JYVÄSKYLÄ STUDIES IN COMPUTING
232

Jouko Selkälä

CIO Decision Making

Issues and a Process View

JYVÄSKYLÄN YLIOPISTO

JYVÄSKYLÄ STUDIES IN COMPUTING 232

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Esitetään Jyväskylän yliopiston informaatioteknologian tiedekunnan suostumuksella
julkisesti tarkastettavaksi yliopiston Agora-rakennuksen auditoriossa 3
helmikuun 20. päivänä 2016 kello 12.

Academic dissertation to be publicly discussed, by permission of
the Faculty of Information Technology of the University of Jyväskylä,
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UNIVERSITY OF JYVÄSKYLÄ

JYVÄSKYLÄ 2016

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Editors
Marja-Leena Rantalainen
Department of Mathematical Information Technology, University of Jyväskylä
Pekka Olsbo, Sini Tuikka
Publishing Unit, University Library of Jyväskylä

URN:ISBN:978-951-39-6548-8
ISBN 978-951-39-6548-8 (PDF)

ISBN 978-951-39-6547-1 (nid.)
ISSN 1456-5390

Jyväskylä University Printing House, Jyväskylä 2016

ABSTRACT

Selkälä, Jouko
CIO decision making; issues and a process view
Jyväskylä: University of Jyväskylä, 2016, 138 p.
(Jyväskylä Studies in Computing
ISSN 1456-5390; 232)
ISBN 978-951-39-6547-1 (nid.)
ISBN 978-951-39-6548-8 (PDF)
Diss.

Nowadays organizations' operations are increasingly dependent on information and communication technology (ICT). Information technology (IT) has during the last decades become a central factor in the infrastructure for companies' value creation. However, ICT is only useful if it is used optimally for the benefit of the organization. Typically, the person who is responsible for ICT at organizations is the chief information officer (CIO). Therefore, it is no surprise that CIO-related research has received interest in information systems research. In terms of CIO-related research, previous work has studied IT governance, IT and business alignment, and IT investment and described the key concerns of CIOs. Interestingly, CIOs' decision-making process has received little interest. This is surprising, given that technology per se is not a panacea, but CIO decisions are required to reap optimal benefit for the ICT of an organization.

As a first step in closing this gap in research, this doctoral thesis explores key issues (concerns) for CIOs and examines how CIOs process these concerns. By interviewing 21 CIOs, I inductively developed a candidate process theory describing the CIOs' decision-making process. As a key result, the elements of the CIO decision-making process and a diagram of the CIO decision process are described and discussed.

This research offers new understanding for information system (IS) research and practice. For IS research, this study outlines new research directions for CIOs' decision making. For IS practice, the doctoral thesis suggests that key issues of IT management should be managed with a good and solid process that takes into consideration the organizational benefits.

Keywords: CIO decision making, CIO issues

Author

Jouko Selkälä
Dept. of Computer Science and Information Systems
University of Jyväskylä

Supervisors

Professor Mikko Siponen
Dept. of Computer Science and Information Systems
University of Jyväskylä

Doctor Tero Vartiainen
Department of Computer Science and Engineering
University of Oulu

Reviewers

Emeritus Professor Ari Heiskanen
Department of Computer Science and Engineering
University of Oulu

Doctor Aggeliki Tsohou
Department of Informatics
Ionian University

Opponents

Emeritus Professor Pertti Järvinen
School of Information Sciences
University of Tampere

Doctor Ari Kuusio
Häme University of Applied Sciences

ACKNOWLEDGEMENTS

I first wish to thank my supervisor Professor Mikko Siponen, for his guidance and encouragement during the work from the starting phase to finalizing the thesis. I thank my assisting supervisor, professor Tero Vartiainen for his guidance in using phenomenographic research as research method for the interviews. I also like to thank Emeritus Professor Juhani Iivari for his support in the beginning of my doctoral study process. I would also like to thank my external reviewers, professor Ari Heiskanen and Dr. Aggeliki Tsohou for their valuable comments that helped me to improve my thesis.

