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The role of the CEO in the performance of construction Information Systems (IS): A Pilot Study.

Abstract

The purpose of the study is to examine the relationship between construction Information Systems (IS) performance and the involvement of the CEO.

The information provided in this article is based on a knowledge, attitude and perception (KAP) study that included a literature review and self-administered questionnaires with a small sample of CEOs of construction companies.

This study suggests that the performance of information systems in construction firms can be linked to the governance role played by CEOs. Other studies reported in the literature suggest a similar linkage, the reality is that in practice IS in the construction sector is underutilised and performs poorly. Similar sentiments have been expressed in the literature. One of the main reasons for IS poor performance has been found to be the lack of executive support and involvement stemming from resistance from executive management. Further, despite the use of IS in construction companies, very few, if any have a strategic plan in place for IS in their organisations.

This article contributes to increased understanding of the importance of information systems in the construction sector, and the relationship between IS performance and CEO commitment and involvement.

Keywords: Information Systems, IS Governance, CEO, CIO

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Abstrak

Die doel van die artikel is om the verhouding tussen konstruksie Inligtingstelsels (IS) en die betrokkenheid van die uitvoerende bestuurder van 'n maatskappy te ondersoek.

Die inligting in hierdie artikel is baseer op 'n kennis, houding en perseptuele studie wat onder andere 'n literatuurstudie en selfsaamgestelde vraelyste (versprei onder 'n klein groepie uitvoerende bestuurders van konstruksie maatskappye) insluit.

Die studie het bevind dat die werksaamhede van inligtingstelses in konstruksiemaatskappye direk verbind kan word aan die rol wat uitvoerende bestuurders van hierdie maatskappye speel. Inligtingsbronne bestudeer vir hierdie studie het dieselfde bevind. Die realiteit is dat inligtingstelsels in praktyk onderbenut en swak gebruik word. Een hoofrede hiervoor is dat bestuurders van maatskappye nie die gebruik van (IS) ondersteun nie. Min bestuurders het 'n strategiese plan in plek vir die gebruik van (IS) in konstruksiemaatskappye.

Hierdie artikel poog om die begrip vir die belangrikheid van inligtingstelsels in die konstruksiesektor en die verhouding tussen IS werksaamhede en uitvoerende bestuurders' se toegewydheid en betrokkeheid te verbeter.

Sleutelwoorde: Inligtingstelsels, IS bestuur, Uitvoerende bestuurders

1.   Introduction

We [construction sector] will have to apply sophisticated technology in doing our work and to understand what our client industries need ... To develop engineering packages and give our clients a total service, that is the key ... Be flexible, stay at the leading edge. For those who adapt to meet the changes the future is bright Cordel Hull, Executive Vice President of Bechtel (Betts, 1999: 7)

Construction is an increasingly dynamic sector that needs to think differently about how it does business given the highly competitive and changing environment in which it operates. This dynamic environment is increasingly influenced by economic, technological and social factors (Betts, 1999). However, the construction sector is reputedly lethargic to adopt innovation and, in particular, new technology. Arguably it has not readily embraced Information Technology (IT) given its reluctance to recognise the many potential efficiencies and competitive advantages afforded by this technology, specifically the impact of Information Systems (IS) on organisations.

Information is becoming a key competitive resource that is critical to business performance (Betts,1999; Moody & Walsh, 1999). The successful completion of construction projects depends on the accuracy, effectiveness and timing of the exchange of information between the project team members, a function easily managed with an information system (Rono & Arif, 2004). The Construction Industry Development Board (CIDB) in South Africa reported that only half of all construction projects had been 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 possibly also contributed to the reluctance within the construction sector to invest in IS. It is likely that the way IS is allowed to be managed presents as a major problem, and therefore, it needs attention and improvement (Stewart, 2002). Most companies manage IS through a decentralised structure, with IS typically used by IS specialists for discrete applications that are only used by staff at technical levels (Betts, 1999). Strategic IS implementation is important in the context of issues, such as organisational structure, management style and human resource policy. Chief Information Officers (CIOs) in construction companies typically do not participate in the formulation of business strategy (Betts, 1999).

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 & 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 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 IT implementation. Further, the study reported that South African construction companies value IT 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. Many construction companies had benefited from the strategic opportunity offered by IS (Rone & Arif, 2004). Despite intensive use of IS in construction companies, none of the case studies revealed an explicit plan for IS use (Betts, 1999).

