

> *" There is a set of standards and procedures set by the management of the company, however best described as frameworks for guidance rather than rules that must be followed"* …T3

The data from the analysed interview transcripts came back strongly in favour of the use of formal project management methodologies with the two industries. In addition, the improvement of these methodologies and the encouragement of flexibility in its application indicated that in general,

the interviewees found formal and flexible project management methodologies easier to use and more applicable to the projects they were involved in.

Consideration of these statements from the various interviewees shows various drivers for the use of formal project management methodologies. In particular was the need to use recognisable methodologies during the management of technical resources from different organisations, in order to ensure uniformity of processes and the encouragement of transparency.

The majority of respondents accepted that greater flexibility in project management methodology application was required and should be encouraged.

Taken as a whole, the interview data support the view that the use of formal and flexible project management methodologies is beneficial to both sets of project managers. From the results of the analysis of the interviewee data, it is accepted that some aspects of project management are increased by the presence of flexibility in the process. Hence, success in its application to projects can only be increased by the empowerment of the project management to apply these methodologies to projects as he/she sees fit.

It is important to point out that the empowerment of project managers does not seem to be generally applicable to public sector projects. One of the ICT respondents working for a public sector department confirmed that flexibility in methodology applications was not actively encouraged within his organisation. He added that…

> *"You must however realise that the main problem with public sector projects is that there is an also slavish attitude within the people involved in these project, and maybe cases of red tape. This means that quite a lot of project managers, and I guess the organisations, are not keen on applying other methodologies as they are not willing to take on associated risk"* …T6

The results of this analysis were valuable in clarifying and reinforcing the data from the interview transcripts. They consistently explained and provided a context for the

background information revealed in the literature review. In addition, they were useful in suggesting future avenues for research especially in relation to establishing the perceived use of inflexible formal project management methodologies within the ICT industry as against the construction industry. The results of the analysis however did not contain any detail on how the various interviewees would employ project management methodologies when working on novel projects. This is regarded as a possible issue for future examination.

6.5.2 Project management methodologies

Results of the analysis of recommended project management methodologies indicate similar use of flexible project management methodologies within both the ICT and construction industry.

Generally, the very nature of the two industries did not seem to have any major effect on the responses of either set of project managers. As the respondents observed: -

> " *The methodology we have is appropriate because it is only a set of frameworks, and not rules that has to be followed by the letter*"... C2

> "*Our organisation does not have a formal standard project management process laid down that must be followed, what we have is a framework with a set of best practice advice. The company has always had an informal system based on long tradition within the organisation*"...C1

> "*The methodology is a framework, so it can be adapted to suit individual projects. In fact it might be clearer to state that we don't have methodologies, we have a set of guiding principles forming a framework*"...C4

In the first place, the methodologies were put together in such a way that inexperienced project manager could manage certain projects without being swamped with documentation. At the same time, in order to achieve best practice, the view was that the more experienced a project manager was, the more able he/she could adapt this framework to fit project needs. Another view expressed was the role of the

procurement route being used. One of the construction respondents felt that because for example…

> *"Design and Build projects are project managed in a different way to PFI (DFBOT-Design, Finance, Build, Operate and transfer) projects"* …C1

Another major factor considered within construction was the role of influential public sector clients such as local authorities. The view was expressed that for most projects, with clients such as local authorities, it was

> *"Usually advisable to stick rigorously to agreed public sector methodologies"*... C3

One major reason was because critical paths for local authority projects are usually very tight. As a result, there was no real opportunity for innovation. Secondly, local authorities do prefer, as customers, to have a clearly stated methodology, based on clearly defined timescales, milestones and acceptance criteria, so for such projects…

> *"It is not usually encouraged to amend the methodology, to suit their requirements"*…C2

While the ICT industry shared similar basic views of the appropriateness of recommended project management methodologies with the construction industry, because of industry peculiarities, there were slightly different issues that had to be taken into consideration when reviewing its application.

In the first place, the development of appropriate ICT methodology and its effective application should be viewed as a critical element for the success of many projects. Secondly, there was a need to accept that there is no simple rule of thumb for selecting appropriate project management methodologies. Methodologies were best chosen after consideration of numerous factors including,

> *"Customers requirements and resource availability"*…T11

The findings of the interviews on the appropriateness of project management methodologies did demonstrate some key relationships.

Project: Management: Methodology: Use: Appropriate <can improve> Project: Deliverables: Cost and Finance
Project: Management: Methodology: Use: Appropriate <can improve> Procurement Process/Route
Project: Management: Methodology: Use: Appropriate <is associated with> Project: Characteristics: Transparency
Project: Management: Methodology: Use: Appropriate <is associated with> Project: Management: Methodology: Framework and Flexible
Project: Management: Methodology: Use: Appropriate <is associated with> Role: Understanding: Experience
Project: Management: Methodology: Framework and Flexible <is associated with> Project: Type: Construction: General Construction
Project: Management: Methodology: Framework and Flexible <is associated with> Project: Type: ICT
Project: Management: Methodology: Use: Inappropriate <is associated with> Project: Outcome: Influences: Poor appreciation and understanding of customers requirements

In conclusion, it is suggested that that based on results of the analysis of interview data on project management methodology, no major difference either on its appreciation, basic fundamentals or its applications exist between the construction and ICT industry. However data analysis found some evidence of higher regard for a flexible methodology within projects being driven by the private sector rather than the public sector. Relationships were also established between key variables especially between appropriate project management methodologies and the project procurement route, project managers experience and the type of project being worked on.

6.6 Management and relationships

This section on management and relationships was used to investigate the possibility that unique management styles existed within the two industries. If this was the case, could it be possible that ICT project managers could be encouraged to adopt some of the management styles being used by their colleagues in the construction industry?

A review of the two management styles based on the outcomes of the interviews began with the establishment of the appropriate interview protocols and associated variables.

Discussion on the role of management style was conducted during the literature review, although on a limited scale.

This review did highlight known conservative management styles within the construction industry.

Table 17.0: Interview Protocols and Associated Variables

Overview	Further Detail	Secondary question	Variables
Management and relationships	Does the type of projects your are involved in influence your management style Who is involved in your projects What Influences this decision When do they get involved How are these resources obtained	Management styles do you have/adopt Would management style be any different if description was different or any of the factors were different? Average number of people/teams Skill sets you require	Management Style Number of Employees

Although it was not possible to establish the level of "*conservatism*" within either industry from the interviews, two comments made by construction interviewees come to mind,

> "*There is an established project management framework within our organisation, and for the best part, this methodology has been tried, tested and utilised over the last 150 years of operation of this company*"...C1

> "*In a way technology may have an impact on project success, but not very much. The reason is simple, construction at least when viewed from the basic point has not really changed over the last two centuries*"...C2

It is important to point out that even though this statement was made in relation to the use and adaptation of project management methodologies and not necessary with *"management style"*, it can be cautiously inferred that this statement does give an indication of prevailing management attitudes. One main reason for this inference is based on an analysis of the interview data where it can be noted that the grounding for the variable *"Management: Style: Changes: Yes "* was significantly higher within the ICT interviews than that of construction.

In reviewing the specific issue of management styles within both industries it is noted that majority of the construction interviewees did confirm having a management style by suggesting that,

> *" Although it's quite hard to define, I will say that I regard it as being relaxed"*...C1

> *" My style is to lead by example and encourage teamwork. I also try to ensure that I understand the strengths and weaknesses and limitations of my staff in order to make allowances for them"* ...C2

This was not necessary the case for the ICT project managers where scepticism about the role of management style in project management had been suggested,

> *"I might have a management style, but I am not sure what it is, nor do I make any conscious efforts either to recognise one, or to adopt one"*...T2

It is tempting based on the review of the interviews to come to the conclusion that on the issue of management style, no significant correlation between the construction and ICT responses existed.

However both sets of interviewees accepted that their management style was not static and could change depending on some factors raging from project environment to skill based of their employees. There was no evidence of industry based trends in responses. On instances when the respondents were not of the opinion that their management style could change, the general reason was that,

"Management style is based on my personality"...C2

Or in other cases,

"My management style is based on a style I best feel comfortable with, so it is unlikely to change" ...T11

No significant relationships were established or suggested as existing between management style and project management practices based on any industry wide approach.

On the issue of number of employees working within the various projects, there was evidence to suggest that a large number of ICT projects do have between 5 and 20 people allocated to the project in question.

The reasons for the large number of small resource based projects within the ICT industry is traceable to its fundamental characteristics. As mentioned earlier in section 6.4.1, most ICT projects are short-term exercises which involve varying and specialist exercises ranging from cost minimisation and systems development to hardware maintenance and firewall monitoring. As a result, unlike construction, the ICT industry is most likely to involve small specialist teams working independently, but linked in a matrix form into an overall temporary project organisation. None of the construction respondents acknowledge the adaptation of a matrix organisation as a recognised project structure on any of their projects.

6.7 Factors affecting projects

The issue of influencing factors on projects was raised during the interview. This was in order to supplement extensive research already available on this subject.

From existing literature, the suggestion was put forward that as important factors driving the success of any project were linked to internal project requirements, in order to ensure that projects were successful, project managers had to ensure that success criteria was easily understood.

Table 18.0: Interview Protocols and Associated Variables

Overview	Further Detail	Secondary question	Variables
Factors affecting Projects	Key issues do you have to deal with when managing projects?	Factors are most likely influence project success or failure How do these factors affect project delivery outcomes How do you know that your project is successful or not and how do you measure success or failure outcomes	Project: Outcomes: Influences

A review of interview transcripts in order to identify key variables was conducted. Based on this review, the following variables were identified as associated with the responses from both construction and ICT samples.

Project: Outcomes: Influences: Design
Project: Outcomes: Influences: Environmental Issues
Project: Outcomes: Influences: Leadership and Senior Management Support
Project: Outcomes: Influences: Legislation
Project: Outcomes: Influences: Political
Project: Outcomes: Influences: Poor Planning
Project: Outcomes: Influences: Information

What emerges from this review is an assumption that there is no single project factor that will either negatively or positively influence the chances of project success, rather project failure occurs through a combination of events occurring on a continuous basis.

In order to address the issue of factors affecting projects, the interviewees were asked four questions.

i) What key issues do you have to deal with when managing projects?

ii) What factors are most likely to influence the success or failure of your projects?
iii) How do these factors affect project delivery outcomes
iv) How do you know that your project is successful or not and how do you measure success or failure outcomes

There was a general acceptance by the construction respondents that,

> *"The single biggest issue that could jeopardise the successful completion of any construction project is information requirements"*...C1

> *"The key to success of most of our projects is with planning"*...C2

There was also a general recognition by the construction project managers that in addition to information and planning, the procurement route would also play a major role in determining project success,

> *" This depends on the type of project and its procurement route. For most design and build projects, it is most likely that there would be a lot of issues on change control and changing requirements. Project leadership and senior management buy-in are not usually issues that could become a problem, unless the project is political or has some political interest"*...C3

The general picture that was created was that construction managers had to deal with when managing projects, is that of incomplete information, poor planning and an inappropriate procurement route.

By highlighting the importance of information availability in project success, the interviewees were confirming existing literature. This suggests that in UK construction difficulty handing relationships and complexities of multi-disciplinary teams can be caused by poor project information. Often, these results in an increase of business transaction cost within the construction industry.

The view generally is that if timely and accurate project information is provided, effective control by the project

manager is possible as informed decisions especially on planning can be facilitated.

The importance of planning within the construction industry has always been highlighted especially due to its characteristic disjointed phases. By considering these characteristics, it is evident that project success within the construction industry will be greatly enhanced with a co-ordinated effort geared towards the collation of project information and its application to the implementation of change.

Similarly, it was of no major surprise that the issue of procurement route had been raised as high on the construction project managers agenda especially as the focus of solving high transaction cost problems in UK construction. In an attempt to address this issue, the development of alternative procurement systems and strategies within UK construction has been given greater attention.

Reviewing the ICT responses did not reveal any particular industry wide peculiarities apart from the issue of the role of technology,

> *"The most important issues I will normally deal with is to do with technology and its application in order to deliver customers requirements"*...T5

> *"It is my opinion that technology, its role and how best to implement it will be the most important issue I will have to deal with"*...T6

> *"Majority of my projects involve the delivery of high specification products to my customers. Unfortunately because the customer community is from a high skilled industry base, I have to constantly battle with them on the need to deliver their products based on high advanced technology. In most cases, there seems to be a view (I suspect), that delivering advanced technology products will win them more clients"*...T13

The role of technology although recognised during the literature review was not emphasised as a major issue by the construction respondents. The role of technology is however to be addressed in greater detail in section 6.8.

On the issue of design factors and its influence on project success or failure, there was again no trend established as specific to either industry.

There was agreement from the construction respondents that,

> " *Having a client who knows not only what he wants but is also able to provide required information to the construction team when it is required, could make a major difference for any project*"…C1

> " *Poor design could be a problem where although it might meet the customers functionality requirements, is either not based on current construction practice or does not meet current efficiency targets*"…C3

Another major issue raised by the construction respondents was on the relationship between the project manager and his sub-contractors.

> "*The issue here is that a lot of the critical task on construction projects are usually carried out by sub-contractors, this means that if the relationship with sub-contractors is not managed properly, major problems with the construction process could arise. This most likely will impact on timescales and cost*"…C5

For the ICT respondents, the emphasis seemed to be more inclined to concerns with the entire requirements capture and management process.