I would like to thank the interviewees in the various entities, private and public companies and other public operators, for allowing me to interview them and giving me deep, confidential and thorough material that forms the foundation of my study. Without these data I would not have been able to finalize my thesis. I hope to be able to give them back something by publishing this work.

I would also like to thank my wife, Anu Selkälä, for her support and encouragement during the process.

Jyväskylä 1.2.2016
Jouko Selkälä

FIGURES

TABLES

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LIST OF ABBREVIATIONS

BA	Business Area
CEO	Chief Executive Officer
CFO	Chief Financial Officer
CF	Corporate Functions
CIO	Chief Information Officer
CoBiT	Control Objectives for Information and Related Technology
COO	Chief Operating Officer
COSO	Committee of Sponsoring Organizations
CPO	Chief Political Officer
CTO	Chief Technology Officer
ERP	Enterprise Resource Plan
HR	Human Resources
HW	Hardware
ICT	Information and Communication Technology
IRM	Information Resource Management
IS	Information System
ISM	Information System Management
IT	Information Technology
ITIL	Information Technology Infrastructure Library
MGNT	Management
MIS	Management Information System
NEB	Nominated Executive Board
PhD	Doctor of Philosophy
ROI	Return On Investment
SISP	Strategic Information Systems Planning
SMIS	Society for Management Information Systems
SW	Software
WLAN	Wireless Local Area Network

1 INTRODUCTION

Organizations' operations are dependent on information systems and technology. In addition, information technology (IT) has also provided new avenues for business. However, technology per se does not guarantee success. Rather the question is how the IT is successfully used to support the business's benefits or organization's goals. The chief information officer (CIO) is the highest-ranking IS executive (Grover et al. 1993).

Typically, the CIO is the key person in organizations who is responsible for the uninterrupted operational performance in terms of IT functions and providing IT services that may support new value creation (Grover et al. 1993, Lee & Myers 2004, Schwarz & Hirschheim 2003). In other words, the CIO's main task is to keep the business running, align IT with the business (Hirschheim & Sabherwal 2001), and communicate it with other stakeholders within and outside the organization (Grover et al. 1993, Ross et al. 1999).

I seek to theorize and extend previous understanding on governing IT-related decision making by focusing on the process by which an entity handles its key IT issues and the interplay between competing values in key issues of IT decision making.

Past CIO research in information systems has concentrated on IT governance, the role of the CIO, and key issues in IT management. There have been several studies to determine the key concerns of information systems managers (Brancheau & Wetherbe 1987, Brancheau et al. 1996, Chun & Mooney 2009, Davenport & Buday 1988, Dickson et al. 1984, Gottschalk et al. 1997, Johnston et al. 2007, Moynihan 1990, Niederman et al. 1991, Rao et al. 1987, Watson et al. 1997). Key issues for IT executives have been studied annually since 2003 (Luftman & McLean 2004, Luftman 2005, Luftman et al. 2006, Luftman & Kempaiah 2008, Luftman et al. 2009, Luftman & Ben-Zvi 2010a, Luftman & Ben-Zvi 2010b, Luftman & Derksen 2012). Also, IT value creation (Gupta 1991, McAfee & Brynjolfsson 2008), and IT governance have received the attention of IS scholars (Schwarz & Hirschheim 2003).

Although these studies have increased our understanding on a number of important issues, such as key concerns of CIOs, IT value creation, and IT governance, I have found no previous research that has examined the decision-making process of CIOs. This is surprising, given the number of common activities of CIOs, such as determining of key issues, IT governance, or IT value creation, that require decision-making and selection among the alternative choices. For example, Sambamurthy & Zmud (2000) note that the focus in CIO research has been on which the best practices are best suited to various organizational contingencies. However, the selection of the best practices requires managerial judgement, context fitting, and hence decision making (Siponen 2006). I argue that in order to support CIOs it is relevant to know how CIOs make decisions in practice. Therefore, it is no surprise that the management decision-making processes have been studied in other research disciplines. As an example of these studies, refer to "Strategic decision making" (Eisenhardt & Zbaracki 1992), "How to make a decision: the analytic hierarchy process" (Saaty 1990) and "Does decision process matter" (Dean & Sharfman 1996).

