INFORMATION SYSTEMS PERFORMANCE IN THE CONSTRUCTION SECTOR: THE ROLE OF THE CHIEF EXECUTIVE OFFICER

By

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A DISSERTATION PRESENTED TO THE CAPE PENINSULA UNIVERSITY
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2006

DECLARATION:
by

ANDRÉ BESTER

"I hereby declare that this dissertation/thesis submitted for the degree (Magister Technologiae Information Technology) at the Cape Peninsula University of Technology, is my own original unaided work and has not previously been submitted to any other institution of higher education. I further declare that all sources cited or quoted indicated or acknowledged by means of a comprehensive list of references"

Name: André Bester

Signature:

Date:24/4/2007

DEDICATION

This study is dedicated to my wife Marné and my sons Guillaume and Llewellyn, for their unconditional support and love.

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All the honour goes to God who shows me the way and never let's go of my hand …Deo Gloria!

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The construction industry is reputedly lethargic to adopt innovation and, in particular, new technology. To date it has not readily embraced Information Technology (IT) given its reluctance to recognise the many potential efficiencies and competitive advantages afforded by this technology. Where IT in the form of Information Systems (IS) has been introduced the likelihood of failure and/or inefficiencies is large considering the historic inability of IS to deliver on its potential. Furthermore, this performance of IS is arguably dependent on the role of the Chief Executive Officer in the construction organisation.

This study examines the performance of IS in the construction firms and the role played by the CEO in that performance. The study has four main objectives; namely: (1) to determine the role of the CEO of construction companies relative to IS governance and performance; (2) to determine the role of the CEO of construction companies in determining the structure of IS to strategically support the company; (3) to examine the relationship between the CEO and Chief Information Officer (CIO) and the impact of this relationship on the performance of IS in a construction firm;

and (4) to examine the importance of information processing and knowledge management of construction companies.

To achieve these objectives, the literature on IS performance in the organisation was reviewed; a structured self-administered questionnaire survey was conducted of a sample of executive managers drawn from 9 construction companies; the data was analysed; the findings discussed against the background of the literature reviewed.

The key findings of this study indicate that most of CEOs of construction companies consider IS performance as of strategic importance in their organisations with respect to information processing and knowledge management; and acknowledge the important role of the CIO in IS governance and information management. Furthermore, the CEOs also acknowledge their role in organisational design, and the structuring of IS to strategically support their companies. Drawing from the responses of a sample of CEOs of contracting firms in the Western Cape province of South Africa there appears to be a direct correlation between the role of the CEO and IS governance and performance.

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CHAPTER 1

SCOPE OF THE RESEARCH

1.1 INTRODUCTION AND BACKGROUND

This Master degree dissertation is the result of research conducted at the Cape Peninsula University of Technology. It is the culmination of the research process designed to develop an understanding of the role of the Chief Executive Officer (CEO) of construction companies in the performance of information systems (IS) given the prominence of the construction sector in the Accelerated Strategic Growth Initiative of South Africa (ASGISA).

1.1.1 Information Systems in Construction Management

> "We have increasingly to apply sophisticated technology in doing our work and to understand what our clients need. For those who adapt to meet the changes the future is bright" (Betts,1999:3).

The business world is fast changing, and the shift in emphasis in management in organisations from tactical to strategic is clear. The construction sector is becoming increasingly dynamic, and needs to think differently about how it conducts its Business in a highly competitive environment.

A study by Paulson (1995) as cited by Stewart (2002) identifies that IS/IT can be applied to, and assist, the construction sector in three main areas, namely:

- construction management and administration;
- construction engineering; and
- automated data acquisition and process control.

Betts (1999) highlights the strategic importance of IS in the construction organisation, and shows that IS is critical to business performance of the

organisation. Figure 1.1 show some examples of generic and proprietary types of IS/IT systems which are important in construction. These include, accounting systems, Computer Aided Drafting and Design (CADD), and bills of quantities. Manual systems are important. In preparing, a key tender failure of these systems at the time the bid is to be submitted could be of strategic significance.

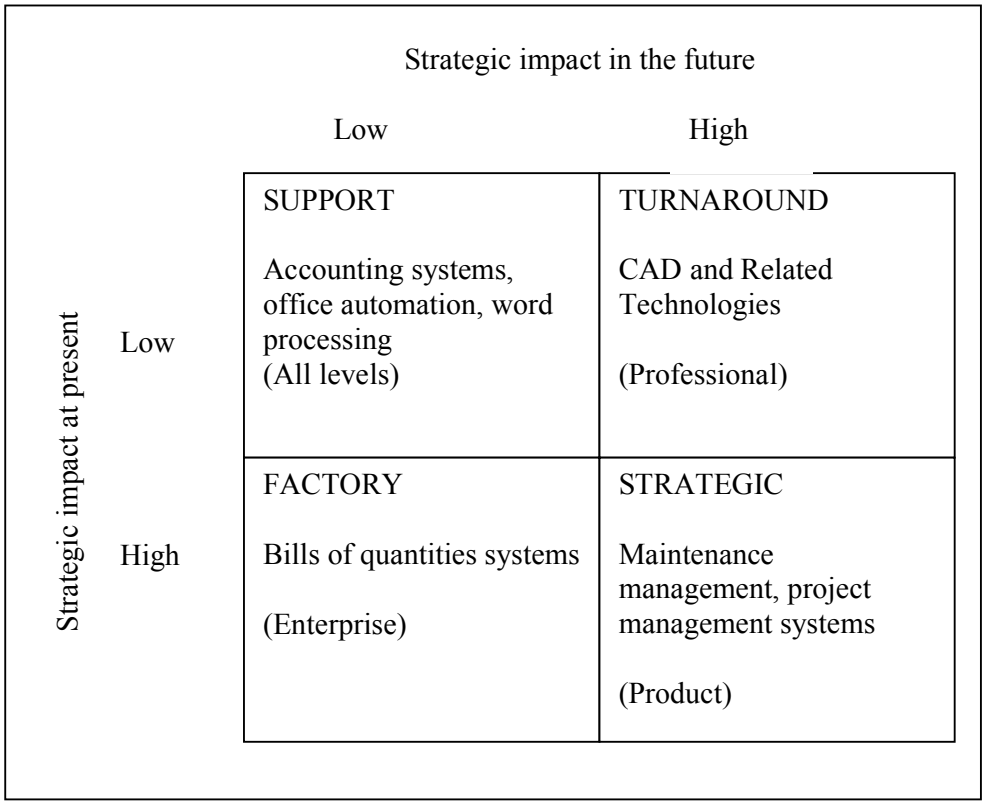

Figure 1.1 Position of information systems in construction organisation (Adapted from Betts, 1999: 98)

Several of the more recent advantages in IS technology that are adopted in the construction industry, include the Internet and World Wide Web (WWW), wireless technology, integrated databases, electronic tendering, videoconferencing and recording.

1.1.2 Barriers to successful IS implementation in Construction Sector

Information is a key resource in the construction sector, and researchers, software developers and practitioners are now applying IS to automate elected phases of the construction process (Betts, 1999). However, given the historic resistance to change by this sector, there appears to be some reluctance that IS can exploit strategic opportunities for the use of IS across the whole construction sector rather than within individual parts of the business processes.

Considering the relatively limited detailed research that has been carried out in this field, Stewart (2002) suggests that it is difficult to define the scope and boundaries of the use and performance of IS in construction. For many construction organisations IS encompasses the use of all electronic means of information transfer, while others see IS as the use of the latest technology, and some see it as part of management strategies. This divergence has led to a number of different IS definitions within the construction sector. Consequently, an information-centric definition might be that IS comprises "the use of electronic machines and programs for processing, storage and presentation of information" (Stewart, 2002:2). This definition illustrates the important role that IS plays in improving the effectiveness of communication and information exchange in the context of managing construction processes. The successful completion of construction projects depends on the accuracy, effectiveness and timing of the exchange of information between the project team members. This exchange can potentially be facilitated by the use of IS (Rono and Arif, 2004).

IS and related technologies provide positive opportunities with which the construction sector can face present and future needs and challenges (Stewart, 2002). However, studies have shown that the construction industry has been traditionally slower than other sectors to adopt IS advances. For example, the construction sector in Australia reportedly lags well behind other industries in its uptake of key IS areas (Stewart, 2002). Compounding this poor uptake is the highly fragmented nature of the construction sector with consequent significant negative impacts in the form of low productivity, cost and time overruns, conflicts and disputes and resultant claims and time-consuming litigation. In South Africa the Construction Industry Development Board (CIDB) reported that only half of all construction projects were completed on time and within budget (CIDB, 2004). Arguably, there is still a fear in the construction sector that investment in IS is risky with the possibility of backing the wrong technology or standards, and constantly having to keep the IS investment up to date (Betts, 1999). Furthermore, past failure to deliver the benefits promised by IS coupled with ongoing difficulty in quantifying the return on investment has also contributed to the reluctance within the construction sector to invest in IS. Stewart (2002) suggests that it is likely that the main problem lies in the way IS is managed, and therefore, this management of IS needs more attention, and improvement. Most companies manage IS through a desentralised structure, with IS typically used by IS specialists for discrete applications that are only used by staff at technical levels (Betts, 1999). Further, CIOs in construction companies do not participate in the formulation of business strategy (Betts, 1999). Strategic IS implementation is important in the context of issues, such as organisational structure, management style and human resource policy.

Many construction organisations appear to approach the management of IS in an unstructured or *ad hoc* manner (Stewart, 2002). The uneasy relationship between executive construction management and IS emanates from a perception by management that IS historically fails to deliver the expected benefits (Betts, 1999). Because of their lack of system knowledge and understanding, executive management is reluctant to support IS (Tucker and Mohamed, 1996). The factors that inhibit the adoption of IS in construction include:

- Resistance from [executive] management;
- Tight profit margins;
- Lack of IS/IT awareness;
- Lack of employee education and training;
- Degree of required organisational change; and
- A belief that the industry is doing well without IS/IT (Stewart, 2002).

The literature suggests ambiguity about the perceived strategic role of IS in the construction sector and its implementation in practice. A multi-national, cross-sector study found that the construction sector did not necessarily lag behind other industrial sectors in its implementation of IS (Clark *et al.*, 1999). A study done by the Council for Scientific and Industrial Research (CSIR) in 2002 suggested that South African construction companies were in line with their international peers with regard to information technology. This finding flowed from a benchmark study completed by the CSIR which looked at information technology in the construction industry. Further, the study reported that South African construction companies value information technology as a key enabler in their businesses and regarded IT as critical for their international competitiveness (CSIR, 2002). A survey carried out in the Western Cape Province of South Africa revealed that most architectural practices had accommodated IS in their operations. The study also found that IS played a key part in the execution of building projects in the

Gauteng Province and many construction companies had benefited from the strategic opportunity offered by IS (Rone and Arif, 2004). The research of Betts (1999) found that despite intensive use of IS in construction companies, none of the case studies revealed an explicit plan for IS use in the organisation.

1.1.3 Information Systems Performance (ISP)

Information Systems Performance has been shown to be related to factors such as top management support, and organisational design, which are important for the successful implementation of IS (Petroni, 2002). Historically there have been more failures than successes with IS (Lakay, 2005). Information systems failure is not a new concept in business literature (Thierry, Zbid and Bakhtiari, 2002). However, it is not an easy task to define at what point in time during the information systems life cycle (ISLC) a system fails. Studies have shown that such failures can be high. For example, failures were found to be as high as 50% (Lyytenin and Hirschheim, 1987), and 70% (Hochtrasser and Griffiths, 1991, Willcocks and Lester , 1991) and Sauer , 1993). Recent studies completed by the Standish Group (2003) found a 70% failure rate for all information technology (IT) projects, where 30% failed outright (cancelled before completion) and the remaining 40% failed over a protracted period of many years - over budget, over-time and less functionality than planned (Hugos, 2003). Gladden (1982) argues that 75% of all IS projects are never completed. Whyte and Bytheway (1996) suggest that 50% of all such projects will be unsuccessful.

Many system failures are due to non-technical issues such as organisational issues which are defined as:

> "… any distinct area of the interface between the technical system and either the characteristics and requirements of the host organisation or individual employees, which can lead to operational problems within the organisation" (Doherty and King, 1997: 105).

Organisational issues can be classified as:

- Impact of the IS on an organisational culture.
- Work practices.
- Need of user participation.
- The importance of senior management commitment (Doherty and King.,1997)

The increasing complexity and size of IS and application software are additional factors that lead to information systems failure (Tolvaden, 1998).

Information Systems Failure (ISF) are both more expensive and more visible than ever before. In the United States of America (USA) alone about $1 trillion was spent on IT in 2002 out of a global IT spend of $2 trillion, representing about 50% of total spend (Gladwyne Software Surety Inc., 2003). Arguably, companies cannot afford spending such vast sums on IT projects given the insignificant 30% success rate that is the current norm (Hugos, 2003). According to Weill and Woodham (2002) as cited by Grewal (2005), the average organisation spends more than 4.2% of their annual revenue on IT, typically accounting for more than 50% of the total capital budget.

According to Doll (1985) the business manager as the owner of the business process and technology needs to take full responsibility for the entire business process while ensuring that every aspect of the business operates successfully, and Bysinger and Knight (1996) supports this notion. Collectively top management in

the form of the Chief Executive Officer (CEO) must provide guidance for all IS activities in the organisation. However, CEOs lack the requisite managerial expertise and confidence to fulfill this function in an increasingly complex technological environment. According to IT Cortex (2005) the primary causes of ISF is *lack* of executive support for IS/IT. Grewal (2005) found that effective organisational IS/IT and governance were important and clarified the roles of executive management, the business and IS/IT. They also noted the lack of executive management goals for IS/IT.

Martin Cobb at the CHAOS University (2003) cites the following famous paradox:

> *"We know why [IS] projects fail; we know how to prevent their failure –so why do they still fail?"*

This study seeks to examine the reasons for and the role of CEOs in ISP in response to this question.

1.2 THE RESEARCH PROCESS

The research process in the context of the business environment is activated when management triggers the need for a decision (Cooper and Schindler, 2003). The researcher needs to develop a theory based on the accumulated body of previous research (Hair *et al.*, 2003). The research process, therefore, provides a roadmap with directions for conducting a research project, and comprises a number of phases (Hair *et al.*, 2003). The research process may be graphically illustrated as shown in Figure 1.2. Oliver (2004) argues that although the various phases of a research project are listed in a linear way, they hardly ever occur in such

sequential way in real life. Cooper *et al.* (2003) suggests that the way to approach the research process is to identify the problem that prompted the research, and then define the research objectives, followed by the research questions. The structure of this research project follows the research process outlined in Figure 1.2

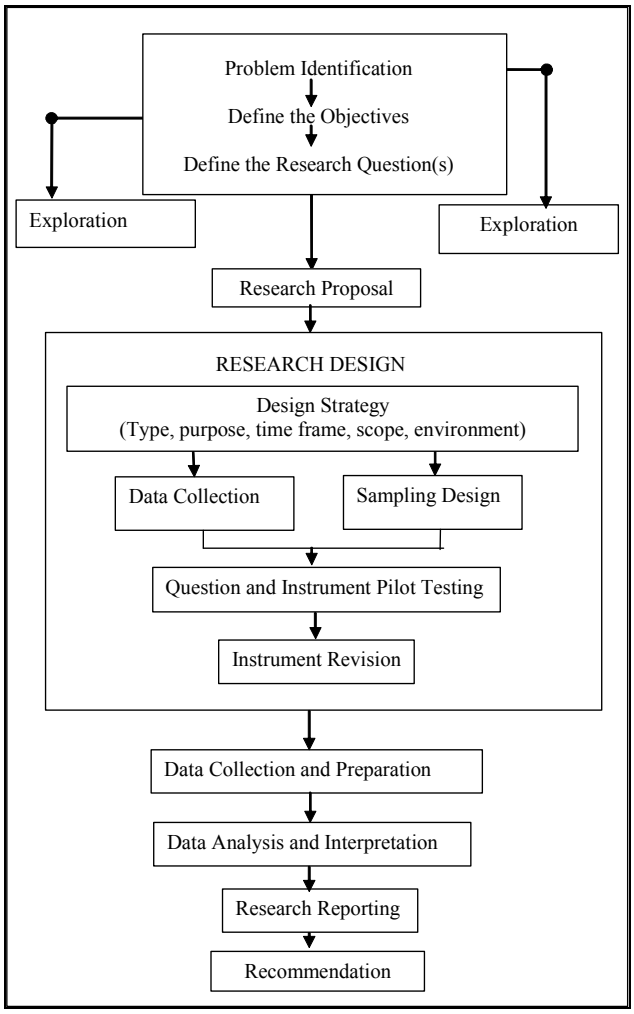

Figure 1.2: The Research Process (Adapted from Cooper (2003)

1.3 THE RESEARCH PROBLEM

ISP is a reality, the extent of which has been the subject of several studies. According to Oram (2002:1) "the total or partial failure of IS is endemic throughout the business world." Brody (2005:1) suggests two important elements in poor ISP, namely:

- Poor ISP is generally not acknowledged until a manager or leader [CEO] declares it to have failed; and
- In studying poor ISP most organisations are not likely to publicly disclose information about failures.

Buuron (2002:12) recognizes the important role of the CEO in IS performance by stating, "I therefore strongly argue IT to be the CEO's responsibility….."

Against this background, the research problem may be stated as:

> "The performance of information systems in construction firms is linked to the role played by CEOs in the governance of their information systems and related technology"

Grewal (2005:1) states, "….that an important factor to achieve an effective IS/IT activity is to have governance that clarifies roles for the executive management, the business, and suppliers of IT services." Furthermore, studies have hinted at the lack of setting of goals for IT by executive management (Grewal, 2005). Weil and Ross (2004) as cited by Grewal (2005) aver (claim) that IS/IT governance in an organisation is not an isolated activity.

1.4 INVESTIGATIVE QUESTIONS

According to Cooper and Schindler (2003) investigative questions are those questions, which must be answered satisfactorily to support the research problem.

For this study these are:

- How important is organisational design in structuring for IS in the construction company for the CEO?
- How important is the role of the CIO in governance of IS in the construction company for the CEO?
- How important is information and knowledge management in the construction company for the CEO?
- How important is the relationship between the CEO and Chief Information Officer (CIO) to the success of IS in a construction firm?

1.5 RESEARCH OBJECTIVES

The objectives for this dissertation are:

- To determine the role of the CEO of construction companies relative to IS governance and performance.
- To determine the role of the CEO of construction companies in determining the structure of IS to strategically support the company.
- To examine the relationship between the "CEO and Chief Information Officer (CIO)" and the impact of the relationship on the performance of IS in a construction firm.
- To examine the importance of information processing and knowledge management of construction companies.

1.6 RESEARCH DESIGN AND METHODOLOGY

According to Yin (2003: 20), a research design can be defined as: "the logical sequence that connects the empirical data to a study's initial research question and ultimately, to its conclusions". Watkins (2006:37) suggests that research design "is an action plan for getting from here to there, where "here" may be defined as the initial set of questions to be answered, and "there" is some conclusion (answers) about these questions". Furthermore, methodology refers to the overall

approach to the research process, from the theoretical underpinning to the collection and analysis of data (Watkins, 2006).

Galliers and Land (1987) identify two tendencies in IS research, namely, the primacy of traditional, empirical research, which is more suited to the natural sciences, and the tendency to advocate a particular mode of IS research, irrespective of the particular topic of IS research being examined. For researchers to gain some insight into what constitutes appropriate research in the field of IS, they must consider the nature of IS itself and then determine what they hope to gain from research in the respective area (Galliers and Land, 1987). Historically, IS research has often been viewed as residing within the area of technology, but increasingly IS academia and practitioners contend that it is more appropriate to extend the focus of IS study to include behavioral and organisational considerations (Galliers and Land, 1987).

The IS researcher must consider the following:

- How will the design connect to the paradigm being used?
- Who or what will be studied?
- What strategies of enquiry will be used?
- What methods of research tools will be used for collecting and analyzing empirical materials? (Evans, 2004)

Qualitative research is an interdisciplinary field – it is therefore perfectly suited for studying organisational behavior and relationship issues in IS field. Although most researchers do either quantitative or qualitative research, this research will use a combined approach, and combine different approaches (Evans, 2004).

Therefore, to achieve the objectives of the research the following process was followed:

- An extensive review of the literature related to the research topic was done.

- Self- administered questionnaires with selected samples of CEOs and construction companies was used to obtain opinions, expectations and attitude of these samples in relation to the research topic.
- Data collected were statistically analysed and the findings from the analysis was discussed and compared against the literature review.
- Conclusions will be drawn and recommendations for future study formulated from the findings of the study.

1.7 DELINEATION OF THE STUDY

The study was limited to the Western Cape Province of South Africa, with the emphasis on the role of the CEO in IS performance in a construction companies. Additionally, only construction companies with IS were included in this study. CEOs were included in the sampling frame.

1.8 ASSUMPTIONS

It was assumed that all CEOs participating in this study:

- Are involved with IS in their companies;
- Make use of IS for strategic decision-making;
- Structure IS to support strategic decision-making;
- Understand the importance of information processing and information management; and
- Will give accurate and comprehensive feedback during the questionnaire interview;

1.9 ETHICAL STATEMENT

To comply with internationally accepted ethical standards, no names of individuals were recorded on research instruments. In this way anonymity was assured. No compensation was paid to any of the respondents for participation in the study. As with other studies, quality respect to the following aspects was assured:

- General conduct and competence of interviewers where interviews and surveys are conducted;
- Correctness and completeness of responses, especially where open ended questions are concerned;
- Quality assurance of data capturing done by encoders; and
- Frequency distributions run to check that all variables contain only values in the accepted range and variable labels.

1.10 STRUCTURE AND OUTLINE OF THE DISSERTATION

The thesis is structured as follows:

Chapter 1 - Introduction In this chapter, the research problem is identified; the research process explained; the research problem, research question, investigative questions and hypotheses are formulated; the research design and methodology are outlined; and the structure of the study described.

Chapter 2 – The role of Information Systems in organisations. This chapter reviews the literature on the role of Information systems in organisations generically with reference to the measurement of factors that contribute to improvement IS performance.

Chapter 3 – The importance of organisational design for IS. This chapter discusses the importance of organisational design for IS, and the role of construction CEOs in IS governance.

Chapter 4 – Research design and methodology This chapter describes the research process followed to achieve the objectives of the study and testing of the stated hypotheses.

Chapter 5 – Analysis and interpretation of survey results. The findings of the study are presented in this chapter and discussed against the literature previously reviewed.

Chapter 6 – Conclusion. The study is concluded in this chapter and final recommendations and considerations for further study are formulated.

1.11 CHAPTER SUMMARY

This chapter introduced key elements, which contribute to Information Systems Performance (ISP) in organisations, and particularly in the construction sector. It furthermore contains the research process followed by the formulation of the research problem, research question and supporting investigative questions. The

important research assumptions and limitations are listed together with an overview of the thesis structure. The significance of the proposed research is outlined. The next chapter will discuss the role of Information Systems in the Organisation.

CHAPTER 2

THE ROLE OF INFORMATION SYSTEMS IN THE ORGANISATION

2.1 INTRODUCTION

The literature reviewed in this chapter relates to the generic role played by information systems in organisations, not necessarily only construction firms and their contribution to the performance of these organisations. The chapter is organised under the following subheadings:

- Information systems in the organisation;
- Role of IS in Construction Management;
- Value of information for organisational success;
- Characteristics of valuable information;
- Business value of information;
- The importance of IS strategic alignment with business strategy;
- Measuring IS success in the organisation; and
- Factors contributing to successful IS.

2.2 INFORMATION SYSTEMS IN THE ORGANISATION

Information systems (IS) in any organisation consist of people, data, communication, hardware, and procedures that are configured to collect, manipulate, store and process data into valuable information and also provide feedback mechanisms that assist organisations to achieve their goals. Since the early 1950s transaction processing systems[1] were the only programs used to record and report transactions. Thereafter COBOL[2] brought programming to the

[1] Transaction Processing Systems (TPS) refer to computer and electronic based systems for recording, processing, and reporting on the day-to-day activities of the organisation.

[2] COBOL (Common Business Oriented Language) refer to a Third Generation programming language developed to support business needs

world of business and changed the face of information systems for years to come (Hambling, 2005). Major information systems in organisations are typically categorised into four basic groups, namely:

- e-commerce[3] and m-commerce[4];
- transaction processing (TPS) and enterprise resource planning (ERP)[5];
- management information systems (MIS)[6] and decision support systems (DSS)[7]; and
- specialised business information systems.

Information systems are deeply embedded in any organisation. As such they are typically found in all the functional areas of business and industry (O`Brien, 2001; Stair and Reynolts, 2006; Oz, 2004). Organisations are continually faced with challenges both internally and externally and therefore need to adapt in order to survive. According to Palanisamy (2005), IS must therefore also be able to change or adapt and adjust in response to new conditions and demands internally as well as externally. Given its role in supporting business change IS has a major impact on all levels of the organisation (Evans, 2004). Three major stages were identified during the last 45 years in the business use of information systems (Stair, 2005). During the 1960s and beyond IS concentrated on cost reduction and productivity while not contributing to increasing the sales side of businesses. During the 1980s the focus of IS shifted towards gaining competitive advantage.

[3] E-commerce is a way organisations conduct business using the internet, classified as business-to-business(B2B), or business-to-consumer (B2C) or consumer-to-consumer (C2C).

[4] m-commerce refers to the use of mobile devices to conduct business.

[5] Enterprise resource planning (ERP) refers to sets of integrated programs capable of managing a company's vital business operations.

[6] Management information systems (MIS) refer to an organized collection of people, procedures, software, databases and communication devices used to provide routine information to managers and decision-makers.

[7] Decision support systems (DSS) refer to an organized collection of people, procedures, software, databases and communication devices used to support problem-specific decision-makers.

Consequently huge amounts were invested on IS with low success rates while not considering the cost implications. The high levels of spending on IS led business leaders and IS executives to change IS towards performance-based management, considering strategic advantage and cost, focusing on productivity, return on investment, net present value, and other performance measures. The benefits of investment in IS to organisations are not easily quantifiable. IS has over time become important and critical to the survival of businesses. Consequently, IS must be viewed as an asset rather than a cost to the organisation, supporting and benefiting it by enhancing the prospects of reaching strategic goals, becoming the business driver that changes the way organisations operate and compete (Yasin and Quigley, 1994; Ramakrishna and Lin, 2002). According to Buuron (2000), IS has evolved beyond the role of mere infrastructure in support of business strategy to become the business strategy itself.

The strategic importance of IS for organisations is widely acknowledged. According to Ramakriskna (2002) and Chan (2000), the role and impact of IS in organisations is becoming increasingly critical. Further, "Information systems are transactional and operational; they help an organisation to automate many of the main operational processes; they improve efficiency but their effectiveness is often suspect" (Daniels, 1998: 167). IS and related technologies play a strategically significant role in the business as a mechanism to lower cost. IS provides functionality software, which enables interaction between customers and suppliers, while becoming a vehicle for customer satisfaction. Furthermore, technology [IS] has strategic significance for competitors through:

- altering industry structures;
- supporting cost and differentiation strategies; and

- initiating complete new business ventures (Buuron, 2002).