> "*We have difficulty with computing customers constantly changing requirements and the fact that there is great resistance when you attempt to reflect these changes on budgets and time-scales*"…T9

> "*The most likely causes of a project failing will be the non-appreciation of the clients requirements by a project manager. Not just not understanding what the requirements are, but non appreciation of the drivers of the clients requirements*"…T11

There was significant evidence to suggest that the perceived higher importance attached to requirements

management by the ICT managers is related to the contentious proposition that the ICT industry is regarded as highly dynamic.

The final issue that was considered within this section was to establish the effects of the identified variables on individual project delivery outcomes.

Again, following the trend established within this section, there was no evidence of industry peculiarities in terms of the responses.

There was general agreement that poor design and will lead to

> " *Longer lead times on the entire project schedule and plan*"…C1
>
> " *Time-scales are affected, which ultimately leads to increased cost*"…C2

On the issue of requirements, the view expressed by both sets of respondents was that,

> "*Chances of producing a product that the client does not want and which fails to meet his business needs*"…C5

was quite high when customer requirements were not properly and professionally captured, understood, managed and met.

There was the chance that this could happen if …

> "*By the time the project is completed, the overriding strategy could have changed thus making the requirement obsolete and not needed, so of no business benefit*"…T7

One clear issue that arose during the interviews, which forms the backbone of the research was on the issue of measurement of project success or failure. When asked when, how or by whom, the responses given were unexpected. In the first place, both sets of respondents agreed that project success or failure was measured by assessing whether the project had been delivered within required timescales, quality, and cost. Only four out of the ten ICT project

managers mentioned overall strategic objectives of a project as being the underlying measure of success. It is however important to point out that all of the ICT respondents who emphasised the role of strategy in success were executive level managers. The importance of safety in defining project success was however mentioned by three of the construction project management that confirmed the importance of site safety in most construction projects. None of the ICT project managers mentioned safety as a success criterion.

In this section, evidence was provided to support the view that variables such as project planning, the procurement route, information and requirements capture, designs and management could affect the success or failure of projects. It is however important to highlight that taken in isolation, it is quite difficult to establish a clear linear relationship between these factors and project success. Most factors affect each other and together form a complicated relationship both of the way they interact and how they actually impact on projects.

6.8 Project Complexity and the role of technology

The final section of data analysis sought to establish whether there was any industry specifics in relation to the issue of project complexity and the role of technology on project success. In particular, there was a drive to establish whether the respondents thought that the complexity of their projects could impact on success and how this could happen. On the issue of technology, the perceived role of technology in project success was to be examined.

The issues on the roles of project complexity and that of technology were raised during the interview stages of data collection due to the following reasons. In the first place, from available literature, it has been demonstrated that there is compelling evidence to point to an increased specialisation within construction. This meant that more construction projects now involved various professionals of varying skills working on different parts of the construction process from sometimes geographically separated locations and sites. Along with these changes, the traditional structure of the industry was now changing especially with a huge increase in the use of new

technology (especially in mechanisation) and novel design techniques and solutions. All these factors had made project complexity and the role of technology in construction projects important issues to address.

Table 19.0: Interview Protocols and Associated Variables

Overview	Further Detail	Secondary question	Variables
Project Complexity	What do you regard as project complexity?	What is the definition based on? Would you regard your projects as complex Measure your project's complexity Can you measure your projects complexity Percentage of your projects or parts of your projects do you regard as complex?	Project: Description: Complex
The role of Technology	Could technology have an impact on project success?	Do you see any impact of "new" technology on project success or complexity?	Project: Outcomes: Influences: Technology

For ICT projects, changes in the industry, both on project level and strategy had also been noted. There was now increased acceptance that global markets sector had undergone regulatory changes both within Europe and across the Atlantic in the United States. As a result, on the strategy and organisational side, the once familiar model of a public monopoly had given way to an open competition market. Furthermore, with the recent trend of most major telecommunications companies to outsource their support requirements to India and the Far East, there was no doubt that issue of technology and complexity that could hamper successful ICT projects were on the increase.

Within the ICT industry, for the larger service providers and suppliers, there was now a major emphasis for reducing transaction cost of projects especially with stiffer competition from smaller software organisations (*majority created during the dot.com boom of the late 1990's*) who are recognised as having smaller overheads. As a result, in

order to remain competitive, the big ICT providers are now getting involved in major ICT projects which are often recognised as being cutting edge and difficult to implement.

On project complexity, the question, *"what do you regard as project complexity"* was asked in a way that allowed for elaboration by the interviewee. This was achieved by adding secondary questions such as *"would you regard your projects as complex, why" and "how would you measure your project's complexity and what percentage of your projects or parts of your projects do you regard as complex".*

All of the respondents from both industry samples regarded their projects as complex. The comments can be categorised into two main concepts, those around complexity dealing with variables and their dependencies and those who felt that complexity had to relate to requirement management.

For the respondents who felt that complexity was more related to variables and dependencies, the general opinion expressed was that,

> *"Project complexity will refer to the number of limiting factors that affect or have the ability to affect or derail a project from achieving its goals"*...C1
>
> *"Complexity in projects will most likely refer to the different and varying number of issues a project manager will have to deal with"*...C2
>
> *"This will refer to the number of interwoven or interdependent issues that will affect a project"*...C3

On the responses dealing with customer requirements: -

> *"The complexity of a project relates to the number of varying issues with both different requirements, that the project manager has to deal with in order to successfully complete a project"*...T1

All the respondents who felt that project complexity was related specifically with requirement management were from the ICT industry. The general view expressed was that,

> *"The effort put into ensuring the integrity of the customer's requirements and ensuring that this fitted into an organisations existing strategy guidelines made a project complex"*...T3

> *"Dealing with service contracts and service level agreements of deployed projects will determine the level of complexity of a project"*...T4

> *"Project complexity will related to the level of commitment required especially when dealing with projects where the customer might not be absolutely sure that all requirements and its impacts have not been fully scoped out"*...T5

It is important to point out that majority of the ICT respondents seemed to recognise project complexity from the point of a requirement to ensure the strategic alignment of business needs and that of information solutions. None of the construction respondents made this observation.

On the issue of why their projects were regarded as being complex, the key point expressed by some of the construction interviewee's was because of the physical nature of construction.

> "...Because of its nature relating to the intensity, peculiar economics, procurement route and the environmental factors, which cannot to an extent, be controlled"...C4

The main purpose of the question on the role of technology was to find out if technology affected project outcomes and if possible, to what extent.

It is clear from the data that the construction respondents did feel that,

> *"Within construction, there has been an increased role for technology especially in terms of easing the physical burden via the introduction of mechanisation"*...C4

There was a general acceptance of the role of existing and new technology by the ICT respondents. Generally, both sets of respondents agreed that unrealistic customer expectation

with new technology was also a major factor contributing to project failure.

6.9 Conclusions

The primary objective of this study has been to conduct a comparative analysis of ICT and construction project failure rates. Based on the outcomes of such as study, develop a method of project performance measurement based on an approach to project success that is separate from progress measurement criteria.

It was hoped that such an approach based on the experience of the construction industry might provide an explanation on why the ICT industry exhibited such high rates of failures, but also how best to measure this success or failure.

The result of the data analysis supports both previous research and the main proposition within this thesis that both the ICT and construction industry fundamentally uses similar project management processes. This confirmed the principles of a generic project management methodology and as a result answered the second research question (*Is it as a result of poor project management practice within ICT, Do ICT projects exhibit any peculiarity that encourages such results*). There was however evidence from the data analysis that slight differences in application existed between project management process application probably caused by the decentralised organisational structure of ICT projects. One particular area of difference seems to be that the ICT industry separates the role of looking after client and customer concerns currently from that of the delivery or production manager by creating a new role "*Service Manager*". By implementing this change, the ICT industry has been able to ensure that its project managers work on multiple small-scale projects (below £5M).

Another key area of difference was also on the issue of measuring project success, while majority of the respondents agreed that project success or failure was best measured by assessing cost, time and quality criteria, only ICT respondents had mentioned overall strategic requirements as the basis of measurement.

The study provides a useful grounding on both generic project management practices and project performance measurement based on an approach to project success that is separate from progress measurement criteria. The implications of the outcomes of the data analysis will be discussed in greater detail in the next chapter.

Chapter Seven- Discussions and Implications

7.1 Discussion on the research findings

The purpose of this chapter is to summarise the key research findings. The chapter also re-examines the failure concept; while at the same time conducts a validation of the ICT Success Measure framework.

7.2 Summary of preceding chapters

The following summary is sub-divided in accordance with the preceding six chapters of this thesis. Conclusions regarding each of the above objectives were extracted from the discussion.

Chapter One provided the initial context for the research. It also identified the importance of managing successful projects and their impact on the ability of an organisation to deliver its objectives. This chapter also summarised the current state of knowledge on ICT project failures. Discussions on ICT project failures provided the starting point for the thesis. In order for this issue to be addressed, comparisons with the construction industry were undertaken. The construction industry was chosen because both ICT and construction projects were managed using fundamentally similar project management methodologies. For example both follow processes detailed in by the Association for Project Management's Body of Knowledge. The main conclusion from this chapter is the proposition that there are possible weaknesses in ICT project management in relation to the current practice of non-linking of business value at requirement definition stage.

Chapter Two reviewed the literature on ICT deployments and implementation. It also looked at reasons for ICT failures. This was required in order to evaluate its influencing factors and impact or alignment to corporate success especially within telecommunications companies. The chapter also examined the role of ICT in telecommunications, while at the same time providing an overview of the UK telecommunications industry and its regulation. It was argued that the convergence of computing and communications had created new opportunities and threats for telecommunications companies. The chapter also highlighted that telecommunications companies are one of the biggest

users of ICT. This chapter also demonstrates that due to the role of ICT in corporate success, it is critical for management to control ICT as a corporate resource. Parochial management of ICT especially in instances where ICT is not fused with business is also seen to be a serious issue that could de-rail corporate success.

An overview of UK construction was carried out in Chapter Three. This overview provided an opportunity to demonstrate not only the importance of the UK construction industry but also to discuss its differences and similarities with the ICT industry. Based on literature evidence, it was shown that the role of the UK construction industry is somewhat similar to that of the ICT industry within the overall UK economy. This chapter concluded that efficient management of the construction process would ensure that customers achieve best value for money.

The key conclusion within Chapter Three was that although similarities exist between both industries, key initiatives and consideration for new ways of working already established in the construction industry have yet to be fully embraced by the ICT industry. Based on this, it was suggested that the challenge for ICT companies reside in their capacity to adopt new process and methods of deployment in order to deliver better products at lower cost.

Chapter Four of the thesis discussed project success and failure. Possible causes of project failure were identified while at the same time; ways of ensuring success within both construction and the ICT industry were reviewed. It was recognised that there were serious consequences in both industries if project objectives are not met. This chapter re-stated the principles of generic application of project management principles when deploying and implementing projects.

Chapter Five of the thesis built on the preceding chapters to propose a research strategy and method. It also addressed the research strategy by which project failure concepts could be evaluated. In order to address the primary research question, it was important to regard the source of data as a critical part of the research process. Consideration was then given to the nature of the chosen

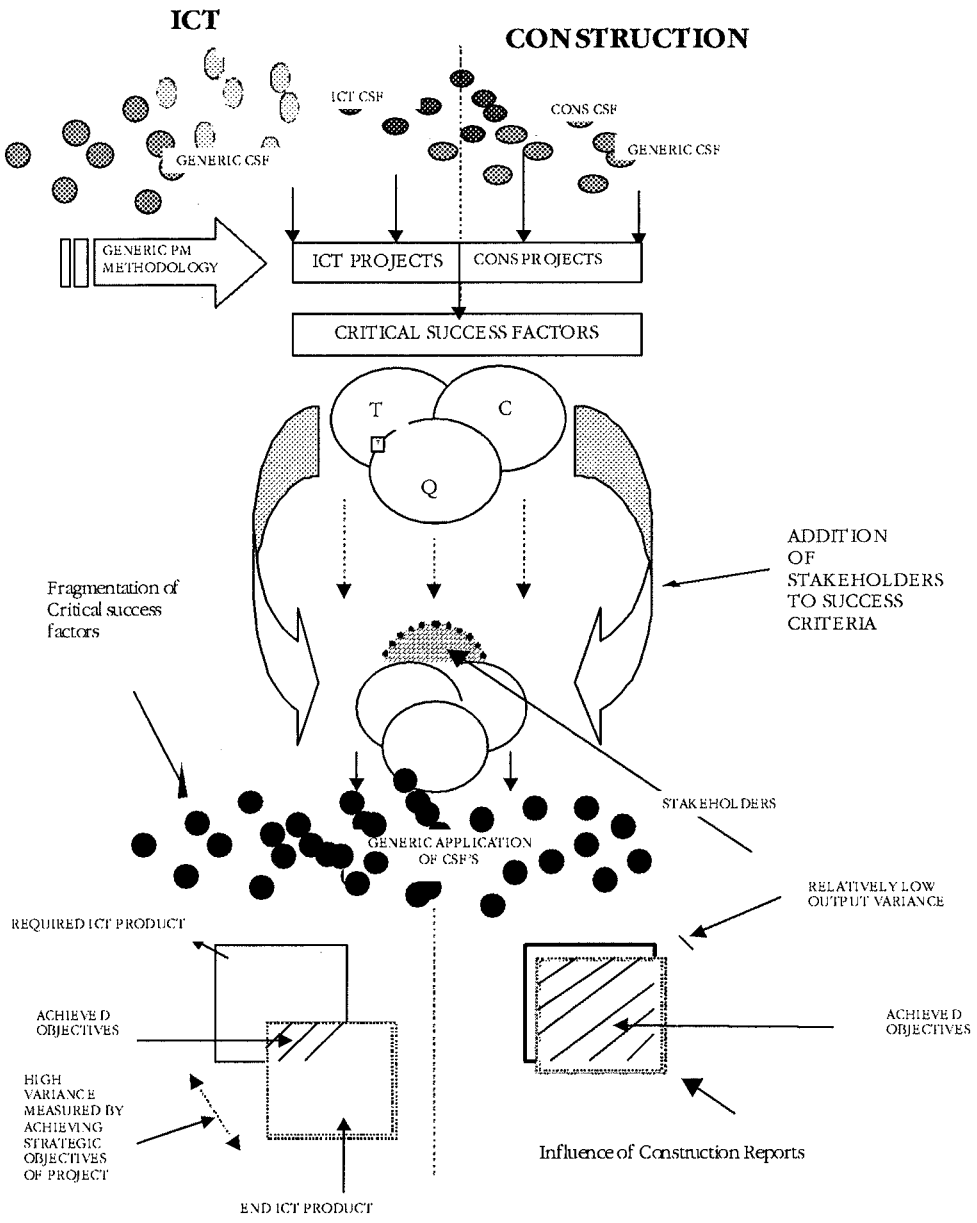
research methodology and how it differs from other established research methodologies.

