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WHAT REALLY MATTERS: AN EMPIRICAL STUDY ON THE RELATIVE IMPORTANCE OF THE CIO AND THE MATURITY OF THE IS ORGANIZATION IN PRODUCING EFFECTIVE IS PERFORMANCE

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Abstract

How do IS leader effectiveness and IS organizational maturity impact IS unit effectiveness? Drawing on existing CIO capabilities literature, IS organizational maturity literature and IS effectiveness literature, this paper proposes to gather and analyze survey data to compare the capabilities of the CIO with the IS unit's organizational maturity to empirically determine which more influences IS effectiveness. The role of CIO in creating IS unit organizational maturity will also be tested.

Keywords: IS Effectiveness, CIO and maturity

Introduction

An organization's use of technology to solve tactical and strategic problems is well documented (Barney 1991; Mata, Fuerst et al. 1995; Feeny and Willcocks 1998; Karahanna 2004). Effective technology implementation is associated with reduced operational costs, reduced inventory cycle time, creation of effective supply chain management and development of strategic differentiated products and services (McFarlan 1984; Ghemawat 1986; Barney 1991; Harter 2000; Kost 2002; Karahanna 2004). Concurrent with the increase of importance of technology to organization has been the rise of the Chief Information Officer (CIO). The CIO is expected to possess significant technical, process and business knowledge to effectively manage the Information Systems (IS) unit, create appropriate organizational structures and processes and help shape IS-enabled strategic business initiatives (Grover 1993; Sambamurthy, Bharadwaj et al. 2003; Smaltz 2004). Yet technology projects fail frequently and the promise of technology remains elusive (Earl and Feeny 1994). The schism is clear: some organizations are better at implementing and managing technology yet the reasons for this are not clear. The research question to be answered in this analysis is: What are the relative importance of CIO capabilities and IS organizational maturity in creating IS effectiveness?

Empirical studies link announcements of new CIO positions to improved market valuation (Chatterjee, Richardson et al. 2001). In companies that are transformed by information technology, the "wealth impact" of these announcements is approximately $8 million in stock price movement. Clearly, the market recognizes that a CIO has a positive impact on an organization. Other studies show that improving process maturity, which refers to an organization's evolution from chaotic IS processes to measurable and repeatable processes (Ramanujan and Kesh 2004), is linked to improved project performance (Jiang 2004), increased product quality (Harter 2000) and enhanced firm performance (Karimi and Gupta 1996). The role of the CIO in transforming the organization's processes is also clear (McLean and Smits 2003).

Theoretical Background

CIO Skills

As technology use within organizations has grown, the need for effective IS leadership has also grown (Sauer and Yetton 1997; Chatterjee, Richardson et al. 2001; Karahanna 2004; Smaltz 2004). IS leadership is conceptualized in several different ways and each conceptualization provides a different perspective on effective leadership. The most recent conceptualization of IS leadership (Smaltz 1999) focuses on the four key skills that are necessary to successfully perform the role of the CIO. These skills are: (1) strategic business knowledge, (2) strategic IS knowledge, (3) strong interpersonal skills and the ability to communicate effectively with superiors, peers and subordinates and (4) political savvy. These skills conceptually fit with previous CIO role-based conceptualizations.

Practitioner reports frequently cite lack of business knowledge as a key shortcoming in current CIOs. Titles like "CIOs Not Up to Snuff as Active Business Leaders" (Wilder 1992), "Chief Information Officers Stay Out in the Cold" (Shillingford 2004), "CIO's Not as Important as They Think They Are" (www.silicon.com 2004) and "CIO Jury: Is there a Boardroom IT Credibility Gap"(www.silicon.com 2004) dominate the popular press. This lack of strategic business knowledge may be partially to blame for the poor relationship between CIOs and the top leadership within an organization (Wang 1994; Smaltz 1999). CIOs must possess a strategic knowledge of the business, business operations and the business environment to be successful (Applegate and Elam 1992; Smaltz 1999). By having strategic business knowledge, CIOs are better able to create IS-business strategic alignment which results in increased IS effectiveness and improved business performance (Chan 1997).

Hiring a non-technologist as a CIO ignores a key reality: CIOs are expected to possess a high level of strategic IS knowledge (Wang 1994; Smaltz 1999; Smaltz 2004). Significant knowledge of IS is necessary for CIO success (Garets 1998) and for aligning IS with the business. This IS-business alignment results in improved IS unit effectiveness (Chan 1997).