2.   Role of the CEO

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 achieve superior performance (Buuron, 2002). According to Earl & Feeny (2000) nearly every strategic issue that businesses are being confronted with are triggered by IS. 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 & 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 & Lederer, 2003).

Earl & 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 venture into 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 interactions impact on the whole organisation;

- Spending Quality Time — CEOs must take their IS leadership seriously and invest quality time with IS matters and keep IS on their agenda; and

- Working Closely with the CIO — CEOs must create an organisational structure to enhance the working relationship with the CIO, in terms of which they build a two-way relationship in which the CEO can challenge or question IS thinking as well as provide business direction for IS.

Additionally, Callahan & Nemec (1999) prescribe four key initiatives for CEOs for driving IS forward, namely:

- 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.

Given that the CIO adds value to the organisation it is important for a CEO to capitalise on this value-adding characteristic through:

• Positioning IS and the CIO as agents of change;

• Focusing on achieving effectiveness, not efficiency from IS;

• Institutionalising business value for IS; and

• Building an executive team that includes the CIO (Delisi, Danielson & Posner, 1998).

Given that 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.

CEOs need to understand IS and how they can make optimal use of IS to achieve organisational goals. Although IS activity is highly technical and complex, top management can provide adequate guidance without detailed technical knowledge (Doll, 1985; Callahan *et al*., 1999). Therefore, the problems of designing and implementing company-wide IS are primarily managerial rather than technical. The role of the CEO in IS/IT planning and development should typically be:

• Measure the business value of the IT by quantifying its overall economic value to the business;

• Recentralise control of IT spending while maintaining flexibility;

• Communicate the results one expects in understandable financial terms;

• Keep the IT architecture/infrastructure simple;

• Insist on rigorous pilot testing;

- Ensure that the new system has the capacity to handle the required number of transactions that need to be processed;

- Closely monitor what IT suppliers are using to run their own businesses; and

- Avoid succumbing to hasty decisions based on the urgency of the situation.

Bennis & O'Toole (2000) note that the right CEO can make or break a company, in part because of the CEO's role in initiating and leading planned change.

3.   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.

Two forms of organisations, namely mechanistic and organic, exist:

- 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 (Galbraith, 1977; Brown & Magill, 1994).

Most organisations and businesses struggle with how to deploy IS to support strategic objectives and goals. One of the solutions to this problem is the way [de]centralisation is implemented by the organisation. Figure 1 illustrates the situational dilemma organisations have in structuring IS. Executive management needs to decide which will best suit the organisation.
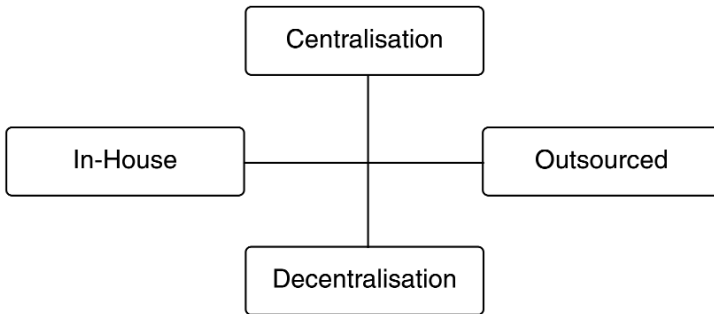
Figure 1:   Two Dimensions: Situational Factors Determining IS in the Organisation
             Source: (Adapted from Tan 1994)

From Figure 1 it is evident that situational factors influence the structuring of 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. In Table 1 the importance of IS for a company can be measured through suggests the use of a simple grid.

Table 1:   Strategic grid to determine importance of IS

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

Source: (Adapted from Tan 1994)

Centralised IS

All IS functions are control-led 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 co-ordinated IS

CIS ● set and control the IS standards throughout. DIS O situated at BU level but report to CIS. IS resources are shared at both CIS and DIS. IS tasks are delegated to DIS through the BU.

Functional co-ordinated IS

CIS ● set and control the standards DIS O report to the BU managers have a funcional relationship with Central IS. BU determines the "what" and DIS the "how". Selective decen-tralisation is controlled from the top down.

Federated IS

CIS ● co-ordinating standards projects and participate in a "steering committee" run by top management but share a mutual responsibility towards standards combined projects and distribution of tasks. Selective decentralisation controlled from the bottom up.

Decentralised IS

IS functions and control are totally decentralised to the business unit (BU) level each setting own standards and control IS.