Chapter Six considered the need to impose structure on the implementation process of both ICT and construction projects. Such an approach is seen as a means of ensuring project success. The main consideration was the extent to which the concept of an appropriate ICT-Construction Framework, compatible with the operating environment of projects within both industries was to be established. On the basis of the analysis of both available literature and the data collection exercise, a revised framework (Fig 11.0) was proposed.

This framework (Fig 11.0, below) can be summarised as being based on: -

- 2 industries
- Use of project management principles
- Similar drivers
- Similarity in the definition of projects
- Similarity in principles of available project management systems and methodologies
- Accepted high levels of failure
- Higher level of failure in ICT projects
- Application of project management principles/processes within the two industries is still unable to provide answers on why difference in level of reported failures.
- Develop a method of project measurement based on approaches to project success that separates performance and progress measurement criteria.

Fig 11.0: Revised ICT- Construction Framework



7.3 Research findings on project management procedures

Results from the data analysis confirmed already existing knowledge on the use of generic project management principles within both construction and ICT.

While the majority of interviewees accepted that the methodologies being used were recommended by their organisations, they also accepted that these methodologies were sometimes restrictive and inappropriate especially when applied to either smaller or fast track projects. Most interviewees also accepted that recommended project management processes was flexible and could be applied to projects in any manner the project manager saw fit.

Results also showed that complexity and uncertainty as a result of new technology did have a substantial impact on project success.

On the issue of an appropriate management style, the question arose as to whether project managers within the two industries demonstrated peculiar management styles and behaviours. The general conclusion from the research was that there were no particular management style being exhibited by either ICT or construction project managers. This was because most of the interviewee's regarded their project management style as reflective of their personal behaviour.

Another point from the results of the data analysis was that of time, cost and quality considerations. For both the construction and ICT respondents, this seemed to be similar with both sets of respondents confirming that project success and failure was primarily measured by analysing these three primary criteria. The primary difference with the responses was the inclusion of strategic objectives as a measure of success in ICT projects.

The outstanding factor thus remained that at this stage of the research, two of the research questions (see section 1.3) had been answered. At this stage of the thesis, the final research question (How can the failure be measured?) had still not been answered. This will be done in section 7.4 although the research had still not developed a method of ICT project performance measurement based on the successful application of proven criteria that existed

within construction. The next section also provides a platform to discuss current thinking on project failure and the development of a project performance measure based on an approach to project success that is separate from progress measurement criteria.

7.4 Re-examining the failure concept

Consideration of project failure and success concepts has featured consistently in project management research since Rubin and Seeling (1967) and Oisen (1971) introduced it. However, according to research by Lyytinen and Hirschheim (1987), Pinto and Slevin (1986) and Belassi and Tukel (1996), the definition of project failure still suffers from not only from ambiguity, but also from an inadequate conceptual clarity of what failure actually means. The definition of project failure also suffers from a realisation that perhaps it is necessary to consider other success criteria. This is being driven according to Atkinson (1999) by management's desire to adopt new strategies that might improve success rates such as improved methodologies and tools. The research question is then why are ICT projects still continuing to be described as failing, despite the extensive research already carried out on this issue.

The basic research problem tackled by this investigation is that the rate of project failure within the ICT industry is unacceptably high; higher that a comparable industry (here construction was used as a means of comparison). One view that can be adopted is that this failure rate is only based on "*reported*" failure rates. This is because although sharing some similar characteristics and drivers, it is extremely difficult to draw direct comparisons between construction and ICT projects. The research has however chosen to conduct the comparative analysis because such comparisons were for the research regarded as valid. In the first place, such an approach allowed for existing management assumptions to be challenged (Green et al, 2004), secondly because the research was not fundamentally to compare construction and ICT. On the other hand, the main research objective was to develop a method of project performance measurement based on an approach to project success that is separate from progress measurement criteria. As the basis of such measure was the practice of project management, it was seen as necessary to *review*

project management practices within the construction industry (and where possible apply learning outcomes to ICT projects). What has however emerged from the research analysis is that *poor* project management practices, might not the reason for a *higher* rate of failure of ICT projects.

Another issue that was addressed was whether the high and spectacular project failures that were being reported in the late 1990's are still occurring.

Although no analysis was carried out to justify this assertion, it may be possible to suggest that there has been a decline in ICT expenditure in most organisations. This has been caused by the absence of any *'special events'* stimulating growth in the industry (e.g. Y2K or the Internet) and also high 3G (new generation mobile) licenses and network development cost. As a result, it could be expected that there would be a reduction in the reported rate of failure of ICT projects. This does not mean that the fundamental reasons for a high number of failures in ICT problems have been addressed and no longer needs attention of the industry.

What then emerges is the importance of having project objectives that can be associated with the achievement of an identifiable level of performance or certain achievable attributes. For ICT projects, it means having in place a method of project measurement based on approaches to project success that separates performance and progress measurement criteria. At the same time, this criteria must also be able to facilitate the successful competitive positioning of the organisation and also set performance indices that defines an explicit acceptability limit, or tolerance level for project success based on the customers expectations.

The problem with most ICT projects is that their criteria for success are very narrowly defined. This happens because ICT projects unlike construction are part of a business process. This means that they have to be deployed to meet specific business change and strategy objectives. As a result, its objectives, specific design requirements have to be explicitly met.

Unfortunately, during the data analysis stage, it became clear that perhaps the most important reason for ICT project failure were that ICT project managers were failing to appreciate the strategic importance of their projects.

In conclusion, research on project success indicates that it is impossible to generate a universal checklist of project success criteria suitable for all projects. Success (or failure) criteria will differ from project to project depending on a number of factors including size, uniqueness, industry, complexity and the stakeholders involved. What has emerged from this research is the need for a method of project measurement based on approaches to project success that separates performance and progress measurement criteria. This does not mean that ICT project managers need to limit their objectives to meeting strategy objectives to the detriment of cost, time and quality criteria that the customers will demand. The bottom line is that the project manager needs to ensure that his project is progressing against set measures of time, cost and quality. It is the achievement of these requirements to some extent that will ensure that the customers overall strategic objectives are met, while at the same time, Without this happening, the project will loose the organisations support. If this happens, the project is a failure. For the ICT project manager, this key issue needs to be taken into consideration when measuring project performance. This may confirm assertion made by de Wit (1988) that the best way to measure project success is to evaluate the degree to which the dominant or ranking objective of the project has been met. Once this is met, then the project should be classed a success.

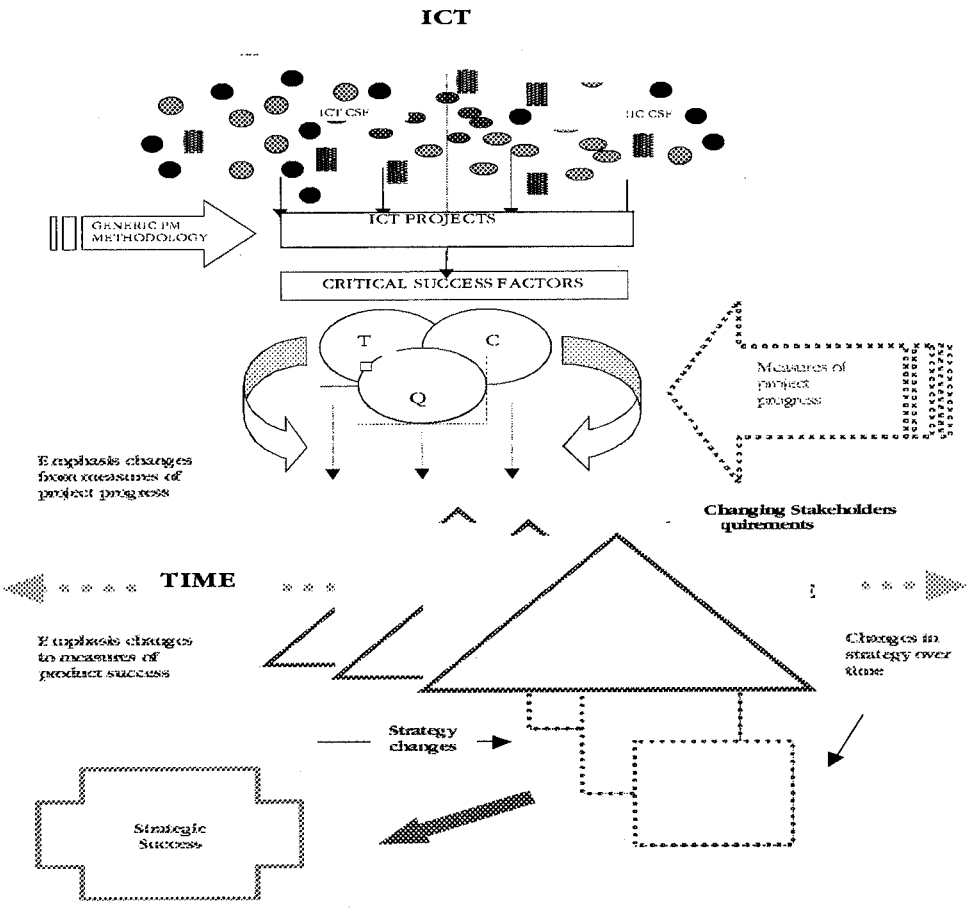
The re-examining of the failure concept has resulted in the development of a new framework for measuring ICT success that is presented in Figure 12.

This framework (Fig 12.0, below) can be summarised as being based on: -

- Acceptance of numerous critical success factors that influence ICT projects
- Use of generic project management principles
- The use of time, cost and quality to measure project *progress*.
- The need to change from emphasis of project progress

- Changes in stakeholder strategic requirements over time requires emphasis of success measures to be based on approaches to project success that separates performance and progress measurement criteria.

Fig 12.0: ICT Success Measure Framework



The new framework for ICT success measure (Fig 12) has been developed based on a review of the ICT- Construction framework. It integrates four key points that have arisen from the thesis.

a) The ICT industry cannot address its success criteria based on simple measures of time, cost, quality.

b) The need to appreciate changing stakeholder's requirements cannot be over-emphasised.

c) Measures of ICT success have to be based on methods of project measurement that are based on approaches to project success that separates performance and progress measurement criteria.

d) The impact of changing strategy on ICT projects has to be recognised.

7.5 Framework Validation

Framework validation is important because it not only increases performance and reliability, but also because it tests how well a framework serves its intended purpose. Validation also promotes improvements and a clearer understanding of a framework's strengths and weaknesses among management and user groups. It also determines whether the user feels that the framework's behaviour is close enough to real world behaviour.

It is argued that the framework that has emerged from this research project has potential value to the management of ICT projects because it seeks to develop a method of project performance measurement based on an approach to project success that is separate from progress measurement criteria. In order to understand its potential use, validation of this framework was seen as necessary. This is because it was seen as essential that the framework correctly represented an answer to the research questions raised in section 1.3.

Validation was seen as necessary in order to ensure that the framework could actually be applicable to reality. An independent validation review panel was purposefully chosen and set up to review the logical and conceptual soundness of the framework (*no respondent had been interviewed during*

the data gathering exercise). The panel included 6 project management experts all working for BT. All had achieved at least Project Manager Grade 2 level (equivalent to Chartered IT Professional status) and had a minimum of 10 years relevant experience managing multi-functional ICT projects with capital value of at least £1 million. The validation exercise was held at the BT Angel Centre in London and lasted for two hours.

The first step in carrying out the validation exercise involved the establishment of clear specifications (Fig 20.0) for the validation.

Table 20: ICT Success Framework Validation

Do you see a distinction between project progress and project success?
Do you see measures of ICT success based on this distinction?
Do you see any benefits of this framework to industry?
Do you detect any defects or inconsistencies with this framework?