Given the strategic importance of IS, reports show that IS spending ranks as one of the top three strategic corporate investments made by organisations. According to Remenyi and Sherwood-Smith (1999), 50% of all business investments are directed at IS.

The organisational role of IS in business organisations is driven by the business environment the organisation operates in. Globalisation of the business environment has forced businesses to operate in different cultural settings. IS is used to scan the global business environment and process the data to provide business leaders and decision-makers with valuable information to formulate and implement business and marketing strategies. The input subsystems of the business organisation, such as value - and supply chain management, rely on IS to function efficiently and effectively. Information systems are the backbone of automation, the process subsystem which is responsible for all automation in the organisation rely on IS for support. Yasin and Quigly (1995: 34) state as follows:

> "Information systems are a basic infrastructure of the modern business organisation; they [IS] co-ordinate the resources and activities of the input, process and output subsystems of the organisation, thus monitoring and ensuring internal efficiency".

IS can be used to scan the external environment and internal operations continuously to ensure that organisational effectiveness is achieved (Yasin and Quigly,1995; Stair and Reynols, 2006). The output of the subsystems of the business organisation must be accurate. IS plays a critical role in supporting the management process of quality assurance systems for the organisation (Lyytinen,

1997; Yasin and Quigley,1995; Stair and Reynolds, 2006). O'Brien (2002) identified the fundamental roles of IS in business as support of:

- Business processes and operations;
- Decision making by employees and managers; and
- Strategies for competitive advantage.

While Stair and Reynolds (2006) refer to three stages in the business use of IS, namely:

- Cost reduction and productivity;
- Competitive advantage ; and
- Performance-based management.

IS additionally supports financial performance and operational efficiency (Saunders, Stoaks and Williams,1992). Since the introduction of computer technology in the 1960s to support business needs, system developers have been driven by the ever increasing demand to develop better and faster business systems to the point where they now strongly rely on IS and computer technology (Page, 1998). The role of IS before and up to the 1960s, was based on simple electronic data processing (EDP) applications and gradually more roles were added to support management decision making processes (O'Brien, 2001). Important application developments took place, and application systems such as decision, strategic and end-user support systems were developed, followed by the fast growth of connectivity technology during the 1990s, all of which have dramatically changed the capabilities of IS.

Given the supportive role of IS in business it therefore needs to support the following:

- Routine cost saving through automation and operation tasks;
- Strategic necessities such as the acquisition of new technology; and
- Strategic IS to ensure technological assertive strategy.

Top management must realise the strategic value of IS, and the impact it has on an organisation and ensure long-term sustainability of the organisation. Table 2.1 illustrates the positive impact of IS on organisations (Remenyi and Sherwood-Smith, 1999).

Table 2.1: Organisational Dimensions (Adapted from Remenyi (1999)

Organisational Dimension	Business benefits of using IS
The reduction of time and space	IS contributes to the response time of organisations, which improves organisational performance – time is money. Furthermore IS contributes to reducing space – organisations can operate from different locations anywhere in the world, using e-commerce applications.
Creating a corporate memory	IS enhances the performance of individuals and groups through intellectual leverage. IS manages and stores data and information in databases. Data warehouses collects business information from many sources in the enterprise, covering all aspects of the products, and customers of the company.
Binding the organisation closely with clients and suppliers	Marketing relies on IS for support in different ways, namely • Inter-organisational systems to support e-trading; • Electronic data interchange; • Mobile or wireless communications; and • Data marketing.
Developing continuously	Business re-engineering and business transformation initiatives rely heavily on IS and may be seen as one of the direct benefits of using this technology.

The success of these four organisational dimensions relies on the accuracy of IS to process the data and information needed for organisation business leaders to plan and execute their corporate strategy.

2.3 ROLE OF IS IN CONSTRUCTION MANAGEMENT

The construction sector can benefit from IS/IT through the following:

- Providing a major integrating force to overcome problems of fragmentation;
- Enabling construction companies to have more accurate and timely information about their projects and their business;
- Enabling new and improved products and special services to be provided;
- Improving quality and certainty of outcome; and
- Adding value to clients from an improved construction process (Betts, 1999).

The potential, use and benefits of IS for construction companies can be further summarized as follows:

- Project planning and scheduling;
- Estimation and tendering;
- Project management and cost control;
- General administration and accounting;
- Asset management;
- Electronic transfers;
- E-mail for exchange of documents/information;
- Quality assurance management; and
- Drafting (Stewart, 2002).

In addition to these opportunities, other significant benefits using IS include:

- A significant increase in turnover, in which IS played a crucial role;
- Faster and cost effective communication to the extent that significant investment in IS is expected to pay for itself within two years;
- The ability to manage construction projects despite large distances between head office and site offices; including real-time audio-visual linkage to review and discuss/construction issues;
- The ability to overcome shortages of skilled workers by integrating process through the intensive use of IS in of site pre-manufacturing processes;
- Early detection and resolution of problems related to project management; and
- Significant reduction in re-work and duplication.

Other researchers such as Love *et al.* (1996) as cited by Stewart (1999) confirmed that other benefits to be gained through the use of IS are:

- Process improvement;
- Decision-making processes;
- Productivity improvement;
- Information storage, handling and transfer; and
- Information access and retrieval.

The study by Paulson (1995) as cited by Stewart (2002) identified 18 sub-categories within the three main areas previously identified that further illustrate where IS can be applied and support the construction industry, namely:

- Accounting and pay roll;
- Cost Engineering;
- Company and project finance;
- Project Planning and scheduling;
- Materials management;
- E-commerce/e-business;
- Human resources management;
- Office administration;
- Education and training;
- Tendering process;
- Design stage;
- Communications;
- Integration;
- Process re-engineering;
- Construction Management;
- Facilities management;
- Benchmarking; and
- Simulation and virtual reality.

2.4 VALUE OF INFORMATION FOR ORGANISATIONAL SUCCESS

The concept of information in the organisational context is far more complex and difficult than the frequent use of the common word would suggest (Lucey, 2005: 17). The usage of the word "information" is common practice within all levels of organisations, and considered as both factual and numeric. Information is data that is organised and imbued with meaning or intelligence resulting from the assembly, analysis, or summary of data into meaning form (Volpe National Transportation Center, 1998).

In the business world, information is a set of facts organised in a way that adds value to an organisation. Information is necessary for problem-solving and in decision-making. Businesses need to understand that information is one of their most valuable resources (Moody and Walsh, 1999). During the so called "information age" businesses became aware of the importance of [valuable] information, and recognised information as an asset separate from the technology

that processes, stores and retrieves it (Evans, 2004). Technology serves as the vehicle to deliver information, for whatever purpose it will serve in the organisation. Moody and Walsh (1999: 1) quote Drucker, an expert in the field of management, by claiming that since the economy is being organised around the flow of information, the importance of information is stressed. Information like many other organisational assets is a non-physical or intangible asset, has a cost and worth to the organisation. Moody and Walch. (1999:02) suggest that:

> "While it [information] consumes vast and ever increasing quantities of organisational resources in terms of data capture, storage, processing and maintenance, it typically receives no financial recognition on the balance sheet. While hardware and rarely software assets are capitalised, the valuation of information was largely ignored, even though this is a much more valuable asset from a business viewpoint."

From Table 2.2 it is evident that a number of laws or principles could arguably govern information. Information has no value if it has no importance to the decision maker or to the outcome of the decision. Lucey (2005: 15) claims that:

> "information has no value in itself; its value derives from the value of change in decision behaviour caused by the information being available minus the cost of producing the information.".

The user of information becomes pivotal in the process in the sense that the information used improves or confirms decision-making.

Table 2.2: Laws of information Adapted from Moody and Walch (1999: 4-10)

Law	Principle	Summary discussion
1	Information is (infinitely) shareable	Information as an asset is shareable between any number of users, business areas and organisations sharing increases its value. There is a tendency that people [can or will] deny others access to information resulting in the loss of business opportunities and duplicating of information.
2	Value of information increases with use	Information on its own has no real value, but the value increases the more it is used. The major cost of information is in its capture, storage and maintenance. Information should be available, its location and how to use it. Users must be information literate to use it effectively.
3	Information is perishable	Information tends to depreciate over time, known as the Information Life Cycle: operational shelf life, decision support shelf life and statutory shelf life. Information tends to have a very short useful lifetime at the operational level. Obsolete information is then processed for decision support and analysis using data warehousing techniques.
4	The value of information increases with accuracy	The more accurate the information system can process data into information, the more useful and valuable it becomes. If decision makers know the level of accuracy of information, they can use an error margin in their decision process. In practice accuracy of data are rarely measured, seems that users rely rather on subjective and untrustworthy opinion and evidence.
5	The value of information increases when combined with other information	Information becomes more valuable when compared with other information. The lack of integration in operational systems is a major obstacle to producing decision support information.
6	More is not necessarily better	Information overload cause major problems for users and decision makers as they seek for more information than they can optimally process in order to avoid mistakes and reduce uncertainty. Research show that information over load leads to reduced productivity of decision-makers. On the other hand, more information tends to increase confidence and satisfaction with the decision by the decision-maker..
7	Information is not depletable.	Information is self-generating, the more it is used, the more new or derived information are created, when combined it creates a new set of information. This is why information is not a scarce resource.

Decision-makers at all levels within firms link the value of information directly to how organisational goals are achieved or not achieved. Managers and decision makers rely on valuable information. Consequently, useful information has certain characteristics and attributes.

2.5 CHARACTERISTICS OF VALUABLE INFORMATION

Valuable information is necessary for sound problem-solving and decision-making and must be useful. Many authors use attributes to outline information quality and usefulness (Oz, 2004; Stair, 2005; Lucey, 2005). Table 2.3 below outlines the characteristics of valuable information as perceived by various authors.

Table 2.3: Matrix of characteristics of valuable information

Characteristics	Oz (2004)	Stair (2005)	Lucey (2005)
Accuracy	✓	✓	✓
Complete	✓	✓	✓
Relevant	✓	✓	✓
Timely	✓	✓	✓
Economical	✓	✓	
Simple		✓	✓
Reliable		✓	✓
Verifiable		✓	
Flexible		✓	
Accessible		✓	
Secure		✓	
Communication			✓
Understandability			✓
Current	✓		

From Table 2.3 the characteristics of accuracy, completeness, relevance and timeliness are common to all three authors. It is evident that there is a cross index of characteristics identified and used by different researchers, identifying the

importance of valuable information. O'Brien (2001) presents information as having three dimensions, namely, time, content and form as shown in Table 2.4.

Table 2.4: Dimensions of Information Adapted from O'Brien (2001: 49)

Time Dimension		**Content Dimension**		**Form Dimension**	
Timeliness	When is it needed	Accuracy	Be free of errors	Clarity	understandable format
Currency	Be up-to-date	Relevance	Should be relevant to the recipient of the information	Detail	detail or summary form
Frequency	As often as needed	Completeness	All necessary information should be provided	Order	arranged in predetermined order or sequence
Time Period	About past, present, and future	Conciseness	Only the needed information should be provided	Presentation	Presented in narrative, numeric, graphic forms
		Scope	Broad or narrow scope, internal or external focused	Media	Printed paper documents, video display, or other media.
		Performance	Reveal performance by measurement criteria		

The Volpe National Transportation Center (1998), describes the benefits of valuable information as:

- Reducing costs;
- Saving time;
- Improving decision-making; and
- Yielding customer satisfaction.

According to Harrington (2005), a successful company needs to focus on parts of the organisation, optimizing the use and effectiveness of all resources. It is argued that the success of any company is based on five pillars, namely process, project management, change management, resource management, and knowledge management. Term "knowledge management" has entered the business world and the research language and became widely used today (Evans, 2004: 7). Knowledge management is the organisations most valuable asset and the key to organisational success.

For organisations, "to fulfill this need, the internet and other IT technology have provided all of us with more information than we can ever consume" (Harrington, 2005:113). Given that IS plays an important role in supporting all the pillars mentioned, it is imperative that IS adds value to the business.

2.6 BUSINESS VALUE OF INFORMATION SYSTEMS

According to Carr (2003) and Buuron (2002), it is estimated that organisations allocate more than 50% of their capital expenditure on IS and related technologies, a staggering $2 trillion worldwide. Huge investments on IS places increasing pressure on top management to justify the outlay by quantifying the business value of IS. However, Carr (2003) also argues that IT[8] has become a commodity, available to everyone and therefore no longer offers strategic value. Tallon, Kraemer and Gurbaxani (2001) argue that IS must necessarily add value

[8] The terms "information technology" (IT) and "information systems" (IS) are used interchangeably by various authors, but the term IS will be used throughout this research document.

and positively impact the performance of companies. However many executives remain sceptical about the payoffs from IS. Cronk and Fritzgerald (1999: 44) define IS business value as:

> "the sustainable value added to the business by IS, either collectively or by individual systems, considered from an organisational perspective, relative to the resource expenditure required"

Because of the complexity of the IS business value construct, and how IS adds value to the organisation, Cronk and Fritzgerald (1999: 46) proposed three dimensions of "IS business value"namely

- **System dependence dimension***:* Value attributed as a result of the type and characteristics of the systems and reflect a certain system quality, such as accuracy, response time and timeliness.
- **User dependent dimension:** Value attributed as a result of user characteristics, user skills and attitude, reflected in the quality of the effectiveness of the systems; and.
- **Business dependent dimension:** Value attributed because of alignment with business strategy in realisation of business goals

Table 2.5. Most popular dimensions of IS business value Adapted from Kraemer *et al.*, (1994: 1)

Organisational Efficiency: refers to the potential impact of IS on cost through reduced labour, which help to increase profits.
Organisational Effectiveness: refers to the potential impact of IS on improved functions of the firm as an organisation in areas such as decision-making, communication, coordination, planning and business process.
Business Innovation: refers to potential impact on business ability to introduce new products and services quickly, improve quality, value and delivery time to customers.
Economics of production: refers to potential impact of IS in helping to achieve economies in production processes of companies through the reduction of design labour and customization cost through improved production out put, and improved utilisation of physical and human resources.

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According to Tallon *et al.*(2001), executive management view the value of IS as:

- the effect of IS on the strategy of the company;
- the risk of the IS investment;
- the success of IS development process; and
- the usability of the resulting IS system in the organisation.

Top executives view the value of IS as important to modern business, and IS has a significant impact on business strategy (InfoWorld, 2001). According to Bytheway (2003) only 6% of organisations make an effort to manage the delivery of the business benefits intended to come from IS investments. In the study conducted by Kraemer *et al.* (1994) into 10 dimensions of business value, the four dimensions that received the highest rating by the top executives are depicted in Table 2.5.

The business value of IS is not cast in concrete and is dynamic. Studies have shown that its importance for business executives changes over time. Kraemer *et al.* (1996) conducted a similar study to the one completed in 1994, with different outcomes in the ranking of the dimensions. The study confirms that different industries (service and manufacturing) ranked the importance of the dimensions differently. The top four important dimensions for executives from the 1996 study are ranked as shown in Table 2.6.

Table 2.6: Industry views of business value Adopted from Kreamer *et al.*, (1996: 01)

Manufacturing Industry	**Service Industry**
Customer relations	Customer relations
Product and service enhancement	Organisational efficiency
Marketing support	Organisational effectiveness
Competitive dynamics	Product and service enhancement

Recent research completed by Goh and Kaufman (2005) and Buuron (2002) indicated that the return on IS investment may not be immediate and might take years to add value to the organisation, referred to as value latency. IS value

latency is the inherent lag in business value returns after implementation of a new IS investment and typically occurs in three phases as shown in Figure 2.1. The phases are continuous, and can overlap each other.

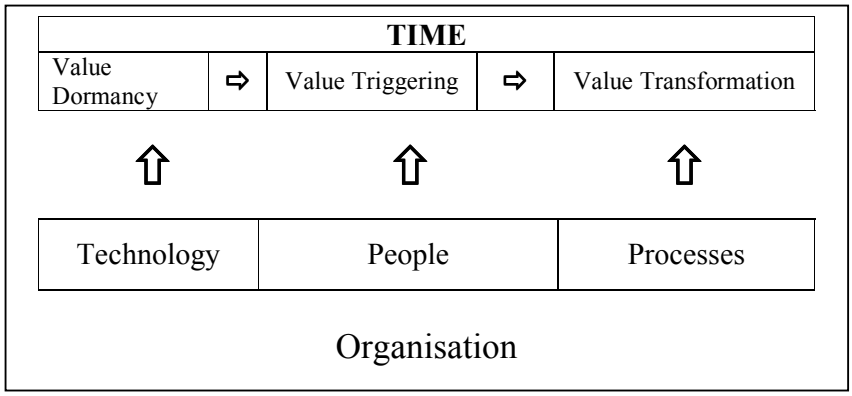

Figure 2.1: IS Value Latency (Adapted from Goh and Kaufmann (2002: 12)

Technology, people and processes impact the phases. Value dormancy is the period after the IS investment is made. The value flow may take time to materialise. The value triggering phase is set off through changes in organisational routines and structures. This phase is typically characterised by high co-ordination costs, which impact on the IT value.

According to Mondragon, Lyons and Kehoe (2004), the perceived value of IS for any organisation is as depicted in Figure 2.2. The broken link between IS and the Value represents the difficulty managers encounter in justifying benefits for IS.

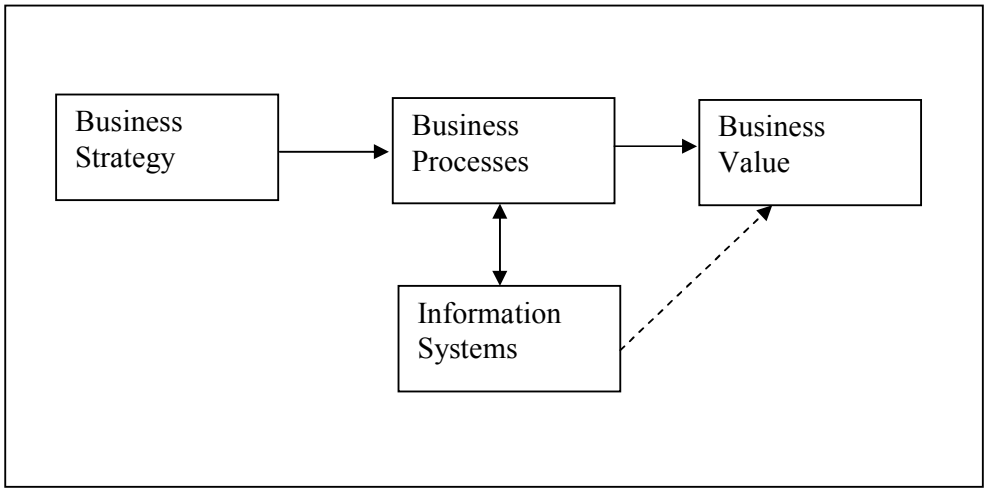

Figure 2.2: IS Contribution and Value (Adapted from Mondragon *et al.*, 2004: 1221)

Business executives are, therefore, required to understand the dynamics involved in how IS reaches its full potential and adds value to their organisation as a whole.

2.7 THE IMPORTANCE OF IS STRATEGY ALIGNMENT WITH ORGANISATIONAL STRATEGY

According to Buuron (2000) IS has developed as the new channel for competitive advantage in the business environment. IS has become the dominant factor in achievement of business excellence with its unique capabilities – speed (velocity) in terms of data processing and providing [valuable] information. According to Ndede-Amadi (2004) it is important that organisational strategies drive technological strategies, not the other way around. Organisations identify corporate and IT strategies. They accordingly use information systems to integrate and manage the link.

Suwardy, Ratantunga, Speight and Sohal (2003) suggest the reasons that motivate organisations to invest in IS include the need:

- to increase operational efficiency;
- to provide improved information management;
- to reduce cost of the organisation;
- to obtain and maintain competitive advantage; and
- to meet and satisfy customer expectations.

IS and its related technologies cannot operate in isolation in generating the information needed by decision-makers. Due to the rapid growth and complexity of IS applications, executive management is concerned about co-ordination between organisational and IS directions. The lack of synchronisation or misalignment of IS and businesses results in undermining strategy and decreasing organisational performance.

According to Ragunathan, Ragunatham, Tu and Shi (2001) there is a consistent emphasis in IS management literature on the need for a proper fit [alignment] between organisational goals and strategies, and IS goals and strategies. Effective strategies provide internal consistency between IS goals and organisational goals. Consequently, the alignment of IS goals and strategies with the businesses strategies should be regarded as a critical success factor. Appropriate IS management strategies that fit with culture, technology and business strategy are required by organisations. Ragunathan *et al.* (2001) identifies three levels of strategy that relate to information systems as depicted in Figure 2.3, namely

- IS strategy is concerned with what a business should do with technology, and is application oriented.
- IM strategy is concerned mainly with the roles and structures for the management of IT and IS and is management oriented;
- IT strategy is concerned primarily with technology policies, top management's involvement with the alignment of business strategy, and is delivery oriented.

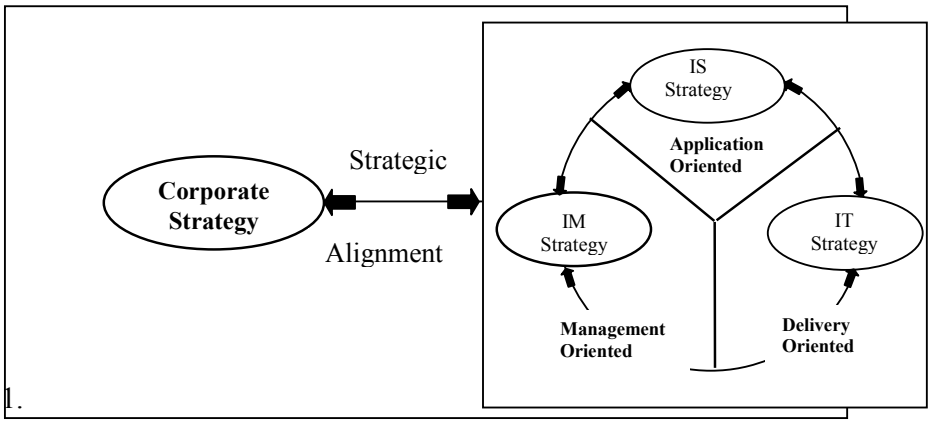

Figure 2.3: Information Systems - and Organisational Strategy. (Adapted from Ragunathan *et al.*, 2001)

Corporate strategy guides the company's activities and resources and establishes priorities to ensure alignment with corporate goals and measures. IS must align itself with the organisation strategy. Tallon (2001) defines strategic alignment as:" the extent to which the IS strategy supports and is supported by the business strategy". The strategic alignment linkage with IS strategy is clearly shown in Figure 2.2. Strategic alignment is important for any business to ease the development and implementation of cohesive organisation and strategies. Strategic alignment brings a new perspective on IS and its role in the development of business strategies. It considers both the strategic fit[9] between business and IS. Strategic alignment addresses both strategy and infrastructure concerns to achieve alignment among these areas. Therefore, strategic alignment should be one of the key concerns of business executives (Peak, 2005; Bakos, 1986; Lee *et al.*, 2003;Varghese, 2004). Given the continuous changing environment of IS and escalating cost to the company, along with its strategic value, measuring the value and performance of IS becomes increasingly important (Evans and Hoole, 2004; Evans, 2004; Saunders, 1992).

[9] Fit defined as the alignment of external and internal environments within an organisation.

2.8 MEASURING IS SUCCESS IN THE ORGANISATION

The modern business is complex, has many elements that are highly related and interconnected while functioning in a dynamic competitive environment. Given its strategic importance of and the large financial spend on IS it is necessary to be able to evaluate its value to the organisation in the same manner as with any other business function (Serafeimidis and Smithson, 1999; Lubbe and Remenyi,1999). Therefore, for IS to add value to the organisation it requires the same degree of planning, visibility, measurement, and control of investment that would be applied in any other business area (Jennings, 2005). Delone and Mclean (2003:10) argue that:

> " the measurement of Information Systems (IS) success or effectiveness is critical to our understanding of the value and efficacy of IS management actions and IS investments".

According to Farbey *et al.* (1992), evaluation can serve four different objectives in the organisation, namely

- Evaluation may used as part of the process of justification of a system;
- Evaluation enables an organisation to make comparisons between different projects competing for resources;
- Evaluation provides a set of measures, which enables the organisation to exercise control over the project; and
- Evaluation and the subsequent measurement and comparison with actual achievements provide a learning experience which is necessary if the organisation is to improve its system evaluation and development capability.

The complexity of IS makes evaluation a complicated process for any organisation. According to Branchea (1987). measurement [IS performance] has long been a problem for IS executives. While measurement of performance is

crucial for sound management, few concrete measures exist for assessing the health of IS organisation. Quantifying IS investment into monetary terms is not easy because of the intangible benefits that are hard to measure (Hubbard, 1997). Organisations also incur IS cost "primarily to minimize risks rather than for any specific benefit to the company" Suwardy (2003). In many organisations, accounting principles are the drivers for IS investment decisions and accounting techniques are used for evaluation. Furthermore, numerous information systems evaluation methodologies have been proposed, but most models are not successful, and not often used (Hallikainen, 1999; Singleton, McLean and Altman, 1988). A survey done by CIO Surveys (2001) on measuring IS value in the organisation noted the following measures being used, namely

- Priority level: as extremely important priority;
- Frequency: IS value are measured more frequently than the traditional budget cycle required; and
- Metrics: most frequently used IS return on investment (ROI), followed by total cost of ownership (TCO) and then internal rate of return (IRR).

Measuring a company's IS value involves total commitment and participation of all role players in the organisation.

> "The effort of creating and realizing a company's IT value needs to be undertaken as a co-operative and complementary interaction between IT and business. In today's' business, where IT is business and business is IT, the value of IT is affected through the IT/business partnership" Tanaszi (2003: 1).

Laudon (2000) suggests that the five most important measurements of a successful IS are:

- System usage: The more the system are used the greater the feedback pool from all the users.
- User satisfaction: Are the users satisfied with the system?
- Favorable attitudes: How well are the system and the users supported by technology?
- Achieved objectives: How well does the system support the strategic goals of the business?
- Financial payoff: Is the system worth the cost layout?

The evaluation-gap is a major problem facing IS and business in measuring IS success. Evaluation-gap refers to the fact that the initiators [top management and users] become distanced from the project development and the developers lose sight of the primary or business objectives of the IS project. Consequently, the primary stakeholders in the effectiveness of the IS system become disenfranchised. Remenyi (1999) is of the opinion that top management very seldom revisits the evaluation process to determine whether the investment made contributes to achieving the original business objective. The lack of the continuous involvement of management in IS evaluation arguably can lead to business failure. Many CEOs consider themselves unqualified to participate directly in decisions regarding IT. They express personal frustration at being unable to evaluate IT proposals [projects] (Jarvenpaa, 1999).