Therefore, the aim of this thesis is to contribute to the understanding of CIO decision making. But before we can do that, we need to understand the context, namely the key issues that face CIOs. The CIO agenda is studied with a particular focus on the factors influencing the CIO's perception of key issues.

A key result of my study is a process for CIO decision making. For IS research, this process provides a new understanding as to how CIOs deal with issues. For practice, this gives a reference point for other CIOs to evaluate their decision-making processes.

The structure of the dissertation

Chapter 1 is the introduction chapter to my research. It motivates the importance of the field of CIO research, outlines the research gap that is going to be answered through this research, and provides the structure of the thesis. In Chapter 2, previous CIO research is reviewed, and different definitions and classifications of IT governance, the role of the CIO, and the key issues in IT management are discussed.

Chapter 3 describes the theoretical framework underlying the study, namely process theories in past research, and identifies the way to develop a decision-making process. Chapter 4 describes the empirical research design of this study. The assumptions underlying this research and the qualitative interview study as a research method are discussed. The research design, the empirical data collection process, and the analysis process of this study are described in this chapter.

In Chapter 5, the research setting is introduced. The empirical context of this study, the CIO as decision maker, is described. Chapter 6 presents the results of analysis of the research setting. Chapter 7 presents a proposal for the process theory for CIO decision making based on the analysis of the empirical

data in Chapter 5 and Chapter 6. Additionally, theoretical and managerial implications and the limitations of this research are discussed, and suggestions for future research are given.

In Chapter 8, the research questions asked in the introduction of this research are answered. The conclusions are stated in Chapter 9. Figure 1 summarizes the outline of this research.