The validation process was based on a question and answer session. Four questions (Table 20.0, above) were asked in order to guide the panel through the theoretical concepts behind the framework. From these questions, general themes, which relates to the frameworks application, practicality and utilisation in a business or project environment, resistance to change and additional amendments that might be required emerged.

The first observation that was made by the validation panel related to whether there was indeed a distinction between project progress and project success. Agreeing that the framework represents the way and manner by which ICT projects need to be measured, respondent V1 pointed out that: -

"This distinction depended on whose perception and understanding it was being made from"…V1

He also suggested that: -

"If its from the project manager's point of view, then this will usually from a time, cost and quality perspective"…V1

Agreeing with V1 on the need for a distinction between project progress and success criteria, another member of the panel (V5) noted that: -

"I see a distinction, because when measuring progress, you are only concerned with meeting clearly agreed milestones (usually in terms of time and cost) for the project. Success is however slightly more difficult to measure because the overriding need of the project can disappear". … V5

Supporting this opinion, respondent (V4) suggesting that in fact: -

"Yes I do, however both have to be measured at the same time, they both go hand in hand. In my opinion, if either measure fails, then its hard to say that the project was successful"…V4

The second question that was raised with the validation panel was whether they actually did see measures of ICT projects success being based on a distinction between project progress and project success.

There was general agreement that such distinction will be valuable to the industry. The general theme that seemed however to emerge related to concerns about the *practicality, application and utilisation of the framework in a business or project environment.*

On the issue of the practicality of the framework, respondent V1 raised concerns because in his view, the framework: -

"Made *assumptions that all customers are clear on where exactly their requirement fits into an overall business need. This is certainly not the case."…V1*

V3 on the other hand had reservations with the framework on its practicality because it was not clear: -

"How this measure can be implemented"…V3

She further pointed out that: -

"The question that has to be answered is whether measuring progress is more or less important than measuring success. As a project manager, I don't see it being so. However I accept that from a business perspective, it is the measure of success that is probably more important "…V3

Agreeing with this observation, another member of the panel (v6) suggested that: -

"The concern is actually with the project manager as he is the one stuck in the middle trying to meet two different sets of objectives. Basically, he needs to meet project time-scales and set quality gates at the end of each project phase, while at the same time, he needs to keep his eyes on overall business requirements. For large-scale projects, this is difficult…V6

The danger of this in V5's opinion was that: -

"For a large company like BT, *the problem which usually emerges is that the customer who has a view of both progress and success never really makes it explicit what his measures are, until things begin to go wrong*"…V5

The validation panel was next asked whether the framework could be of any benefit to industry.

Majority of the panel members did agree that the framework would be beneficial to industry. For example,

According to V2…

" I do believe that the framework represents the way and manner by which ICT projects need to be measured and therefore in this respect could be of some benefit to industry."…V2

It is important to note that one of the panel member's (V1) did not see any benefits of the framework. In his opinion, it was *"too theoretical and makes assumptions of delivery without appreciating or including one key factor in project management, this is the human factor"*…V1

The panel however had concerns on the framework's utilisation especially within a business or project environment.

According to respondent V1: -

"The framework makes assumption that all project managers are competent and will seek to ensure that their projects meets its targets. I am aware that in-competency is an exception rather than the norm, but I would have preferred a situation where the uncertainty of human resources gets included in the framework"...V1

Respondents V6 and V2 on the other hand appeared more concerned with the prioritisation of the success criteria. For example, according to respondent V6: -

"Often what happens in BT is that the project manager concentrates on measurable success criteria at the expense of the business requirements. This is the reason why most of our products are late arriving on market"...V6

Respondent V5 elaborated further by pointing out that: -

" Your framework only highlights the problems project managers are facing. The questions still remains which measure takes precedence."...V5

The panel was asked a final question on whether they did see any defects or inconsistencies with the framework. From this, two major themes on the need for additional amendments to the framework and general resistance to change emerged.

Majority of the panel members did see certain limitations with the framework, which needed to be addressed in order to, enable the framework to be more applicable to *real* situations. For example according to V2: -

"I was however expecting to be presented with a framework which explicitly sets steps that improve the chances of projects being more successful". In his opinion, *" I don't really think that the framework has been explicit in providing this guideline"*...V2

"The framework *gives an impression that both measures could be separated. I will not always agree that it can, because both sets of measures need to be met before a project can be regarded as successful. This is because success is based on not only the customers perception, but also to an extent the project managers*"...V4

" *The framework is not clear on how it is to be applied to real life projects*"... V3

Respondent V5 elaborated further by pointing out that: -

" *If your suggestion is the need to concentrate on measures of success as against that of progress, then how do you measure strategic success? Strategic success is set by the business and my opinion is that they are notoriously difficult to pin down to specifics*"...V5

The impression was created during the discussions that there was a slight resistance from some of the panel members to accept the concepts behind the ICT success measures framework. For example, picking up from earlier comments by respondent V2, respondent V3 raised concerns with the framework because in her view: -

"The framework had not considered cost of its implementation"...V3

Elaborating further on this, V5 suggested that: -

"*Although the framework does clearly take a radical view on project success measures which I will like to have further explored, it does not make any statements on how this can be implemented within an organisation like BT. In my view, any framework that improves business results is acceptable and welcome, however the true test of any such framework is its how this can be implemented, to what cost and what are the overall impacts in terms of working practices. Such a framework requires the company to adopt a different mindset than what I think exist. Changing this mindset involves training and a change to our processes. This will involve cost. This framework has failed to provide information on this and in my opinion, it remains its biggest flaw*"...V5

It has been seen as necessary to validate the ICT Success Measure framework because by completing this validation, it

makes it possible for future users to understand the framework's meaning and limitations. It is expected that future improvement of this framework will concentrate on simplifying the frameworks especially as it is regarded as too abstract for non-specialists to understand the underlying theory. The expectation is that such exercises will transform the framework into a more applicable decision-making tool, without disguising the framework's inevitable limitations. This has to be done to ensure that the framework meets actual requirements of the measures being proposed. It also ensures that the framework meets the form, fit, and function to address the research question.

Chapter Eight- Conclusions

8.1 Introduction

In the previous chapter, a framework for ICT Success Measure was developed. From this framework, it became clear that for ICT projects, changes in stakeholder strategic requirements over time will require emphasis of success measures to be based on approaches to project success that separates performance and progress measurement criteria. A validation exercise was also conducted. From the validation, four general themes emerged which indicated that future improvement especially related to the framework's simplification, application and practicality were required.

Within this concluding chapter, the contributions to knowledge of this research will be identified, while at the same time discussions on the research limitations and uniqueness of the research will be conducted. This chapter will be concluded with recommendations being made for possible future research.

8.2 The contributions to knowledge

In summary, the contribution to knowledge of this research has been demonstrated via the following: -

- Develop a method of project performance measurement based on an approach to project success that is separate from progress measurement criteria (Fig 12.0).

- Establishing a performance variance framework for ICT projects based on the modification of criteria that exist for construction projects.

- Using existing literature, a direct link has been established between the successful deployment of ICT products and organisational strategy.

- The research has also put forward a finding that inappropriate success measures for ICT projects as perhaps the main reason for high failure rates. This assertion has not been previously put forward.

8.3 Limitations of Research

It is possible that there were limitations within the research that may have impacted on the conclusion. Possible limitations are listed below.

8.3.1 The use of qualitative data analysis

On a more fundamental level, it is accepted that limitations exist within the study especially as the adopted strategy of naturalistic inquiry has always been susceptible to the criticism that it relies too much on subjective interpretation and intuitive.

In particular, it is noted that the research was based on the use of qualitative data analysis. Although the adaptation of this technique was seen as being appropriate to the research, there is the possibility that results/deductions made by in the research could be flawed if the existence of personal perceptions was allowed to impact the analysis of data.

8.3.2 Sampling Data

The adopted research strategy may also open to criticism on the numbers of interviews conducted during the research. However, as previously mentioned, the sample was justified as appropriate as requirements for informational redundancy and saturation was satisfied. It is also debatable whether the conduct of further interviews would have provided any additional insights. It is worthwhile recalling that the prime reason for putting together an interview guide was seen as a further attempt to ensure that the interview was conducted in a credible manner. However, whilst the feedback in response to the conduct of the interviews were generally positive, it should also be recognised that interviewees' were often unable to assess its content independently of the quality of the questions. Thus there existed a danger that the interviewee's could have found the techniques of the interviews to be interesting without having understood the broader issues of the paradigm being investigated

Another key limiting factor is that due to the sample size, it was difficult to generalise the results as representing the views of the two industries' project managers. The

findings hence do not posses the degree of precision to be seen as linked to the industries under study.

8.3.3 The Interview Questions

In addition to the discussed limitations of the sample size, is the issue of the interview questionnaire itself. The questions were few and it's content of a limited nature. Thus it could be inferred that the survey only provided baseline information. An avenue for future research might include the use of a more detailed questionnaire framework.

8.3.4 The interview

The interview techniques adopted during the data gathering exercise presented several problems that need to be considered. In the first place, it relied heavily on appropriate levels of access, trust, and commitment existing between with the respondents during interview. This was an important factor in order to ensure that the interviewees to be able to provide open and honest answers.

Another limitation in the research is the possibility of interpretation and recording error occurring during the interview (Mathers et al, 1998b).

In order to address this, the maintenance of an objective nature during the interview process became of paramount importance. Various procedures such as standardised instructions for the interviewees and a minimisation of any contact with the interviewees, which have been previously recommended by Willig (2001), were employed.

8.3.5 The Researchers background

Another identified limitation with the thesis is that researcher being a practising ICT Project Manager. This raised two issues.

In the first place, there was the possibility of becoming sub-consciously too attached to the data. This could have led to an unwillingness to produce results that criticised project management practises within the ICT industry. This limitation is mediated through the use of multiple sources of data.

Another limitation as highlighted by Kruger (1988) was concern with the actual interview bearing in mind the researchers background. Thus there is a possibility that on taking the lead in the interviews; data obtained from interviews were likely to be interpreted in a manner that supported preconceived ideas of the interviewer as the attitude of the subject interviewed.

8.3.6 The research constants

Although there are no doubt numerous limitations of the way the research was conducted, the most important research limitation relates to the actual comparison of projects between the construction and ICT industries.

In the first place, the research was deliberately limited to addressing the components of standard project success criteria such as time, cost and quality component of value for money. No attempt was made to measure or compare success variances between ICT and construction projects.

Secondly, the Revised ICT- Construction Framework was developed for analytical purposes with differing characteristics regarded as constants. This meant that for the duration of the research, the general principle that all projects are different since they differ in scope, location, size, time, and location was ignored. The impact of these differing environmental factors on the research results has not been substantiated.

Based on the listed limitations, attention is called to findings presented in this thesis should in their context be viewed with caution and instead should be used as a starting point for further thinking on the issue of project failure within the ICT industry.

8.4 The Uniqueness of the research

In the light of the preceding discussion regarding the research limitations, it is appropriate to offer a final summary of the contribution, which this thesis has made to current knowledge. Firstly, a link was established between successful ICT deployment and strategy success in organisations. This link was established in Chapters Three and Four where an Input-Output Framework for Strategic

Success was developed from available literature. The second link used processes employed for construction projects as a benchmark for ICT project deployments, a comparison which was employed within the research strategy and formed the basis of the Revised ICT-Construction Framework. The third link that was established within this research involved applying basic qualitative analysis techniques to this framework. The outcome from this exercise produced the revised framework that formed a new measure of success criteria. This can be viewed as an extension on work carried out by Lyytinen and Hirschheim (1987) on the success-failure concepts for projects.

Based on these established links, the uniqueness of this work has been that the research is situated at the interface of three specific disciplines. These are strategy (macroeconomics and organisational theory), ICT and construction implementation and thirdly, project management processes and methodologies. The originality of the work is thus based on the use and combination of established theory from these mentioned disciplines into an empirically tested framework in the field of project management. This framework is expected to be of interest to researchers within the project management community.

On a more practical level, this works seeks to highlight the effects of project failure on overall strategic success of any organisation. It highlights the fact that organisational strategy does not necessarily fail to be achieved as a result of only poor alignment of ICT strategy, but also because of the use of project performance measurement based on an approach to project success that is not separate from progress measurement criteria.

The role of the revised ICT Success Framework is seen as applicable to ICT deployment especially as the telecommunication companies seeks to rollout important ICT products such as broadband and 3G mobile across the UK.

8.5 Recommendations for future research

In this thesis, a framework to study the application of project management principles within two industries has been put forward. This was seen initially as a means to help organisations in their learning process and prevent

future project failures. Through the interviews, qualitative data gathered from which findings revealed that there was no conclusive evidence that differing project management practice within the ICT and construction industry resulted in higher number of reported ICT project failures. Instead, what has been found is an ICT industry driven by its role in creating economic success projecting a definition of project based on an extremely narrow variance of success.

The study breaks new ground in providing systematic evidence that could help explain the need to understand the criteria for classifying project success and failure.

This provides a launch pad for the research to be developed in three new directions:

- There is a need to validate the framework among a larger sample outside BT.

- There is a need for the framework to be continually re-validated. This involves constant re-correlation where if any of the factors on which the framework is based consistently to demonstrate no association with framework, the factor should be dropped from the framework altogether.

- Develop a quantitative definition for measuring success criteria of projects.