In a recent study it was established that only 16% of the organisations surveyed used accurate methods to evaluate and prioritize their IS investments (Nijland, 2005). Furthermore, Whittaker (2001) is of the opinion that IS as a system is constantly ambiguous, and the outcomes of the system, are directly influenced by it being a socio-technical system, the nature of which is such that outcomes cannot be determined in advance, or with any certainty. For IS to be managed effectively, management control mechanisms need to be in place to measure and evaluate potential benefits and cost. The evaluation feedback loop helps trace, understand and improve the underlying factors leading to success (Nijland, 2005; Evans, 2001). The research of DeLone and Mclean.(2003) was instrumental to designing the first model for IS evaluation, which is known as the D&M IS

Success Model[10] and examines six success categories namely, (1) Information quality, (2) System Quality, (3) Service quality, (4) Intention to use, (5) User satisfaction, and (6) Net benefits. This model attempts to capture the multidimensional and interdependent nature of IS success. In their study to aid future measurements of IS function performance Saunders and Jones (1992) found it necessary to identify those dimensions of performance that are important to practitioners and researchers Their model (IS Function Performance Evaluation Model) differs from the well cited D&M IS Success Model in that it concentrates on ten dimensions of IS performance. The ten dimensions are:

- IS impact on strategic direction;
- Integration of IS and corporate planning;
- Quality of information outputs;
- IS contribution to the organisational performance;
- IS operational efficiency,
- User/Management attitudes;
- IS staff competence;
- Integration with related technologies across other organisational units,
- Adequacy of systems development; and
- IS personnel development.

One of the major assumptions of DeLone and Mclean study was that the "CEO plays a key role in the evaluation of the IS function" (DeLone and Mclean, 2003). The mean rating of the finding was 4.07 on a scale of 5, indicating the importance of the executive management role in IS evaluation and success. The success of the organisation efficiency is determined by how the organisation uses the measurement tools available to evaluate the IS success factors which play an important role in IS governance.

[10] The DeLone and McLean IS Success Model (1992 and updated in 2003) serve as a framework and model for conceptualising and operationalising IS success. Many empirical studies have validated the model, nearly 300 articles in refereed journals refereed to the model (DeLone and McLean, 2003).

2.9 FACTORS CONTRIBUTING TO IS SUCCESS

According to Wateridge (1998), there is consensus that the success criteria of time, cost and user requirements define IS success. Fortune and Peters (2005) define success in the IS context as: "The system achieved that which was intended of it; it was operational at the time and cost that were planned; the project team [IS] and the users are pleased with the result and they continue to be satisfied afterwards". The research of Wateridge (1998) identifies the important criteria for IS success as:

- Meeting user requirements;
- Achieving purpose;
- Meeting timescales;
- Meeting budget;
- Having happy users; and
- Meeting quality standards.

Research by Jawad and Revees (1997) also identified several factors associated with success or failure in the acquisition of IS. Their factors are catogorised under the headings of:

- Technological factors;
- Organisational factors;
- Management factors;
- Human factors; and
- External factors.

Jawad (1997) identified eight success measures which according to the researcher are important in IS development phases, as shown in Figure 2.4. Whyte and Bytheway (1996) researched the factors affecting the success of IS. They applied the repertory grid technique to uncover a total of 43 constructs relating to the user's perception of success of IS in business.

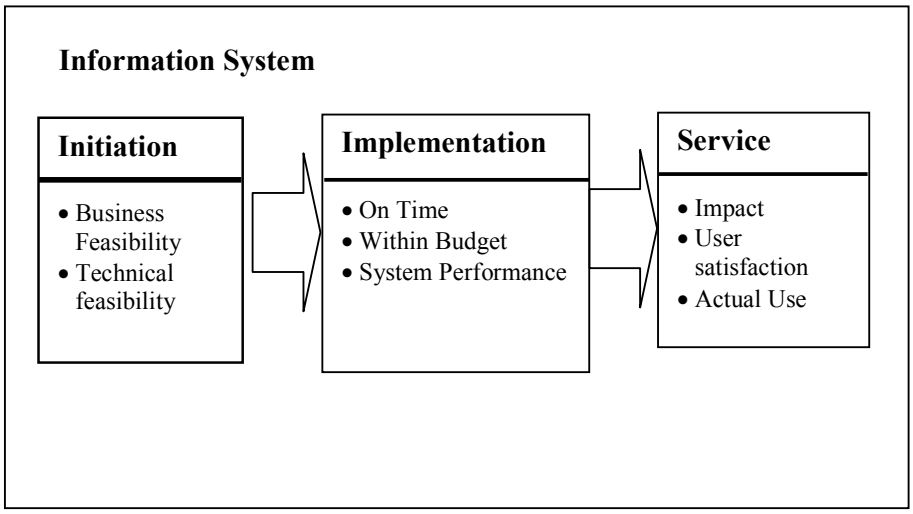

Figure 2.4: IS development phases and success measures (Adapted from Jawad and Reeves (1997: 10)

Whyte and Bytheway (1996) argued that there are key service attributes which must be addressed if IS is to meet the expectations of the users and identified 21 such service attributes.

Karababas and Cather (1994) in their study on developing strategic IS identified critical factors perceived to lead to, or deny success, namely:

- Senior management commitment;
- Senior management involvement;
- User management involvement;
- Assessment and evaluation of IT plan;
- Plan supported by IT management;
- Plan based corporate strategy; and
- Process included debate of objectives.

Kendra and Taplin (2004) categorized success factors into four dimensions reflecting the micro and macro levels of social and technical organisational design, as shown in Table 2.7:

Table 2.7: Success Factors Adapted from Kendra (2004: 31)

Structure	Success Factors

Micro-Social	Managerial skills and competencies
	Leadership behavioral characteristics and attributes
	Subject areas: general managerial skills
Macro-social	Organisation structures
	Matrixed and projectised
	Cross-Functional team participation.
	Collaborative (participative) work environment

Chrusciel and Field (2003), identified guidelines for the successful implementation of IS in terms of Critical Success Factors (CSF) for implementing of IS. Top management support was evidently critically important for the successful implementation of IS. Remeneyi and Sherwood-Smith (1999: 14) concluded that:

> "Because of growing concerns about the effectiveness of information systems expenditure there is an increasing need to re-think approaches to evaluation of information systems in order to demonstrate business benefits from these investments"

2.10 CHAPTER SUMMARY

The role of information systems in organisations was discussed relative to the following aspects

- Information systems in the organisation;
- Role of IS in Construction Management;
- Value of information for the organisational success;
- Characteristics of valuable information;
- Business value of information;
- The importance of IS strategic alignment with business strategy;
- Measuring IS success in the organisation;
- Factors contributing to successful IS;

The next chapter discusses organisational design and the importance of organisational structure for IS.

CHAPTER 3

ORGANISATIONAL STRUCTURE

3.1 INTRODUCTION

This chapter discusses organisational design and the importance and impact of organisational structure on IS performance under the following subheadings

- Organisational Structure
- Importance of organisational structure
- Centralisation and Decentralisation
- A typology of organisation structures
- IS Governance
- Chief Executive Officer (CEO) role in IS Governance
- Organisational Structure for IS
- Role of the Chief Information Officer(CIO)

3.2 ORGANISATIONAL STRUCTURE

Many organisational theorists and practitioners have researched the importance of organisational design and structure, and their relationship to the successful performance of organisations (Galbraith, 1977, Mintzberg, 1979, Duncan, 1997; McMillan, 2002; Dalziel *et al.*, 2004). According to Daziel *et al.* (2004: 60)

> "If the job and organisation structure do not adequately support the business strategy, then efforts become wasted, balls get dropped, turf wars break out, and a general sense of dysfunction can permeate the organisation".

According to Peterson, O'Callaghan and Ribbers (2000), organisational design involves two complementary processes, namely the division of responsibilities for various tasks performed, and the co-ordination of these tasks to realize organisational objectives. Duncan (1997) indicate that organisational structures impact organisations in two ways, namely:

- They facilitate the flow of information in the organisation for effective decision-making and control; and

- They enhance effective coordination and integration between the different levels of the organisation.
-

According to Burke (2004) and Douglas (1999) the cornerstone of any organisational success is the accurate flow and access of information to support decision-makers. Therefore, a distinct relation between information processing and organisation structure must exist. Arguably, the structure needs to be designed to suit the purpose of the organisation. Hitt, Ireland and Hoskisson (2001) suggest that the proper design of the structure of an organisation can contribute to the strategic competitiveness of the organisation. In addition, the organisational structure influences the effectiveness of the managerial work of companies and decisions made by their top-level managers. For any organisation to achieve maximum performance, its structure must fit with or match the rate of change in its internal and external environment (McMillan, 2002; Halachmi ,1994; Douglas ,1999).

Organisational culture[11] affects the ability of strategic managers to change functional and structural components of the organisation. Culture provides consistency, order and structure for activities, establishes communication patterns, and determines the nature and use of power (Douglas, 1999 and McMillan, 2002). Furthermore, organisational culture as a determinant for organisational structure design can either assist or derail design activities. Burke (2004) concludes that [organisational] structure is one of the most important variables of an organisation. According to McMillan (2002) the importance of organisation structure is too often overlooked. The important role of the manager [CEO]

[11] Culture: defined as the sum total of belief, rules, techniques, institutions, and artifacts that characterize [organisations] human populations. Culture consists of learned patterns of behavior common to members of a given society – the unique lifestyle of a particular group of people [320].

during the organisational design process is often a neglected responsibility. According to Duncan (1997) and Dibrell (2002) the selection of the best form or structure for an organisation is critical. Contingency theories[12] of organisations have shown that there is no one best structure. Different forms of structures reflect the environment within which the organisation operates. According to Anumba, Baugh and Khalfan (2002), the contingency factors, which affect organisational structures, are:

- organisational environment;
- organisational strategy and objectives;
- technology;
- organisational size; and
- human resources.

Organisations are social organisms, influenced by forces and influences of the environment. It is the task of managers [CEO's] to integrate employees into a structure to achieve the goals of the organisation. Consequently, they need structures that focus on efficiency and satisfy the primary goal[s]. According to McCleary, Asubonteng and Munchus (1995) it takes a dynamic organisation to adjust to the constant challenges of a turbulent environment, and respond to emerging new organisational forms to remain competitive. Given this reality organisations select organisational structures to fit their specific needs, which will be most efficient for their particular environment and operational conditions (Lucey, 1997). According to Karake (1994) different organisations subscribe to several types of overall organisational structures as well as various IS structures, ranging from highly centralized to highly decentralized.

[12] Contingency Theory: Contemporary researchers investigating the "relationship between structure and situation" in the organisation. Their theory suggests that (1) there is no best way to organize, (2) not all the ways to organize are equally effective.

3.3 DEFINITIONS OF ORGANISATIONAL STRUCTURE

According to Anumba *et al.* (2002) the structure of an organisation relates to the way in which its various parts are arranged, namely, the sum of the total ways in which it divides its labour into distinct tasks and co-ordinates them. A structure is generally described as the arrangement of duties to perform work and graphically represented by an organisational chart as shown in Figure 3.1 below. The basic structure for many large organisations during the 20th century was based on linear segmented, hierarchal design principles (McMillan, 2002).

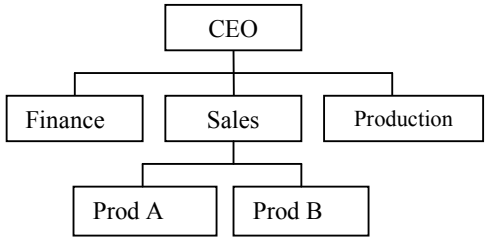

Figure 3.1: Classic Organisational Chart (adapted from McMillan, 2002)

The structure of an organisation is more than boxes on a chart. Rather it is a pattern of interactions and co-ordination that links the technology, task, and human components of the organisation to ensure that organisation accomplishes it purpose (Duncan, 1997); Friesen, 2005). McMillan (2002) further refers to the structure of an organisation as the pattern of relationships between the roles in an organisation and its different parts, and is a traditional view of organisational design that uses principles deriving from classical and scientific management.

The definitions of organisational structure from seminal researchers and authors are summarised in Table 3.1.

It is evident that there is a relationship between each of the definitions, which can be grouped in terms of four dimensions, namely:

- Concentration of authority;
- Structuring of activities;
- Line control of work flow; and
- Division of labour.

Table 3.1: Definitions of organisational structure

Author	Definition
Mintzberg, 1979	The structure of an organisation can be defined simply as the sum total of ways in which it divides its labour into distinct tasks and achieves coordination among them
Hitt, 2001	Organisational structure is a firm's formal role configuration, procedures, governance and control mechanisms and authority and decision-making processes
Thomson, 2003	The structure of an organisation is designed to break down the work to be carried out, tasks, into discrete components, which might compromise individual businesses, divisions and functional departments.
Stair and Reynolds, 2005	Organisational structure refers to organisational subunits and the way they relate to the overall organisation
Galbraith, 1977	A primary contribution of organisation structure is to coordinate the inter-dependent subtasks, which result from the division of labour.
McMillan, 2002	An organisation's structure as the architecture both visible and invisible which connects and weaves together all aspects of an organisation's activities so that it functions as a complete dynamic entity
Dess *et al.*, 2006	Organisational structure refers to the formalised patterns of interactions that link the tasks, technologies, and the people of the firms.
Anumba *et al.*, 2002	An organisational structure can be defined as: a formal system of task and management reporting relationships that co-ordinates and motivates organisational members so that they work together to achieve organisational design goals

For the purpose of this study an operational definition of organisational structure is reads as follow:

> *The dynamic dimensional entity, irrespective of the form it takes, designed to support relationships between all the role players, responsibilities and elements of the organisation, to provide a communication network of channels through which strategic information flow in decision making.*

The characteristics that define types of organisational structures are:

- The grouping of roles, tasks and functions;
- The method of decision-making – whether decisions are made by a few senior managers (centralisation) or by a large number of employees (decentralisation);
- The method of communication whether communication is done in a top-down or lateral manner;
- The number of management levels – firms with several management are referred to as tall, as opposed to flat;
- The span of control – referred to as narrow or wide , based on the number of people under each managers control; and
- The chain of command – lines of authority in the company, firms with rigid chains of command are said to be bureaucratic and centralised (Anumba *et al*., 2002).

3.4 CENTRALISATION AND DECENTRALISATION

Organisational structures are primarily characterised and influenced by two types of design configurations, namely: centralisation and decentralisation (Lucey, 2005; Tan, 1994). These configurations relate to the degree to which the authority, power and responsibility for decision-making have devolved through the organisation (Thompson, 2003). Organisations in which all the power decisions are made by the top management are called centralised, and those in which authority for decision making is distributed to the lower levels are referred to as decentralised (Galbriath, 1977; Mintzberg, 1979).

Tan (1994) argues that one of the oldest debates in organisational design revolves around centralisation versus decentralisation. Literature normally refers to the advantages and disadvantages of centralisation or decentralisation, as summarized in Table 3.2.

Table 3.2: Centralisation versus decentralisation(Adapted from Duncan, 1997 and Thomson, 2003)

Centralisation		Decentralisation	
Advantages	Disadvantages	Advantages	Disadvantages
Consistency of strategy; Easier to co-ordinate activities (and handle the interdependencies) and control changes. Changes in strategic perspective are more easily facilitated	May be slow to respond to changes which affect subsidiaries individually rather than the organisation as a whole, depending on the remoteness of the head office. General Managers [CEO] with real strategic ability are not developed within the organisation. Instead, the organisation is dependent on specialists and as a result, the various functions may not be properly co-coordinated. Does this achieve a fit between the organisation and its environment?	Ability to change competitive and functional strategies more quickly. Improve motivation. Can develop better overall strategic awareness in very complex organisations which is to diverse for head office to control effectively.	There may be problems in clarifying the role of head-office central services which aim to co-ordinate the various divisions and business units and achieve certain economics through, and the centralization of, selected activities. Problems of linking the power that general managers need and the responsibility that goes with power. General Managers must have the freedom to make decisions without referrals back. Relative inability to provide integration-coordination among divisions

.

The organisational environment is a key factor in deciding what type of organisational structure is appropriate. Organisations can be classified in several ways. Stair and Reynolds. (2005) uses classifications such as: simple/complex, open/closed, stable/dynamic, adaptive/nonadaptive and permanent/temporary. Duncan (1997) makes use of two dimensions, namely simple-complex and static-dynamic. The simple-complex dimension of the environment focuses on whether the factors in the environment being considered are few in number and similar or many in number and different.

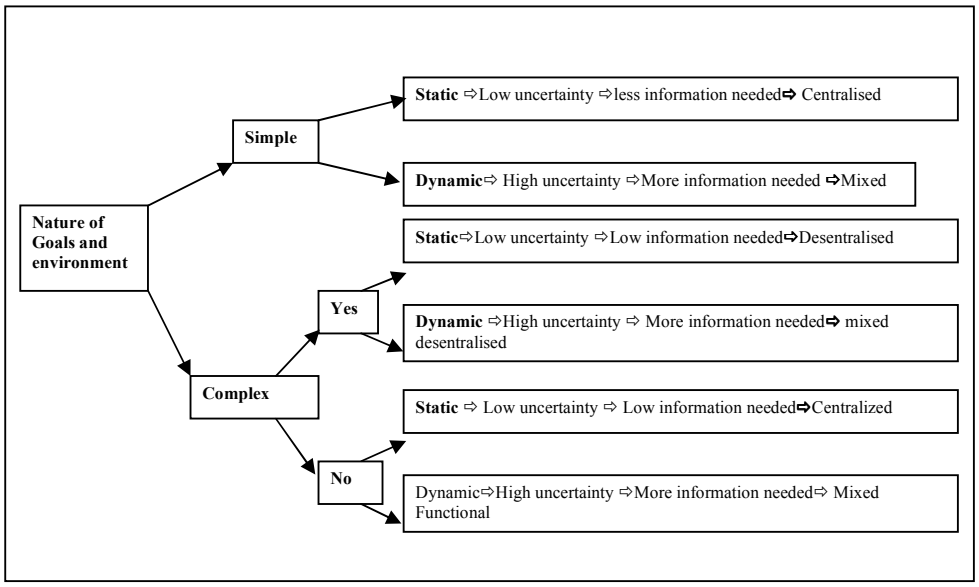

Figure 3.2: Organisational Design Decision Tree Heuristic (Adapted from Duncan, 1997)

The static- dynamic dimension is concerned with whether the factors of the environment remain the same over time or change. Duncan (1997) uses an organisational design decision tree as depicted in Figure 3.2 to select between a centralised[13] or decentralised structure.

[13] Duncan(1997) use the term "Functional" to describe centralized structure.

Lucey (2005) and Duncan (1997) suggest that more successful organisations practice both centralisation and decentralisation. Drucker (1993), as referred to by Lucey (2005) argues that organisations must take care not to fragment the business between centralisation or decentralization. The three main areas of decision-making reserved for top management alone are:

- Decision about what technologies, markets and products to go into and what business to start or to abort;
- Decisions on corporate finance; and
- Decisions on corporate personnel policy and key appointments.

Karake (1994) in her study found that the empirical results suggested that IS structure (centralised versus decentralised) is strongly related to the following:

- Management equity ownership (MEO): companies with high MEO tend to prefer a centralised IS structure;
- Concentration of stock holding (CSH): companies with high CSH levels tend to have a decentralised IS structure, and
- Age of the CEO: the move toward centralised IS structure increases with the age of the CEO.

Brown and Magill (1994) sought to explain a firm's IS organisation design decision for a centralised, decentralised or hybrid configuration. They classified IS functions as management of technology, and management of the use of technology. Furthermore, the term IS structure denotes a firm's total set of [de]centralised solutions for the management of the IS function.

3.5 A TYPOLOGY OF ORGANISATION STRUCTURES

According to Lucey (2005) and Dibrell (2002), different forms of organisational structures reflect the environment in which they operate, and organisational designers often use a mixture of types in an attempt to combine the best characteristics of each type of structure. The purpose of structures is:

- To ensure optimal use of resources for organisations to accomplish their goals and mission;
- To provide managers with a means of balancing two conflicting forces, namely a need for division of tasks into meaningful groupings, and the need to integrate such groupings in order to ensure organisational efficiency and effectiveness;
- To identify the executive, managerial and administrative functions of the organisation, and indicate roles, responsibilities and hierarchical relationships; and
- To influence the flow of information (Dess *et al.*, 2006).

Figure 3.3 shows a simplified model of organisational structure characterized by a pyramid configuration. A managerial pyramid typifies the hierarchy of decision-making and authority in the organisation. The apex presents the strategic management level and the arrow indicates the level of decision dimension. The strategic level in terms of the decision dimensions has a higher degree of decision authority, more impact on organisational goals, and encounter unique problems.

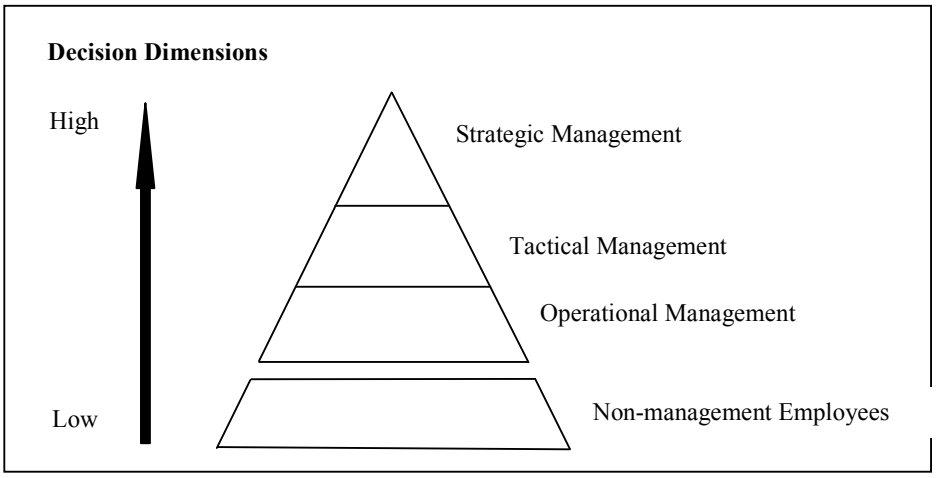

Figure 3.3: Hierarchy of decision making and authority (Adapted from Stair and Reynolds, 2005)

Dibrell and Miller (2002) refer to the hierarchical structure as the mechanistic form, providing a good fit for an organisation operating in a stable environment with limited uncertainty, and characterised by the following elements:

- Tasks are broken down;
- Tasks are rigidly defined;

- Strict hierarchy of control, with many rules and procedures;
- Knowledge and tasks are centralised at the top; and
- Communication channels are vertical.

According to Galbraith (1977) and Duncan (1997), the hierarchical form organisational structure is an efficient information-processing mechanism that links the elements of the organisation by providing the channels of communication through which information flows. Furthermore, an organisation may contain many levels of authority. The current trend is to reduce the number of management levels to form a flat structure. Flat organisational structures improve communications; empower people at the lower levels to make decisions and lower management costs because of fewer levels (Thomson, 2003, Lucey,2005; Stair and Reynolds, 2006). According to Mintzberg (1979) in flat structures people are encouraged, even pushed, to reach to the limit of their capacities, and sometimes to develop capabilities they never knew they had. But flat structures also require more discussion and consultation in the decision-making process. A comparison of the key features between a flat organisational structure and a tall organisational structure is shown in Table 3.3.

Table 3.3: Comparison between flat and tall organisational structures (Adapted from Lucey, 2005).

Flat Organisational Structure	Tall Organisational Structure
1. Relative small size	1. Characteristic of larger organisations
2. Few levels of authority and management	2. Numerous levels of authority and management
3. Short chain of command	3. Long chain of command
4. Broad span of control	4. Narrow span of control
5. Tendency to suit mass production operations	5. More formality, specialisation and standardisation

In tall organisational structures, there is a tendency for the number of levels to increase with the size of the organisation. Taller structures increase vertical

communication problems and lengthen decision times. Drucker (1988) predicted that the organisation of the future would have fewer managers and fewer layers in the management hierarchy and that IS would lead to more autonomy for individual managers.

Mintzberg (1979) cited by Thomson (2003) based his organisational design structure on five basic parts of the contemporary organisation as follows as illustrated in figure 3.4. :

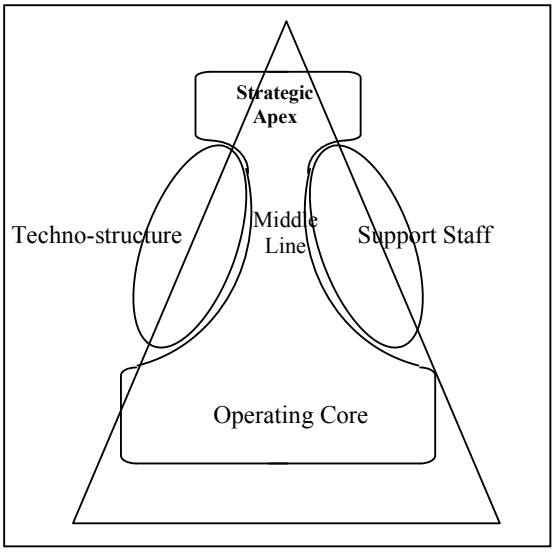

Figure 3.4: The basic parts of the organisation. (Adapted from Mintzberg (1979)

- **The operating core:** Encompasses those employees, normally the bulk providing direct support and performing various tasks involving primary activities of the value chain[14], which include securing inputs, transforming processing inputs into outputs (adding value) and then distributing the outputs;

- **The strategic apex:** The strategic leader who is responsible for corporate governance, in developing corporate strategy, managing relations with the environment, designing the organisational structure and allocating resources;

- **The middle management:** Connect the strategic apex with the operating core. Middle managers have authority, and manage the task carried out by

[14] The value chain defined as a series[chain] of activities that include inbound logistics, warehouse and storage, production, finished products storage, outbound logistics, marketing and sales, and customer services(Stair and Reynolds, 2005: 49)

the operating core, set standards, policies and systems established by strategic apex, through channelling information up and down the organisation;

- **Support staff:** Support activities can be found at various levels of the hierarchy, providing support to all the levels of the organisation, such as legal aspects, research and development, desktop/helpdesk support and many other;

- **The techno-structure:** Analysts and their supporting staff who affect the work of others, but removed from operating work flow. The techno-structure is only effective in using analytical techniques, such as information processing to improve the work of others.

Leifer (1988), Mukherjl (2002), Tan (1994) and Thomson (2003) support Mintzberg's five-part typology of organisational structure, namely:

- **Simple structures:** Are characteristic of young and start-up, entrepreneurial organisations and entrenched autocracies. Small, operating in a specific niche market, very dynamic environment and CEO makes most or all of the important decisions.

- **Machine bureaucracies:** Are characterised by standardisation, functional structural design, and large size. These structures are generally differentiated both horizontally and vertically and normally associated with mass production technology in a stable environment.

- **Professional bureaucracies:** Rely on standardisation of skills as a basis for coordination, where as the machine bureaucracies rely on standardisation of work functions. Professional bureaucracies have a high informational component. These organisations must be desentralised down to the level of those professionals responsible for carrying out the organisation's tasks.

- **Divisionalized forms:** These structures are integrated sets of semi-autonomous entities loosely joined by administrative framework, and are characteristic of older more mature, very large organisations. Furthermore, the semi-autonomous entities, often referred to as strategic business units (SBUs), and may be decentralised from the perspective of the total organisation, but can be centralised from within the division, identified as Form A. Leifer (1988) includes an additional form, not discussed by Mintzberg , identified as Form B, that is characterised by the bonding effect of a strong culture.