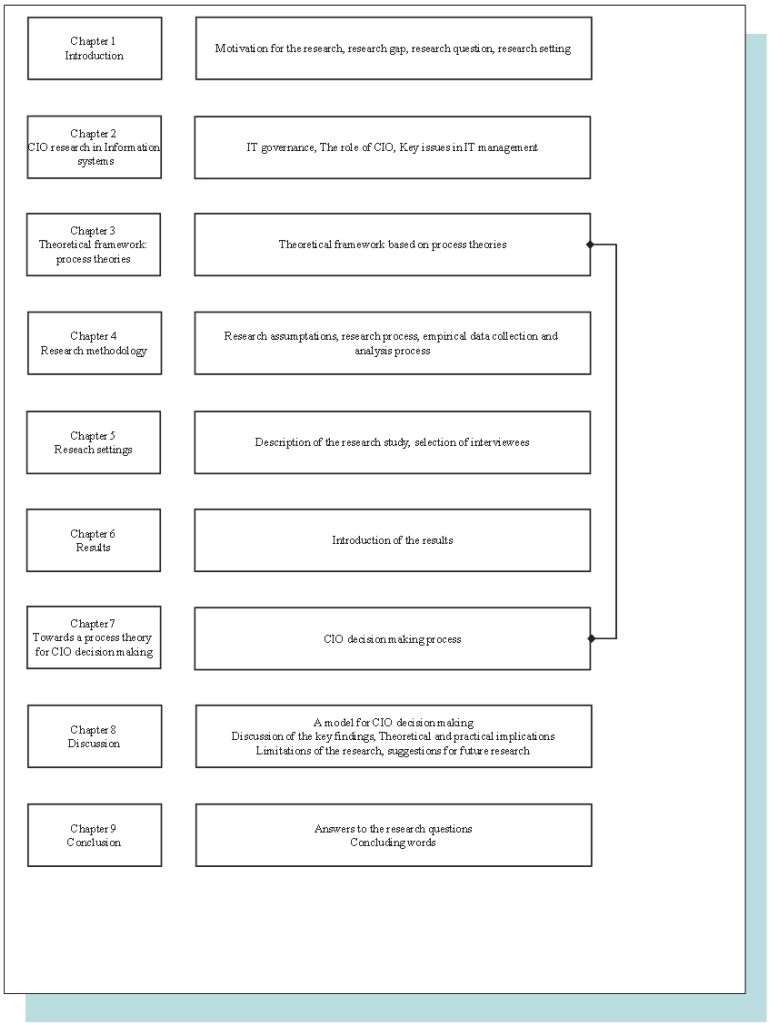

FIGURE 1 The structure of the dissertation

2 CIO RESEARCH IN INFORMATION SYSTEMS

This chapter highlights the key themes of CIO research in information systems literature, including IT governance, the role of the CIO, and key issues that face CIOs. This chapter concludes the literature review by pointing out that CIO research is a recognized research area in information systems, whereas the examination of the decision-making process of CIOs has dropped off the radar of the previous CIO research.

The top information systems journals, such as *MIS Quarterly* and *Information Systems Research*, were used for reviewing CIO research literature. In addition to the top journals, (Webster & Watson 2002) also note the importance of finding previous work in any outlets. To address this concern, Google Scholar and other databases were used for gathering further information related to CIO research. Three themes that are introduced in this chapter—IT governance, the role of the CIO, and key issues in IT management—were found when reviewing CIO research. These themes are strongly related to the CIO decision-making process. IT governance is the overall agreement in an organization of how IT-related matters are managed and who participates in decision making. The role of the CIO has been studied for a couple of decades, but it has changed over time together with the importance of IT in companies. A list of key IT issues was first introduced in the early 1980s. This list was based on the Society for Management Information Systems (SMIS) member list in the United States.

2.1 IT governance

Governance issues (Daily et al. 2003) related to organizing IS are often portrayed as highly complex and cumbersome (Schwarz & Hirschheim 2003). Despite this portrayal, research into the phenomena of IT governance has been relatively limited (Sambamurthy & Zmud 2000).

Issues related to the necessary settings for successful management of IT have been dealt with variously as strategic information systems planning (SISP) (Lederer & Sethi 1988), information resource management (IRM) (Lewis et al. 1995), and IS management (ISM) (Brancheau et al. 1996, Watson et al. 1997). However, these authors have focused on the internal efficiency of IS and the operational/tactical layers governing IS resources (Weill & Ross 2004). Apart from issues related to structure (Dearden 1965, Dearden 1965) and the loci of responsibility (Schwarz & Hirschheim 2003), more recent developments in IT governance have turned toward organizing logic (Bettis & Prahalad 1986), authority patterns (Sambamurthy & Zmud 1999), and capabilities (Feeny & Willcocks 1998).

2.1.1 The definition of the concept of IT governance

The definition of the concept of IT governance has been settled by various researchers. One of the shortest versions is that IT governance is the decision-making processes for IT investment (Symons 2005). On the other hand, IT governance is the framework for decisions, rights and accountabilities that encourage desirable behavior in the use of IT (Weill & Ross 2004). Governance can be seen from different viewpoints (Huotari & Savolainen 2003).

The increased discussion of IT governance is evidence of the growing interest in IT in management culture. Information technology should not be stressed too much, since IT has a lot of other meanings as well, such as change management in organizations (Gottschalk 2001).

Organizations must recognize that managing the change enabled by IT is at least as important as bringing IT to the organization. Otherwise, IT will not provide the productivity gains expected. To accomplish such management, people must be trained in a change process that takes into account the unique challenges presented by IT (Benjamin & Levinson 1993).

Until recently, the research focus was on operational decision making (Sohal & Fitzpatrick 2002, Weill & Ross 2004). IT governance research includes sectors such as the responsibilities and locus of IT decision making and IT management architecture (Boynton et al. 1992), and the IS organizational role and location of IS responsibility (Brown & Magill 1994).

One study addresses the theoretically neglected interplay between organizational IT architecture and IT governance structure in shaping IT alignment (Tiwana & Konsynski 2009). IT governance research can be divided into the categories of form and contingencies (Brown & Grant 2005).

Prior research has often narrowly viewed IT alignment as a "static end-state" wherein IT strategy exhibits fit with organizational imperatives (Sabherwal et al. 2001). Maintaining IT alignment is instead a dynamic, ongoing process that is driven by adaptive correction of emergent misfits between IT activities and perpetually evolving organizational imperatives (Hirschheim & Sabherwal 2001).