- Investigate the link between successful organisational strategy and ICT project performance measurement.

This thesis has achieved its set objectives by first examining via extensive literature knowledge about failures of ICT projects. Possible gaps were investigated via qualitative data analysis. The research has also conducted a comparative analysis of ICT and construction project failure rates again by extensive literature review. By developing a revised ICT- Construction comparative framework, a framework which is expected to demonstrate project performance measurement for ICT projects based on the successful application of proven criteria that existed within construction has been produced.

The aims of the thesis as set out in section 1.2 have been met. In order to revisit the original research concepts, a framework shown in Fig 11 has been developed. Using this, a revised framework for project performance measurement based on an approach to project success that is separate from progress measurement criteria was proposed for ICT success measure (Fig 12).

Specifically the research goes further than current project management thinking. This is because it views the issue of analysing project success not only from the point of the need to establish a success variable such as delivery and product precision. It achieves this by asking one key question that is if research ranging from Rubin and Seeling (1967) and Oisen (1971) has been unable to address and identify a key measure for the failure concept, is a more radical view which challenges current thinking not required? It is believed that by presenting the need to address the degree of product delivery and its precision variance, such an objective has been achieved.

By developing a framework of project performance measurement, the research was able to propose a project performance measurement based on an approach to project success that is separate from progress measurement criteria.

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APPENDICES

Appendix A: Code-Filter: All

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Budget: Any price
Budget: b/w £0 and £100K
Budget: b/w £100K and £1M
Budget: b/w £1M and £5M
Budget: b/w £20M and £10bn
Budget: b/w £5M and £20M
Knowledge Management
Limitation
Management: Style: Assertive
Management: Style: Changes: Sometimes
Management: Style: Changes: Yes
Management: Style: Changes:No
Management: Style: Formal
Management: Style: In-charge
Management: Style: Inclusive
Management: Style: Informal
Management: Style: Leadership
Management: Style: Mentoring
Management: Style: No
Management: Style: Non-confrontational
Management: Style: Personality
Management: Style: Personality: Comfort Zone
Management: Style: Relaxed
Management: Style: Yes
Number of years: <10yrs
Number of years: <25yrs
Number of years: <5yrs
Number of years: >25yrs
Procurement Process/Route
Project: Characteristics
Project: Characteristics: Transparency
Project: Client/ Customer: Requirements and deliverables
Project: Client/Customer Perception Questionnaire
Project: Client/Customer: Expectations
Project: Deliverables: Cost and Finance
Project: Deliverables: Quality
Project: Deliverables: Quality: Excellent and Good
Project: Deliverables: Quality: Poor and Bad
Project: Deliverables: Time
Project: Deliverables: Time: Long
Project: Deliverables: Time: Short
Project: Deliverables: Uncertain and Unknown
Project: Description: Business Driven or Strategy
Project: Description: Business Driven or Strategy: Based on our experience
Project: Description: Client/Customer driven and facilitated
Project: Description: Complex
Project: Description: Controlled Derivatives
Project: Description: Easier to innovate with private sector clients than public sector
i.e. government
Project: Description: Highly skilled
Project: Description: Innovation
Project: Documentation
Project: Feedback: Regular: Ad-hoc
Project: Feedback: Regular: At Project Start
Project: Feedback: Regular: Monthly
Project: Feedback: Regular: Project End
Project: Feedback: Regular: Project Life-Cycle
Project: Impact/Influence/Effects/Relationship:No
Project: Impact/Influence/Effects/Relationship:Yes
Project: Management: Methodology: Alternative: No
Project: Management: Methodology: Alternative: Yes
Project: Management: Methodology: Formal

Project: Management: Methodology: Formal: Any change will be agreed in advance with client
Project: Management: Methodology: Formal: Forms part of project contract
Project: Management: Methodology: Framework and Flexible
Project: Management: Methodology: Not used
Project: Management: Methodology: Use: Appropriate
Project: Management:Methodology: Use: Inappropriate
Project: Outcome: Result: Failure: Wrong Solution or Product
Project: Outcome: Results: Failure
Project: Outcome: Results: Success
Project: Outcome:Influences: Failure: Success/ Failure Acceptance Criteria Not agreed
Project: Outcome:Influences:Poor appreciation and understanding of customer's requirements
Project: Outcomes: Influences: Design
Project: Outcomes: Influences: Environmental Issues
Project: Outcomes: Influences: Leadership and Senior Management Support
Project: Outcomes: Influences: Legislation
Project: Outcomes: Influences: Political
Project: Outcomes: Influences: Poor Planning
Project: Outcomes: Influences: Technology
Project: Outcomes: Influences: Technology and Techniques: Existing
Project: Outcomes: Influences: Technology and Techniques: New
Project: Outcomes: Influences: Technology: Appropriate
Project: Outcomes: Influences: Technology: Inappropriate
Project: Outcomes: Influences: Information
Project: Phase/ milestone or stage
Project: Phase/milestone or stage: End/Completion
Project: Phase/milestone or stage: Life-cycle
Project: Phase/milestone or stage: Start/Commence
Project: Phase/milestone or stage: Start/Commence: Costing stage
Project: Planning
Project: Qualification: Dependencies
Project: Qualification: Factors, Variables and Issues
Project: Qualification: Flexible and Different
Project: Qualification:Factors, Variables and Issues: Culture
Project: Quantity: All
Project: Quantity: Majority
Project: Review: Not happening
Project: Review: Only happening because of possibility of repeat business
Project: Review: Project End
Project: Review: Project End: PIR: No
Project: Review: Project Start
Project: Review: Regularity: Ad-hoc
Project: Review: Regularity: Entire project life-cycle
Project: Review: Regularity: Weekly
Project: Review: Regularity:Monthly
Project: Size: Big or Large
Project: Size: Small
Project: Type: Construction: Building
Project: Type: Construction: Civil Engineering
Project: Type: Construction: Commercial
Project: Type: Construction: Factory
Project: Type: Construction: General Construction
Project: Type: Construction: Hospitals
Project: Type: Construction: Industry
Project: Type: Development, Delivery and Implementation
Project: Type: ICT
Project: Type: ICT: Infrastructure
Project: Type: ICT: Software Deployments
Project: Type: ICT: Systems and Solutions Delivery
Project: Type: Improvement and Upgrade
Project: Type: Private Sector
Project: Type: Public Sector
Resource: Num. of Employees: b/w 1 and 5
Resource: Num. of Employees: b/w 100 and 500
Resource: Num. of Employees: b/w 20 and 100
Resource: Num. of Employees: b/w 5 and 20
Resource: Personnel
Resource: Personnel: Employees

Resource: Personnel: Matrix Management
Resource: Personnel: Skills
Role: Grade: Middle Management
Role: Grade: Senior Management
Role: Job Title: Client/Customer Project Manager
Role: Job Title: Contract Manager
Role: Job Title: Project Manager
Role: Job Title: Site Manager
Role: Job Title: Team Leader
Role: Project Involvement: Client/ Customer
Role: Project Involvement: Non Project Manager
Role: Project Involvement: Project Manager
Role: Project Involvement: Sub- contractor
Role: Project Involvement: Technical Management
Role: Understanding: Contractor will prefer experienced project manager to work on political projects
Role: Understanding: Experience
Role: Understanding: Observation
Role: Understanding: Participation
Role:Task: Co-ordinator
Role:Task: Communicating and Interaction
Role:Task: Conflict Management and Resolution
Role:Task: Management
Role:Task: Monitoring
Role:Task: Project and Change Control
Role:Task: Represents Client/Customer
Role:Task: Responsible or decision
Role:Task: Risk Management
Role:Task: Security
Role:Task: Work Package Agreement
Role:Task:Safety
Role:Task:Team Building
Sometimes
Training
Usage: Not Recommended
Usage: Recommended

Appendix B: Codes-Primary-Documents-Table

Code-Filter: All
PD-Filter: All

	PRIMARY DOCS															
CODES	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	Totals
Budget: Any price	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	1
Budget: b/w £0 and £10	0	0	0	0	0	0	1	1	0	0	0	1	0	0	0	3
Budget: b/w £100K and	2	1	1	0	0	1	0	0	1	1	0	0	0	1	0	8
Budget: b/w £1M and £5	1	0	1	1	1	0	0	1	0	0	1	0	1	0	1	8
Budget: b/w £20M and £	1	2	0	0	0	0	0	0	0	0	0	0	0	0	0	3
Budget: b/w £5M and £2	2	0	2	0	0	0	0	0	0	0	0	0	0	0	0	4
Knowledge Management	0	0	0	0	0	0	0	0	0	1	1	0	0	1	0	3
Limitation	2	3	1	1	0	0	1	0	0	0	0	0	0	0	0	8
Management: Style: A	0	1	0	0	0	0	0	0	0	0	0	0	1	0	0	2
Management: Style: C	0	0	0	0	0	0	2	2	0	0	0	0	0	0	0	4
Management: Style: C	2	0	1	0	0	0	0	3	4	1	0	0	2	0	3	16
Management: Style: C	0	2	1	0	2	2	1	0	0	1	3	2	0	2	0	16
Management: Style: F	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	1
Management: Style: I	0	0	0	0	0	1	0	0	1	0	0	0	0	0	0	2
Management: Style: I	0	0	0	0	0	1	0	0	0	1	0	0	0	0	1	3
Management: Style: I	1	0	1	0	0	0	0	0	0	0	1	0	0	0	0	3
Management: Style: L	2	1	1	0	2	0	0	0	0	0	0	0	0	1	0	7
Management: Style: M	0	1	0	0	0	0	0	1	0	0	0	0	0	1	0	3
Management: Style: N	0	0	0	3	0	0	1	0	0	0	0	3	0	0	0	7
Management: Style: N	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	2
Management: Style: P	2	2	1	0	2	1	0	0	0	1	2	0	0	1	0	12
Management: Style: P	4	1	2	0	1	0	0	0	0	0	0	0	0	0	0	8
Management: Style: R	1	0	1	0	0	0	0	1	0	0	0	0	0	0	1	4
Management: Style: Y	1	1	1	0	1	0	0	0	1	1	1	0	1	1	1	10
number of years: <10	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1
number of years: <25	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	1
number of years: <5y	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	1
number of years: >25	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
Procurement Process/	6	5	5	0	0	0	0	0	0	0	0	0	0	0	0	16
Project: Characteris	4	0	2	0	2	0	0	2	0	0	0	0	0	0	0	10
Project: Characteris	1	2	0	0	0	0	0	0	0	0	0	0	0	0	0	3
Project: Client/ Cus	13	6	8	6	3	15	10	6	2	7	7	20	13	6	8	130
Project: Client/Cust	3	1	1	0	0	0	0	0	0	2	0	0	0	0	0	7
Project: Client/Cust	2	0	4	0	0	0	1	4	5	0	0	2	2	0	0	20
Project: Deliverable	8	5	3	5	3	5	3	6	1	1	3	3	1	1	2	50
Project: Deliverable	2	4	1	1	0	2	2	1	1	0	1	0	0	0	0	15
Project: Deliverable	2	0	2	2	0	0	1	1	2	0	1	4	1	3	1	20
Project: Deliverable	0	4	2	0	1	3	3	2	2	0	1	2	3	2	2	27
Project: Deliverable	4	3	4	3	1	3	1	2	3	0	2	1	1	0	0	28
Project: Deliverable	1	1	0	0	1	0	0	0	0	0	0	1	0	0	1	5
Project: Deliverable	0	0	0	2	0	0	0	1	2	0	0	3	1	2	3	14
Project: Deliverable	2	0	0	2	1	0	0	0	0	2	1	3	1	0	7	19
Project: Description	0	0	0	0	0	0	4	4	0	1	3	1	1	1	2	17
Project: Description	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	1
Project: Description	5	3	3	2	1	1	0	2	1	0	1	1	0	2	2	24
Project: Description	11	2	7	7	8	5	10	6	3	8	7	11	6	6	8	105
Project: Description	0	0	0	1	0	0	0	0	0	0	0	2	1	0	0	4
Project: Description	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	1
Project: Description	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	1
Project: Description	3	1	3	0	2	1	0	0	0	0	0	1	0	0	0	11
Project: Documentati	0	2	0	0	1	0	0	0	0	0	0	0	1	0	0	4
Project: Feedback: R	1	1	0	1	2	0	0	0	0	1	1	0	0	1	0	8
Project: Feedback: R	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	1
Project: Feedback: R	1	0	1	1	0	0	0	0	0	0	1	0	0	1	0	5
Project: Feedback: R	0	1	1	0	0	0	0	0	0	1	0	0	0	0	1	4
Project: Feedback: R	0	0	0	0	0	0	1	2	2	0	4	3	2	2	1	17
Project: Impact/Infl	2	0	2	1	1	1	1	2	2	1	5	3	0	0	0	21