- **Adhocracy form:** These forms constructed as divisional forms are held together by a strong culture. These are usually small and have the characteristics of young organisations, informal and innovative, which features teams of specialists and decentralised power.

According to Anumba *et al.* (2002) the development of modern organisational structures are intended to promote teamwork and collaboration and often consist of a team structure imposed on a functional structure.

Table 3.4 summarises the key elements and compares the salient points of different structures.

Table 3.4: Selected elements of typology (Adapted from Thomson, 2003)

	Structures				
	Simple	Machine Bureaucracy	Professional Bureaucracy	Divisional Form	Adhocracy
Key co-ordinating mechanism	Direct supervision	Standardisation of work	Standardisation of skills	Standardisation of outputs	Mutual adjustment
Key part of organisation (resources concentration)	Strategic apex	Technostructure	Operating core	Middle management	Support staff
Role of strategic apex/leadership in addition to responsibility for corporate strategy	Centralised	Co-ordination and conflict resolution	External liaison and conflict resolution	Strategic perspective and control of performance	External liaison, conflict resolution and project monitoring
Centralisation/ Decentralisation	Centralised	Limited horizontal decentralisation	Desentralised	Desentralised vertically	Decentralised
Environment	Simple dynamic	Simple and stable	Complex and stable	Relative simple and stable but diverse	Complex and dynamic
Power and values	Controlled by strategic leader-possible owner-manager	Technocratic and sometimes external control	Professional manager control	Middle management control, i.e. general managers	Expert control
Typical examples	Small firms young organisations	Processing companies	Hospital university	Diversified or multi product organisation	Management consultants

For organisations to be successful they must implement a strategy ensuring that strategic resources are developed, deployed and controlled, and accomplished through selecting the appropriate organisation structure to fit the purpose of the organisation (Thomson, 2003). Corporate governance is used to determine and control the strategic direction and performance of organisations (Hitt *et al.*, 2001; Grewal and Knutsson, 2005).

The most common type is the matrix structure as shown in Figure 3.5, which has dual benefits of the levels of technical expertise created by functional structure, and flexibility and teamwork. The matrix structure is also suitable for construction companies which carry out many projects concurrently, all of which need technical expertise and special managerial attention.

Information and IT assets are acknowledged as key assets, which create business value for organisations. IS[IT] as a key asset needs to be governed and used by the senior executive team. IS[IT] decisions made within the organisation need to be managed – also referred to as the role of IS[IT] Governance.

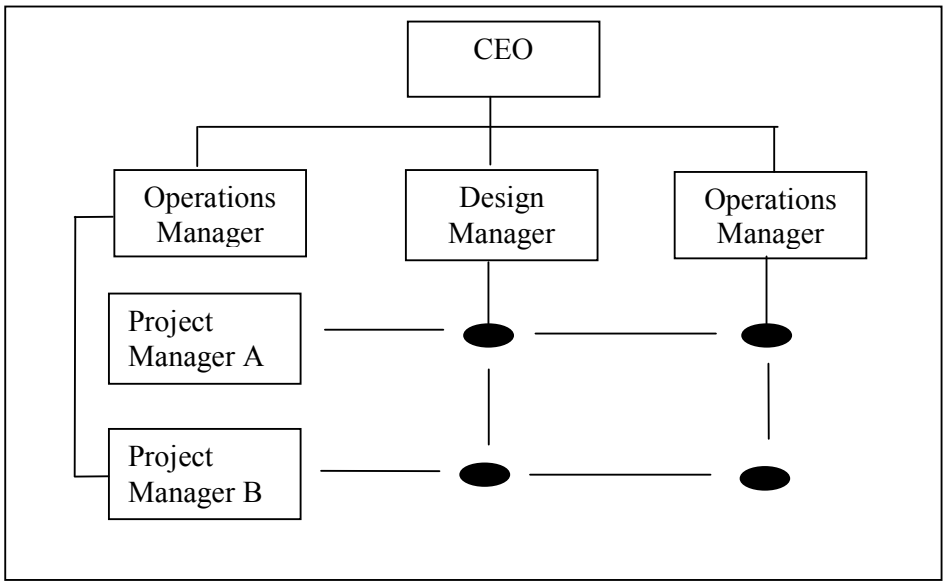

Figure 3.5: Example of a matrix structure (Adapted from Anumba *et al.*,2002)

3.6 IS GOVERNANCE

According to Korac-Kakabadse and Kakabadse (2001), IS governance is a key component of corporate governance that facilitates timely and accurate

accountability on IS investments. Corporate governance is concerned with board roles, board composition, organisational structure and processes in order to develop, implement and monitor corporate strategy On the other hand, IS governance concentrates on the structure of relationships and processes to develop, direct and control IS resources in order to achieve the organisational goals. Weill and Woodham (2002) define IT governance as specifying the right decisions and accountability framework to encourage desirable behaviour in the use of IS (Weill, 2002:1). MITI (1999) defines IT governance as "The organisational capacity to control the formulation and implementation of IT [IS] strategy and guide to proper direction for the purpose of achieving competitive advantages for the corporation". Figure 3.6 demonstrates schematically the link between corporate and IT[IS] governance. The top half of the framework indicates corporate governance, and the board in relation to the executive team. The executive team (CEO, CFO, CIO) is typically commissioned by the board to govern the organisation and determine its strategy. Desirable behaviour embraces the belief and culture of the organisation and is defined through strategies, corporate value statements, mission statements, business principles, rituals, and structure.

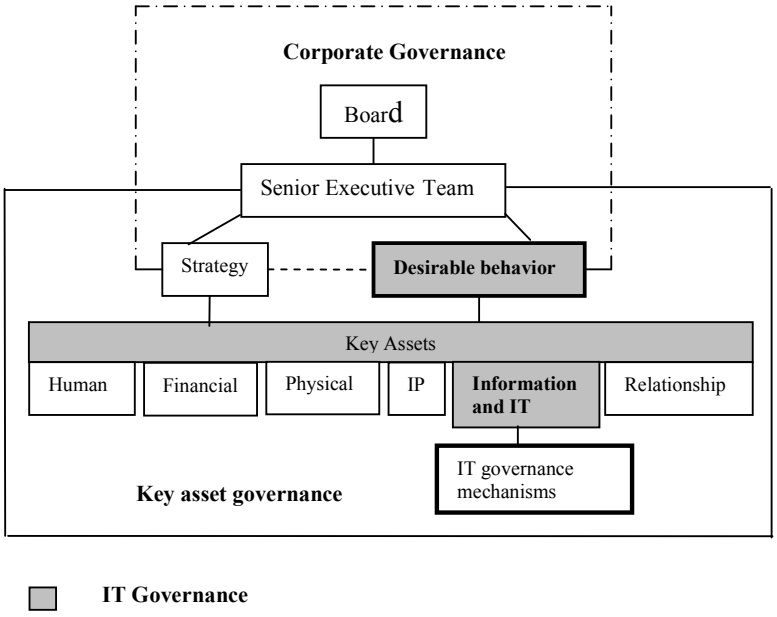

Figure 3.6: Framework linking Corporate and Key Asset Governance (Adapted from Grewal *et al.*,2005).

The strategy and desirable behaviours are informed by six key assets which create business value for the organisation. Information and IT assets are depicted as digitised data, information, and knowledge about customers, process performance, finance and information systems. According to Grewal *et al.* (2005) these key assets need to be governed by senior management teams [CEO].

According to the IT Governance Institute (2000) the management of IS-related risks has become a key factor of enterprise governance. They define IS governance as " a structure of relationships and processes to direct and control the enterprise in order to achieve the enterprise's goals by adding value while balancing risk versus return over IS and its process". Critical business processes increasingly rely on IS, as the benefits and risk grow exponentially (Williams, 2001). It is important that senior executives proactively address the governance of

IS alongside their other corporate governance responsibilities given that IS governance ensures that IS delivers value to the business and mitigates IS risk. Executive management should encourage and monitor IS governance in terms of the role and impact of IS on the organisation, assigning IT responsibilities, defining constraints within which IS professionals operate, measuring IS performance, managing risk and obtaining assurance of compliance with IS governance standards (MUSC, 2003). Pohl (2003) suggests that good IS governance should incorporate the strategic alignment of the IS processes with business objectives, the delivery of value to the business, ensuring that all risks are addressed and IS manage effectively and efficiently. According to Varghese and Kurien (2004) the optimal governance structure of IS within an organisation depends on:

- Size and scope of the business activities. Independent organisations would optimally opt for decentralised IS, in order to retain the flexibility to build and maintain IS business realities and not be constrained by the bureaucracy of corporate headquarters.
- Geographical spread. Multinational organisations need to disperse their IS/IT infrastructure maintenance groups to ensure high quality of service to business users.
- Disruptive technologies. Technology trends that have the potential to have a significant impact on the very foundations of the organisation will require them to incubate themselves outside the traditional organisational structure to ensure success.

Several researchers consider IS governance as the locus of IS decision-making mechanisms and forums and assigns levels of authority and accountability for decision-making (Peterson *et al.*, 2000; Korac-Kakabadse *et al.*, 2001; Chu *et al.*, 2003). There are three traditional configurations for IS governance, namely:

- Centralised configurations where corporate management has IS decision-making authority concerning infrastructure, applications, and development;

- Decentralized configurations where division IS management and business-unit management have authority for infrastructure, applications, and development; and
- Federal configurations (hybrid configuration of centralised and decentralised), where corporate IS has authority over infrastructure, and division IS and business-unit have authority over applications and development.

In each of the configurations, stakeholder constituencies take different lead roles and responsibilities for IS decision making. Centralization provides greater efficiency and standardization, while decentralisation improves business-ownership and responsiveness. The federal configuration provides the benefits of both centralized and decentralized configurations.

According to Broadbent (2003) and Weill *et al.* (2002), IS governance involves decisions about five IS domains, namely:

- IS principles which are high-level statements about how IS will be used to create business value.
- IT infrastructure strategies that describe the approach to building shared and standard services across the organisation.
- IT architecture which is about the set of technical choices that guide the business in satisfying organisational needs.
- Business application needs that refer to the acquired application.
- IT investment and prioritising which cover the process of IS, including where they should be focused and the procedures for processing initiatives, their justification, approval and accountability.

According to Weill *et al.* (2002), IS governance defines who gives input and who makes decisions. They refer to six IS governance archetypes, namely

- Business monarchy, where the executive leadership has all the decision rights.
- IS monarchy, where IS executives have decision rights.
- Feudal, where business-unit leaders have the decision rights and authority is localized.

- Federal, where governance rights are shared by C-level executives and at least one other business group.
- Duopoly, where rights are shared by IS/IT executives and at least on other business group.
- Anarchy, where individual process owners or end users have decision rights and there are usually no formal mechanisms for exercising rights resulting in decisions being made ad hoc and locally.

If organisations do not actively design their IS governance structures, there will be major inconsistencies that encourage different and sometimes conflicting desirable behaviours (Weill *et al.*, 2002). High-performing organisations use governance mechanisms as vehicles to implement a particular governance archetype, which includes organisational structures, procedures, committees and policies.

Critical characteristics for effective IS governance are outlined in Table 3.5.

Table 3.5: Critical Characteristics for effective IS governance

Characteristic	Explanation
Transparency	Make the governance mechanism transparent to all managers.
Actively Design Governance	Openly design IS governance with desirable behaviours and outcomes.
Redesign Governance	Designing and implementing a new governance structure is complicated, and should be done infrequently.
Educate about Governance	Education structures to support managers understand and use governance mechanisms, to benefit the organisations goals.
Good governance requires choice	Effective governance structures should be simple in order to optimize a small number of performance goals and metrics.
Handling of exceptions	The business world is continuously changing and forging new opportunities that must be supported by the IS governance structure and able of handling exceptions.

IS governance designs went through different organisational pattern changes. For example, the 1970s was a period of centralisation. In the 1980s decentralisation featured and recentralisation was the trend in the 1990s.

The continuous changing business environment, rapid evolving technology are reasons why IT governance is experiencing another redesign phase - a major challenge for top management teams (TMT).

Organisational structure is a perennial problem for organisations, and existing structures are under pressure to change to new structures driven by evolving technology and business needs, supported by the CEO (McClearly, 1995, Whittaker, 2001; Chu *et al.* 2003).

3.7 THE ROLE OF THE CEO IN IS GOVERNANCE

Until recently CEOs were able to survive even when they avoided anything related to IS, leaving IS leadership to others in the organisation (Buuron, 2002). This attitude of CEOs towards IS governance resulted in large scale IS failure during the 1990s, and CEOs paying the price. CEOs needed to become IS "believers" to support business strategy and to achieving superior performance (Buuron, 2002). According to Earl and Feeny.(2000) nearly every strategic issue that businesses are being confronted with are triggered by IS. The CEOs can, therefore, neither avoid IS nor delegate the issues it raises to others. Organisations were less likely to make IS strategic investments when the IS perspective was not integrated into executive management (Jenks and Dooley, 2000). Furthermore, it is found that if there was limited dialogue and mutual

understanding between the CIO and CEO, the CEO was less likely to view IS as strategically important (Johnson and Lederer, 2003).

Earl and Feeny. (2000) suggest five important roles for CEOs in steering IS in the organisation, namely

- **Creating Context:**– CEOs must create a context of positive hunger for change, empower IS to successfully exploit new ways of doing things and ventures in the unknown;
- **Setting Priorities:**– CEOs should highlight a small set of business priorities the importance of which they consistently reinforce;
- **Signalling Continuously – and Positively :-** The beliefs of CEOs are not private, and therefore their speeches, documents, comments, meetings and daily inter actions impact on the whole organisation. IS to positively signals about the importance of IS in the organisation are critically important.
- **Spending Quality Time:-** CEOs must take their IS leadership seriously and invest quality time with IS matters and keep IS on their agenda;
- **Working Closely with the CIO:-** CEOs must create an organisational structure to enhance the working relationship with the CIO. The aim is to build a two-way relationship in which the CEO can challenge or question IS thinking as well as provide business direction for IS.

Callahan and Nemec (1999) prescribe four key initiatives for CEOs for driving IS forward:

- Make IS a key part of the CEO agenda.
- Manage for value creation;
- Manage IS spending and investment priorities in line with corporations overall investment priorities; and
- Deploy the best IS management model.

According to Delisi, Danielson and Posner (1998) the CIO adds value to the organisation, and therefore it is important for a CEO to capitalise on the value-adding characteristics of the CIO through:

- Positioning IS and the CIO as agents of change;
- Focusing on achieving effectiveness, not efficiency from IS;
- Institutionalizing business value for IS, and;
- Building an executive team that includes the CIO.

According to Earl *et al.* (2000) it is important for CEOs living in the information age to understand the need of new technologies imposed by IS. They need to continuously possess a vision of the future and use IS to analyse it. CEOs need to sponsor IS architecture through close engagement with IS technologists, ensure IS architecture standards are respected across the business and establish the necessary funding for maintenance and upgrades. The CEO ensures that IS is embedded in the company by the ways that IS strategies are created, potential IS investment is evaluated and sanctioned, and projects to implement approved investment plans are set and governed. CEOs need to challenge the supply side of IS, in particular, sourcing and capabilities.

According to Ragu-Nathan *et al.* (2002) the CEO has two main responsibilities in IS governance, namely

- The development or structuring of the IS function within the organisation, and;
- The responsibilities to govern the current and future portfolio of IS.

CEOs have before them a vast array of IT opportunities that can affect virtually every function and every capability in the organisation (Callahan *et al.*, 1999). Therefore, CEOs need to understand IS and how they can optimal make use of IS to achieve organisational goals. According to Doll (1985), top management guidance can play an important role in improving the management of the IS function. Although IS activity is highly technical and complex, top management can provide adequate guidance without detailed technical knowledge. Therefore,

the problems of designing and implementing company-wide IS are primarily managerial rather than technical.

3.8 ORGANISATIONAL STRUCTURE FOR IS

The environment plays an important role in which the organisation operates, and clearly reflects the different forms of organisational structures used. Organisations need to design a structure that will support IS to process information more effectively and efficiently (Dibrell, 2002). According to Karake (1992; 1994) the dynamic changes in IT and its related technologies has a profound effect on people, processes, structures and strategies of organisations. Technology and communications improvements and accessibility lead to systems centralisation of the business processes, and the growing reliance on integrated systems.

Galbraith (1977) identifies two types of organisations- mechanistic and organic, and Brown and Magill (1994) define these two design forms as:

- **Organic form:**- knowledge and control of task is located anywhere in the organisation. Communication is predominately horizontal. There is a weak hierarchy of authority and control with few rules. Employees contribute to the common task of their department. Tasks are adjusted and redefined through employee's interaction.
- **Mechanistic form:**- knowledge and control of tasks are centralised at the top of the organisation. Communication is predominately vertical. There is strong hierarchy of authority and control with many rules. Tasks are broken down into specialised separated tasks.

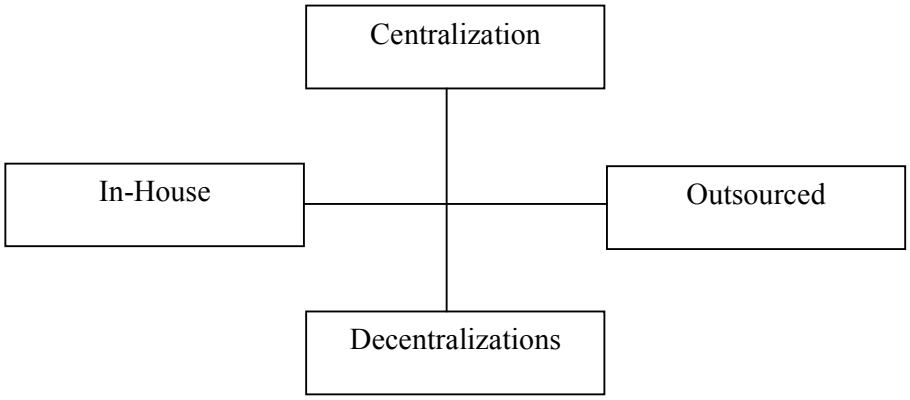

Figure 3.7: Two Dimensions: Situational Factors Determining IS in the Organisation (Adapted from Tan, 1994)

Most organisations and businesses struggle with the problem of how to deploy IS to support the strategic objectives and goals. One of the solutions to this problem is the way [de]centralisation is implemented by the organisation. Figure 3.7 illustrates the situational dilemma organisations have in structuring IS, and executive management need to decide which will best suit the organisation.

Tan (1994) refer to situational factors that have an influence in structuring IS for the organisation. The following contingency variables influence the position of IS in the organisation:

- The structure of the organisation;
- The culture of the organisation;
- The importance of IS for the company;
- The current phase of IS in the company; and
- The extent of automation inheritance.

The importance of IS for a company depends on how companies value the current and future IS, this will have a strategic impact on the way the organisation operates. In Table 3.6 Tan (1994) suggests the use of a simple grid reflecting the importance of IS for a company.

When the importance of the current and future IS is low, then IS will only play a supportive role and receive little attention from executive management. However,

IS are of operational importance when the current functioning of the organisation dependent on IS, but relative few developments are expected in the future. When the current IS has an expected supportive role and is vitally important to the survival of the organisation, IS plays a transforming role.

Table 3.6: Strategic grid to determine importance of IS (Adapted from Tan,1994)

		Importance of future IS	
		HIGH	LOW
Importance of current IS	HIGH	Operational	Strategic
	LOW	Supportive	Transforming

As seen from Figure 3.8 here are five possible organisational forms for structuring IS within the organisation. The two most extreme structures for IS are normally total Centralised IS oppose to Decentralised IS functions. According to Ulrich (2004), Centralised IS relies on a governance structure where information management reports up through a single chain of command.

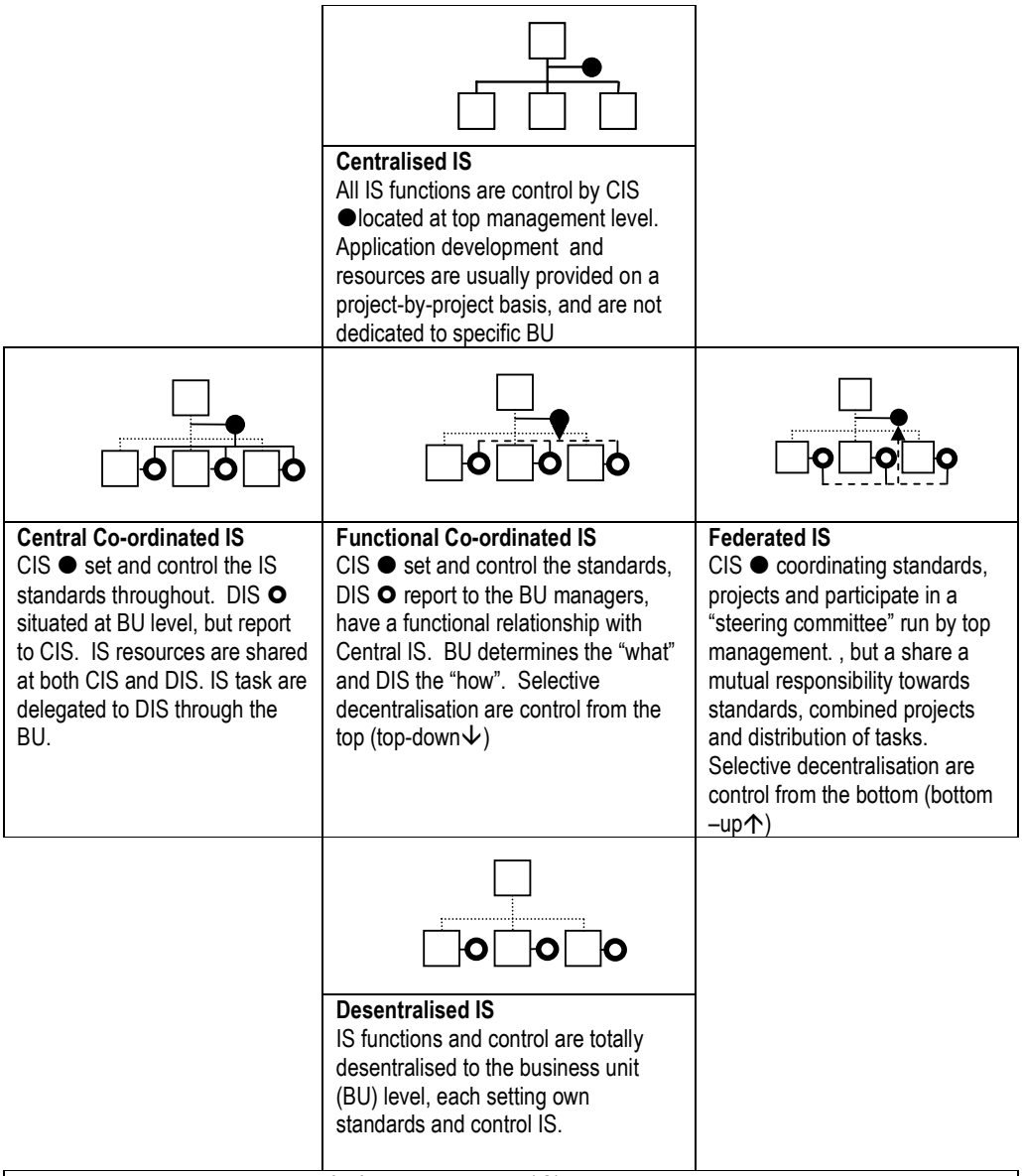

Figure 3.8: Five Organisational Structures for IS (Adapted from Tan (1994)

Decentralised IT, on the other hand, distributes management of IS through a multitude of functional and regional commands. Studies also show that most IS organisations utilize either a centralised (45%) or combination (hybrid) of centralised and decentralised (48%) governance structures.

According to Peppard and Ward (1999), the centralised IS organisation can be seen primarily as a legacy of technology development and traditionally viewed as automating of existing business processes, which led to bureaucracy and lack of flexibility were acceptable. Ulrich (2003) points out that IS is moving towards a scenario where centralised IS and decentralised IS can coexist and flourish under the same governance structure. Both centralised and decentralised decision-making structures have advantages as well as their disadvantages. Industry sought to capitalise on advantages of structures refed to as centrally decentralised IS and later as a federal structure (Peppard and Ward, 1999).

Ulrich (2003) support the notion that centralised and decentralised and other different hybrid configurations of IS can flourish towards collaborative, adaptive governance. In the past the function of IS was primarily related to data processing. However, these days IS plays a central role in competitive strategies. Consequently, business management has a critical role to play. While IS can deliver the technology, the benefits and value from this technology must be unlocked – a business management function. According to Gottschalk and Taylor (2000)

> "Chief Information Officers (CIO) have the difficult task of running a function that uses a lot of resources but delivers little evidence of its value. To respond to business and technological changes, CIOs now must build relationships with line managers [and executives'] "

3. 9 ROLE OF THE CHIEF INFORMATION OFFICER (CIO)

A key factor in determining whether the full potential of IS investments is realized may be the role played by the company's Chief Information Officer (CIO). This

is generally the person in the organisation who knows the most about IT systems, their adoption and uses, and technology. According to Gottschalk and Taylor (2000) the role of the CIO emerged during the 1970s as IS became more important, especially in the information intensive industries such as banking. Rockart (1985) studies as cited by Gottschalk and Taylor (2000) showed information intensity as the determining factor for the CIO position. This position is most likely to exist when the IS functions are decentralised, and to what extent does the CEO appreciates the strategic value and importance of IS/IT. According to Gottschalk and Taylor (2000) the role of the CIO was driven by two organisational needs, namely;

- Accountability is increased: making a single executive responsible for the organisations information processing needs;
- Need to close the gap between organisational and IS strategies which is a primary business concern.

Gottschalk and Taylor (2000), tabled six IS leadership roles for the CIO which are required to execute IS future agenda as shown in Table 3.7.

Table 3.7: Six IS leadership roles(Adapted from Gottschalk, 2000)

1.	The **chief architect** designs future possibilities for the business.
2.	The **change leader** orchestrates resources to achieve optimal implementation of the future.
3.	The **product developer** helps define the company's place in the emerging digital economy.
4.	The **technology provocateur** embeds IS/IT into the strategic business.
5.	The **coach teaches** people to acquire the skillset they need for the future.
6.	The **chief operating strategist** invents the future with the TMT.

According to Yodokawa (2000), the CIO plays an important role in IS strategy and should perform the following roles, namely:

- Develop new business by means of IS strategy;

- Builds and manage the company's systems by means of its corporate strategy;
- Provide the right systems service by means of an IT strategy;
- Transform the company's structures, processes and systems by means of its corporate strategy.

A report by Japan's Ministry of International Trade and Industry (1999) on Corporate Approaches to IT Governance highlighted the importance of the CIO/CEO direct relationship. Bai and Lee (2003) indicated that conflict between CEO and CIO can result in unsuccessful IS. Their research found the following reasons for the gap between CEO and CIO namely (1) differences in visions of IS and organisation of IS; and (2) inadequate communication indicates that CEO not value IS sufficiently. Furthermore, for an organisation to capitalize successfully on IS, the CIO must bridge the gab between IS and strategy – between technology and business, it requires a shift in the role of the CIO from specialist functional manager to strategic contributor.