The circles indicate the location of Information Systems (IS) in relationship to the organisational structure of the company. ● = Central IS (CIS). O = decentralised function of IS (DIS). BU = Business Units. FD = Functional Departments

Figure 2:   Five Organisational Structures for IS
            Source: (Adapted from Tan (1994))

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.

As seen from Figure 2 there are five possible organisational forms for structuring IS within the organisation. The two most extreme structures for IS are normally total Centralised IS opposed to Decentralised IS functions.

Centralised IS relies on a governance structure where information management reports up through a single chain of command. Decentralised IT, on the other hand, distributes management of IS through a multitude of functional and regional commands (Ulrich, 2004). Studies also show that most IS organisations utilize either a centralised (45%) or combination (hybrid) of centralised and de-centralised (48%) governance structures.

Arguably, centralised IS and decentralised IS can coexist and flourish under the same governance structure.

Centralised and decentralised and other different hybrid configur-ations of IS can flourish towards collaborative, adaptive governance (Ulrich, 2003). In the past the function of IS was primarily related to data processing. However, these days IS plays a central role in com-petitive 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 manage-ment function. According to Gottschalk & 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'] "

4.   Research methods

The use of a suitable research methodological approach is neces-sary to achieve the objectives of any study. Hussey & Hussey (1997: 54) suggest that "Methodology refers to the overall approach of the research process, from the theoretical underpinning to the collection and analysis of data." This section describes the research design used to achieve the objectives of this particular study.

Having taken cognisance 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 & Lawley (2000) as shown in Table 2.

Table 2:   Links between stages of research process

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.

Considering that there could be a wide range of expected or possible responses, questions that were open-ended were kept to a minimum. Where they were included, respondents had the freedom to fully explain their choice of response. For most of the questions a 5-point Likert scale was deemed appropriate and scaled responses were developed. The questionnaire was divided into 5 sections, namely, demographic information, organisational design, IS governance, management of IS, and information and knowledge management. This questionnaire was designed to be completed by CEOs of construction companies. For the purpose of this paper two sections of the survey will be highlighted, namely:

•   Organisational Design that addresses IS governance 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; and

•   IS governance that examines CEOs of construction companies, and their 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. Respondents were also requested to indicate which structural form best described IS in their company.

CEOs were asked to respond to questions on a 5-point Likert scale ranging from 'strongly disagree' to 'strongly agree.' CEOs were also requested to add additional comments if they wished to clarify their responses.

5.   Findings

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) was used to analyse the data from the survey instrument. The findings of the questionnaire as well as the analyses of the findings are as follows:

5.1   Organisational Design

Table 3 suggests that in most companies the CEO either alone, or with an executive management team, made all the major decisions. Most companies regarded themselves as well established, large and serving different markets. Fewer companies reported that their management structures were flat, used cross-hierarchical and cross-functional teams, had low formalisation, possessed a comprehensive information network, and relied on participative decision-making.

Table 3:   Hierarchy of authority

Statement		SD	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 formalisation 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		

Table 4:   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		

From Table 4 it is evident that most CEOs 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. CEOs also consider IS to be critical to the process of [re]structuring their companies towards more effective lean and flat management structures.

Table 5 suggests that most CEOs inherited the existing organisational structure and made changes that they considered necessary, while all CEOs were involved in developing the organogram or organisational structure of their companies.

Table 5:   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 6 suggest that the companies of most CEOs are characterised 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. Several companies regarded

themselves as being well established, highly specialised and formalised in terms of work, with decision-making usually concentrated at top management level. Fewer companies 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 indicated that they were temporary alliances between two or more organisations, grouped together to accomplish a specific venture, but were still formally structured.

Table 6:   Importance of structural forms in the Organisation

Statement		SD	TD	U	TA	SA	Mean	Std. Deviation
My company is characterised 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 characterised as well established work is highly specialised and formalised 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 characterised as simple with little specialisation or formalisation 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 3 it is evident that the most popular organisational structure for IS is Centralised IS (CIS). A Decentralised IS (DIS) organisational structure is less common, while Centralised Coordinated IS (CCIS), Functional Coordinated IS (FCIS), and Federated IS (FIS) are the least popular in terms of organisational structure.
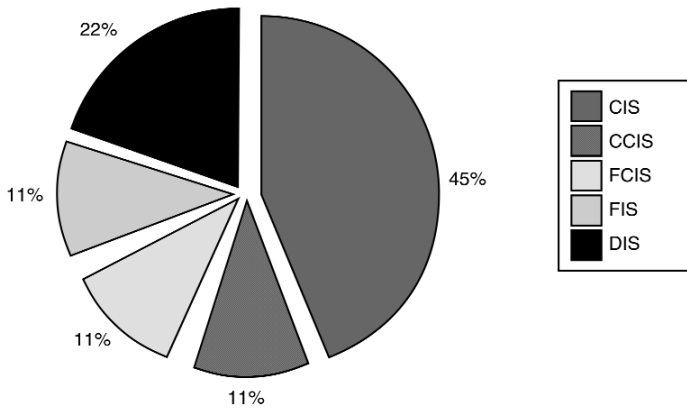