Project: Impact/Infl	4	4	8	3	2	1	2	10	7	4	11	7	8	9	4	84
Project: Management:	1	2	1	1	1	1	1	1	0	0	1	1	0	0	1	12
Project: Management:	1	0	0	0	0	0	0	0	1	0	0	0	2	1	0	5
Project: Management:	5	2	4	0	1	4	11	3	6	0	0	6	2	3	3	50
Project: Management:	0	0	0	0	4	0	0	0	0	0	0	0	0	0	0	4
Project: Management:	0	0	0	0	2	0	0	0	0	0	0	0	0	0	0	2
Project: Management:	5	16	2	2	3	0	1	3	1	0	5	0	2	0	0	40
Project: Management:	0	0	0	2	0	0	0	0	0	5	0	0	0	0	0	7
Project: Management:	3	4	2	0	0	3	2	2	0	0	1	1	1	1	0	20
Project: Management:	0	3	0	0	0	1	0	0	5	0	0	2	0	2	1	14
Project: Outcome: Re	0	0	0	0	2	0	0	0	0	0	0	0	0	0	0	2
Project: Outcome: Re	2	3	1	3	2	1	2	1	4	4	0	2	4	0	3	32
Project: Outcome: Re	11	6	5	2	0	4	3	2	0	1	3	2	1	3	1	44
Project: Outcome:Inf	0	1	0	0	0	0	0	1	0	1	0	0	0	0	0	3
Project: Outcome:Inf	0	0	0	3	3	0	0	0	0	0	0	0	0	0	0	6
Project: Outcomes: I	2	5	1	1	1	7	0	0	0	0	0	3	0	0	0	20
Project: Outcomes: I	1	0	0	1	0	0	0	0	0	0	0	0	0	0	0	2
Project: Outcomes: I	0	0	0	1	0	0	0	1	0	0	3	0	2	1	1	9
Project: Outcomes: I	0	0	0	1	0	0	0	3	0	1	3	0	0	1	0	9
Project: Outcomes: I	2	0	1	0	1	0	0	0	0	0	0	0	0	0	0	4
Project: Outcomes: I	0	0	0	0	1	0	0	0	1	0	0	0	0	0	0	2
Project: Outcomes: I	7	1	2	2	0	4	1	0	2	0	0	0	1	0	0	20
Project: Outcomes: I	1	0	0	0	1	0	0	1	2	0	2	0	0	0	0	7
Project: Outcomes: I	5	3	3	2	2	2	2	0	4	3	1	3	1	1	3	35
Project: Outcomes: I	1	0	0	0	0	2	1	0	0	2	0	0	0	3	0	9
Project: Outcomes: I	0	0	0	0	1	2	0	0	0	0	1	1	1	0	2	8
Project: Outcomes: I	3	1	0	2	1	1	0	1	0	0	0	0	1	1	0	11
Project: Phase/ mile	2	2	4	0	0	1	2	0	2	0	2	1	1	1	2	20
Project: Phase/miles	1	0	0	0	0	1	0	1	2	1	1	0	0	0	0	7
Project: Phase/miles	2	3	1	2	0	0	0	1	3	1	1	2	0	1	1	18
Project: Phase/miles	0	1	0	0	0	1	0	1	1	0	0	0	1	1	0	6
Project: Phase/miles	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	1
Project: Planning	6	4	3	2	3	0	0	1	1	0	2	0	1	2	0	25
Project: Qualificati	1	1	5	0	1	0	1	1	0	0	0	0	0	0	0	10
Project: Qualificati	3	7	5	5	3	5	2	5	3	5	2	2	3	7	6	63
Project: Qualificati	17	6	11	1	3	4	3	7	3	0	4	7	1	0	2	69
Project: Qualificati	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	1
Project: Quantity: A	4	1	1	0	0	0	0	0	2	0	1	1	2	0	2	14
Project: Quantity: M	3	1	2	1	1	2	1	1	1	2	1	0	0	2	0	18
Project: Review: Not	1	0	0	0	0	0	0	2	0	0	3	0	1	0	0	7
Project: Review: Onl	0	0	1	0	0	0	0	2	0	0	0	1	1	0	0	5
Project: Review: Pro	2	1	1	0	0	1	0	0	3	1	1	2	0	1	1	14
Project: Review: Pro	1	0	1	0	0	0	0	2	0	1	1	1	0	1	0	8
Project: Review: Pro	0	0	0	0	0	1	1	0	0	0	0	1	0	0	0	3
Project: Review: Reg	0	0	0	0	0	0	1	0	0	2	0	0	2	0	0	5
Project: Review: Reg	3	2	2	1	3	1	1	1	3	0	3	1	0	0	0	21
Project: Review: Reg	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	2
Project: Review: Reg	0	2	1	3	3	0	0	0	0	0	0	0	0	0	0	9
Project: Size: Big o	2	0	0	0	0	2	0	2	2	0	0	0	1	0	0	9
Project: Size: Small	1	0	0	1	0	0	0	1	3	0	1	0	0	0	0	7
Project: Type: Const	0	0	1	2	2	0	0	0	0	0	0	0	0	0	0	5
Project: Type: Const	2	2	0	0	0	0	0	0	0	0	0	0	0	0	0	4
Project: Type: Const	3	0	2	0	0	0	0	0	0	0	0	0	0	0	0	5
Project: Type: Const	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
Project: Type: Const	22	9	7	0	0	0	0	0	0	0	0	0	0	0	0	38
Project: Type: Const	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
Project: Type: Const	4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	4
Project: Type: Devel	0	1	0	0	0	4	4	1	3	0	0	3	1	1	1	19
Project: Type: ICT	0	0	0	0	0	4	0	1	7	0	0	0	0	0	3	15
Project: Type: ICT:	0	0	0	0	0	3	2	0	2	0	0	0	0	2	1	10
Project: Type: ICT:	2	0	1	0	0	1	11	0	2	0	0	7	0	2	0	26
Project: Type: ICT:	0	0	0	0	0	0	0	4	3	5	3	0	4	1	2	22
Project: Type: Impro	0	0	0	0	0	1	0	0	1	0	0	0	0	0	0	2
Project: Type: Priva	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	3
Project: Type: Publi	2	1	2	0	0	0	0	0	5	0	0	0	0	0	0	10
Resource: Num. of Em	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Resource: Num. of Em	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	2
Resource: Num. of Em	0	1	0	1	1	0	0	0	0	0	1	0	0	0	0	4
Resource: Num. of Em	0	0	0	1	1	0	1	0	1	1	0	1	1	1	1	9

Resource: Personnel	5	5	3	1	0	3	2	0	0	0	0	0	0	0	0	19
Resource: Personnel:	2	5	4	1	0	0	0	1	0	0	2	1	1	1	0	18
Resource: Personnel:	0	1	0	0	0	0	0	0	0	0	1	0	0	1	0	3
Resource: Personnel:	4	1	3	0	0	0	2	1	0	1	2	2	0	0	1	17
Role: Grade: Middle	0	0	0	1	0	0	0	0	1	1	0	1	1	0	0	5
Role: Grade: Senior	2	0	1	0	1	1	0	1	0	0	1	0	0	0	1	8
Role: Job Title: Cli	0	0	0	0	0	1	1	0	0	0	0	0	0	0	0	2
Role: Job Title: Con	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	1
Role: Job Title: Pro	12	8	5	0	1	1	1	0	1	1	0	1	1	2	1	35
Role: Job Title: Sit	1	0	2	0	0	0	0	0	0	0	0	0	0	0	0	3
Role: Job Title: Tea	0	0	0	0	0	0	1	0	0	0	0	1	0	0	2	4
Role: Project Involv	17	9	6	2	1	5	0	1	2	0	0	0	1	0	2	46
Role: Project Involv	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	1
Role: Project Involv	5	4	1	7	5	1	2	2	7	0	5	8	2	1	4	54
Role: Project Involv	6	4	4	0	1	1	1	0	1	0	0	0	0	0	0	18
Role: Project Involv	0	0	0	0	0	1	1	0	0	3	2	3	0	0	0	10
Role: Understanding:	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	1
Role: Understanding:	2	6	1	2	3	1	2	2	3	3	5	1	1	1	2	35
Role: Understanding:	0	0	0	0	0	1	1	0	0	2	0	0	0	0	0	4
Role: Understanding:	3	1	1	0	0	0	0	0	0	0	0	0	0	0	0	5
Role:Task: Co-ordina	3	0	3	2	3	2	1	1	0	3	1	2	0	0	0	21
Role:Task: Communica	0	0	0	0	1	3	0	0	1	1	1	1	1	0	0	9
Role:Task: Conflict	0	0	0	0	2	0	0	0	0	0	0	0	0	0	0	2
Role:Task: Managemen	1	0	3	2	3	0	1	0	0	0	0	0	1	0	2	13
Role:Task: Monitorin	1	1	1	1	0	0	0	0	1	0	0	0	0	1	0	6
Role:Task: Project and	7	4	4	0	1	0	0	2	3	0	0	3	1	3	1	29
Role:Task: Represent	3	0	0	0	0	0	0	0	0	0	0	0	0	1	4	
Role:Task: Responsib	4	6	3	5	2	0	5	1	1	0	3	1	5	2	1	39
Role:Task: Risk Mana	0	0	0	0	0	0	0	0	1	0	0	1	1	0	0	3
Role:Task: Security	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0	2
Role:Task: Work Pack	1	0	0	1	3	0	0	0	0	0	0	0	0	0	0	5
Role:Task:Safety	1	4	0	2	1	0	0	1	0	0	0	0	0	1	0	10
Role:Task:Team Build	2	2	1	0	0	0	0	0	1	0	0	0	0	0	0	6
Sometimes	1	2	0	0	0	1	0	0	0	0	1	2	0	0	0	7
Training	0	3	0	1	0	0	0	1	0	0	3	1	1	0	1	11
Useage: Not Recommen	0	0	0	4	0	0	0	0	4	1	0	0	0	0	0	9
Useage: Recommended	1	1	2	0	1	1	1	1	1	2	4	1	1	2	1	20
Totals	321	221	196	123	119	131	122	128	147	89	136	155	104	100	1062198	

Appendix C: Memo-Filter: All

MEMO: 3:C:P.M Work: Client Relationship Management (0 Quotations) (Super, 15/08/03 06:40:28)
No codes
No memos
Type: Commentary

MEMO: Any change in the project management process could have cost implications, so any changes must be agreed with client (0 Quotations) (Super, 06/09/03 18:10:12)
No codes
No memos
Type: Commentary

MEMO: Client/customer does not appreciate impact of changed designs and requirements (1 Quotation) (Super, 16/08/03 11:52:56)
  P 1: Mgd Intw(C1).txt
       213 - 218
No codes
No memos
Type: Commentary

MEMO: Critical paths for local authority projects are very tight so opportunities for innovation are minimal (0 Quotations) (Super, 17/08/03 18:29:27)
No codes
No memos
Type: Commentary

MEMO: Easier to innovate with private sector and commercial clients than with government (0 Quotations) (Super, 06/09/03 17:49:58)
No codes
No memos
Type: Commentary

MEMO: Formal project management methdology being used in delivery to ensure standards and avoid delivery incompactibility (1 Quotation) (Super, 24/08/03 11:43:02)
  P12: Mgd Intw(T7).txt
       204 - 209
No codes
Memo(s): [Projects are managed by the way p.m feels more
         comfortable->1:340]
Type: Commentary

MEMO: Government projects are political in nature (0 Quotations) (Super, 06/09/03 17:48:01)
No codes
No memos
Type: Commentary

MEMO: Impact of technology has been limited to heavy construction and the management of the construction process (1 Quotation) (Super, 17/08/03 17:19:50)
  P 1: Mgd Intw(C1).txt
       811 - 817
No codes
No memos
Type: Commentary

MEMO: Non linear dependencies are not complex. They are just large. (1 Quotation) (Super, 17/08/03 19:56:02)
  P 1: Mgd Intw(C1).txt
       1146-1151
No codes
No memos
Type: Commentary

MEMO: Organisation is small family based that will be involved in mainly refurbishment and restoration construction projects (0 Quotations) (Super, 06/09/03 19:24:13)
No codes
No memos
Type: Commentary

MEMO: People drift back into comfort zone (0 Quotations) (Super, 16/08/03 10:16:08)
No codes
No memos
Type: Commentary

MEMO: PIR's not happening because of lack of knowledge management systems (0 Quotations) (Super, 25/08/03 18:39:49)
No codes
Memo(s): [The project review process does not happen regularly becuase of
         the lack of existence of a knowledge management system]
Type: Commentary

MEMO: Project management methodology depends on procurement method (0 Quotations) (Super, 16/08/03 10:16:45)
No codes
No memos
Type: Commentary

MEMO: Project management methodology depends on the procurement method being used, thus no real impact (0 Quotations) (Super, 16/08/03 10:04:41)
No codes
No memos
Type: Commentary

MEMO: Projects are managed by the way p.m feels more comfortable->1:340 (0 Quotations) (Super, 16/08/03 10:15:20)

No codes
Memo(s): [Formal project management methdology being used in delivery to ensure standards and avoid delivery incompactibility]
Type: Commentary

MEMO: Projects can only fail as a result of the use of leading edge technology. Here there is non-experience to draw on when deploying it. (1 Quotation) (Super, 22/08/03 06:41:51)
P 9: Mgd Intw (T4).txt
244 - 260
No codes
No memos
Type: Commentary

MEMO: Reviews are not held if customer/clinet not keen to participate (0 Quotations) (Super, 16/08/03 10:40:05)
Code(s): [Project: Review: Not happening] [Project: Review: Regularity: Entire project life-cycle]
No memos
Type: Commentary

MEMO: Reviews for smaller projects are not seen as cost effective (0 Quotations) (Super, 16/08/03 10:35:30)
Code(s): [Project: Review: Not happening] [Project: Review: Regularity: Entire project life-cycle]
No memos
Type: Commentary