Organisations incorporating the CIO in its strategic decision-making are more likely to emphasise the strategic use of IS thus ensuring integration of IS systems into the strategic plans of the organisation. In organisations, the top management team (TMT) is responsible for making strategic decisions. Each team member supports the team through different skills, capabilities, and knowledge. The CIO as an authority on technology and IS systems will have a considerable influence on strategic decision concerning IS, and its importance to the organisation. Studies show that CIOs who are members of TMT, compared to those holding functional positions, are perceived to be more influential by executives because of the position they hold, and also promote the strategic importance of IS within the

organisation. Furthermore, it was found that organisations are less likely to make strategic IS investments when IS perspectives are not integrated into top management. If limited dialogue between the CIO and CEO exists, the CEO is less likely to view IS as strategically important (Jenks and Dooley, 2000; Bai *et al.*, 2003),. According to Smackzny (2001) the responsibilities of the CIO have changed dramatically due to changes in technology. Gartner Group as cited by Smaczny (2001) the role of the CIO went through the following phases:

- Mainframe era (end of 1980s): the functional head was merely responsible for operational management;
- Distributed era (1990s): – the role of a strategic partner was responsible for expectations management, technology advice and procurement of hardware and software;
- Web-based era (2000s): – the role of a business visionary is responsible for business innovation and utilisation of opportunities created by technology.

Feeney and Ross (1999) identified three interactive forces that have an influence on the role of the CIO. These are

- **Applications portfolio:** The extent to which the organisation's operation and strategy is dependent on IS;
- **Business executives' attitudes:** Towards IS in terms the level of investments available and the organisations predisposition to apply IS strategically;
- **Dominant IS suppliers:** The availability, quality and extent of external resources and services that can be acquired to substitute for or compliment internal resources.

Gartner Group as cited by Smaczny (2001) suggests that the CIO "performance measurement" is based on the following criteria:

- Fusing[15] of IS with business objectives;
- Advocacy of opportunities of IS to exploit the opening of new channels;
- Autonomy for external service providers;
- Lead the transition to office of the future;
- Advising and coaching peers in the potential of IS;
- Exercising visionary through leadership in pursuing new technology to enhance business opportunities;
- Allocation of IS resources to most attractive opportunities;
- Adding value to business operations;
- Analysing systems and their value and adjust accordingly;
- Access of knowledge;
- Accountable for business outcomes;
- Addressing and reducing total cost of ownership.

Evans and Hoole (2005) state that IS executives play an important role in promoting fusion in the modern organisation which is a highly political environment. Furthermore, organisations must keep their business and technology [IS] strategies together, and develop in parallel, but in "in concert" with one another a term refer to as IT/Business `strategy fusion' (Evans, 2004). The GAO (2002) report on Maximizing the Success of Chief Information Officers (CIO's) identified six fundamental principles each linked to a Critical Success Factor (CFS). Table 3.8 summarises the practices of successful organisations in each CFS category and principles, furthermore, a gap can exist between success and unsuccessful CIO in the organisation.

[15] The term "fusion" or "fusing refers to the process or act of joining, uniting or integrating (Smaczny,2001)]

Table 3.8: Maximising the success of CIO through fundamental CSF principles Adapted from GAO/AIMD (2000)

Critical Success Factors	Principle	Leading Organisations
Align IS leadership for Value Creation	Recognise the role of IS in creating value	CEOs ensure that the IS organisation is a key business player CIO is part of the executive decision-making process
	Position the CIO for success	Define clear CIO role and authorities Matches CIO type and skills set with business needs Forges CIO partnership with CEO and other senior executives
Promote Organisational Credibility	Ensure the credibility of IS organisation	CIO builds credibility through effective IS leadership, good working relationships, track records, and partnership with customers and peers
	Measure success and demonstrate results	Strong links between business objectives and performance measures Performance management structure still evolving
Executive IS Responsibilities	Organise IS to meet business needs	Re-assigns IS staff as needed to best serve interest of customers Structure the organisation along business lines and IS functional areas
	Develop IS human capital	Maintains up-to-date professional skills in technology management Outsource entry-level positions but largely hires at all levels of experience

To bridge this gap Penrod(2003), suggested that the leadership style of the CEO and the top management team (TMT) determines many of the parameters for successful governance and decision-making. The successful CIO must have insight into the philosophy of all the TMT and work to develop processes that fit the particular environment. The participation of the CIO in the business planning process is an effective integrating mechanism for bridging the gap between IS

processes and business planning processes, and also leads to the CIO understanding TMT plans (Kearns and Lederer,1999).

Feeny *et al.*, 2003:294) suggests that:

> "The single most important role of the CIO seemed to be that of a strategic partner, the person who successfully provides the CEO and other executive members with the understanding of the role of IS within the future business vision"

3.10 CHAPTER SUMMARY

In this chapter, detail was outlined on organisational structure and the importance of organisation structure for IS, contributing to the success of organisations, under the following headings:

- Organisational Structure
- Importance of organisational structure
- Centralisation and Decentralisation
- A typology of organisation structures
- IS Governance
- CEO role in IS Governance
- Organisational Structure for IS
- Role of the CIO

The next chapter discusses the research design that will be followed to achieve the objectives of this study will include both qualitative and quantitative methods. The chapter discusses the methodology and approaches used to gather data from a variety of sources to test the hypothesis and research question.

CHAPTER 4

RESEARCH DESIGN

4.1 INTRODUCTION

The use of a suitable research methodological approach is necessary to achieve the objectives of the study which also fits into the overall framework of the research. "Methodology refers to the overall approach of the research process, from the theoretical underpinning to the collection and analysis of data" (Hussey and Hussey, 1997:54). The selection of the most appropriate design and methodology for a research study cannot be overemphasised (Watkins, 2006). This chapter describes the research methodology and research methods which were used to achieve the objectives of the study.

4.2 RESEARCH APPROACHES IN INFORMATION SYSTEMS

Research academics provide a plethora of distinguishing characteristics to qualitative (phenomenological) and quantitative (positivistic) research (Watkins, 2006). Table 4.1 provides a practical perspective of the differences between quantitative and qualitative approaches in terms of the research focus.

It is evident from Table 4.1 that qualitative and quantitative methods differ substantially. However, in practice most qualitative-style researchers examine quantitative data and vice versa (Watkins, 2006). Qualitative research strives to understand the perspective of participants or a situation by looking at firsthand experience to provide meaningful data (Evans, 2004). There is a general shift in IS research away from technological to managerial and organisational issues, resulting in an increasing interest in qualitative research (Myers, 1997).

Considering that qualitative research is an interdisciplinary field it is suitable for studying organisational behaviour and relationship issues in the IS field (Evans, 2004). Early IS research was predominantly quantitative in nature, conforming to the positivist epistemology. Benefits of using positivist research methods are that it is easier to undertake and consumes less time to produce results than interpretive research.

Table 4.1.: Distinguishing characteristics of quantitative and qualitative approaches(Adapted from Watkins (2006:7)

Research Focus	Quantitative (Positivistic)	Qualitative (Phenomenological)
Purpose of the research	To explain and predict To confirm and validate To test theory	To describe and explain To explore and interpret To build theory
Nature of research process	Focused Known variables Established guidelines Static design Context-free Detached view	Holistic Unknown variable Flexible guidelines Emergent Design Context-bound Personal view
Method of data collection	Representative, large sample Standardized instruments	Informative, small sample Observations, interviews
Analytic form for reasoning	Deductive analysis	Inductive analysis
Method of communication findings	Numbers, Statistics, aggregated data Formal voice, scientific style	Words Narratives, individual quotes Personal voice, literary style

Qualitative research can be positivist, interpretive, or critical. These research paradigms are not necessarily opposed and can be accommodated within one study Meyers (1997). Babbie (2005:25) as cited by Watkins (2006) suggests that "recognising the distinction between qualitative and quantitative research does not

mean that you must identify your research activities with oneto the exclusion of the other. A complete understanding of a topic often requires both techniques."

Table 4.2 summarizes various research processes and provides a holistic perspective of the key drivers to each approach.

Table 4.2: Research approaches in quantitative and or qualitative paradigms(Adapted from Watkins (2006: 37)

Qualitative Approaches	Quantitative Approaches
Action Research	
Case study research Descriptive case study research Illustrative case study research Experimental case study research Explanatory case study research	Case study research Descriptive case study research Illustrative case study research Experimental case study research Explanatory case study research
Ethnography	
Focus groups	Focus groups
In-depth surveys	In-depth surveys
	Large-scale surveys
Participant- observer approach	
Hermeneutics	
	Simulation or stochastic modelling
	Cross-sectional studies
	Longitudinal studies
Mixed methodologies (Methodological triangulation)	Mixed methodologies (Methodological triangulation)

There are typically two tendencies in IS research (Galliers and Land, 1978 as cited by Watkins, 2006). The first relates to the primacy of traditional empirical research, which is more suited for natural sciences, while the second relates to the tendency to advocate a particular mode of IS research, irrespective of the particular mode of IS research topic being studied.

Evans (2004) shows that 85% of published IS research undertaken by leading US institutions were of the traditional type. "Increasingly, however, both information

systems academics and practioners have begun to realize it is more appropriate to extend the focus of study to include behavioral and organisational considerations" (Watkins, 2006:75).

A research method is a strategy of inquiry which moves from the underlying assumptions to research design and data collection. The choice of the research method influences the research design and data collection.

4.3 CASE STUDY RESEARCH

The term "case study" has multiple meanings. It can be used to describe a unit of analysis such as, for example, a case study of a particular organisation or to describe a research method. The case study is the most common qualitative method used in IS research (Myers, 1997). Yin (1994) defines the scope of a case study as an empirical inquiry that investigates a contemporary phenomenon within a real-life context, especially when the boundaries between phenomenon and context are not clearly evident. The case study research strategy comprises an all-encompassing method – with the logic of design incorporating specific approaches to data collection and data analysis. In this sense, the case study is not either a data collection tactic or merely a design feature alone, but a comprehensive research strategy. Case studies are often described as exploratory research used in areas where there are few theories or a deficient body of knowledge, and is particular valuable in answering who, why and how questions in research (Watkins, 2006).

4.3.1 Action research

There are numerous definitions of action research, and one of the most widely cited is that

> "Action research aims to contribute both to the practical concerns of people in an immediate situation and to the goals of social science by joint collaboration within a mutually acceptable ethical framework" (Meyers, 1997: 5).

The main aim of action research is to enter into a situation and attempt to bring about change and monitor results (Watkins, 2006). Action research has been accepted as a valid research method in applied fields such as organisational development (Meyers, 1997). In IS, there seems to be increasing interest in action research approach.

4.3.2 Ethnography

Ethnography falls within the phenomenological or qualitative paradigm (Watkins, 2006), and aims to provide an in-depth description of a group of people or community (Mouton, 2001). This research approach requires that the researcher becomes involved with the actors being studied for an extended period of time. This approach has some application in business and management studies. However, it is not frequently used (Watkins, 2006) .

4.3.3 Focus groups

Focus groups are one of the most widely used exploratory interview techniques, best known as semi-structured interviews (Hair *et al.*, 2003). This approach is used for collecting evidence from a highly specialized group of individuals, who will debate an issue of interest with the researcher (Watkins, 2006). Focus groups are used across all business disciplines for business and management research.

4.3.4 In-depth surveys

An in-depth survey is a commonly applied qualitative research approach, falling within the phenomenological paradigm. It is preferable when a respondent may be more open to participate in a study in a private setting as opposed to a group setting. As a rule, structured questionnaires are not used for in-depth surveys, but rather allow the respondent to speak freely on sensitive subjects of interest to the researcher The use of an in-depth survey is more appropriate when interviewing managing executives in a one-to-one setting, and useful in clarifying concepts (Hair *et al.*, 2003; Watkins, 2006;).

4.3.5 Large-scale surveys

Large-scale surveys fall within the positivistic or quantitative paradigm (Watkins, 2006), and aim to provide a broad overview of a representative sample of a large population (Mouton, 2001). The large-scale survey is a common approach to research in business and management. According to Mouton (2001) large-scale surveys are normally used in organisational surveys, public opinion polls, attitude surveys, and needs assessment surveys. Large-scale surveys can be used in IS to explore the acceptance of an organisation's computer strategy by its staff or end-users (Watkins, 2006).

4.3.6 Participant – observer approach

The participant – observer approach is used in studies that involve the subjects of research (research participants) as an integral part of the design. Using mainly qualitative methods, the participant-observer approach requires the researcher to take part in the phenomenon in the same way as the other participants, while at the

same time focusing on observing the way in which the group operates (Mouton,2001; Watkins, 2006) show an example of this type of research is where the researcher conducted research in two companies and spent some time as an employee in these companies gathering relevant information related to the research (Watkins, 2006) .

4.3.7 Hermeneutics

Hermeneutics falls within the phenomenological or qualitative paradigm (Watkins, 2006). It is referred to as the approach of analysis of text (religious or literary) in order to understand the meaning of such text (Mouton, 2003). This method can also be applied to any situation in which the researcher want to ”recover” historical meaning (Watkins, 2006). The quality and authenticity of text are major determining factors of the quality of interpretation, which sometimes results in multiple, conflicting, interpretations to the receiver (Mouton, 2003).

4.3.8 Simulation or stochastic modeling

Simulation or stochastic modelling situates within the positivistic (quantitative) paradigm. Simulation or stochastic modelling can be defined as a domain of study in which the input variables and the manner in which they interact are generally known to an uncertain level of accuracy (Watkins, 2006). The type of research involves the building of a mathematical model to describe how to optimize a certain function in the organisation.

4.3.9 Cross-sectional studies

Cross-sectional studies also fall within the positivistic or quantitative paradigm. Descriptive studies can provide the user with a snapshot, or description of

business elements at a given point of time and summarized statistically. Cross-sectional studies are conducted when there are constraints of time or resources. The data is collected only once and over a short period of time before it is analysed and reported (Hair *et al.*, 2001; Watkins, 2006).

4.3.10 Longitudinal studies

Longitudinal studies are positivistic or quantitative in nature. Longitudinal studies use a sample to describe business elements, by investigating the same situation or people several times, or continuously over the period in which the problem runs its course (Watkins, 2006). The advantage of longitudinal study is that it can track changes over time, but the constraints of budget and time impose the need of cross-sectional analysis (Cooper and Schindler, 2003).

4.3.11 Mixing methodologies

Most researchers do either quantitative or qualitative research work (Myers, 1997). The use of multiple but independent measures is known as triangulation, and may be described by categories, namely:

- Triangulation of theories, which involves borrowing models from one discipline and using them to explain situations in another discipline;
- Triangulation of data, which refers to research where data is collected over different time frames or different sources;
- Triangulation by investigators, which refers to different people collecting data on the same situation, and the results are then compared; and
- Methodological triangulation, which refers to research where both qualitative and quantitative research approaches are used for data collection (Watkins, 2006).

Each of the research methods discussed uses one or more techniques for collecting empirical data. These techniques range from interviews, observational techniques such as participant observation and field work, through to archival research.

4.4 RESEARCH DATA CHARACTERISTICS

Selecting the right research design depends upon the research question. If the research question involves primarily discovery or classification of some issue, an exploratory design is best, but research questions that emphasise the description of some quantity calls for a descriptive design (Hair *et al.*, 2001)

Research projects require analysis of data, where data is simply information recorded with the intent of presenting facts. Researchers are normally interested in data on more than one characteristic. Researchers often investigate relationships between the different characteristics. Once the data is successfully analysed and statistical results addressing specific research questions have been interpreted, invaluable knowledge may result (Hair *et al.*, 2001).

Data can be characterised as:

- Objective data which is independent of the opinion of any single person and provide data that is difficult to dispute.
- Subjective data that is in the opinion of an individual. All perceptual data is subjective.

In general, there are two types of data sources, namely:

- **Primary data:** Which (collected for the first time) is collected for the purpose of completing a current research project. The researchers are involved in all aspects of turning the data to knowledge, including the design of the data collecting instrument, collecting the data, coding, checking for errors, analysis and interpreting the data (Watkins, 2006; Hair *et al.*, 2001).
- **Secondary data:** Which refers to existing data that have been collected for some other research purpose, which can be utilised for the proposed research. Researchers must be aware of the disadvantages using secondary data. One disadvantage is that secondary data seldom fits the purpose at hand precisely. Another disadvantage with secondary data is that its quality is difficult to assess. Caution should be exercised in using data from unknown or unfamiliar sources (Watkins, 2006; Hair *et al.*, 2001)

Data collected from research questionnaires can be either quantitative or qualitative (Mouton,2003; Watkins, 2006).

4.2 QUANTITATIVE DATA

Quantitative data consists of two subgroups of data, namely (1) Discrete or quantitative data representing fixed values, where numbers are used directly to present the properties of something, and are in a form that lends itself to statistical analysis; and (2) Continuous or qualitative data representing all possible values within a specific interval (Hair *et al.*, 2001; Watkins, 2006;). Quantitative approaches to data collection are often used when a well defined research problem is constituted. They help provide objectivity in that hypotheses are tested by applying statistical criteria to the variables to be measured (Hair *et al.*, 2003).

4.3 QUALITATIVE DATA

Qualitative data is information that is difficult to measure, count, or express in numerical terms. This type of data is used in research involving detailed, verbal descriptions of characteristics, cases, and settings. Qualitative data represents descriptions of things that are made without assigning numbers directly (Hair *et al.*, 2003). Qualitative research is described as "any kind of research that produces findings not arrived at by means of statistical procedure or means of quantification" (Hoepfl, 1997:2).

The processing of qualitative data is different from quantitative data given that it cannot be measured like quantitative data (Olivier, 2004). Furthermore, the

researcher who acts as the "human instrument" in the data collection process, and relies on interpretations is considered to be subjective (Hoepfl, 1997). From a positivist view then in order to be objective, researchers have to eliminate all personal bias, using external standards against which all observations can be objectively measured (Oliver, 2004).

Table 4.3: Comparison of quantitative and qualitative data (Adapted from Hair *et al.*, 2001: 76)

Description	Quantitative Data	Qualitative Data
Purpose	More useful for testing. Provides summary information on many characteristics. Useful in tracking trends	More useful for discovering. Provides in-depth information on a few characteristics. Discovering hidden motivations and values.
Properties	More structured collection techniques and objective ratings. High concern for representative. Relative short interviews (1-20 minutes) Interviewer is passive. Large samples (over 50) Results are objective.	More unstructured collection techniques require a subjective interpretation. Little concern for representative. Relatively long interviews (1/2 to many hours) Interviewer is active and should be highly skilled. Small samples (1-50) Results are subjective

In Table 4.3 quantitative and qualitative data are compared and contrasted. Some researchers debate the superiority of qualitative over quantitative research or vice versa. However, a comparison of the two approaches suggests that they complement each other very well (Hair *et al.*, 2006).

4.4 DATA COLLECTION

Research projects often involve a survey to conduct fieldwork using a questionnaire as an instrument to gather the relevant data. The analysis of data

takes place with the intent of presenting facts related to set characteristics. The relationships between the different characteristics are investigated and statistically presented and analyzed to determine any patterns or trends that can be identified or isolated, or to establish themes in the data (Hair *et al.*, 2003; Mouton, 2001).

Researchers use measurements to describe phenomena that exist in the business world, in terms of, demographics, behaviour, attitudes, belief, lifestyles and expectations of organisations (Hair *et al.*, 2003). Therefore to describe phenomena, researchers must have data, and data may be obtained by observations, interviews and questionnaire surveys. Measurement is fundamental to research, and represents a key element that shapes the stages in both quantitative and qualitative data processes. Without measurement, it is difficult, if not impossible, to comment on behavior or phenomena (Hair *et al.*, 2003).

4.5 MEASUREMENT SCALES

Raw data needs to be processed into usable information through analysis. In designing a questionnaire, data must be in a suitable format so that an appropriate data analysis technique can be used to answer the research question (Frazer and Lawley, 2000). Table 4.4 show the types of measures of data often used in questionnaires (Frazer *et al.*, 2000; Oliver, 2004; and Watkins, 2006).

Table 4.4: Types of measurement scales (Adapted from Haupt,2006)

Scale	Characteristics	Statistical possibilities
Nominal	Measures in terms of names or designations of discrete units or categories	Mode, frequency distribution, chi square
Ordinal	Measures in terms of such values as ">" or "<" without specifying the size of intervals	Mode, frequency distribution, chi square, median, percentile rank, rank correlation
Interval	Measures in terms of equal intervals or degrees of difference but zero is arbitrarily established	Mode, mean, std. dev., *t*-test, *F*-test, product moment correlation
Ratio	Measures in terms of equal intervals and an absolute zero point of origin	Geometric mean, percent variation, and other

4.6 QUESTIONNAIRE DESIGN

A questionnaire as "gathers information about characteristics, actions, or opinions of a group of people, referred to as a population" (Kraemer and Pinsonnealt, 1993:2). According to Leedy and Ormrod (2001) as cited by Watkins (2006),

> "…a survey is a simple design: The researcher poses a series of questions to willing participants; summarizes their responses with percentages, frequency counts, or more sophisticated statistical indexes; and then draws inferences about a particular population from the responses of the sample".

Surveys conducted for IS research purposes have distinct characteristics, namely:

- The purpose of the survey is to produce quantitative descriptions of some aspect of the population.
- The main way of collecting information is by asking people structured and predefined questions.
- Information is generally collected about only a fraction of the study population (sample), but is collected in such way as to be able to generalize the findings to the population.

According to Watkins (2006) the most commonly used survey design in business and management, is that of the descriptive survey. The most important aspect of questionnaire design is that the respondent clearly understands the questions. On the other hand, Hair (2003) states that before developing a questionnaire, the researcher must be clear as to what is being studied, and the expected outcome of the research. The questionnaire design process is described as follows:

- Determine the required information, and from whom it should be sought;
- Determine the interview method, and the length of the questionnaire;
- Prepare the draft questionnaire:
    - ☞Question content;
    - ☞Question wording;
    - ☞Response format, and
    - ☞Structure and layout.
- Pre-test and revise questionnaire; and
- Assess the reliability and validity of the questionnaire (Frazer and Lawley, 2000).

Administering a questionnaire Hair (2003):

- Identify the best practice for administering the type of questionnaire utilized;
- Ensure a process is in place to handle completed questionnaires;
- Determine the deadline and follow-up methods.

Frazer and Lawley, (2000: 26) list the three main response formats (question types) used in questionnaire design as:

- **Open-ended:** (unstructured) questions that are suitable where precise information is required and places no constraints on the respondents who are free to answer in their own words. According to Hair *et al.*(2003), open-ended questions should be used sparingly in self completion questionnaires, because it is complicated to analyse the responses:
- **Closed-ended:** or structured questions that according to Frazer *et al.* (2000), can be categorised as either single (where only one response is required), dichotomous (where two response items are provided), or multichotomous (where several alternatives are listed), and are usually used in quantitative research.

- **Scaled-response:** questions that require the use of a scale to measure the respondent's attitudes toward a particular issue.

Having taken cognizance of the questionnaire design process, it was decided that e-mail or self-administered questionnaires would be the most appropriate survey instrument to use in this study.

Questions pertaining to the research were developed using a grid proposed by Frazer and Lawley (2000) as shown in Table 4.5.

Table 4.5: Links between stages of research process(Adapted from Frazer et al (2000: 12)

Questionnaire design				
Research Problem:				
Research Question/s:				
Investigative Questions	Research objectives	Relevant questions for questionnaire	Level of data	Proposed analysis technique used
IQ1	RO1	Q1	Nominal Ratio Ordinal Interval	Frequencies and percentages, then appropriate measures of central tendency Frequencies, means and standard deviations, then t-test to establish significant differences, or appropriate bivarate tests.

The questionnaire length of 8 pages excluding the cover page was in line with the recommendation that the optimal length for a questionnaire is 10 to 12 pages

(Dillman, 1978). There is no difference in response rates for various questionnaire lengths below 12 pages.

Questions that were open-ended were kept to a minimum, either to cater for the wide range of expected or possible responses or to allow the respondents the freedom to fully explain their choice of response. For most of the questions a 5-point Likert scale was deemed appropriate and scaled answers were developed. The Likert scale is the most common scale for obtaining the opinions of the respondents (Fellows and Lui, 1997). The questionnaire was divided into 5 sections, namely, demographic information, organisational design, IS governance, management of IS, and information and knowledge management. (The questionnaire has been attached as Appendix A). This questionnaire was designed to be completed by CEOs of construction companies.

4.7 ORGANISATIONAL DESIGN

This section dealt with the CEO of a construction company, and his role in organisational design. The aim of this section was to establish to what extent the CEO of a particular company is involved in the structuring of the company, and more specifically how IS is structured to play a strategic role in the company. The respondents were asked to respond to questions on a 5-point Likert scale ranging from "strongly disagree, tend to disagree, undecided, tend to agree, and strongly agree". Respondents were also requested to add additional comment in the column "Comment" if they wished to clarify their response.

4.8 INFORMATION SYSTEM GOVERNANCE

This section dealt with how IS was governed in the construction company. The aim of this section was to establish the importance of IS for the CEO in terms of IS strategy, IS on the CEO's agenda, IS investment, importance of IS output, and importance of a CIO/CEO relationship. Respondents were also requested to indicate which structural form best described IS in their company. The respondents were asked to respond to questions on a 5-point Likert scale ranging from "strongly disagree, tend to disagree, undecided, tend to agree, and strongly agree". Respondents were also requested to add additional comment in the column "Comment" if they wished to clarify their response.

4.9 MANAGEMENT OF INFORMATION SYSTEMS

This section dealt with the management of IS in the construction company. The aim of this section was to establish to what extent the CEO played a supporting role in the management of IS. Respondents were asked to respond to questions related to CIO responsibility, CIO authority and responsibility, CIO participation in strategic decision making, and importance of information processing in terms of the different reports generated by the IS. The respondents were asked to respond to questions on a 5-point Likert scale ranging from "strongly disagree, tend to disagree, undecided, tend to agree, and strongly agree". Respondents were also requested to add additional comment in the column "Comment" if they wished to clarify their response.

4.10 INFORMATION AND KNOWLEDGE MANAGEMENT

This section of the questionnaire dealt with the importance of information and knowledge management for the CEO of a construction company. The aim was to establish the importance of information, and reports generated by IS. Respondents were asked to indicate the types of reports generated by the IS that were considered important for the CEO decision-making process. The respondents were asked to respond to questions on a 5-point Likert scale ranging from "strongly disagree, tend to disagree, undecided, tend to agree, and strongly agree". Respondents were also requested to add any additional comment in the column "Comment" if they wished to clarify their response.

Finally, respondents were requested to submit an organogram showing IS in relation to the overall structure of their organisation.

4.11 SAMPLE SELECTION

For the researcher to evaluate questions from the respondents` view point, the target population must be identified and defined (Hair *et al.*, 2003: 188). When using surveys defining the target population is important (Watkins, 2006). Similarly it is important to define the target population as "that group which constitutes the defined population from a statistical viewpoint." The target population is "the complete group of objects or elements relevant to the research project" (Hair *et al.*, 2003: 209).