Figure 3: Structure forms for IS

5.2 Information Systems Governance

Table 7 suggests that to most CEOs IS investment is an important part of their business strategy. Slightly fewer CEOs consider IS as a strategic asset, and still fewer have a formal IS strategy for their companies. To the least number of CEOs it was not important to have an IS strategy on the company's strategic agenda.

Table 7:   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 8 suggests that most companies IS supports all managerial levels of the organisation, while in slightly fewer companies IS as a valuable tool is less important for lowering costs through all levels of the company.

Table 8:   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%		

Table 9: 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%		

The findings in Table 9 indicate that in most companies IS plays an important role in reacting to changing environments, while in slightly fewer companies IS has become the primary vehicle for creating new advantages, and warding off competitors.

From Table 10 it is evident that in most companies IS is on the CEO's agenda, while in fewer companies the involvement of the CEO in IS strategic and project meetings is less important.

Table 10: 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 11:   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		

Table 11 suggests that in most companies the CIO reports directly to the CEO, and is a member of the executive management committee. However, in slightly fewer companies their CIOs had the skills to manage IS themselves. In fewer companies designated persons took responsibility for IS, and in some companies CIOs participated in strategic meetings. Furthermore, in even fewer companies the articulation by the CEO of a clear mission for IS to the CIO is even less important.

The results in Table 12 indicate that to most CEOs 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 companies all employees had an accurate understanding of the importance of IS output to executive management.

Table 12: 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

6.   Conclusion

The study found that the participating companies had been in existence for lengthy periods and had experienced CEOs. Authority was typically vested in their CEOs and executive management. The executive teams of construction firms participated in the structuring of their companies, making changes to the organisational structure as they deemed 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 centralised 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 centralised and centrally coordinated IS structures. These findings are supported by the findings of several other studies by Karake (1994); Brown & Magill (1994), Duncan (1997), Burke (2004), Douglas (1999), Hitt *et al*. (2001), McMillan (2002), Lucey (2005), Tan (1994), Galbraith (1977), Mintzberg (1979), Dibrell (2002), Ulrich (2004) and Peppard & Ward, (1999).

Evidently, most companies consider IS investment to be a strategic asset, and have formal IS strategies in place. Furthermore, most CEOs reported that IS supported all managerial levels of their organisations. They also considered IS to be 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 their 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 & Quigley (1994), Ramakrishna (2002), Buuron (2000), Chan (2000), Daniels (1998), Remenyi (1999), Suwardy *et al.* (2003), Ragunathan *et al.* (2002), McMillan (2002), Halachimi (1994), McClearly *et al.* (1995), Earl & Feeney (2000), Johnson *et al.* (2003) and Palanisamy (2005).

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 & Lee (2003), MITI (1999), Jenks & Dooley (2000), Feeney & Ross (1999), Evans & Hoole (2005).

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.

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.

References

Anumba, C.J., Baugh,C. & Khalfan,M.M.A. 2002. Organisational Structures to Support Concurrent Engineering in Construction. *Industrial Management & Data Systems*, 102(5), p. 260 — 270.

Bai, R. & Lee, G. 2003. Organizational Factors Influencing the Quality of the IS/IT Strategic Planning Process. *Industrial Management and Data Systems*, 10(8), p. 622-632.

Bennis, W. & O'Toole, J. 2000. Don't Hire the Wrong CEO. *Harvard Business Review*, 78(3), p. 170-177, May-June.

Betts, M. 1999. *Strategic Management of IT in Construction*. UK: Blackwell Science.

Brown, C.V. & Magill, S.L. 1994. Alignment of the IT Function with the Enterprise: Towards a Model of Antecedents. *Management Information Systems Quarterly*, 18(4), p. 371-403.

Brown, C.V. & Magill, S.L. 1994. Alignment of the IT Function with the Enterprise: Towards a Model of Antecedents. *Management Information Systems Quarterly*, 18(4), p. 371-403.