IT becomes not only a success factor for survival and prosperity, but also an opportunity to differentiate and to achieve competitive advantage. IT also offers a means for increasing productivity (Van Grembergen et al. 2004a). Leveraging IT successfully to transform the enterprise and create products and services with added value has become a universal business competency (Guldentops 2003). In this viewpoint, the IT department moves from a commodity service provider to a strategic partner, as illustrated in Table 1.

Research in the category of form has focused on centralized, decentralized, and federal forms of governance (Camillus & Lederer 1985, Luftman & Ben-Zvi 2010a, Main & Short 1989, Schwarz & Hirschheim 2003, Tavakolian 1989). One of the major factors that can affect the performance of the IT organization is the degree to which it is centralized, decentralized, or federated (Luftman & Ben-Zvi 2010a).

Developments in common sense, or the most dominant form of organizing IS, have gone through radical changes over the decades from the 1960s to the 2000s. This back-and-forth movement has gone from centralized to distributed models of IS management. The isomorphism of IT and the business organization was discussed in the 1980s (Olson & Chervany 1980).

TABLE 1 IT as Service Provider or as Strategic Partner (Venkatraman 1999)

Service provider	Strategic partner
IT is for efficiency	IT for business growth
Budgets are driven by external benchmarks	Budgets are driven by business strategy
IT is separable from the business	IT is inseparable from the business
IT is seen as an expense to control	IT is seen as an investment to manage
IT managers are technical experts	IT managers are business problem solvers

The comparison of centralized and decentralized IT governance categories gives reasoning for both categories (Cross et al. 1997, Kayworth & Sambamurthy 2000). The clearest advantages relate to the efficiency achieved by the centralized model and to the customization in the decentralized model.

The research on contingencies (Brown & Grant 2005) has been saturated in recent years, in part because very few contingencies can actually be scientifically proven (Brown & Magill 1994, Sambamurthy & Zmud 1999).

An early attempt to relate single contingencies such as size, strategy and structure to the organization of IS was conducted in a study of 53 Israeli firms (Ein-Dor & Segev 1978). It concluded that centralization is associated with size, climate, and user relationships (Ein-Dor & Segev 1982).

The significance of industry as a contingency in relation to the organization of IS was ruled out close to the end of 1990s by researchers (Ahituv et al. 1989). There is no relationship between company size and the organization of the IT function (Ahituv et al. 1989, Olson & Chervany 1980, Tavakolian 1989).

Single-contingency analysis was expanded to multi-contingency analysis when several variables were identified (Brown & Magill 1994, Sambamurthy & Zmud 1999) in which contingency patterns were produced (Ross & Weill 2005, Weill & Ross 2004).

2.1.2 IT governance frameworks

An enormous amount of normative and highly simplified research is conducted in the IT governance area (Sambamurthy & Zmud 2000). The majority of research is prescriptive, with a new framework, model, or idea as the final product of the research. As a result, there are a number of frameworks available for IT Governance, see Table 2.

TABLE 2 IT Governance Frameworks

IT governance frameworks	Reference
Archetypes and IT decisions	(Ross & Weill 2005)
Nine core IS capabilities	(Feeny & Willcocks 1998)
Eight imperatives for the new IT organization	(Rockart et al. 1996)
Three key IT assets	(Ross et al. 1998)
IT portfolio management	(Jeffrey & Leliveld 2003)
Application portfolio scorecard	(Prahalad & Krishnan 2002)
IT investment portfolio management	(Weill & Aral 2006)
Platform logic	(Sambamurthy & Zmud 1999)
Extended platform logic	(Schwarz & Hirschheim 2003)
IT balanced scorecards	(Van Grembergen et al. 2004b)
Critical IT capabilities	(Sambamurthy & Zmud 2000)

IT governance is said to include myths. Furthermore, it has been stated that miracles can happen and automatically solve organizations' IT-related problems (Jalonen 2008, Peterson 2003).