A sampling frame is an accurate, complete listing of all the elements in the population targeted by the research (Hair *et al.*, 2003). In the case of this

research, the online active database for "Masters Builders Association Listed Membership" was used to select the appropriate construction companies active in the Western Cape. During the selection process the researcher had to eliminate those construction companies with no formal IS/IT. The elimination process was done by a telephonic survey using a grid as shown below in Table 4.6.

Table 4.6: Elimination grid for pre sampling

Name of Company	Contact Number	Contact Details			CEO Details	IS/IT Structure	CIO			Comments
		Address	Tel	e-mail		Yes	No	Yes	No	

The study was directed toward the CEOs of construction companies in the Western Cape. A low response rate was anticipated, as evidenced in similar research done by Falconer and Hodgett (1999).

4.12 SPECIFIC PROCEDURES

A sample of 29 construction companies in the Western Cape was selected. The researcher contacted the CEOs of each of the construction companies personally, explained the purpose of the research, the research instrument and the importance of their participation in the survey in the form of a personal interview. All the CEOs who agreed to participate in the study indicated that they did not have any time for interviews and would rather complete the survey in their own time. An e-mail was then sent with a cover letter and survey attached (Refer to Appendices A and B). Despite numerous personal calls and follow-up e-mails requesting the

return of the survey as promised, only 9 companies responded, resulting in a sample size of 9 which represents 31% out of the original intended sample size.

4.13 RELIABILITY AND VALIDITY

The measurement instrument used to gather the relevant data to support the research question and hypotheses must be accurate and consistent. Accuracy is associated with the term '*validity*', and consistency is associated with the term '*reliability*' (Hair *et al.*, 2003). A questionnaire is valid if it measures what it is supposed to measure, and it is reliable if the responses are consistent and stable (Frazer *et al.* 2000). There are three major criteria for evaluating a measurement tool, namely,

- **Validity:** Which refers to the extent to which a test measures what it is actually supposed to measure. Internal validity according to Frazer *et al.* (2000: 35) is concerned with the degree of confidence the researcher has in the casual effects between the variables;
- **Reliability:** That has to do with the accuracy and precision of the measurement procedure; and
- **Practicality:** Which is concerned with a wide range of factors of economy, convenience, and interpretability (Cooper and Schindler, 2003).

4.14 ANONYMITY AND CONFIDENTIALITY

All respondents have the right to remain anonymous (Mouton, 2002). It is the duty of the researcher to safeguard the privacy of the respondents (Hair *et al.*, 2003). Anonymity refers to the principle that the identity of the individual or the organisation is kept secret, whereas confidential information provided by the respondents must be treated accordingly. The following guidelines should be followed for ensuring informed consent:

- Obtain approval for the research;

- State clearly what institution is being represented;
- Explain to the respondents the objectives of the research;
- Assure them of the respect for their confidentiality;
- Thank the respondents for their participation; and
- Offer them availability of the research results (Mouton, 2003).

4.15 ANALYSIS OF DATA

The collected data was captured, encoded and statistically analysed using the Statistical Package for the Social Sciences (SPSS).

4.16 CHAPTER SUMMARY

The objective of this chapter was to describe the research methodology adopted in this study. The literature review provided the basis for designing the research instrument. Both the qualitative and quantitative approaches were used to achieve the purpose of the study. In the next chapter, the analysis of the data is presented and discussed.

CHAPTER 5

DATA ANALYSIS

5.1 INTRODUCTION

In order to draw conclusions from the empirical data collected, statistical evidence is necessary to establish the existence and strength of the relationships between the variables represented by the data. The Statistical Package for Social Sciences (SPSS) computer software was used to analyse the data from the survey instrument. The findings of the questionnaire as well as the analyses of the findings are presented in this chapter. The questionnaire is attached as Appendix A.

5.2 ANALYSIS OF DATA

The questionnaire was designed to determine the role of the Chief Executive Officer (CEO) in IS governance in the construction sector.

Section A: Profile of the sample

From Table 5.1 it is evident that the respondents had been CEOs of their respective companies for about 9 years. All CEOs who participated in this study had more than 5 years experience in their current positions.

Table 5.1: Length of service as CEO

Years as CEO	Frequency	Percent	Statistics	
6	3	37.50	Median	9.00
8	1	12.50	Minimum	6.00
10	1	12.50	Maximum	33.00
17	1	12.50		
23	1	12.50		
33	1	12.50		
Total	8	100.00		

Table 5.2 suggests that the sampled companies had been in existence for approximately (median) 28 years. The oldest company was reported to be 102 years old and the youngest 7 years. The ages of the participating CEOs ranged between 35 and 60 years with a median age of 45 years.

Table 5.2: Length of company existence

Years of operation	Frequency	Percent	Statistics	
7	1	12.50	Median	28.00
16	1	12.50	Minimum	7.00
23	2	25.00	Maximum	102.00
33	1	12.50		
45	1	12.50		
61	1	12.50		
102	1	12.50		
Total	8	100.00		

Table 5.3 suggests that the split between the private and public sector as sources of work is 65% and 35% respectively. About a third (33.3%) of respondents secured all of their work in the private sector. In contrast, one company received almost all (95%) of its work from the public sector. All respondents were active in the construction sector with an average annual turnover for the past 3 years of greater than R20 million. Further, 28.6% secured all their work on the basis of tendering while 14.3% of respondents obtained almost all of their work (90%) by means of negotiation. The overall median split between tendered and negotiated projects was 70/ 30 respectively.

Table 5.3: Primary sources of work

% Split Private Sector	Frequency	Percent	Statistics	
5	1	11.11	Median	65.00
60	3	33.33	Minimum	5.00
70	1	11.11	Maximum	100.00
100	3	33.33		
Total	8	100		
% Split Public Sector	Frequency	Percent	Statistics	
0	3	37.5	Median	35.00
30	1	12.5	Minimum	0.00
40	2	25	Maximum	95.00
45	1	12.5		
95	1	12.5		
Total	8	100		
Tender	Frequency	Percent	Statistics	
10	1	14.3	Median	70.00
60	2	28.6	Minimum	10.00
70	1	14.3	Maximum	100.00
80	1	14.3		
100	2	28.6		
Total	7	100		
Negotiated	Frequency	Valid Percent	Statistics	
0	2	28.6	Median	30.00
20	1	14.3	Minimum	0.00
30	1	14.3	Maximum	90.00
40	2	28.6		
90	1	14.3		
Total	7	100		

With respect to the type of construction that companies engaged in the findings are as follows (refer Figure 5.1):

- Residential 29.00%;
- Maintenance 12.50%;
- Non-residential 32.13%; and
- Civil 26.37%.

All companies engaged in more than one type of construction.

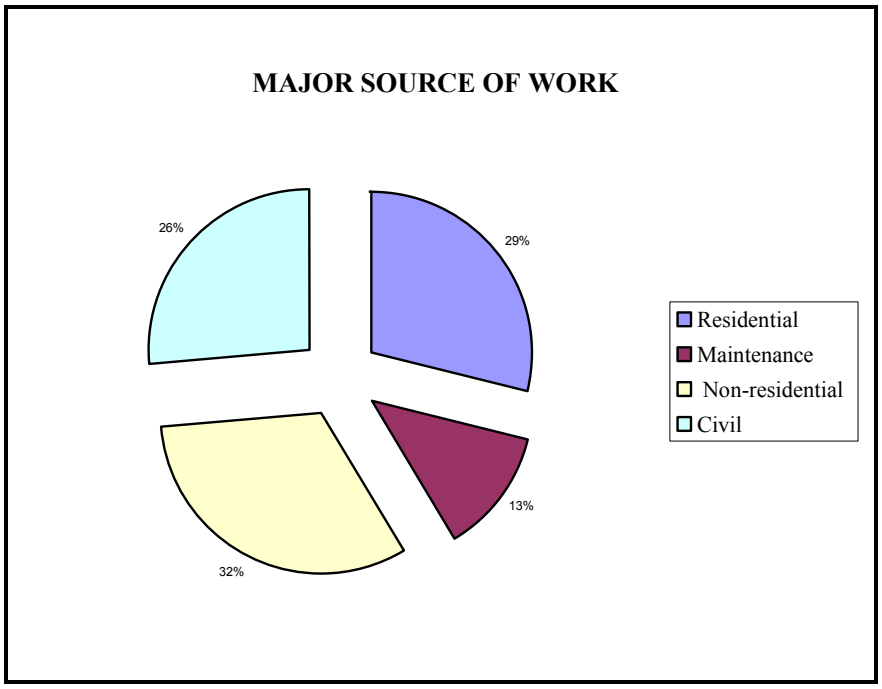

Figure 5.1: Major source of work in the construction sector

The provinces in which companies primarily operated from are demonstrated in Figure 5.2. Evidently 50% of the companies operated exclusively in the Western Cape.

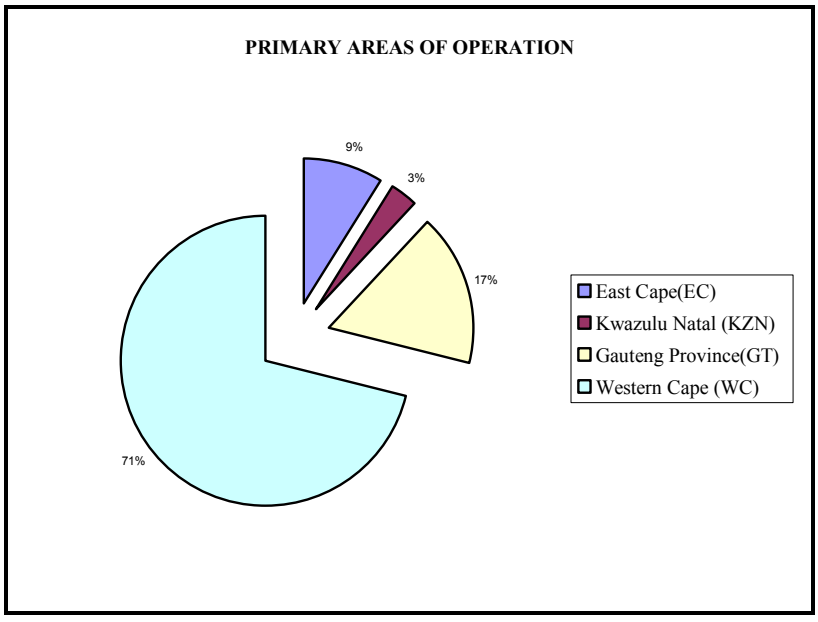

Figure 5.2: Primary areas of operation

Section B: Organisational Design

Table 5.4 suggests that in most companies (mean = 4.44) the CEO either alone, or with an executive management team, made all the major decisions. Slightly fewer companies (mean = 4.44) regarded themselves as well established, large and serving different markets. Still fewer companies (mean = 3.44) reported that their management structures were flat, used cross-hierarchical and cross-functional teams, had low formalization, possessed a comprehensive information network, and relied on participative decision-making.

Table 5.4: Hierarchy of authority

Statement		SD[16]	TD	U	TA	SA	Mean	Std. Deviation
The CEO makes all major strategic decisions alone or together with a group of senior executives.	N	0	0	01	4	4	4.44	0.527
	%	0	0	0	44.4	55.6		
	%	0	11.1	11.1	22.2	55.6		
The management structure of my company is flat, uses cross-hierarchical and cross functional teams, has low formalization, possesses a comprehensive information network, and relies on participative decision-making	N	1	1	0	7	0	3.44	1.13
	%	11.1	11.1	0	77.8	0		
	%	11.1	55.6	0	33.3	0		

From Table 5.5 it is evident that most of the respondents (mean= 4.38) agree that the construction process is highly dependent upon both the transfer of information and the exchange of information between all levels of the organisation. Further, that IS is supported by the organisational structure of the company. Fewer respondents

[16] Key = SD = Strongly Disagree; TD = Tend to Disagree U = Undecided TA = Tend to Agree SA = Strongly Agree

(mean = 3.11) consider IS to be critical to the process of [re]structuring their companies towards more effective lean and flat management structures.

Table 5.5: Importance of IS in Organisational Design Process

Statement		SD	TD	U	TA	SA	Mean	Std. Deviation
Given that the construction process is highly dependent upon the transfer of information and the exchange of information between all levels of the organisation [IS] is supported by the organisational structure of the company	N	0	0	0	5	3	4.38	0.52
	%	0	0	0	62.5	37.5		
"Information systems" are considered to be critical to the process of [re]structuring my company towards a more effective lean and flat management structure	N	1	3	1	2	2	3.11	1.45
	%	11.1	33.3	11.1	22.2	22.2		

Table 5.6 suggests that most respondents (mean = 3.88) inherited the existing organisational structure and made changes that they considered necessary, while all of the respondents were involved in developing the organogram or organisational structure of their companies.

Table 5.6: Extent of CEO involvement in organisational development

Statement		SD	TD	U	TA	SA	Mean	Std. Deviation
I inherited the existing organisational structure and made changes that I deemed necessary	N	1	1	0	2	4	3.88	1.55
	%	12.5%	12.5%	0	25%	50%		
	%	77.8%	22.2	0	0	0		

The results in Table 5.7 suggest that the companies of most respondents (mean = 4.00) are characterized by a flexible reporting structure in terms of which subordinate staff report to different managers, depending on the project or the location of the work. Slightly fewer companies (mean = 3.38) regarded themselves as being well established, highly specialized and formalized in terms of work, with decision-making usually concentrated at top management level. Still

fewer companies (mean = 2.78) regarded themselves as young organisations serving a highly technical environment with decision-making spread throughout the organisation with power residing in the experts. Even fewer (mean = 1.67) indicated that their companies were temporary alliances between two or more organisations, grouped together to accomplish a specific venture, but were still formally structured.

Table 5.7: Importance of structural forms in the Organisation

Statement		SD	TD	U	TA	SA	Mean	Std. Deviation
My company is characterized by a flexible reporting structure in terms of which subordinate staff report to different managers, depending on the project or the location of the work	N	0	0	2	5	2	4.00	0.71
	%	0	0	22.2	55.6	22.2		
My company is characterized as well established, work is highly specialized and formalized and decision making usually concentrated at top management level	N	0	2	2	3	1	3.38	1.06
	%	25	25	0	37.5	12.5		
My company is regarded as a young organisation in a highly technical environment with decision making spread throughout the organisation while power resides in experts	N	1	4	0	4	0	2.78	1.20
	%	11.1	44.4	0	44.4	0		
My company is characterized as simple with little specialization or formalization; Consequently, power and decision-making are vested in the chief executive.	N	4	2	0	2	0	2.00	1.31
	%	50	25	0	25	0		
Company is a temporary alliance between two or more organisations that band together to accomplish a specific venture, but is still formally structured.	N	7		1		1	1.67	1.41
	%	77.8		11.1		11.1		

From Figure 5.3 it is evident that the most popular organisational structure for IS (44.4%) is Centralised IS (CIS). A Decentralised IS (DIS) organisational structure (22.2%) is less common, while Centralised Coordinated IS (CCIS), Functional Coordinated IS (FCIS), and Federated IS (FIS) are the least popular (11.1%) in terms of organisational structure.

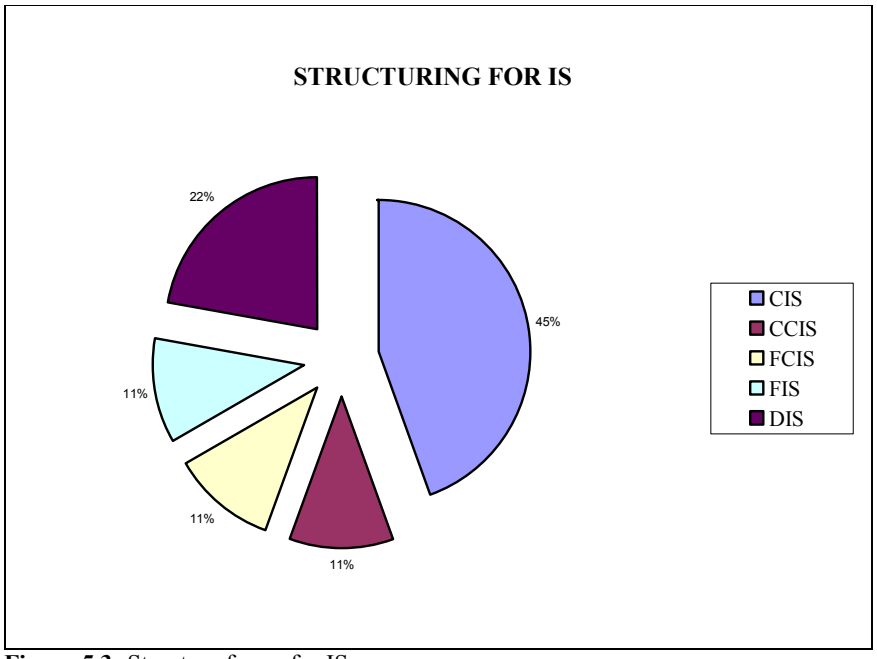

Figure 5.3: Structure forms for IS

Section C: Information Systems Governance

Table 5.8 suggests that to most companies (mean = 4.11) IS investment is an important part of their business strategy. Slightly fewer companies (mean = 4.00) consider IS as a strategic asset, and still fewer (mean = 3.97) have a formal IS strategy for their companies. To the least number of companies (mean =3.33) it was not important to have an IS strategy on the company's strategic agenda.

Table 5.8: Importance of IS strategy for the organisation

Statement		SD	TD	U	TA	SA	Mean	Std. Deviation
IS investment must be key part of the business strategy in order to build a competitive advantage	N	1	1	0	3	4	4.11	1.05
	%	11.1%	11.1%	0	33.3%	44.4%		
Information Systems (IS) is a crucial part of the strategic assets of the business in terms of its long-term strategy, daily performance, and sustainability	N	0	1	0	6	2	4.00	0.87
	%	0	11.1%	0	66.7%	22.2%		
My company has an IS strategy? (An agreement on the goals of the company for its use of IS and the means of achieving these goals)	N	0	1	1	6	1	3.97	0.83
	%	0	11.1%	11.1%	66.7%	11.1%		
	%	0	22.2%	22.2%	33.3%	22.2%		
My company executive board makes provision for the discussion of company wide IS strategy at its meetings	N	1	2	0	5	1	3.33	1.32
	%	11.1%	22.2%	0	55.6%	11.1%		

Table 5.9 suggests that in most companies (mean = 4.25) IS supports all managerial levels of the organisation, while in slightly fewer companies (mean = 4.00) IS as a valuable tool for lowering costs through all levels of the company is less important.

Table 5.9: Importance of IS supporting operational processes of the organisation

Statement		SD	TD	U	TA	SA	Mean	Std. Deviation
Information systems support all managerial levels in my organisation(strategic management, tactical management, operational management)	N	0	0	1	4	3	4.25	0.71
	%	0	0	12.5%	50%	37.5%		
IS has become critical to lower production cost, reduce time to complete projects, add value to the construction process and interact with clients and suppliers	N	0	1	1	4	3	4.00	1.00
	%		11.1%	11.1%	44.4%	33.3%		

From Table 5.10 it is evident that in most of the companies (mean = 4.00) IS plays an important role in reacting to changing environments, while in slightly fewer companies (mean = 3.22) IS has become the primary vehicle for creating new advantages, and ward off competitors.

Table 5.10: Importance of IS supporting organisation sustainability

Statement		SD	TD	U	TA	SA	Mean	Std. Deviation
IS plays an important role in the efforts of my company to be more efficient and effective in reacting to changing environments	N	0	0	2	4	2	4.00	0.76
	%	0	0	25%	50%	25%		
IS has become the primary vehicle for creating new advantages and parrying the advantages of competitors	N	0	3	3	1	2	3.22	1.20
	%	0	33.3%	33.3%	11.1%	22.2%		

From Table 5.11 it is evident that in most companies (mean = 3.56) IS has to be on the CEO's agenda, while in fewer companies (mean = 2.89) the involvement of the CEO in IS strategic and project meetings is less important.

Table 5.11: Importance of CEO support of IS functions

Statement		SD	TD	U	TA	SA	Mean	Std. Deviation
IS must be on the CEO's agenda because so many high-priority agenda items rely on it for delivery and execution	N	1	2	0	3	3	3.56	1.51
	%	11.1%	22.2%	0	33.3%	33.3%		
It is important for the CEO to attend IS project meetings, and be involved in information requirement analysis, participate and review recommendations and decision-making, and monitor IS project progress	N	2	2	1	3	1	2.89	1.45
	%	22.2%	22.2%	11.1%	33.3%	11.1%		

Table 5.12 suggests that in most companies (mean = 3.88) the CIO reports directly to the CEO, and is a member of the executive management committee. However, in slightly fewer companies (mean = 3.67) their CIOs had the skills to

manage IS themselves. In fewer companies (mean = 3.38) designated persons took responsibility for IS, and in some (mean = 3.33) companies CIOs participated in strategic meetings. Furthermore, in even fewer (mean = 3.17) companies the CEO articulating a clear mission for IS to the CIO is even less important.

Table 5.12: Importance of CEO/CIO relationship in the organisation

Statement		SD	TD	U	TA	SA	Mean	Std. Deviation
The CIO reports directly to me, and is a member of my executive management committee.	N	2	3	0	0	3	3.88	1.25
	%	25	37.5%	0	0	37.5%		
The CIO has adequate knowledge, business and IS skills for to be able to be responsible for IS governance	%	0	2	0	2	2	3.67	1.37
	N	0	33.3%	0	33.3%	33.3%		
Responsibility for IS performance is the task of a designated person such as a CIO	N	0	3	0	4	1	3.38	1.19
	%	0	33.3%		44.4%	11.1%		
The CIO always (or when necessary) attends major strategy formulation meetings	%	0	2	0	4	0	3.33	1.03
	N	0	33.3%	0	66.7%	0		
I (CEO) articulate a clear mission for the CIO, including specific responsibilities for IS/IT that go above and beyond management of the head office IS/IT department	N	0	3	0	2	1	3.17	1.33
	%	0	50%		33.3%	16.7%		
	%	50%	50%	0	0	0		

The results in Table 5.13 indicate that to most (mean = 3.33) companies it is important for the executive management to use IS output for objective verification and discussion, and for making decisions concerning strategy formulation or performance evaluation. In some (mean = 3.00) companies all employees had an accurate understanding of the importance of IS output for executive management.

Table 5.13: The importance of IS output for strategic management

Statement		SD	TD	U	TA	SA	Mean	Std. Deviation
Executive management uses IS output for objective verification and discussion. For example, to make decisions concerning strategy formulation or performance evaluation	N	1	1	3	2	2	3.33	1.32
	%	11.1%	11.1%	33.3%	22.2%	22.2%		
Employees [staff] at all levels of my organisation have an accurate understanding of the IS output that my executive team uses/requires	N	1	2	2	4	0	3.00	1.12
	%	11.1%	22.2%	22.2%	44.4%	0		

Section D: The role of the CIO in IS management

In Table 5.14 it appears that in most companies (mean = 4.00) their CIOs successfully communicate the IS strategy to the organisation, and were directly involved with strategic projects. In slightly fewer companies (mean = 3.83) it was less important for CIOs to understand the business principles in order to optimize IS operations in the company.

Table 5.14: CIOs ability to communicate IS strategy in the organisation

Statement		SD	TD	U	TA	SA	Mean	Std. Deviation
The CIO is able to explain IS/IT and the potential for optimum use of IT/IS to everyone in the organisation	%	0	1	0	3	2	4.00	1.10
	N	0	16.7%	0	50%	33.3%		
The CIO is individually involved with IS/IT projects of strategic importance, and directly controls progress and levels of investment	%	0	1	0	3	2	4.00	1.10
	N	0	16.7%	0	50%	33.3%		
The CIO understands the need to optimize IS operations based on rich business and planning experience	%	0	1	0	4	1	3.83	0.98
	N	0	16.7%	0	66.7%	16.7%		

According to Table 5.15, it is evident that in most companies (mean = 3.50) the CIOs took full responsibility for IS management and governance

Table 5.15: CIO hierarchy of authority

Statement		SD	TD	U	TA	SA	Mean	Std. Deviation
The authority of the CIO extends beyond merely acting as the approval authority at head office with clearly defined authority over and responsibility for IS	%		2	0	3	1	3.50	1.22
	N	0	33.3%		50	16.7%		

Section E: Information and Knowledge Management

From Table 5.16 it is evident that in most companies (mean = 4.67) IS plays a key role in the generation of reports. Reports are important for the process of strategic decision-making. In slightly fewer companies (mean = 4.13) it was less important to identify specific information needs in order to process the required reports.

Table 5.16: Importance of IS in Information Management

Statement		SD	TD	U	TA	SA	Mean	Std. Deviation
Information systems play an important role in the generation of reports in my company	N	0	0	0	3	6	4.67	0.50
	%	0	0	0	33.3%	66.7%		
Reports are important for the strategic decision-making process in my company	N	0	0	0	3	6	4.67	0.50
	%	0	0	0	33.3%	66.7%		
There is a clear consideration of the kind of information required to inform different strategic objectives, the IS systems gather and process accordingly and without redundancy, and data is maintained according to these strategic objectives	N	0	0	1	5	2	4.13	0.64
	%	0	0	12.5%	62.5%	25%		

5.2 CHAPTER SUMMARY

The responses to the questionnaire survey were analysed. The main findings suggest that the participating companies had been in existence for lengthy periods, had experienced CEOs, had their primary source of work in the private sector procured on a tender basis, were engaged in several different types of construction mainly in the Western Cape with budgets exceeding R20 million. Authority was typically vested in their CEOs and executive management. Most companies had flat management structures characterised by flexible reporting structures. Most CEOs considered the construction sector to be information-dependent. The study found that IS played an important role in contributing to the competitive element of the construction sector. A Centralised IS (CIS) was indicated as the most popular organisational structure for IS.

Most companies considered investment in IS to be an important part of their business strategy, and had IS strategy on their strategic agenda. They also articulated clear missions for their respective CIOs. IS was found to support all managerial levels of the organisation. IS was particularly critical in the construction process for example, buying procedures, cost control, materials receipts, tendering, resource planning, labor allocations and optimization, scheduling, certificates, payments, claims, variation orders, etc.

IS was reported to be important to most CEOs. Their CIOs typically reported directly to them. Most CIOs were deemed to have adequate knowledge, business and IS skills to manage the organizational IS function and responsible for IS.

IS was found to be important in the generation of reports, which were, in turn, important for strategic decision-making. There was consideration for and appreciation of the kind of information required to support and inform different strategic objectives. Most CEOs reported that their IS gathered and processed data accurately and without redundancy.

In the next chapter the findings of the study are summarized and compared with the literature. The study is then concluded and suggestions are offered for further research

CHAPTER 6

SUMMARY, CONCLUSION AND RECOMMENDATION

6.1 INTRODUCTION

The purpose of this study as stated in the chapter entitled, Introduction, was to develop an understanding of the role of the Chief Executive Officers (CEOs) of construction companies in the overall performance of information systems (IS) in their organisations.