MEMO: Reviews not carried out for smaller projects->1:353 (0 Quotations) (Super, 16/08/03 10:35:10)
No codes
No memos
Type: Commentary

MEMO: Safety does not seem to be a key requirement to the majority of ICT project managers interviewed (1 Quotation) (Super, 25/08/03 17:50:23)
P14: Mgd Intw (T9). txt
83 - 86
No codes
No memos
Type: Commentary

MEMO: The issue to be aware here is that not all new technology projects are complex (1 Quotation) (Super, 22/08/03 09:04:31)
P 8: Mgd Intw (T3). txt
327 - 338
No codes
No memos
Type: Commentary

MEMO: The project management methodology established the basis of a contract with the client (0 Quotations) (Super, 06/09/03 18:01:36)
No codes
No memos
Type: Commentary

MEMO: The project review process does not happen regularly becuase of the lack of existence of a knowledge management system (1 Quotation) (Super, 23/08/03 10:05:24)
  P10: Mgd Intw(T5).txt
       260 - 273
No codes
Memo(s): [PIR's not happening because of lack of knowledge management systems]
Type: Commentary

MEMO: Will work on any project if price is right (0 Quotations) (Super, 06/09/03 17:44:22)
No codes
No memos
Type: Commentary

Appendix D: Variable Labels

```
/QU 'Q-Index'
/SL 'Start Line'
/SC 'Start Column'
/EL 'End Line'
/EC 'End Column'
/TI 'Creation Date'
/K1 'Budget: Any price'
/K2 'Budget: b/w £0 and £100K'
/K3 'Budget: b/w £100K and £1M'
/K4 'Budget: b/w £1M and £5M'
/K5 'Budget: b/w £20M and £10bn'
/K6 'Budget: b/w £5M and £20M'
/K7 'Knowledge Management'
/K8 'Limitation'
/K9 'Management: Style: Assertive'
/K10 'Management: Style: Changes: Sometimes'
/K11 'Management: Style: Changes: Yes'
/K12 'Management: Style: Changes: No'
/K13 'Management: Style: Formal'
/K14 'Management: Style: In-charge'
/K15 'Management: Style: Inclusive'
/K16 'Management: Style: Informal'
/K17 'Management: Style: Leadership'
/K18 'Management: Style: Mentoring'
/K19 'Management: Style: No'
/K20 'Management: Style: Non-confrontational'
/K21 'Management: Style: Personality'
/K22 'Management: Style: Personality: Comfort Zone'
/K23 'Management: Style: Relaxed'
/K24 'Management: Style: Yes'
/K25 'number of years: <10yrs'
/K26 'number of years: <25yrs'
/K27 'number of years: <5yrs'
/K28 'number of years: >25yrs'
/K29 'Procurement Process/Route'
/K30 'Project: Characteristics'
/K31 'Project: Characteristics: Transparency'
/K32 'Project: Client/ Customer: Requirements and
deliverables'
/K33 'Project: Client/Customer Perception Questionnaire'
/K34 'Project: Client/Customer: Expectations'
/K35 'Project: Deliverables: Cost and Finance'
/K36 'Project: Deliverables: Quality'
/K37 'Project: Deliverables: Quality: Excellent and Good'
```

```
/K38 'Project: Deliverables: Quality: Poor and Bad'
/K39 'Project: Deliverables: Time'
/K40 'Project: Deliverables: Time: Long'
/K41 'Project: Deliverables: Time: Short'
/K42 'Project: Deliverables: Uncertain and Unknown'
/K43 'Project: Description: Business Driven or Strategy'
/K44 'Project: Description: Business Driven or Strategy:
Based on our experience'
/K45 'Project: Description: Client/Customer driven and
facilitated'
/K46 'Project: Description: Complex'
/K47 'Project: Description: Controlled Derivatives'
/K48 'Project: Description: Easier to innovate with private
sector clients than public sector ie government'
/K49 'Project: Description: Highly skilled'
/K50 'Project: Description: Innovation'
/K51 'Project: Documentation'
/K52 'Project: Feedback: Regular: Ad-hoc'
/K53 'Project: Feedback: Regular: At Project Start'
/K54 'Project: Feedback: Regular: Monthly'
/K55 'Project: Feedback: Regular: Project End'
/K56 'Project: Feedback: Regular: Project Life-Cycle'
/K57 'Project: Impact/Influence/Effects/Relationship:No'
/K58 'Project: Impact/Influence/Effects/Relationship:Yes'
/K59 'Project: Management: Methodology: Alternative: No'
/K60 'Project: Management: Methodology: Alternative: Yes'
/K61 'Project: Management: Methodology: Formal'
/K62 'Project: Management: Methodology: Formal: Any change
will be agreed in advance with client'
/K63 'Project: Management: Methodology: Formal: Forms part
of project contract'
/K64 'Project: Management: Methodology: Framework and
Flexible'
/K65 'Project: Management: Methodology: Not used'
/K66 'Project: Management: Methodology: Use: Appropriate'
/K67 'Project: Management: Methodology: Use: Inappropriate'
/K68 'Project: Outcome: Result: Failure: Wrong Solution or
Product'
/K69 'Project: Outcome: Results: Failure'
/K70 'Project: Outcome: Results: Success'
/K71 'Project: Outcome: Influences: Failure: Success/
Failure Acceptance Criteria Not agreed'
/K72 'Project: Outcome: Influences: Poor appreciation and
understanding of customers requirements'
/K73 'Project: Outcomes: Influences: Design'
/K74 'Project: Outcomes: Influences: Environmental Issues'
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/K75 'Project: Outcomes: Influences: Leadership and Senior
Management Support'
/K76 'Project: Outcomes: Influences: Legislation'
/K77 'Project: Outcomes: Influences: Political'
/K78 'Project: Outcomes: Influences: Poor Planning'
/K79 'Project: Outcomes: Influences: Technology'
/K80 'Project: Outcomes: Influences: Technology and
Techniques: Existing'
/K81 'Project: Outcomes: Influences: Technology and
Techniques: New'
/K82 'Project: Outcomes: Influences: Technology:
Appropriate'
/K83 'Project: Outcomes: Influences: Technology:
Inappropriate'
/K84 'Project: Outcomes: Influences: Information'
/K85 'Project: Phase/ milestone or stage'
/K86 'Project: Phase/milestone or stage: End/Completion'
/K87 'Project: Phase/milestone or stage: Life-cycle'
/K88 'Project: Phase/milestone or stage: Start/Commence'
/K89 'Project: Phase/milestone or stage: Start/Commence:
Costing stage'
/K90 'Project: Planning'
/K91 'Project: Qualification: Dependencies'
/K92 'Project: Qualification: Factors, Variables and
Issues'
/K93 'Project: Qualification: Flexible and Different'
/K94 'Project: Qualification: Factors, Variables and
Issues: Culture'
/K95 'Project: Quantity: All'
/K96 'Project: Quantity: Majority'
/K97 'Project: Review: Not happening'
/K98 'Project: Review: Only happening because of posibility
of repeat business'
/K99 'Project: Review: Project End'
/K100 'Project: Review: Project End: PIR: No'
/K101 'Project: Review: Project Start'
/K102 'Project: Review: Regularity: Ad-hoc'
/K103 'Project: Review: Regularity: Entire project life-
cycle'
/K104 'Project: Review: Regularity: Weekly'
/K105 'Project: Review: Regularity: Monthly'
/K106 'Project: Size: Big or Large'
/K107 'Project: Size: Small'
/K108 'Project: Type: Construction: Building'
/K109 'Project: Type: Construction: Civil Engineering'
/K110 'Project: Type: Construction: Commercial'
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/K111 'Project: Type: Construction: Factory'
/K112 'Project: Type: Construction: General Construction'
/K113 'Project: Type: Construction: Hospitals'
/K114 'Project: Type: Construction: Industry'
/K115 'Project: Type: Development, Delivery and
Implementation'
/K116 'Project: Type: ICT'
/K117 'Project: Type: ICT: Infrastructure'
/K118 'Project: Type: ICT: Software Deployments'
/K119 'Project: Type: ICT: Systems and Solutions Delivery'
/K120 'Project: Type: Improvement and Upgrade'
/K121 'Project: Type: Private Sector'
/K122 'Project: Type: Public Sector'
/K123 'Resource: Num. of Employees: b/w 1 and 5'
/K124 'Resource: Num. of Employees: b/w 100 and 500'
/K125 'Resource: Num. of Employees: b/w 20 and 100'
/K126 'Resource: Num. of Employees: b/w 5 and 20'
/K127 'Resource: Personnel'
/K128 'Resource: Personnel: Employees'
/K129 'Resource: Personnel: Matrix Management'
/K130 'Resource: Personnel: Skills'
/K131 'Role: Grade: Middle Management'
/K132 'Role: Grade: Senior Management'
/K133 'Role: Job Title: Client/Customer Project Manager'
/K134 'Role: Job Title: Contract Manager'
/K135 'Role: Job Title: Project Manager'
/K136 'Role: Job Title: Site Manager'
/K137 'Role: Job Title: Team Leader'
/K138 'Role: Project Involvement: Client/ Customer'
/K139 'Role: Project Involvement: Non Project Manager'
/K140 'Role: Project Involvement: Project Manager'
/K141 'Role: Project Involvement: Sub- contractor'
/K142 'Role: Project Involvement: Technical Management'
/K143 'Role: Understanding: Contractor will prefer
experienced project manager to work on political projects'
/K144 'Role: Understanding: Experience'
/K145 'Role: Understanding: Observation'
/K146 'Role: Understanding: Participation'
/K147 'Role: Task: Co-ordinator'
/K148 'Role: Task: Communicating and Interaction'
/K149 'Role: Task: Conflict Management and Resolution'
/K150 'Role: Task: Management'
/K151 'Role: Task: Monitoring'
/K152 'Role: Task: Project and Change Control'
/K153 'Role: Task: Represents Client/Customer'
/K154 'Role: Task: Responsible or decision'
```