The need to communicate with senior management using non-technical terms has received broad support in academic research and practitioner research (Grover 1993; Kost 2002; Gartner 2004). In his dissertation, Smaltz (1999) provides an illuminating quote from one of his CEO survey respondents "(Our) CIO discusses (in English!) how we might achieve what I want, not (in technobabble) why we can't achieve what I want, he (or she) doesn't patronize me by saying 'it's all very complicated and it would take a long time to explain (it) to someone like you.'"(pp. 38). In their study of 14 UK organizations, Feeny et al (1992) propose that the successful CIO needs strong interpersonal communication skills to successfully interact with CEO without resorting to technical jargon.

Success at the top level of an organization requires political savvy and CIOs with a high level of relationship management skills are likely to be perceived as more effective leaders (Smaltz 1999). The ability to successfully read the power terrain is essential for the CIO to bridge the gap between technical and business objectives of the organization (Stephens 1992). Implementing enterprise-wide systems requires the cooperation of stakeholders from across the organization and the role of technology advocate often falls to the CIO (Grover 1993). Political savvy, often in the form of change management, is necessary to overcome turf conflicts associated with implementing systems to support the IS-business strategic alignment.

IS Maturity

Since leadership is the skill to "direct and coordinate the activities of group members towards goal attainment", it logically flows that the capabilities of the CIO will be reflected in the maturity and effectiveness of the IS unit (McLean and Smits 2003). Organizational maturity refers to the evolution of an organization's processes from an initial chaotic state fraught with unexpected results and poor oversight to an evolved mature state where processes are rationalized, measured and repeatable. Maturity is thought to lead to quality, cost and time improvements (CMM 2004).

Initial organizational maturity research focuses on the attributes used to assess IS maturity and evolved from early stage hypothesis work (Gibson and Nolan 1974) however the stage hypothesis work was not supported in further research (King 1984). While eleven dimensions of maturity have been identified (Benbasat 1980) , there has been no research connecting these dimensions and maturity .

By one estimate, practitioner efforts have developed over 150 different ways to measure IS organizational maturity (Young 2003) . Arguably the most widely used model of IS maturity within industry (Harter 2000), the Capability Maturity Model (CMM) is the de facto standard for application development, personnel management and process definition (Young 2003). It is highly prescriptive and provides objective criteria for determining each maturity level. It uses a five-item maturity scale to assess an organization's evolution from an initial ad hoc or chaotic state (Level 1), to creating repeatable project management process (Level 2), to documenting, standardizing and integrating defined processes (Level 3), to managing process through detailed quantitative measures (Level 4), and to optimizing processes based on continuous process improvement (Level 5) (CMM 2004). As of April 2003, over 2500 organizations have formally been certified under CMM while thousands more have adopted CMM processes (CMM 2004).

Research testing the relationship between IS maturity and firm performance suggests that increasing a firm's IS maturity increases its ability to achieve global technology-based initiatives (Karimi and Gupta 1996). Maturity, as measured by CMM certification, is shown to improve project performance (Jiang 2004), increase product quality (Harter 2000) and to highlight the "symbiotic relationship" between knowledge management and process maturity (Ramanujan and Kesh 2004).

The role of senior IS leadership in creating IS organizational maturity is strongly implied. Following CMM nomenclature, the key people in initiating, supporting and enforcing maturity are the Manager and the Senior Manager. Their job roles are to "provide the technical and administrative direction…. to organize, direct and control (the) work within an area of responsibility…(and) to direct the allocation or reallocation of resources in support of organizational process-improvement effectiveness" ("Carnegie Mellon 2001). The attributes are consistent with the attributes of a successful CIO.

IS Effectiveness

Defining what comprises an effective IS performance has been exhaustively studied. This elusive dependent variable has as many measures as studies (DeLone and McLean 1992). Early definitions of IS effectiveness focus on the computer systems itself and its ability to produce accurate results (Shannon and Weaver 1949). These studies conceptualize IS effectiveness as relating to the quality of the information that the system provides (Mason 1978). Further definitions focus on the effectiveness of the information system to influence recipient behavior (DeLone and McLean 1992). The influence is thought to be measurable with seven attributes: system quality, information quality, information use, user satisfaction, individual impact, organizational impact, and information systems quality service.