Burke. M.E. 2004. Relations between organisational design and information processing systems: a passionate affair or stormy interlude? Proceedings of the *13th European Conference on Information Systems*, The European IS Profession in the Global Networking Environment, ECIS 2004, Turku, Finland, June 14-16, 2004.

Buuron, M.A. 2002. *The CEO in the Information Age: How to achieve Business Excellence trough IT*. Inaugural speech in acceptance of the Professorship at the Universiteit Nyenrode. [Online]. Available from: <http://www.nyenrode.nl/download/lectures/buuron.pdf>

Callahan, C.V. & Nemec, J. 1999. *The CEOs Information Challenge: Creating True Value*. [Online]. Available at <www.strategy-business.com/press/16635507/10234>.

Carr, N.G. 2003. *IT Doesn't Matter*. Harvard Business School Publishing Corporation. Product Number 3558

Chan, S.L. 2000. Information technology in business processes. *Business Process Management Journal*, 6(3). p. 224-237.

CIDB. 2004. *SA Construction Industry STATUS REPORT: Synthesis Review on the South African Construction Industry and its Development*. Discussion Document.

Clark, M., Atkin, B.L., Betts, M.P. & Smith, D.A. 1999. Benchmarking the Use of IT to Support Supplier Management in Construction. *ITCon* Vol. 4, pp. 1 -16. [Online]. Available from: <http://www.itcon.org/1999/1/>

CSIR. 2002. *IT key to competitiveness in construction industry*. [Online]. Available from <http://www.csir.co.za/plsql/ptl0002/PTL0002_PGE 038_ARTICLE?ARTICLE_NO=4300133>.

Daniels, S. 1998. The strategic use of information systems. *Work Study*. 47(5), p. 167 — 171.

DeLisi, P.S., Danielson, R.L. & Posner, B.Z. 1998. A CEOs — Eye View of the IT Function. *Business Horizons*, 41(1), p. 65-74.

Dibrell, C.C. & Miller, T.R. 2002. Organization Design: The Continuing Influences of Information Systems. *Management Decision*, 40(6), p. 620-627.

Dibrell, C.C. & Miller, T.R. 2002. Organization Design: The Continuing Influences of Information Systems. *Management Decision*, 40(6), p. 620-627.

Doll,W. J. 1985. Avenues for Top Management Involvement in Successful MIS Development. *MIS Quarterly*, 9(1), p. 17-35 doi:10.2307/249271

Douglas, C. 1999. Organization Redesign: the Current state and Projected Trends. *Management Decision*, 37(8), p. 621-627.

Duncan, R. 1997. What Is the Right Organization Structure? *Organizational Dynamics*. Winter. AMACON, a Division of America Management Association.

Earl, M. & Feeny,D. 2000. Opinion How To Be a CEO for the Information Age. *Sloan Management Review*, 41(4), p. 11-23, Winter.

Evans, N. & Hoole, C. 2004. Promoting Business/IT fusion: an OD Perspective. *Leadership and Organisational Development Journal* 26(4), p. 310-325.

Frazer, L. & Lawley, M. 2000. *Questionnaire Design and Administration*. Wiley Publishers.

Galbraith, J.R. 1977. *Organization Design*. Addison-Wesley publishing Company.

Gottschalk, P. & Taylor, N.J. 2000. Strategic Management of IS/IT Functions: The role of the CIO. Proceedings of the 33rd *Hawaii International Conference on Systems Design -2000*.

Halachmi, A. & Bouckaert, G. 1994. Performance Measurement, Organizational Technology, and Organizational Design. *Work Study*, 43(3), p.19-25.

Hitt, M.A., Ireland, R.D. & Hoskisson, R.E. 2001. *Strategic Management: Competitiveness and Globalization (Concepts and Cases)*. 4th ed, South-Western College Publications, a Division of Thomson Learning.

Hussey, J. & Hussey, R. 1997. Business research: *A Practical Guide for Undergraudate and Pos graduate Students*. Boston, Irwin: Macmillian Press Ltd.

IT Cortex. 2005. *Failure Rate: Statistics over IT projects failure rate*. [Online]. Available from: <http://itcortex.com/Stat_Failure_Rate .htm>.

Jenks, J. & Dooley, R. 2000. The strategic role of IT executives: An Empirical Examination of CIO strategic Involvement and IT Usage in the Fortune 500. Presented at the *60th Academy of Management Meeting*,Toronto, Canada.