The objectives of this study were:

- To determine the role of the CEOs of construction companies in determining the structure of IS to strategically support the company
- To determine the role of the CEOs of construction companies relative to IS governance and performance.
- To examine the relationship between the "CEOs and Chief Information Officer (CIO)" and the impact of this relationship on the performance of IS in a construction firm.
- To examine the importance the CEOs of information processing and knowledge management of construction companies.
- This chapter provides a summary of the findings of the study, and conclusions and recommendations for future study relative to each of the objectives.

The role of the CEO of construction companies in determining the structure of IS to strategically support the company

The findings of this study suggest that the executive teams of construction firms participate in structuring their companies, making changes to the organisational structure as they deem necessary. Furthermore, CEOs either made strategic decisions by themselves or together with other members of their executive team. The study suggests that most construction companies had flat management structures and centralized authority and control in the form of the CEO. Most companies had structures based on a matrix form, which has dual benefits of the

levels of technical expertise created by functional structure, and flexibility and teamwork. The matrix structure is also suitable for construction companies which carry out many projects concurrently, all of which need technical expertise and special managerial attention.

Further, evidence of hybrid structures was detected. These findings correlate with those of Anumba *et al.* (2002) who determined in their study that the most common organisational type was the matrix structure, with the dual benefits of high levels of technical expertise created by the functional structure, flexibility and team work. The predominating forms of IS structure in the surveyed companies were centralized and centrally coordinated IS structures. These findings are supported by the findings of several other studies by Karake, (1994); Brown and Magill., (1994), Duncan, (1997), Burke, (2004), Douglas, (1999), Hitt *et al.*, (2001), McMillan, (2002), Friesen, (2002), Lucey, (2005), Tan, (1994), Galbraith, (1977), Mintzberg, (1979), Dibrell, (2002), Ulrich, (2004), and Peppard and Ward, (1999).

It can be concluded that the CEOs of construction companies actively determine the structure of IS to strategically support their companies.

The role of the CEO of construction companies relative to IS governance and performance.

Evidently, most companies consider IS investment as a strategic asset, and have formal IS strategies in place. Furthermore, most CEOs support the notion that IS supports all managerial levels of their organisations. They also consider IS as a tool for lowering construction costs. The findings suggest that in most companies IS assists them to react and adapt to changing environments while also providing

them with competitive advantages. Most CEOs surveyed regarded IS as an important agenda item. Consequently, they remained involved in the IS strategy and project meetings. The study suggests that CEOs influence the performance of IS by the involvement in strategic aspects of IS governance. These findings are supported by the findings of other studies by Callahan *et al.*, (1999); Ndebe-Amandi,2004; Carr(2003); Yasin and Quigley (1994); Ramakrishna(2002); Buuron(2000); Chan(2000); Daniels(1998); Remenyi(1999), Suwardy *et al.*(2003); Ragunathan *et al.*(2001); McMillan (2002), Halachimi(1994) (McClearly *et al.*(1995);Earl and Feeney.(2000); Johnson *et al.*(2003); Palanisamy(2005).

The role of CEO in IS governance is important and impacts on the performance of IS in construction companies

The relationship between the CEO and Chief Information Officer (CIO) and the impact of the relationship on the performance of IS in a construction company.

There is evidence from this study that most CIOs report directly to the CEO while taking full responsibility for IS management and governance. Further, most CIOs had adequate knowledge, business and IS skills to perform their governance functions. CEOs typically articulated a clear mission for their CIOs with specific responsibilities. Most CIOs were required to attend major strategy formulation meetings. These findings correlate favorably with studies by Earl *et al.*(2000); Delisi *et al.*(1998); Ragunathan *et al.*(2002); Gottchalk(2000); Yodakawa(2000);

Bai and Lee .(2003); MITI(1999); Jenks and Dooley (2000); Feeney and Ross.(1999); Evans and Hoole.(2005).

The relationship between the CEO and Chief Information Officer (CIO) is important and impacts the performance of IS in construction companies.

The importance of information processing and knowledge management of construction companies.

The study found that IS was very important in terms of information management, and was supported by the organisational structure. There was overall agreement that the construction process is highly dependent upon the transfer and exchange of information between all levels of the organisation. This transfer and exchange was supported by IS. Further, IS output was found to be important for business performance evaluation and strategic decision-making. Evidently, IS plays a key role in the generation of reports that are important for the strategic decision-making process. These findings compare favorably with the findings of the studies of Brown and Magill.(1994); Stewart(2002); Betts(1999); Lucey (2005); Moody and Walch.(1997); Evans(2004); Oz(2004); Stair(2005); Harrington(2005).

Information processing and knowledge management is evidently important in the construction organisations surveyed.

6.2 LIMITATION OF THE STUDY

It might be argued that generalization of the findings of the study to the entire construction sector may be unreasonable given the small sample size. However, as previously stated, efforts were made to use standard procedures to increase the participation rate of the larger sample. However, time constrains compelled the study to be completed with the small sample size The researcher recognizes that the findings of the study merely provide an indication of the possible trends and perceptions of construction CEOs relative to the role of IS in their organisations as well as the broader sector.

6.3 CONCLUSION

This study set out to determine whether the performance of information systems in construction companies can be linked to the role played by the CEOs in the governance of their information systems and related technology. It was evident that the roles of the CEO of construction companies were important in determining:

- the organisational structure of IS;
- the governance structure for IS performance;
- the relationship boundaries between the Chief Executive Officer and Chief Information Officer; and
- the importance of information processing and knowledge management

Further, these findings are supported by other studies reported in the literature. However, despite the study findings, the reality is that in practice IS in the construction sector performs poorly. Similar sentiments have been expressed in the literature. One of the main reasons for IS poor performance in the organisation has been found to be the lack of executive support for IS (ITCortex, 2005). Arguably, the lack of executive support for IS typically results from

- Resistance from executive management;
- Organisational structure for IS;
- Lack of IS awareness;
- Tight profit margins that inhibit IS investment;
- Lack of IS fusion in the company relative to the alignment of business practice and performance to the overall IS strategy; and
- A general belief that the industry is doing well without IS.

This problem has been identified by researchers and practitioners as not only a local, but also a world-wide phenomenon. Betts (1999) found that despite the intensive use of IS in construction companies, very few, if any, had a strategic plan in place for IS in their organisations.

Further research

This research has confirmed the importance of IS in construction organisations. However, there is a need for a more in-depth examination of the subject area using a larger representative sample cross-referenced to samples of employees involved with IS within their respective organisations to obtain a more generalisable view of the status and performance of IS in the construction sector.

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APPENDIX A

QUESTIONNAIRE

DUE TO THE LANDSCAPE FORMAT OF THE QUESTIONNAIRE THE DOCUMENT WILL FOLLOW ON THE NEXT PAGE

QUESTIONNAIRE ON INFORMATION SYSTEMS MANAGEMENT IN THE WESTERN CAPE CONSTRUCTION SECTOR

Please note that this questionnaire consists of 5 sections, namely Sections A through E.
Anonymity is assured in that all responses will be held in the strictest confidence

SECTION A: CONSTRUCTION COMPANY PROFILE

1. For how many years have you been the **CEO** of this company? ____

2. Where were you previously employed? ____

3. In what capacity? ____

4.How old are you? ____

5. How long has your company been established? ____

6. Indicate ☑ your company's **PRIMARY** participation in the construction industry (please select only ONE?

Contractor	
Subcontractor	
Special contractor	
Labor-only subcontractor	
Other	

6.1 If other, please specify below:

7. What is your company's major source of work? Please indicate the **PERCENTAGE** split. (Should equal 100%)

Private Sector	Public Sector

8. How is your company's work usually obtained? Please indicate the **PERCENTAGE** split

Tender	Negotiated

9. Type of work or projects? Please indicate the **PERCENTAGE** split

Residential	Repairs, renovation and maintenance	Non residential (Schools, hospitals, etc.)	Civil (Roads,bridges, dams,etc.)

10.. **Average** annual turnover during the past 3 years.

<R1million	R1 million ⩾ R5 million	R5 million ⩾ R20 million	>R20 million

11. In which provinces does your company operate? Please indicate the **PERCENTAGE** split

EC	KZN	FS	NC	GT	NP	MP	LIM	WC

12. If your company operates **internationally**, list the countries below

13. If your company participates in **joint ventures** (JV) indicate whether this occurs nationally or internationally?

Nat	Inter

14. Please attach a copy of your company's **organogram** (organizational structure). For purposes of confidentiality indicate only the employment categories/responsibilities.

SECTION B: ORGANISATIONAL DESIGN

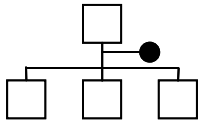
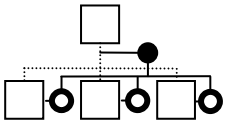
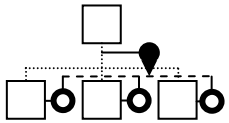
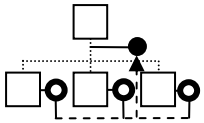
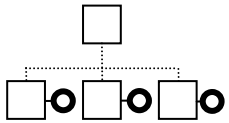
In your capacity as CEO please indicate to what extent you either agree or disagree with each of the following statements
Please tick ☑the box which most accurately reflects your sentiments using the following scale:

SD = Strongly Disagree
T = Tend to Disagree
U= Undecided
TA = Tend to Agree
SA = Strongly Agree

Q	Statement	SD	TD	U	TA	SA	Comment
15	It is hard to work here because we are not consulted on how the company is structured						
16	It is difficult to work here because we are unfamiliar with the company's organogram or organisational structure						
17	The CEO plays no part in developing the organogram or organisational structure						
18	I inherited the existing organisational structure and made changes that I deemed necessary						
19	I inherited the existing organizational structure and have made no changes to it						
20	Given that the construction process is highly dependent upon the transfer of information and the exchange of information between all levels of the organization it is supported by the organizational structure of the company						

21	"Information systems" are considered to be critical to the process of [re]structuring my company towards a more effective lean and flat management structure						
22	All major strategic decisions are made by either me alone or together with a group of senior executives.						
23	The management structure of my company is flat, uses cross-hierarchical and cross functional teams, has low formalization, possesses a comprehensive information network, and relies on participative decision-making						
24	My company is characterized by centralized management, extensive departmentalisation, with specific sets of procedures and rules that are to be followed by everyone throughout the company						
25	My company is characterized as simple with little specialization or formalization; Consequently, power and decision making are vested in the chief executive.						
26	My company is characterized as well established, work is highly specialised and formalized and decision making usually concentrated at top management level						
27	My company is characterized by horizontal specialization, by professional areas of expertise, little formalization, and decentralized decision-making						
28	My company is viewed as being well established, large and serving different markets						
29	My company is regarded as a young organization in a highly technical environment with decision making spread throughout the organization while power resides in experts						
30	My company is characterized by a flexible reporting structure in terms of which subordinate staff report to different managers, depending on the project or the location of the work						
31	My company is a temporary alliance between two or more organisations that band together to accomplish a specific venture, but is still formally structured.						

32	Which of the following organisational structures (forms) below best describes **IS** in your company? Please indicate by means tick ☑ in the appropriate box. **NOTE:** The circles indicates the location of Information systems (IS) in relationship with the organisational structure of the company ● = Central IS (CIS) and ⭘ = desentralised function of IS(DIS), BU = Business units or FD = Functional Departments

A	B	C	D	E
				
Centralised IS All IS functions are control by CIS ●located at top management level. Application development and resources are usually provided on a project-by-project basis, and are not dedicated to specific BU	**Central Coordinated IS** CIS ● set and control the IS standards throughout. DIS ⭘ situated at BU level, but report to CIS. IS resources are shared at both CIS and DIS. IS task are delegated to DIS through the BU.	**Functional Coordinated IS** CIS ● set and control the standards, DIS ⭘ report to the BU managers, have a functional relationship with Central IS. BU determines the "what" and DIS the "how". Selective decentralisation are control from the top (top-down↓)	**Federated IS** CIS ● coordinating standards, projects and participate in a "steering committee" run by top management. , but a share a mutual responsibility towards standards, combined projects and distribution of tasks. Selective decentralisation are control from the bottom (bottom –up↑)	**Desentralised IS** IS functions and control are totally desentralised to the business unit (BU) level, each setting own standards and control IS.

SECTION C: INFORMATION SYSTEM GOVERNANCE

No	Statement	SD	TD	U	TA	SA	Comment
33	My company has an IS strategy? (An agreement on the goals of the company for its use of IS and the means of achieving these goals)						
34	My company proactively seek to use IS as part of a well-thought-through strategy for achieving competitive advantage						
35	IS must be on the CEO's agenda because so many high-priority agenda items rely on it for delivery and execution						
36	IS investment must be key part of the business strategy in order to build a competitive advantage						

37	The CEO must align IS spending and investments priorities with the overall investment priorities of the company						
38	Information Systems (IS) is a crucial part of the strategic assets of the business in terms of its long-term strategy, daily performance, and sustainability						
39	IS has become critical to lower production cost, reduce time to complete projects, add value to the construction process and interact with clients and suppliers						
40	IS has become the primary vehicle for creating new advantages and parrying the advantages of competitors						
41	It is important for the CEO to attend IS project meetings, and be involved in information requirement analysis, participate and review recommendations and decision-making, and monitor IS project progress						
42	My company executive board makes provision for the discussion of company wide IS strategy at its meetings						
43	Executive management uses IS output for objective verification and discussion. For example, to make decisions concerning strategy formulation or performance evaluation						
44	Employees [staff] at all levels of my organization have an accurate understanding of the IS output that my executive team uses/requires						
45	Responsibility for IS performance is the task of a designated person such as a CIO						
46	This person reports directly to me, and is a member of my executive management committee.						
47	**If** your organisation does not employ someone such as a **CIO** please explain below why this is so in the space below						

Your Explanation:

No	Statement	SD	TD	U	TA	SA	Comment
48	The CIO is solely responsible for IS governance on a full-time basis						
49	The CIO is merely “head of a functional department” or an “agent for change management and business practices”						
50	I articulate a clear mission for the CIO, including specific responsibilities for IS/IT that go above and beyond management of the head office IS/IT department						
51	The authority of the CIO extends beyond merely acting as the approval authority at head office with clearly defined authority over and responsibility for IS						
53	The CIO understands the need to optimize IS operations based on rich business and planning experience						
54	The CIO is able to explain IS/IT and the potential for optimum use of IT/IS in terms understood by everyone in the organization						
55	The CIO has adequate knowledge, business and IS skills for to be able to be responsible for IS governance						
56	The CIO always (or when necessary) attends major strategy formulation meetings						
57	The CIO is individually involved with IS/IT projects of strategic importance, and directly controls progress and levels of investment						

SECTION D: INFORMATION AND KNOWLEDGE MANAGEMENT

No	Statement	SD	TD	U	TA	SA	Comment
58	Information in my company plays an important role in the strategic decision-making process						
59	Reports are important for the strategic decision-making process in my company						
60	Information systems play an important role in the generation of reports in my company						

The output of Information Systems (IS) is a collection of reports that are distributed to managers at all levels of the organization for decision-making purposes.
Definitions of typical reports generated by IS.

- **Scheduled report:** report periodically, or on schedule, such as daily, weekly, or monthly;
- **Key-indicator report:** summary of the previous day's activities; typically available at the beginning of each work day;
- **Demand report:** report developed to give certain information at someone's request;
- **Exeption report:** report automatically produced when a situation is unusually or requires management action;
- **Drill-down report:** report providing increasingly detailed data about a situation.

61 **Write down** in the space below, any reports generated by your IS and the frequency with which they are produced

Types of Reports	Frequency					
	Daily	Weekly	Monthly	Quarterly	Annually`	None

No	Statement	SD	TD	U	TA	SA	Comment
62	Information systems support all managerial levels in my organisation(strategic management, tactical management, operational management						
63	Everybody in the company is responsible for managing their own data and information, as long as I receive the correct information when needed						
64	When IS is used to disperse information throughout my company, decision-making occurs across all hierarchal levels without a reduction in quality or timeliness						
65	IS plays an important role in the efforts of my company to be more efficient and effective in reacting to changing environments						
66	There is a clear consideration of the kind of information required to inform different strategic objectives, the IS systems gather and process accordingly and without redundancy, and data is maintained according to these strategic objectives						

If you have any comments you would like to make regarding **IS Governance** in your company, please write them on this page**:**

PLEASE REMEMBER TO ATTACH YOUR COMPANY'S ORGANOGRAM

Your contribution to this survey is greatly appreciated.

Please return your questionnaire in the replay envelope provided or Contact the researcher at **082 2020 674** to make arrangements to collect the survey.

APPENDIX B
COVER LETTER TO RESPONDENTS

Southern African Built Environment Research Centre

PO BOX 1906, **Bellville 7535, Republic of South Africa**

Switchboard: +27 (21) 959 6911 Direct phone:+27 (21) 959 6637

19 April, 2011

Dear

RESEARCH STUDY TO EVALUATE THE ROLE OF INFORMATION SYSTEMS IN CONSTRUCTION

The Department of Information Technology in collaboration with the Southern African Built Environment Research Centre is conducting a study to examine the role of Information Systems (IS) Management in the Western Cape Construction Sector. The aim of the study is to determine to what extent the construction sector makes use of Information Systems to support executive management in strategic decision-making process. The information gathered will be used to provide some insights into how IS are implemented and managed in the construction sector.

The survey questionnaire that is attached contains a variety of questions designed to obtain your perspectives about the role of IS in the construction sector. Many of the questions can be answered by simply marking responses with **"X"** in spaces provided. The survey can be completed in about 15 to 20 minutes. Your participation in the study is extremely important for its success. We would appreciate it if you could return the questionnaire duly completed to the address below:

Southern African Built Environment Research Centre
Cape Peninsula University of Technology
PO Box 1906
BELLVILLE
7535

Or electronically to: bestera@cput.ac.za (if you received it electronically) by **11 July 2006**., or Fax to (021) 959 6870.

Should you have any questions please feel free to call the researcher, **Mr. A Bester** (021) 959 6028(W) or cell 082 2020 674. The information will be used for academic purpose only, as it is a critical part of a Masters Degree research thesis. Responses provided will be kept strictly confidential. Research data will be summarized so that the identity of individual respondents will be concealed.

Thanking you in anticipation of your assistance.

Yours faithfully

Andre Bester
Researcher
FCIOB MASI

Theo Haupt
PhD (Construction Management)

APPENDIX C
DATA ANALYSIS

STATISTICAL DATA FROM SPSS 14

Frequency Table

SECTION A: CONSTRUCTION COMPANY PROFILE

1.How many yrs have you been CEO of company?

		Frequency	Percent	Valid Percent	Cumulative Percent	Statistics
Valid	6	3	33.3	37.5	37.5	Mean
	8	1	11.1	12.5	50	Median
	10	1	11.1	12.5	62.5	Mode
	17	1	11.1	12.5	75	Std. Deviation
	23	1	11.1	12.5	87.5	Variance
	33	1	11.1	12.5	100	Range
	Total	8	88.9	100		Minimum
Missing	9999	1	11.1			Maximum
Total		9	100			Sum

2.Where were you previously employed?

		Frequency	Percent	Valid Percent	Cumulative Percent	Statistics
Valid	A	1	11.1	14.3	14.3	Mean
	B	2	22.2	28.6	42.9	Median
	C	1	11.1	14.3	57.1	Mode
	D	1	11.1	14.3	71.4	Std. Deviation
	E	1	11.1	14.3	85.7	Variance
	F	1	11.1	14.3	100	Range
	Total	7	77.8	100		Minimum
Missing	9999	2	22.2			Maximum
Total		9	100			Sum

3.In what capacity?

		Frequency	Percent	Valid Percent	Cumulative Percent	Statistics
Valid	MD	4	44.4	50	50	Mean
	Quantity Surveyor	1	11.1	12.5	62.5	Median
	Engineering & Training	1	11.1	12.5	75	Mode
	Trainee Qs	1	11.1	12.5	87.5	Std. Deviation
	Site Agent	1	11.1	12.5	100	Variance
	Total	8	88.9	100	50	Range
Missing	9999	1	11.1			Minimum
Total		9	100			Maximum
						Sum

4.How old are you?

		Frequency	Percent	Valid Percent	Cumulative Percent	Statistics
Valid	36	1	11.1	12.5	12.5	Mean
	39	1	11.1	12.5	25	Median
	41	1	11.1	12.5	37.5	Mode
	44	1	11.1	12.5	50	Std. Deviation
	46	1	11.1	12.5	62.5	Variance
	51	1	11.1	12.5	75	Range
	56	1	11.1	12.5	87.5	Minimum
	58	1	11.1	12.5	100	Maximum
	Total	8	88.9	100		Sum
Missing	9999	1	11.1			
Total		9	100			

5.How long has your company established?

		Frequency	Percent	Valid Percent	Cumulative Percent	Statistics
Valid	7	1	11.1	12.5	12.5	Mean
	16	1	11.1	12.5	25	Median
	23	2	22.2	25	50	Mode
	33	1	11.1	12.5	62.5	Std. Deviation
	45	1	11.1	12.5	75	Variance
	61	1	11.1	12.5	87.5	Range
	102	1	11.1	12.5	100	Minimum
	Total	8	88.9	100		Maximum
Missing	9999	1	11.1			Sum
Total		9	100			

6.Indicate your company's primary participation in the construction industry (select 1)

		Frequency	Percent	Valid Percent	Cumulative Percent	Staistics
Valid	Contractor	7	77.8	100	100	Mean
Missing	9999	2	22.2			Median
Total		9	100			Mode
						Std. Deviation
						Variance
						Range
						Minimum
						Maximum
						Sum

6.1If other, please specify

		Frequency	Percent	Valid Percent	Cumulative Percent	Statistics
Valid	Insurance, related repairs	1	11.1	100	100	Mean
Missing	9999	8	88.9			Median
Total		9	100			Mode
						Std. Deviation
						Variance
						Range

						Minimum
						Maximum
						Sum

7. What is your company's major source of work? (indicate % split): Private Sec

		Frequency	Percent	Valid Percent	CumPercent	Statistics	
Valid	5	1		11.11	12.5	Mean	
	60	3		33.33	37.5	Median	
	70	1		11.11	12.5	Mode	6
	100	3		33.33	37.5	Std. Deviation	
	Total	8		88.89	100	Variance	
Missing	9999	1		11.11		Range	
Total		9		100		Minimum	
						Maximum	
						Sum	

7.1 What is your company's major source of work? (indicate % split):Public Sector

		Frequency	Percent	Valid Percent	Cum Percent	Statistics	
Valid	0	3	33.3	37.5	37.5	Mean	
	30	1	11.1	12.5	50	Median	
	40	2	22.2	25	75	Mode	
	45	1	11.1	12.5	87.5	Std. Deviation	
	95	1	11.1	12.5	100	Variance	
	Total	8	88.9	100		Range	
Missing	9999	1	11.1			Minimum	
Total		9	9	100		Maximum	
						Sum	

8. How is your company's work usually obtained? % Split: Tender

		Frequency	Percent	Valid Percent	Cumulative Percent	Statistics	
Valid	10	1	11.1	14.3	14.3	Mean	
	60	2	22.2	28.6	42.9	Median	
	70	1	11.1	14.3	57.1	Mode	6
	80	1	11.1	14.3	71.4	Std. Deviation	
	100	2	22.2	28.6	100	Variance	
	Total	7	77.8	100		Range	
Missing	9999	2	22.2			Minimum	
Total		9	100			Maximum	
						Sum	

8.1 How is your company's work usually obtained? % Split: Negotiated

		Frequency	Percent	Valid Percent	Cumulative Percent	Statistics	
Valid	0	2	22.2	28.6	28.6	Mean	
	20	1	11.1	14.3	42.9	Median	
	30	1	11.1	14.3	57.1	Mode	.
	40	2	22.2	28.6	85.7	Std. Deviation	
	90	1	11.1	14.3	100	Variance	
	Total	7	77.8	100		Range	
Missing	9999	2	22.2			Minimum	
Total		9	100			Maximum	
						Sum	

9. Type of work or projects? % split: Residential

		Frequency	Percent	Valid Percent	Cumulative Percent	Statistics

Valid	0	3	33.3	37.5	37.5	Mean
	20	1	11.1	12.5	50	Median
	39	1	11.1	12.5	62.5	Mode
	50	1	11.1	12.5	75	Std. Deviation
	53	1	11.1	12.5	87.5	Variance
	70	1	11.1	12.5	100	Range
	Total	8	88.9	100		Minimum
Missing	9999	1	11.1			Maximum
Total		9	100			Sum

9.1 Repairs, renovation & maintenance

		Frequency	Percent	Valid Percent	Cumulative Percent	Statistics
Valid	0	4	44.4	50	50	Mean
	10	2	22.2	25	75	Median
	30	1	11.1	12.5	87.5	Mode
	50	1	11.1	12.5	100	Std. Deviation
	Total	8	88.9	100		Variance
Missing	9999	1	11.1			Range
Total		9	100			Minimum
						Maximum
						Sum

9.2 Non-residential (schools, hospitals, etc)

		Frequency	Percent	Valid Percent	Cumulative Percent	Statistics
Valid	0	4	44.4	50	50	Mean
	20	1	11.1	12.5	62.5	Median
	50	1	11.1	12.5	75	Mode
	61	1	11.1	12.5	87.5	Std. Deviation
	80	1	11.1	12.5	100	Variance
	Total	8	88.9	100		Range
Missing	9999	1	11.1			Minimum
Total		9	100			Maximum
						Sum

9.3 Civil (roads, bridges, dams, etc)

		Frequency	Percent	Valid Percent	Cumulative Percent	Statistics
Valid	0	3	33.3	37.5	37.5	Mean
	10	1	11.1	12.5	50	Median
	30	1	11.1	12.5	62.5	Mode
	47	1	11.1	12.5	75	Std. Deviation
	70	1	11.1	12.5	87.5	Variance
	100	1	11.1	12.5	100	Range
	Total	8	88.9	100		Minimum
Missing	9999	1	11.1			Maximum
Total		9	100			Sum

10. Average annual turnover during the past 3 yrs

		Frequency	Percent	Valid Percent	Cumulative Percent	Statistics
Valid	>R20 million	8	88.9	100	100	Mean
Missing	9999	1	11.1			Median
Total		9	100			Mode
						Std. Deviation

Variance
Range
Minimum
Maximum
Sum

11. In which provinces does your company operate? % split: EC

		Frequency	Percent	Valid Percent	Cumulative Percent	Statistics
Valid	0	6	66.7	75	75	Mean
	20	1	11.1	12.5	87.5	Median
	50	1	11.1	12.5	100	Mode
	Total	8	88.9	100		Std. Deviation
Missing	9999	1	11.1			Variance
Total		9	100			Range
						Minimum
						Maximum

11.1 KZN

		Frequency	Percent	Valid Percent	Cumulative Percent	Statistics
Valid	0	6	66.7	75	75	Mean
	10	1	11.1	12.5	87.5	Median
	15	1	11.1	12.5	100	Mode
	Total	8	88.9	100		Std. Deviation
Missing	9999	1	11.1			Variance
Total		9	100			Range
						Minimum
						Maximum
						Sum