2.2 The role of CIO

During the 1980s there were no real claims for jurisdiction in the area of information handling and processing by any significant group of professional actors (Abbott 1988). Since the start of mainstream IT adoption in the 1950s, substantial efforts have been devoted to finding the optimal organizational settings for IT (Sambamurthy & Zmud 2000). Strategic thinking is seeing into the future. There is no experience-based knowledge of the future, so that's why strategic thinking is also perceived as envisioning (Santalainen 2005).

Proponents of the decentralized approach have advocated a close linkage between the use and the organization of IT (Dearden 1965). By contrast, the centralized approach in taking the position that IT can be centralized with substantial benefits (Davenport 1998) has often argued for standardized operating procedures and economies of scale.

Chief information officers have the difficult job of running a function that uses a lot of resources but offers little measurable evidence of its value (Gottschalk 2000).

This conflict in ideology between centralized and distributed IS relates to the role of the CIO. Mainstream adoption of the concept of the CIO role appeared in the beginning of the 1980s when the CIO was portrayed as the corporate savior who would align the worlds of technology and business (Grover et al. 1993). CIOs were described as the new breed of information managers, who were businessmen first, managers second, and technologists third (Synnott 1987). CIOs were first appointed to major US corporations in the early 1980s. It was predicted that the development of the senior executive responsible for IT would depend upon three major trends (Rockart et al. 1982). The focus of the CIO role was going to change to reflect the need to decrease direct line responsibilities and an increase in staff orientation and corporate responsibilities for information resource policy and strategy (Benjamin et al. 1985, Rockart et al. 1982).

As can been seen in Table 3, there are many activities and definitions of knowledge management. At a generic level, it can be defined as the collection of processes that govern the creation, dissemination, and utilization of knowledge (Gupta et al. 2004).

TABLE 3 Seven knowledge levels (Gupta et al. 2004)

Level	Key activities
Customer knowledge	Developing deep, knowledge-sharing relationships. Understanding the needs of your customer's customers. Articulating unmet needs. Identifying new opportunities.
Stakeholder relationships	Improving knowledge flows between suppliers, employees, shareholders, community, etc., and using this knowledge to inform key strategies.
Business environment insights	Systematic environmental scanning including political, economic, technology, social, and environmental trends. Competitor analysis. Market intelligence systems.
Organizational memory	Knowledge sharing. Best practice databases. Directories of expertise. Online documents, procedures, and discussion forums. Intranets.
Knowledge of processes	Embedding knowledge into business processes and management. Decision making.
Knowledge of products and services	Embedding knowledge in products. Surrounding products with knowledge, e.g., in user guides, and enhanced knowledge-intensive services.
Knowledge of people	Knowledge-sharing fairs. Innovation workshops. Expert and learning networks. Communities of knowledge practice.

2.2.1 CIO associated tasks

The CIO's role was developing by focusing on reporting relationships, corporate IS budgets, critical responsibilities, the importance of selected IS initiatives, and the organization of IS functions and activities (Benjamin et al. 1985, Rockart et al. 1982). This development is set in conjunction with the split of the CIO into either the technical or the strategic realm (Chun & Mooney 2009).

Managerial roles related to the role of CIO were taking an increasingly important role, especially as the CIO was promoted as a spokesman and liaison (Grover et al. 1993). The CIO became the highest-ranking IS executive, who typically exhibited managerial roles requiring effective communication with top management, a broad corporate perspective in managing information resources, influence on organizational strategy, and responsibility for the planning of IT to cope with a firm's competitive environment (Grover et al. 1993).

The recession was posing new challenges to IT executives around the globe. The relatively consistent top managerial concerns in previous years are shifting toward concerns that are closely related to the unique characteristics of recession. In previous downturns, business executives simply asked their IT organizations to cut their budgets. In this recession, which is worse than previous ones, business executives are rethinking the role of IT, and they are now asking IT leaders to work with the business to reduce corporate costs and to improve the productivity of the rest of the business (Luftman & Ben-Zvi 2010a).