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/K155 'Role: Task: Risk Management'
/K156 'Role: Task: Security'
/K157 'Role: Task: Work Package Agreement'
/K158 'Role: Task: Safety'
/K159 'Role: Task: Team Building'
/K160 'Sometimes'
/K161 'Training'
/K162 'Usage: Not Recommended'
/K163 'Usage: Recommended'.
```

Appendix E: Construct Variables- Construction

Originating Primary Codes	Var	Synonyms/derivatives
Role: Job Title: Client/Customer Project Manager	Job Title	Client/Customer Project Manager, Contract Manager, Project Manager, Site Manager, Team Leader
Role: Job Title: Contract Manager		
Role: Job Title: Project Manager		
Role: Job Title: Site Manager		
Role: Job Title: Team Leader		
Role: Grade: Middle Management	Grade	Middle Management, Senior Management
Role: Grade: Senior Management		
Role: Project Involvement: Client/ Customer	Involvement	Client/ Customer, Non Project Manager, Project Manager, Sub- contractor, Technical Management
Role: Project Involvement: Non Project Manager		
Role: Project Involvement: Project Manager		
Role: Project Involvement: Sub- contractor		
Role: Project Involvement: Technical Management		
Role:Task: Co-ordinator	Task	Co-ordinator, Communicating, Interaction, Conflict, Management, Monitoring, Change, Control, Represents, Responsible, decision, Risk, Security, Agreement, Safety, Team- Building
Role:Task: Communicating and Interaction		
Role:Task: Conflict Management and Resolution		
Role:Task: Management		
Role:Task: Monitoring		
Role:Task: Project and Change Control		
Role:Task: Represents Client/Customer		
Role:Task: Responsible or decision		
Role:Task: Risk Management		
Role:Task: Security		
Role:Task: Work Package Agreement		
Role:Task:Safety		
Role:Task:Team Building		
Project: Description: Business Driven or Strategy: Based on our experience	Understanding	Experience, Observation, Participation
Role: Understanding: Contractor will prefer experienced project manager to work on political projects		
Role: Understanding: Experience		
Role: Understanding: Observation		
Role: Understanding: Participation		
Project: Type: Construction: Building	Project Type	Private Sector, Public Sector, ICT, Construction
Project: Type: Construction: Civil Engineering		
Project: Type: Construction: Commercial		
Project: Type: Construction: Factory		
Project: Type: Construction: General Construction		

Project: Type: Construction: Hospitals		
Project: Type: Construction: Industry		
Project: Type: Development, Delivery and Implementation		
Project: Type: ICT		
Project: Type: ICT: Infrastructure		
Project: Type: ICT: Software Deployments		
Project: Type: ICT: Systems and Solutions Delivery		
Project: Type: Improvement and Upgrade		
Project: Type: Private Sector		
Project: Type: Public Sector		
Budget: Any price	Budget	Any price, b/w £0 and £100K, b/w £100K and £1M, b/w £1M and £5M, b/w £20M and £10bn, b/w £5M and £20M
Budget: b/w £0 and £100K		
Budget: b/w £100K and £1M		
Budget: b/w £1M and £5M		
Budget: b/w £5M and £20M		
Budget: b/w £20M and £10bn		
Project: Description: Business Driven or Strategy	Description	Business- Driven, Strategy, Client/Customer driven and facilitated, Complex, Controlled- Derivatives, Highly skilled, Innovation, Documentation, Uncertain, Changes, Sometimes
Project: Description: Client/Customer driven and facilitated		
Project: Description: Complex		
Project: Description: Controlled Derivatives		
Project: Description: Easier to innovate with private sector clients than public sector ie government		
Project: Description: Highly skilled		
Project: Description: Innovation		
Project: Deliverables: Uncertain and Unknown		
Project: Management: Methodology: Alternative: No	Methodology	Alternative, Formal, Framework, Flexible, Not used, Appropriate, Inappropriate, Recommended, Not Recommended
Project: Management: Methodology: Alternative: Yes		
Project: Management: Methodology: Formal		
Project: Management: Methodology: Formal: Any change will be agreed in advance with client		
Project: Management: Methodology: Formal: Forms part of project contract		
Project: Management: Methodology: Framework and Flexible		
Project: Management: Methodology: Not used		
Project: Management: Methodology: Use: Appropriate		
Project: Management:Methodology: Use: Inappropriate		
Useage: Not Recommended		
Useage: Recommended		
Management: Style: Assertive	Management style	Assertive, Changes, Formal, In-charge, Inclusive, Informal, Leadership, Mentoring, Non-confrontational, Personality, Relaxed
Management: Style: Changes: Sometimes		
Management: Style: Changes: Yes		
Management: Style: Changes: No		

Management: Style: Formal		
Management: Style: In-charge		
Management: Style: Inclusive		
Management: Style: Informal		
Management: Style: Leadership		
Management: Style: Mentoring		
Management: Style: Non-confrontational		
Management: Style: Personality		
Management: Style: Personality: Comfort Zone		
Management: Style: Relaxed		
Resource: Num. of Employees: b/w 1 and 5	Resource	Num. of Employees, Personnel, Skills, Training
Resource: Num. of Employees: b/w 100 and 500		
Resource: Num. of Employees: b/w 20 and 100		
Resource: Num. of Employees: b/w 5 and 20		
Resource: Personnel		
Resource: Personnel: Employees		
Resource: Personnel: Matrix Management		
Resource: Personnel: Skills		
Training		
Project: Characteristics: Transparency		Characteristics
number of years: <10yrs	Time	<10yrs, <25yrs, <5yrs, 25yrs, Short, Long
number of years: <25yrs		
number of years: <5yrs		
number of years: >25yrs		
Project: Deliverables: Time		
Project: Deliverables: Time: Long		
Project: Deliverables: Time: Short		
Project: Deliverables: Quality	Quality	
Project: Deliverables: Quality: Excellent and Good		
Project: Deliverables: Quality: Poor and Bad		
Project: Client/ Customer: Requirements and deliverables	Requirements	Deliverables, Expectations
Project: Outcome:Influences:Poor appreciation and understanding of customers requirements		
Project: Deliverables: Cost and Finance		
Project: Deliverables: Time		
Project: Deliverables: Quality		
Project: Client/Customer: Expectations		
Project: Phase/ milestone or stage	Phase/ milestone or stage	End/Completion, Life-cycle, Start/Commence
Project: Phase/milestone or stage: End/Completion		
Project: Phase/milestone or stage: Life-cycle		
Project: Phase/milestone or stage: Start/Commence		
Project: Phase/milestone or stage: Start/Commence: Costing stage		

Project: Qualification: Dependencies	Qualification	Dependencies, Factors, Variables, Issues, Flexible, Different
Project: Qualification: Factors, Variables and Issues		
Project: Qualification: Flexible and Different		
Project: Qualification:Factors, Variables and Issues: Culture		
Project: Size: Big or Large	Size	Small, Big, Large
Project: Size: Small		
Project: Quantity: All	Quantity	All, Majority, None
Project: Quantity: Majority		
Limitation	Constraint	Limitation, unknown
Project: Deliverables: Uncertain and Unknown		
Project: Outcomes: Influences: Design	Influences	Design, Environmental Issues, Leadership and Senior Management Support, Legislation, Political, Poor Planning, Technology, Information
Project: Outcomes: Influences: Environmental Issues		
Project: Outcomes: Influences: Leadership and Senior Management Support		
Project: Outcomes: Influences: Legislation		
Project: Outcomes: Influences: Political		
Project: Outcomes: Influences: Poor Planning		
Project: Outcomes: Influences: Technology		
Project: Outcomes: Influences: Technology and Techniques: Existing		
Project: Outcomes: Influences: Technology and Techniques: New		
Project: Outcomes: Influences: Technology: Appropriate		
Project: Outcomes: Influences: Technology: Inappropriate		
Project: Outcomes: Influences: Information		
Project: Outcome: Result: Failure: Wrong Solution or Product	Outcome	Failure, Success
Project: Outcome: Results: Failure		
Project: Outcome: Results: Success		
Project: Outcome:Influences: Failure: Success/ Failure Acceptance Criteria Not agreed		
Project: Feedback: Regular: Ad-hoc	Feedback	Regular, Ad-hoc, Start, Monthly, End, Life-Cycle
Project: Feedback: Regular: At Project Start		
Project: Feedback: Regular: Monthly		
Project: Feedback: Regular: Project End		
Project: Feedback: Regular: Project Life-Cycle		
Project: Review: Not happening	Review	No, End, PIR, Start, Ad-hoc, life-cycle, Weekly, Monthly
Project: Review: Only happening because of possibility of repeat business		
Project: Review: Project End		
Project: Review: Project End: PIR: No		
Project: Review: Project Start		
Project: Review: Regularity: Ad-hoc		
Project: Review: Regularity: Entire project life-cycle		
Project: Review: Regularity: Weekly		
Project: Review: Regularity:Monthly		

Appendix F: Construct variables Vs originating codes

Construct Variables	Synonyms/derivatives	Originating Primary Codes
Budget	Any price, b/w £0 and £100K, b/w £100K and £1M, b/w £1M and £5M, b/w £20M and £10bn, b/w £5M and £20M	Budget: Any price Budget: b/w £0 and £100K Budget: b/w £100K and £1M Budget: b/w £1M and £5M Budget: b/w £5M and £20M Budget: b/w £20M and £10bn
Management Style	Assertive, Changes, Formal, In-charge, Inclusive, Informal, Leadership, Mentoring, Non-confrontational, Personality, Relaxed	Management: Style: Assertive Management: Style: Changes: Sometimes Management: Style: Changes: Yes Management: Style: Changes: No Management: Style: Formal Management: Style: In-charge Management: Style: Inclusive Management: Style: Informal Management: Style: Leadership Management: Style: Mentoring Management: Style: Non-confrontational Management: Style: Personality Management: Style: Personality: Comfort Zone Management: Style: Relaxed
Time	<10yrs, <25yrs, <5yrs, 25yrs, Short, Long	number of years: <10yrs number of years: <25yrs number of years: <5yrs number of years: >25yrs Project: Deliverables: Time Project: Deliverables: Time: Long Project: Deliverables: Time: Short
Quality	Excellent, Good, Poor, Bad	Project: Deliverables: Quality Project: Deliverables: Quality: Excellent and Good Project: Deliverables: Quality: Poor and Bad
Project Characteristics	Transparency	Project: Characteristics: Transparency
Constraint	Limitation, Unknown	Limitation Project: Deliverables: Uncertain and Unknown
Understanding	Experience, Observation, Participation	Project: Description: Business Driven or Strategy: Based on our experience Role: Understanding: Contractor will prefer experienced project manager to work on political projects Role: Understanding: Experience Role: Understanding: Observation Role: Understanding: Participation
Task	Co-ordinator, Communicating, Interaction, Conflict, Management, Monitoring, Change, Control, Represents, Responsible, decision, Risk, Security, Agreement,	Role:Task: Co-ordinator Role:Task: Communicating and Interaction Role:Task: Conflict Management and Resolution Role:Task: Management Role:Task: Monitoring Role:Task: Project and Change Control Role:Task: Represents Client/Customer Role:Task: Responsible or decision

	Safety, Team- Building	Role:Task: Risk Management Role:Task: Security Role:Task: Work Package Agreement Role:Task:Safety Role:Task:Team Building
Description	Business- Driven, Strategy, Client/Customer driven and facilitated, Complex, Controlled-Derivatives, Highly skilled, Innovation, Documentation, Uncertain,	Project: Description: Business Driven or Strategy Project: Description: Client/Customer driven and facilitated Project: Description: Complex Project: Description: Controlled Derivatives Project: Description: Easier to innovate with private sector clients than public sector ie government Project: Description: Highly skilled Project: Description: Innovation Project: Deliverables: Uncertain and Unknown
Feedback	Regular, Ad-hoc, Start, Monthly, End, Life-Cycle	Project: Feedback: Regular: Ad-hoc Project: Feedback: Regular: At Project Start Project: Feedback: Regular: Monthly Project: Feedback: Regular: Project End Project: Feedback: Regular: Project Life-Cycle
Requirements	Deliverables, Expectations	Project: Client/ Customer: Requirements and deliverables Project: Outcome:Influences:Poor appreciation and understanding of customers requirements Project: Deliverables: Cost and Finance Project: Deliverables: Time Project: Deliverables: Quality Project: Client/Customer: Expectations
Methodology	Alternative, Formal, Framework, Flexible, Not used, Appropriate, Inappropriate, Recommended, Not Recommended	Project: Management: Methodology: Alternative: No Project: Management: Methodology: Alternative: Yes Project: Management: Methodology: Formal Project: Management: Methodology: Formal: Any change will be agreed in advance with client Project: Management: Methodology: Formal: Forms part of project contract Project: Management: Methodology: Framework and Flexible Project: Management: Methodology: Not used Project: Management: Methodology: Use: Appropriate Project: Management:Methodology: Use: Inappropriate Useage: Not Recommended Useage: Recommended
Phase/ milestone or stage	End/Completion, Life-cycle, Start/Commence	Project: Phase/ milestone or stage Project: Phase/milestone or stage: End/Completion Project: Phase/milestone or stage: Life-cycle Project: Phase/milestone or stage:

		Start/Commence Project: Phase/milestone or stage: Start/Commence: Costing stage
Outcome	Failure, Success	Project: Outcome: Result: Failure: Wrong Solution or Product Project: Outcome: Results: Failure Project: Outcome: Results: Success Project: Outcome:Influences: Failure: Success/ Failure
Size	Small, Big, Large	Project: Size: Big or Large Project: Size: Small
Quantity	All, Majority, None	Project: Quantity: All Project: Quantity: Majority
Qualification	Dependencies, Factors, Variables, Issues, Flexible, Different	Project: Qualification: Dependencies Project: Qualification: Factors, Variables and Issues Project: Qualification: Flexible and Different Project: Qualification:Factors, Variables and Issues: Culture
Influences	Design, Environmental Issues, Leadership and Senior Management Support, Legislation, Political, Poor Planning, Technology, Information	Project: Outcomes: Influences: Design Project: Outcomes: Influences: Environmental Issues Project: Outcomes: Influences: Leadership and Senior Management Support Project: Outcomes: Influences: Legislation Project: Outcomes: Influences: Political Project: Outcomes: Influences: Poor Planning Project: Outcomes: Influences: Technology Project: Outcomes: Influences: Technology and Techniques: Existing Project: Outcomes: Influences: Technology and Techniques: New Project: Outcomes: Influences: Technology: Appropriate Project: Outcomes: Influences: Technology: Inappropriate Project: Outcomes: Infuences: Information
Review	No, End, PIR, Start, Ad-hoc, life-cycle, Weekly, Monthly	Project: Review: Not happening Project: Review: Only happening because of posibility of repeat business Project: Review: Project End Project: Review: Project End: PIR: No Project: Review: Project Start Project: Review: Regularity: Ad-hoc Project: Review: Regularity: Entire project life-cycle Project: Review: Regularity: Weekly Project: Review: Regularity:Monthly
Project Type	Private Sector, Public Sector, ICT, Construction	Project: Type: Construction: Building Project: Type: Construction: Civil Engineering Project: Type: Construction: Commercial Project: Type: Construction: Factory Project: Type: Construction: General

		Construction Project: Type: Construction: Hospitals Project: Type: Construction: Industry Project: Type: Development, Delivery and Implementation Project: Type: ICT Project: Type: ICT: Infrastructure Project: Type: ICT: Software Deployments Project: Type: ICT: Systems and Solutions Delivery Project: Type: Improvement and Upgrade Project: Type: Private Sector Project: Type: Public Sector
Resource	Num. of Employees, Personnel, Skills, Training	Resource: Num. of Employees: b/w 1 and 5 Resource: Num. of Employees: b/w 100 and 500 Resource: Num. of Employees: b/w 20 and 100 Resource: Num. of Employees: b/w 5 and 20 Resource: Personnel Resource: Personnel: Employees Resource: Personnel: Matrix Management Resource: Personnel: Skills Training
Grade	Middle Management, Senior Management	Role: Grade: Middle Management Role: Grade: Senior Management
Job Title	Client/Customer Project Manager, Contract Manager, Project Manager, Site Manager, Team Leader	Role: Job Title: Client/Customer Project Manager Role: Job Title: Contract Manager Role: Job Title: Project Manager Role: Job Title: Site Manager Role: Job Title: Team Leader
Involvement	Client/ Customer, Non Project Manager, Project Manager, Sub-contractor, Technical Management	Role: Project Involvement: Client/ Customer Role: Project Involvement: Non Project Manager Role: Project Involvement: Project Manager Role: Project Involvement: Sub- contractor Role: Project Involvement: Technical Management