Using the system effectiveness attributes as building blocks, subsequent studies define IS effectiveness using the link between IS and business strategy (Venktraman 1986). This linkage has broad support in the literature and includes the linking of business strategy and performance, business strategy and IS strategy, IS strategy and IS effectiveness, IS strategy and business performance and IS strategic alignment (Chan 1997). Venkatraman (1985) defined the "strategic orientation of

business enterprises' (STROBE) as the general pattern of means to achieve a business goal. Chan builds off the STROBE model and conceptualizes IS effectiveness as including: IS staff and services, information product, end user knowledge and involvement, contribution to efficiency, contribution to effectiveness, contribution to market linkage and contribution to products and services. While some research exists on how to improve IS effectiveness, no known studies have compared the relative importance of the CIO as compared to IS maturity to empirically determine which more influences IS effectiveness and the relationship between the CIO skills and IS maturity.

Summary and Hypotheses

The literature review suggests:

- **CIO – IS effectiveness:** The capabilities of the CIO are reflected in the achievement of strategic and operational goals. The greater the capabilities of the CIO, the more effective the CIO will be in creating IS effectiveness.
  - *Proposition 1: The CIO's capabilities will be positively associated with IS effectiveness*
- **CIO – Organizational maturity:** The capabilities of the CIO impact IS organizational maturity. Senior management support is critical to initiate and sustain increases in organizational maturity.
  - *Proposition 2: The capabilities of the CIO will be positively associated with IS unit maturity.*
- **Organizational maturity – IS Effectiveness:** IS organizational maturity increases the strategic and operational achievement of the IS Unit, which increases IS effectiveness.
  - *Proposition 3: IS unit maturity will be positively associated with IS effectiveness.*

The research model for this paper is as follows:

Figure 1 – Research Model
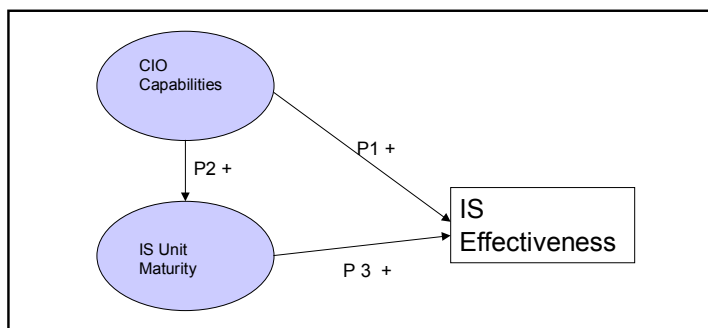
Methodology

The methodology described in this study follows a framework used in previous studies on CIO performance (Smaltz 1999) and is consistent with recommended scholarly practice (Gray 2004). Since this research involves making generalizations about CIOs and IS units, a representative sample of organizations is needed to achieve generalizability. Surveys are means of gathering the necessary sample data to allow generalizations to a larger population. Although there have been some problems in using surveys in MIS research, including inappropriate research questions and lack of theoretical basis for questions, two of the constructs in this analysis have academically developed and validated survey instruments (CIO capabilities and IS effectiveness). The other construct, IS maturity, does not have an academically validated survey instrument although detailed practitioner surveys exist.

Population and Sample

In order to control for industry effects, this research seeks to limit the population under analysis to a single industry. This strategy is similar to the one used in previous studies on CIO effectiveness on the health care industry (Smaltz 1999). The population of interest is governmental organizations. Since these organizations are large, information intensive and complex, they provide an excellent population to analyze. In their annual CIO survey, Gartner identifies three distinct environments:

(1) breaking away organizations, which are characterized by significantly increasing budgets and building for agility and growth (15 percent of organizations), (2) maintaining competitiveness organizations, which are characterized by balance efficiency and effectiveness and stable budgets, (69 percent) and (3) organizations that are fighting for survival, which are characterized by declining budgets and strict cost management (15 percent) (Gartner 2004).

Government organizations fit neatly into this characterization. Breaking away organizations, like those involved with defense, homeland security and intelligence, have rapidly rising budgets and a need to be agile in their response to security related issues. Organizations fighting for survival, like those focused on conservation and urban development, face declining budgets and need strict cost management to achieve their organizational goals. Finally, maintaining competitive organizations, like those in social services, public health and education, face stagnant budgets and the need to balance efficiency and effectiveness (Baker 1999; Kost 2002; ComputerWorld 2003; IAC 2004).