The general impression in IT-related research is that IS workers constitute a professional group (Ahuja et al. 2007, Baroudi 1985, Bartol & Martin 1982, Goldstein & Rockart 1984). However, IS workers are not professional in the traditional sense of the concept (Orlikowski & Baroudi 1988). To form a profession, what's needed is the categorization of a profession as a separate occupational group that has achieved status and power in society (Freidson 1986). It is clear that Orlikowski and Baroudi (1988) are unconvinced that IS workers make up a profession. Contrary to previous findings, they find no evidence that IS workers constitute more than a general occupational group (Orlikowski & Baroudi 1988). Yet there are still doubts about the CIO as a member of an existing profession (Magnusson 2010). See Table 4 for an analysis by Magnusson based on Orlikowski and Baroudi's framework and Freidson's categories.

TABLE 4 Assessment of CIO as a profession (adapted from Magnusson 2010)

#	Elements	Shortcomings
1	Technical autonomy	The CIO is evaluated based on his performance in relation to specific performance-related metrics, just as other functional managers are.
2	Educational control	The CIO's knowledge base is not strictly technical, and there are no formal education or certification requirements by higher educational institutions that directly prepare an individual for the role of CIO. The introduction of process standards, such as ITIL, COSO, and COBIT, as well as professional certification, such as CISM, is steadily increasing educational control.
3	Freedom from competition	Given that IT is increasingly regarded as a cost center, the CIO is under constant pressure to cut costs in IS operations in order to avoid outsourcing.
4	Control over other occupations	The CIO has increased his impact on the overall strategic direction of the organization and has become more involved in the business process design (or rather, choice) through IT-based best practices (i.e., ERP systems).

Table 4 shows that there have been some developments since Orlikowski and Baroudi's (1988) analysis of the general IS worker. The CIO can be seen as a member of a profession in transition (Abbott 1988). There is a lack of research within contextual studies of IT governance (Sambamurthy & Zmud 2000).

2.2.2 The importance of IT alignment

The coordination of business and IT is an essential element of IT investments and the IT investment process (Lederer & Mendelow 1988). The same view of the IT executive's obligations is taken by a number of researchers (Papp 2001, Tallon et al. 2000, Tallon & Kraemer 2003). Strategic alignment is ranked among the most important issues faced by IT executives (Avison et al. 2004). The linkage between investments and business has been studied under a wide variety of pseudonyms, such as fit, fusion, and integration (Avison et al. 2004). Achieving alignment is a constant struggle for practitioners (Chan 1997, Hussin et al. 2002). The notion of strategic alignment is a part of the concept of ideal patterns of alignment and their influence on business performance (Bergeron et al. 2004). Recent research suggests that, while IT and business alignment have been improving and there is a strong correlation between alignment maturity and an organization's performance, there are still challenges that need to be addressed (Luftman et al. 2010).

Technology is often treated simply as a cost that leads to a bias in management attention (Avison et al. 1999, Papp 2001). If investments in IT are to be linked to business imperatives and objectives, then this perception on IS as a cost center is one of the main obstacles to overcome.

The advantages of linking investments in IT to business are investigated in numerous articles (Cragg et al. 2002, Croteau & Bergeron 2001, Kearns & Lederer 2000, Reich & Benbasat 2000, Slaughter et al. 2006). The disadvantages have also been studied. Slaughter et al. (2006) found reduced strategic flexibility as a result of an overly tight linkage between investments in IT and the business of a company.

According to Thatcher & Oliver (2001) a further contribution was made in differentiating between production efficiency and product quality as measures of business performance. The approach of focusing more on how rather than whether IT investments influence business performance is also advocated (Quan et al. 2004).

A model of seven performance indicators is presented to be used as a framework in the impact of IT investments on business (Sircar et al. 2000). IT investments have significant effects on sales, assets, and equity. However, a significant relationship between IT investments and net income cannot be shown (Sircar et al. 2000). Kumar (2004) proposed a model for assessing the business value of IT infrastructure. The notion of time lag to assist in the understanding and investigation of business performance is presented (Devaraj & Kohli 2000). A model is also developed for assessing the impact of IT investments based on a balanced approach, with the balanced scorecard as the

main influence (Van der Zee & De Jong 1999). Quan et al. (2004) highlighted the issue of market sensitivities to price and quality under duopoly conditions. Additionally, the focus on the impact of IT investments on firm growth is important (Mitra 2005).