Johnson, A.M., Lederer, A.L. 2003. Two Predictors of CEO/CIO Convergence. *SIGMIS CONFERENCE 2003*, ACM 1-58113-666-8/03/004

Karake, Z.A. 1992. An Emperical Investigation of Information Technology Structure, Control and Corporate Governance. *Journal of Strategic Information Systems*. 5(1), p. 258-65.

Lucey, T. 2005. *Management Information Systems*, 9th ed, Thomson Learning.

McClearly, K., Asubonteng, P. & Munchus,G. 1995. The effects of advance Information Technology on Organizational Design. *Health Manpower management*, 21(2), p. 20-23.

McMillan, E. 2002. *Considering Organisation Structure and design from a Complexity Paradigm Perspective*. [Online] Available from: <wwww.ifm.eng.cam.ac.uk/mcn/pdf_files/part5_5.pdf>.

Mintzberg, H. 1979. *Structuring of Organizations*. Englewood Cliffs, NJ: Prentice-Hall.

MITI. 1999. *Corporate Approaches to IT Governance. Japan Ministry of International Trade and Industry*. [Online]. Available from: <www.jipdec.jp/chosa/gavanance9903/MITIBE/MITIbe.pdf>

Moody, D. & Walsh, P. 1999. Measuring the Value of Information: An Asset Valuation Approach. *Europen Conference on Information Systems (ECIS)*.

Ndede-Amadi, A.A. 2004. What Strategic Alignment, Process Redesign, Enterprise Resource Planning, and E-Commerce have in common: Enterprise-wide computing. *Business Process Management Journal*. 10(2), p. 184-199.

Palanisamy, R. 2005. Strategic information systems planning model for building flexibility and success. *Industrial & Data Systems*, 105(1), p. 63-81.

Peppard, J. & Ward, J. 1999. Mind the Gap: Diagnosing the Relationship between the IT organisation and the rest of the Business. *Journal of Strategic Information Systems*. Vol. 8, p. 26-60.

Ragu-Nathan, B., Ragu-Nathan, T.S., Tu, Q. & Shi. Z. 2002. A Path analytical Study of the Effect of Top Management support of IS. *Decision Sciences Institute Annual Meetings Proceedings*.

Ramakrishna, H.V. & Lin. X. 2002. Perception of the role of information technology function in organizations: Toward the development of a Measure. *ACM SIGCPR Computer Personnel*, 20(4), p. 39 — 54.

Remenyi, D. & Sherwood-Smith, M. 1999. Maximize Information Systems value by Continuous Participative Evaluation. *Logistics Information Management*, 12i(1⁄2), p. 14-31.

Rono, R. & Arif, A. 2004. The Role of ICT in Construction-Related Firms. School of Construction Economics and Management, University of

the Witwatersrand. *The 2nd Postgraduate Conference for the Construction Industry Development Board*

Standish Group. 2003. *Unfinished Voyages: A Follow-UP to the CHAOS Report*. [Online] Available from: <http://www.standishgroup .com/sample-research/unfinished-voyages-1.php>.

Stewart, R. A. 2002. *Lifecycle management of Information Technology (IT) Projects in Construction*. A thesis submitted in partial fulfillment of the requirements for the degree Doctor of Philosophy Faculty of Engineering and Information Technology. Griffith University, Gold Coast Campus.

Surwardy, T., Ratnatunga, J., Sohal, A.S. & Speight, G. 2003. IT Projects: Evaluation, outcomes and impediments. *Benchmarking: An International Journal*, 10(4), p. 325-242.

Tan, D. S. 1994. De Informatiemanagement-matrix. *Information & Information Policy (I&I)*, Jaargannen 1994, Herfs, Nr. 1. p.1-15 [Online]. Available from: <http://www.cram.nl/ieni/940107.htm>.

Tucker, S.N. & Mohamed, S. 1996. Introducing Information Technology in Construction: Pains and Gains., *CIB W65 Symosuim on Organisation and management of Construction*, University of Glasgow,pp 348-356.

Ulrich,W. M. 2004. *IT Centralization versus Decentralization: The Trend Towards Collaborative Governance*. Tactical Strategy Group, Inc. [Online]. Available from: <www.systemtransformation.com/Org_ Transformation_Articles/org_decentralization.htm>

Yasin, M.M. & Quigley, J.V. 1994. The Utility of Information Systems: Views of CEOs and Information Executives. *Industrial Management Data Systems*, 94(5), p. 25-29.

Yodokawa, K. 2000. *The CIO as the Driving Force Behind IT Restructuring*. Numara Research Institute (NRI), No. 7, June.