11.2 FS

		Frequency	Percent	Valid Percent	Cumulative Percent	Statistics
Valid	0	8	88.9	100	100	Mean
Missing	9999	1	11.1			Median
Total		9	100			Mode
						Std. Deviation
						Variance
						Range
						Minimum
						Maximum
						Sum

11.3 NC

		Frequency	Percent	Valid Percent	Cumulative Percent	Statistics
Valid	0	8	88.9	100	100	Mean
Missing	9999	1	11.1			Median
Total		9	100			Mode
						Std. Deviation
						Variance
						Range
						Minimum
						Maximum
						Sum

11.4 GT

		Frequency	Percent	Valid Percent	Cumulative Percent	Statistics
Valid	0	5	55.6	62.5	62.5	Mean
	20	1	11.1	12.5	75	Median
	43	1	11.1	12.5	87.5	Mode
	70	1	11.1	12.5	100	Std. Deviation
	Total	8	88.9	100		Variance
Missing	9999	1	11.1			Range
Total		9	100			Minimum
						Maximum
						Sum

11.5 NP

		Frequency	Percent	Valid Percent	Cumulative Percent	Statistics
Valid	0	8	88.9	100	100	Mean
Missing	9999	1	11.1			Median
Total		9	100			Mode
						Std. Deviation
						Variance
						Range
						Minimum
						Maximum
						Sum

11.6 MP

		Frequency	Percent	Valid Percent	Cumulative Percent	Statistics
Valid	0	8	88.9	100	100	Mean
Missing	9999	1	11.1			Median
Total		9	100			Mode
						Std. Deviation
						Variance
						Range
						Minimum
						Maximum
						Sum

11.7 LIM

		Frequency	Percent	Valid Percent	Cumulative Percent	Statistics
Valid	0	8	88.9	100	100	Mean
Missing	9999	1	11.1			Median
Total		9	100			Mode
						Std. Deviation
						Variance
						Range
						Minimum
						Maximum
						Sum

11.8 WC

		Frequency	Percent	Valid Percent	Cumulative Percent	Statistics
Valid	20	1	11.1	12.5	12.5	Mean
	40	1	11.1	12.5	25	Median
	42	1	11.1	12.5	37.5	Mode
	60	1	11.1	12.5	50	Std. Deviation
	100	4	44.4	50	100	Variance

	Total	8	88.9	100		Range
Missing	9999	1	11.1			Minimum
Total		9	100			Maximum
						Sum

12. If your company operates internationally, list countries below.

		Frequency	Percent	Valid Percent	Cumulative Percent	Statistics
Valid	No	6	66.7	75	75	Mean
	NAMIBIA	1	11.1	12.5	87.5	Median
	Botswana & UAE	1	11.1	12.5	100	Mode
	Total	8	88.9	100		Std. Deviation
Missing	9999	1	11.1			Variance
Total		9	100			Range
						Minimum
						Maximum
						Sum

13. If your company participates in joint ventures, indicate whether nationally or internationally

		Frequency	Percent	Valid Percent	Cumulative Percent	Statistics
Valid	National	4	44.4	80	80	Mean
	BOTH	1	11.1	20	100	Median
	Total	5	55.6	100		Mode
Missing	9999	4	44.4			Std. Deviation
Total		9	100			Variance
						Range
						Minimum
						Maximum
						Sum

SECTION B: ORGANISATIONAL DESIGN

It is hard to work here because we are not consulted on how the company is structured

		Frequency	Percent	Valid Percent	Cumulative Percent	Statistics
Valid	SD	7	77.8	77.8	77.8	Mean
	TD	2	22.2	22.2	100	Median
	Total	9	100	100		Mode
						Std. Deviation
						Variance
						Range
						Minimum
						Maximum
						Sum

16. It is difficult to work here because we are unfamiliar with the company's organogram/org structure

		Frequency	Percent	Valid Percent	Cumulative Percent	Statistics
Valid	SD	6	66.7	66.7	66.7	Mean
	TD	2	22.2	22.2	88.9	Median
	TA	1	11.1	11.1	100	Mode
	Total	9	100	100		Std. Deviation
						Variance
						Range
						Minimum
						Maximum

Sum

17. The CEO plays no part in developing the organogram or org structure

		Frequency	Percent	Valid Percent	Cumulative Percent	Statistics
Valid	SD	9	100	100	100	Mean
						Median
						Mode
						Std. Deviation
						Variance
						Range
						Minimum
						Maximum
						Sum

18. I inherited the existing organizational structure and made changes that I deemed necessary

		Frequency	Percent	Valid Percent	Cumulative Percent	Statistics
Valid	SD	1	11.1	12.5	12.5	Mean
	TD	1	11.1	12.5	25	Median
	TA	2	22.2	25	50	Mode
	SA	4	44.4	50	100	Std. Deviation
	Total	8	88.9	100		Variance
Missing	9999	1	11.1			Range
Total		9	100			Minimum
						Maximum
						Sum

19. I inherited the existing organizational structure and have made no changes to it

		Frequency	Percent	Valid Percent	Cumulative Percent	Statistics
Valid	SD	6	66.7	75	75	Mean
	TD	2	22.2	25	100	Median
	Total	8	88.9	100		Mode
Missing	9999	1	11.1			Std. Deviation
Total		9	100			Variance
						Range
						Minimum
						Maximum
						Sum

20. Given that the constr process is highly dependent upon the transfer of info & the exchange of info between levels ...

		Frequency	Percent	Valid Percent	Cumulative Percent	Statistics
Valid	TA	5	55.6	62.5	62.5	Mean
	SA	3	33.3	37.5	100	Median
	Total	8	88.9	100		Mode
Missing	9999	1	11.1			Std. Deviation
Total		9	100			Variance
						Range
						Minimum
						Maximum
						Sum

21. Info systems are considered to be critical to the process of [re]structuring my co towards a more effective lean & flat managemt structure

		Frequency	Percent	Valid Percent	Cumulative Percent	Statistics
Valid	SD	1	11.1	11.1	11.1	Mean
	TD	3	33.3	33.3	44.4	Median
	U	1	11.1	11.1	55.6	Mode
	TA	2	22.2	22.2	77.8	Std. Deviation
	SA	2	22.2	22.2	100	Variance
	Total	9	100	100		Range
						Minimum
						Maximum
						Sum

22. All major strategies decisions are made by either me alone or together with a group of senior executives

		Frequency	Percent	Valid Percent	Cumulative Percent	Statistics
Valid	TA	4	44.4	44.4	44.4	Mean
	SA	5	55.6	55.6	100	Median
	Total	9	100	100		Mode
						Std. Deviation
						Variance
						Range
						Minimum
						Maximum
						Sum

23. The management structure of my company is flat, uses cross-hierarchical & cross functional teams, ...

		Frequency	Percent	Valid Percent	Cumulative Percent	Statistics
Valid	SD	1	11.1	11.1	11.1	Mean
	TD	1	11.1	11.1	22.2	Median
	TA	7	77.8	77.8	100	Mode
	Total	9	100	100		Std. Deviation
						Variance
						Range
						Minimum
						Maximum
						Sum

24. My company is characterized by centralized management, extensive departmentalization, ...

		Frequency	Percent	Valid Percent	Cumulative Percent	Statistics
Valid	SD	1	11.1	11.1	11.1	Mean
	TD	5	55.6	55.6	66.7	Median
	TA	1	11.1	11.1	77.8	Mode
	SA	2	22.2	22.2	100	Std. Deviation
	Total	9	100	100		Variance
						Range
						Minimum
						Maximum
						Sum

25. My company is characterized as simple with little specialization or

		Frequency	Percent	Valid Percent	Cumulative Percent	Statistics
Valid	SD	4	44.4	50	50	Mean
	TD	2	22.2	25	75	Median

	TA	2	22.2	25	100	Mode
	Total	8	88.9	100		Std. Deviation
Missing	9999	1	11.1			Variance
Total		9	100			Range
						Minimum
						Maximum
						Sum

26. My company is charachterized as well established, work is .....

		Frequency	Percent	Valid Percent	Cumulative Percent	Statistics
Valid	TD	2	22.2	25	25	Mean
	U	2	22.2	25	50	Median
	TA	3	33.3	37.5	87.5	Mode
	SA	1	11.1	12.5	100	Std. Deviation
	Total	8	88.9	100		Variance
Missing	9999	1	11.1			Range
Total		9	100			Minimum
						Maximum
						Sum

27. My company is characterized by horizontal specialization, ...

		Frequency	Percent	Valid Percent	Cumulative Percent	Statistics
Valid	SD	1	11.1	11.1	11.1	Mean
	TD	5	55.6	55.6	66.7	Median
	TA	3	33.3	33.3	100	Mode
	Total	9	100	100		Std. Deviation
						Variance
						Range
						Minimum
						Maximum
						Sum

28. My company is viewed as as being well established, large & serving different markets

		Frequency	Percent	Valid Percent	Cumulative Percent	Statistics
Valid	TD	1	11.1	11.1	11.1	Mean
	U	1	11.1	11.1	22.2	Median
	TA	2	22.2	22.2	44.4	Mode
	SA	5	55.6	55.6	100	Std. Deviation
	Total	9	100	100		Variance
						Range
						Minimum
						Maximum
						Sum

29. My company is regarded as a young organization in a highly technical environment with the decision making spread throughout the organisation, while powe in experts

		Frequency	Percent	Valid Percent	Cumulative Percent	Statistics	
Valid	SD	1	11.1	11.1	11.1	Mean	
	TD	4	44.4	44.4	55.6	Median	
	TA	4	44.4	44.4	100	Mode	2

	Total	9	100	100		Std. Deviation
						Variance
						Range
						Minimum
						Maximum
						Sum

30. My company is characterized by by a flexible reporting structure in terms of which subordinate staff ...

		Frequency	Percent	Valid Percent	Cumulative Percent	Statistics
Valid	U	2	22.2	22.2	22.2	Mean
	TA	5	55.6	55.6	77.8	Median
	SA	2	22.2	22.2	100	Mode
	Total	9	100	100		Std. Deviation
						Variance
						Range
						Minimum
						Maximum
						Sum

31. My company is a temporary alliance between two or more organisations that band together to accomplish a specific venture, but is still formally structured.

		Frequency	Percent	Valid Percent	Cumulative Percent	Statistics
Valid	SD	7	77.8	77.8	77.8	Mean
	U	1	11.1	11.1	88.9	Median
	SA	1	11.1	11.1	100	Mode
	Total	9	100	100		Std. Deviation
						Variance
						Range
						Minimum
						Maximum
						Sum

32. Which of the following organisational structures best describes IS in your co?

		Frequency	Percent	Valid Percent	Cumulative Percent	Statistics
Valid	Centralised IS	4	44.4	44.4	44.4	Mean
	Central Coordinated IS	1	11.1	11.1	55.6	Median
	Functional Coordinated IS	1	11.1	11.1	66.7	Mode
	Federated IS	1	11.1	11.1	77.8	Std. Deviation
	Decentralised IS	2	22.2	22.2	100	Variance
	Total	9	100	100		Range
						Minimum
						Maximum
						Sum

SECTION C: INFORMATION SYSTEMS GOVERNANCE

33. My company has an IS strategy?

		Frequency	Percent	Valid Percent	Cumulative Percent	Statistics
Valid	TD	1	11.1	11.1	11.1	Mean
	U	1	11.1	11.1	22.2	Median
	TA	6	66.7	66.7	88.9	Mode
	SA	1	11.1	11.1	100	Std. Deviation
	Total	9	100	100		Variance
						Range
						Minimum
						Maximum
						Sum

34. My company proactively seek to use IS as part of a well-thought-through strategy for achieving competive advantage

		Frequency	Percent	Valid Percent	Cumulative Percent	Statistics
Valid	TD	2	22.2	22.2	22.2	Mean
	U	2	22.2	22.2	44.4	Median
	TA	3	33.3	33.3	77.8	Mode
	SA	2	22.2	22.2	100	Std. Deviation
	Total	9	100	100		Variance
						Range
						Minimum
						Maximum
						Sum

35. IS must be on the CEO's agenda because so many high-priority agenda items rely on it for delivery and execution

		Frequency	Percent	Valid Percent	Cumulative Percent	Statistics
Valid	SD	1	11.1	11.1	11.1	Mean
	TD	2	22.2	22.2	33.3	Median
	TA	3	33.3	33.3	66.7	Mode
	SA	3	33.3	33.3	100	Std. Deviation
	Total	9	100	100		Variance
						Range
						Minimum
						Maximum
						Sum

36. IS investment must be key part of the business strategy in order to build a competitive advantage

		Frequency	Percent	Valid Percent	Cumulative Percent	Statistics
Valid	TD	1	11.1	11.1	11.1	Mean
	U	1	11.1	11.1	22.2	Median
	TA	3	33.3	33.3	55.6	Mode
	SA	4	44.4	44.4	100	Std. Deviation
	Total	9	100	100		Variance
						Range
						Minimum
						Maximum
						Sum

37. The CEO must align Is spending and investments priorities with the overall investment priorities of the company

		Frequency	Percent	Valid Percent	Cumulative Percent	Statistics
Valid	TD	1	11.1	11.1	11.1	Mean
	U	2	22.2	22.2	33.3	Median
	TA	4	44.4	44.4	77.8	Mode
	SA	2	22.2	22.2	100	Std. Deviation
	Total	9	100	100		Variance
						Range
						Minimum
						Maximum
						Sum

38.IS is a crucial part of the strategic assets of the business in terms of its long-term strategy, daily performance and sustainability

		Frequency	Percent	Valid Percent	Cumulative Percent	Statistics
Valid	TD	1	11.1	11.1	11.1	Mean
	TA	6	66.7	66.7	77.8	Median
	SA	2	22.2	22.2	100	Mode
	Total	9	100	100		Std. Deviation
						Variance
						Range
						Minimum
						Maximum
						Sum

39. IS has become critical to lower production cost, reduces time to complete projects, ...

		Frequency	Percent	Valid Percent	Cumulative Percent	Statistics
Valid	TD	1	11.1	11.1	11.1	Mean
	U	1	11.1	11.1	22.2	Median
	TA	4	44.4	44.4	66.7	Mode
	SA	3	33.3	33.3	100	Std. Deviation
	Total	9	100	100		Variance
						Range
						Minimum
						Maximum
						Sum

40. IS has become the primary vehicle for creating new advantages and parrying the advantages of competitors

		Frequency	Percent	Valid Percent	Cumulative Percent	Statistics	
Valid	TD	3	33.3	33.3	33.3	Mean	
	U	3	33.3	33.3	66.7	Median	
	TA	1	11.1	11.1	77.8	Mode	2
	SA	2	22.2	22.2	100	Std. Deviation	
	Total	9	100	100		Variance	
						Range	
						Minimum	
						Maximum	
						Sum	

41. It is important for the CEO to attend IS project meetings, and be involved .....

		Frequency	Percent	Valid Percent	Cumulative Percent	Statistics
Valid	SD	2	22.2	22.2	22.2	Mean
	TD	2	22.2	22.2	44.4	Median
	U	1	11.1	11.1	55.6	Mode
	TA	3	33.3	33.3	88.9	Std. Deviation
	SA	1	11.1	11.1	100	Variance
	Total	9	100	100		Range
						Minimum
						Maximum
						Sum

42. My company executive board makes provision for the discussion of company wide IS strategy at its meetings

		Frequency	Percent	Valid Percent	Cumulative Percent	Statistics
Valid	SD	1	11.1	11.1	11.1	Mean
	TD	2	22.2	22.2	33.3	Median
	TA	5	55.6	55.6	88.9	Mode
	SA	1	11.1	11.1	100	Std. Deviation
	Total	9	100	100		Variance
						Range
						Minimum
						Maximum
						Sum

43. Executive management uses IS output for objective verification and discussion.

		Frequency	Percent	Valid Percent	Cumulative Percent	Statistics
Valid	SD	1	11.1	11.1	11.1	Mean
	TD	1	11.1	11.1	22.2	Median
	U	3	33.3	33.3	55.6	Mode
	TA	2	22.2	22.2	77.8	Std. Deviation
	SA	2	22.2	22.2	100	Variance
	Total	9	100	100		Range
						Minimum
						Maximum
						Sum

44. Employees at all levels of my org have an accurate understanding of the IS output ...

		Frequency	Percent	Valid Percent	Cumulative Percent	Statistics
Valid	SD	1	11.1	11.1	11.1	Mean
	TD	2	22.2	22.2	33.3	Median
	U	2	22.2	22.2	55.6	Mode
	TA	4	44.4	44.4	100	Std. Deviation
	Total	9	100	100		Variance
						Range
						Minimum
						Maximum
						Sum

45. Responsibility for IS performance is the task of a designated person such as a CIQ

		Frequency	Percent	Valid Percent	Cumulative Percent	Statistics

Valid	TD	3	33.3	37.5	37.5	Mean
	TA	4	44.4	50	87.5	Median
	SA	1	11.1	12.5	100	Mode
	Total	8	88.9	100		Std. Deviation
Missing	9999	1	11.1			Variance
Total		9	100			Range
						Minimum
						Maximum
						Sum

46. This person reports directly to me, and is a member of my executive management committee.

		Frequency	Percent	Valid Percent	Cumulative Percent	Statistics	
Valid	TD	2	22.2	25	25	Mean	
	TA	3	33.3	37.5	62.5	Median	
	SA	3	33.3	37.5	100	Mode	4
	Total	8	88.9	100		Std. Deviation	
Missing	9999	1	11.1			Variance	
Total		9	100			Range	
						Minimum	
						Maximum	
						Sum	

SECTION D: MANAGEMENT OF INFORMATION SYSTEMS

47. If your organisation does not employ someone such as a CIQ, please explain why this is so

		Frequency	Percent	Valid Percent	Cumulative Percent	Statistics
Valid	FD & PA are responsible for various aspects of IS	1	11.1	12.5	12.5	Mean
	All staff & directors do more than one task. QS work or site supervising done by one person	1	11.1	12.5	25	Median
	An employee is partially responsible for IT. Need for CIO has not been identified	2	22.2	25	50	Mode
	We have a system E in Q32. The IS system is decided upon in each operational unit	1	11.1	12.5	62.5	Std. Deviatio
	Part of the function of the CFO, so in CIO below, read "CFO"	1	11.1	12.5	75	Variance
	Still trying to finalize general OS & CIO strategy for this business	1	11.1	12.5	87.5	Range

	Each division has competent leaders who are aware of the importance of IS and aware of the Groups IS strategy	1	11.1	12.5	100	Minimum
	Total	8	88.9	100		Maximum
Missing	9999	1	11.1			Sum
Total		9	100			

48. The CIO is solely responsible for IS governance on full-time basis

		Frequency	Percent	Valid Percent	Cumulative Percent	Statistics	
Valid	SD	3	33.3	50	50	Mean	
	TD	3	33.3	50	100	Median	
	Total	6	66.7	100		Mode	1
Missing	9999	3	33.3			Std. Deviation	
Total		9	100			Variance	
						Range	
						Minimum	
						Maximum	
						Sum	

49. CIO is merely head of a functional dept or an agent for change management ....

		Frequency	Percent	Valid Percent	Cumulative Percent	Statistics
Valid	SD	1	11.1	16.7	16.7	Mean
	U	3	33.3	50	66.7	Median
	TA	2	22.2	33.3	100	Mode
	Total	6	66.7	100		Std. Deviation
Missing	9999	3	33.3			Variance
Total		9	100			Range
						Minimum
						Maximum
						Sum

50. I articulate a clear mission for the CIO ....

		Frequency	Percent	Valid Percent	Cumulative Percent	Statistics
Valid	TD	3	33.3	50	50	Mean
	TA	2	22.2	33.3	83.3	Median
	SA	1	11.1	16.7	100	Mode
	Total	6	66.7	100		Std. Deviation
Missing	9999	3	33.3			Variance
Total		9	100			Range
						Minimum
						Maximum
						Sum

51. The authority of the CIQ extends beyond merely acting as the approval authority ...

	Frequency	Percent	Valid Percent	Cumulative Percent	Statistics

Valid	TD	2	22.2	33.3	33.3	Mean
	TA	3	33.3	50	83.3	Median
	SA	1	11.1	16.7	100	Mode
	Total	6	66.7	100		Std. Deviation
Missing	9999	3	33.3			Variance
Total		9	100			Range
						Minimum
						Maximum
						Sum

52. The CIO understands the need to optimize IS operations based on rich business & planning experience

		Frequency	Percent	Valid Percent	Cumulative Percent	Statistics
Valid	TD	1	11.1	16.7	16.7	Mean
	TA	4	44.4	66.7	83.3	Median
	SA	1	11.1	16.7	100	Mode
	Total	6	66.7	100		Std. Deviation
Missing	9999	3	33.3			Variance
Total		9	100			Range
						Minimum
						Maximum
						Sum

53. The CIO is able to explain IS/IT and the potential for optimum use ...

		Frequency	Percent	Valid Percent	Cumulative Percent	Statistics
Valid	TD	1	11.1	16.7	16.7	Mean
	TA	3	33.3	50	66.7	Median
	SA	2	22.2	33.3	100	Mode
	Total	6	66.7	100		Std. Deviation
Missing	9999	3	33.3			Variance
Total		9	100			Range
						Minimum
						Maximum
						Sum

54. The CIO has adequate knowledge, business and IS skills for to be able to be responsible for IS governance

		Frequency	Percent	Valid Percent	Cumulative Percent	Statistics	
Valid	TD	2	22.2	33.3	33.3	Mean	
	TA	2	22.2	33.3	66.7	Median	
	SA	2	22.2	33.3	100	Mode	2
	Total	6	66.7	100		Std. Deviation	
Missing	9999	3	33.3			Variance	
Total		9	100			Range	
						Minimum	
						Maximum	
						Sum	

55. The CIO always attends major strategy formulation meetings

		Frequency	Percent	Valid Percent	Cumulative Percent	Statistics

Valid	TD	2	22.2	33.3	33.3	Mean
	TA	4	44.4	66.7	100	Median
	Total	6	66.7	100		Mode
Missing	9999	3	33.3			Std. Deviation
Total		9	100			Variance
						Range
						Minimum
						Maximum
						Sum

56. The CIO is individually involved with IS/IT projects of strategic importance, ...

		Frequency	Percent	Valid Percent	Cumulative Percent	Statistics
Valid	TD	1	11.1	16.7	16.7	Mean
	TA	3	33.3	50	66.7	Median
	SA	2	22.2	33.3	100	Mode
	Total	6	66.7	100		Std. Deviation
Missing	9999	3	33.3			Variance
Total		9	100			Range
						Minimum
						Maximum
						Sum

SECTION E: INFORMATION AND KNOWLEDGE MANAGEMENT

57. Information in my company plays an important role in the strategic decision-making process

		Frequency	Percent	Valid Percent	Cumulative Percent	Statistics	
Valid	TD	1	11.1	12.5	12.5	Mean	
	U	1	11.1	12.5	25	Median	
	TA	3	33.3	37.5	62.5	Mode	4
	SA	3	33.3	37.5	100	Std. Deviation	
	Total	8	88.9	100		Variance	
Missing	9999	1	11.1			Range	
Total		9	100			Minimum	
						Maximum	
						Sum	

58. Reports are important for the strategic decision-making process in my co.

		Frequency	Percent	Valid Percent	Cumulative Percent	Statistics
Valid	TA	3	33.3	33.3	33.3	Mean
	SA	6	66.7	66.7	100	Median
	Total	9	100	100		Mode
						Std. Deviation
						Variance
						Range
						Minimum
						Maximum
						Sum

59. Information systems plays an important role in the generation of reports

		Frequency	Percent	Valid Percent	Cumulative Percent	Statistics
Valid	TA	3	33.3	33.3	33.3	Mean
	SA	6	66.7	66.7	100	Median
	Total	9	100	100		Mode
						Std. Deviation
						Variance
						Range
						Minimum
						Maximum
						Sum

61. IS support all managerial levels in my organisation

		Frequency	Percent	Valid Percent	Cumulative Percent	Statistics
Valid	U	1	11.1	12.5	12.5	Mean
	TA	4	44.4	50	62.5	Median
	SA	3	33.3	37.5	100	Mode
	Total	8	88.9	100		Std. Deviation
Missing	9999	1	11.1			Variance
Total		9	100			Range
						Minimum
						Maximum
						Sum

62. Everybody in the co is responsible for managing their own data and info .....

		Frequency	Percent	Valid Percent	Cumulative Percent	Statistics
Valid	SD	1	11.1	12.5	12.5	Mean
	TD	1	11.1	12.5	25	Median
	TA	5	55.6	62.5	87.5	Mode
	SA	1	11.1	12.5	100	Std. Deviation
	Total	8	88.9	100		Variance
Missing	9999	1	11.1			Range
Total		9	100			Minimum
						Maximum
						Sum

63. When IS is used to disperse info throughout my co, decision-making ....

		Frequency	Percent	Valid Percent	Cumulative Percent	Statistics
Valid	SD	1	11.1	12.5	12.5	Mean
	TD	2	22.2	25	37.5	Median
	U	2	22.2	25	62.5	Mode
	TA	2	22.2	25	87.5	Std. Deviation
	SA	1	11.1	12.5	100	Variance
	Total	8	88.9	100		Range
Missing	9999	1	11.1			Minimum
Total		9	100			Maximum
						Sum

64. IS plays an important role in the efforts of my co to be more efficient and ....

		Frequency	Percent	Valid Percent	Cumulative Percent	Statistics
Valid	U	2	22.2	25	25	Mean

	TA	4	44.4	50	75	Median
	SA	2	22.2	25	100	Mode
	Total	8	88.9	100		Std. Deviation
Missing	9999	1	11.1			Variance
Total		9	100			Range
						Minimum
						Maximum
						Sum

65. There is a clear consideration of the kind .....

		Frequency	Percent	Valid Percent	Cumulative Percent	Statistics
Valid	U	1	11.1	12.5	12.5	Mean
	TA	5	55.6	62.5	75	Median
	SA	2	22.2	25	100	Mode
	Total	8	88.9	100		Std. Deviation
Missing	9999	1	11.1			Variance
Total		9	100			Range
						Minimum
						Maximum
						Sum

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BIOGRAPHICAL SKETCH

André Bester was born on 7 April 1953 in Johannesburg South Africa. He completed his apprenticeship with ISCOR as Fitter and Turner during 1975. He then became a teacher at Pretoria Technical High School and obtained his HED (Technical) at UNISA during 1977. André work in industry from 1979 to 1994, mainly in the engineering field, ranging from industrial training, industrial & production engineering, engineering design, and system engineering. His last company was with Houwteq an aerospace division of Denel, a system house responsible for the design of low earth satellites. He was System Engineer (Mechanical Interfaces).

He completed his National Diploma (Mechanical) and Baccalaureus Technologiae Engineering (Mechanical) at Peninsula Technikon. André jointed the academic domain in 1995 at Cape Technikon as lecturer in Information Technology. During 1996 he jointed Peninsula Technikon as lecturer in the Department of Information Technology. These two institutions merged during 2005 and is known as the Cape Peninsula University of Technology.

His lecturing portfolio includes lecturing Information Systems, Software Development, Computer Skills and Project Management. He also, e supervises BTECH:IT and Quality students completing their research projects.