It is impossible to determine the actual size of the population of governmental organizations so this study uses 100 public sector organizations that have CIOs that have been in place for at least 12 months. Some studies argue that CIOs need to produce effective results with 90 days (Gartner 2004), however we believe that this is unacceptably short. Twelve months is selected as the minimally acceptable CIO tenure to allow the organization to begin to respond to the direction of the CIO and to allow the CIO to have a full budget cycle to begin to implement maturity and effectiveness strategies. The CMM literature shows that organizations typically are fully capable of maturing to the next level within 18 – 24 months (CMM 2004), thus some increased maturity should be evident within 12 months.

CIO Capabilities

This paper's operationalization of CIO capabilities is derived from earlier research done on CIO effectiveness and CIO capabilities (Smaltz 1999; Smaltz 2004) and is shown in Table 1.

Table 1 – Operationalization of CIO Capabilities

Indicators	Conceptual Description	Items	Reliability (Cronbach's Alpha)	Source
Degree of strategic business knowledge	Measures the CIO's awareness of the internal and external business environment	CIO's knowledge of organizations: - Services - Business processes - Threats	.82 - .9	Smaltz 1999
Degree of strategic IT knowledge	Measures the CIO's awareness of the organization's technology as well as competitor's technology	CIO's knowledge of: - How other organizations are applying technology - How to use existing technology to meet organizational need - How to identify emerging technologies - How to guide technology acquisition decisions	.86	Smaltz 1999
Degree of political savvy	Measures how the CIO's capabilities to work effectively within a team	CIO's ability to: - Accurately read contentious situations - Ability to act with tact - Ability to develop good rapport with most people	.88	Smaltz 1999

Interpersonal communication skills	Measures the CIO's communication ability with senior management	CIO's ability to: - Use non-technical terms when speaking with senior functional leadership on technical issues - Use appropriate business terms	.83 * *Several other measures were used in Smaltz's study, which are not germane to this analysis.	Smaltz 1999

IS Maturity

Studies examining CMM process maturity have focused on the software development life cycle and have operationalized it as including process and product maturity (Harter 2000). This analysis expands Harter's operationalization of maturity to make it consistent with the CMM conceptualization of maturity.   The operationalization of IS maturity is shown in Table 2.

Table 2 – Operationalization of IS Maturity

Indicators	Conceptual Description	Items	Reliability
Process maturity	Measures the planning, controlling and repeatability of IS process	Organization's - Planned process that are in accordance with process - Skilled people to produce controlled outputs - Involved stakeholders to participate in the process - Continuously measured and improved processes	Operationalization is consistent with CMM definitions ("Carnegie Mellon 2001) however there are no known reliability tests
Personnel maturity	Measures the likelihood of the organization to have people who are knowledgeable in and trained in the organization's processes	Organization have people who can: - Describe the organization's standard process - Follow the organization's standard processes - Seek to improve the organization's standard processes	Operationalization is consistent with CMM definitions ("Carnegie Mellon 2001) however there are no known reliability tests

IS Effectiveness

This paper's operationalization of IS Effectiveness is consistent with earlier operationalization of IS effectiveness (Chan 1997) and is shown in Table 3.

Table 3 – Operationalization of IS Unit Effectiveness

Indicators	Conceptual Description	Items	Reliability (Cronbach's Alpha)	Source
User Information	Measures how satisfied the users	User satisfaction with: - IS staff and services	.88 - .92	Chan 1997

satisfaction	are with the people, processes and outputs of the information system	- Final information product - End user knowledge		
Strategic value of the systems	Measures how satisfied the users are with the effectiveness of the systems	User's satisfaction with the systems': - Operational efficiency - Management effectiveness - Market linkages - Contribution to organizational products and services	.88 - .94	Chan 1997

Summary and Conclusions

We believe that a study on the relationship of the CIO, the internal IS organization and IS effectiveness makes an important contribution to both IS research and practitioner knowledge. In terms of theoretical contributions, we seek to understand how IS effectiveness is created. We believe that this understanding will benefit practitioners by helping them to better understand the nature of the relationship between the maturity of the IS unit, the CIO and IS effectiveness.

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