There has been a substantial amount of research on the strategic role of IT (Piccoli & Ives 2005). A considerable interest in perception of IT as a strategic resource has been directed (Lopes & Galletta 1997, Powell & Dent-Micallef 1997). This research is synthesized into a typology of IS resources (Wade & Hulland 2004). A set of IS resource types corresponds to the call for multidimensional IT capability measures (Santhanam & Hartono 2003).

IS resources have become an important ingredient in any interaction between the organization and its business environment (Feeny & Willcocks 1998). IS resources help the organization to improve its responsiveness to changes in the market through strategic flexibility (Jarvenpaa & Leidner 1997). They also decrease time to delivery and time to respond (Bharadwaj 2000).

Some researchers have reported decreased productivity when there has been an increase in investments in IT (Carr 2004, McAfee & Brynjolfsson 2008).

Lack of convergent findings has been discussed, and it was included that IT can be attributed to a combination of problems regarding measurement and level of analysis (Pinsonneault & Rivard 1998).

2.2.3 Top management's interest for IT is needed

Wade & Hulland (2004) claimed the necessity of involving top management in the overall management of IT. IS is depicted as having either a supporting or a transformative function in the organization (Jiang & Klein 2000).

Chatfield & Yetton (2000) identified a positive relationship between the strategic payoff of IT-related investments and the level of social embeddedness of the technology as such. It has been shown that the more involved the top manager is in the everyday use of technology, the more active manager will be and hence the more successful the investment will be (Chatfield & Yetton 2000). A different approach is taken in focusing on cost allocation through the chargeback mechanisms as a means for achieving a successful line of sight and communication between IS and the business (Ross et al. 1999). As Ross et al. (1999) found in their empirical investigation, many companies have significant deficiencies in their cost allocation practices. A lack of corporate insight and a failure to take responsibility by top management has been studied, and it was claimed that this may explain failures in IT investments (Sohal & Ng 1998). On the other hand, such failures could be explained by an overemphasis on cost reduction by top management, indicating a perspective that sees IT as more of a cost than a possible benefit (Jiang & Klein 2000). A focus is concentrated on large Australian organizations' successful work with benefits management. Despite the fact that formalization leads to more elaborate and efficient benefits for management, there is still a degree of variety in successful benefits management (Lin & Pervan 2003).

Stables et al. (2002) identified that the negative aspects of involving and selling IT projects to top management in terms of the blowing of smoke that comes from selling. Expectation management needs to be explicit, and benefits must not be exaggerated (Staples et al. 2002).

Organizational and political skills can be said to be needed as crucial factors. These competencies can be learnt (Rocheleau 2003).

In the review of literature on the establishment of the IT agenda, it quickly became apparent that the literature does not address this issue explicitly (Magnusson 2010). None of the articles selected mentioned the IT agenda (Magnusson 2010). The only expressions related to agenda were in studies focusing on enriching or changing the research agenda (Magnusson 2010). The IT agenda may be set of activities planned within IT. Given that strategy may be patterns of activities (Mintzberg 1978). The integrated model for strategic information systems planning is presented and placed clearly in the strategic realm, governed by a body directly championed by top management (Min et al. 1999). Strategic planning of IT is conducted by top management. Watson (1990) analyzed factors influencing the IS manager's perception of key issues. The model depicted in Figure 2 is very broad in scope and is beyond the scope of a single piece of research. As there has been a little prior work in this area, this attempt to understand the origin of key issues focuses on a small but important segment of the full model (Watson 1990).

Peppard (1999) developed a conceptual model for understanding the construction of information strategies in global corporations that takes a clear starting point in business needs. The strategy formulation is dependent upon a set of competencies from both sides of the business-IT spectrum. The strategic fit between IT and business while taking an explicit starting point from the business strategy as such is important (Lee & Myers 2004). The CIOs of the business are seen as the primary stakeholders of the IT strategy and hence the champions of the strategy formulation (Lee & Myers 2004).

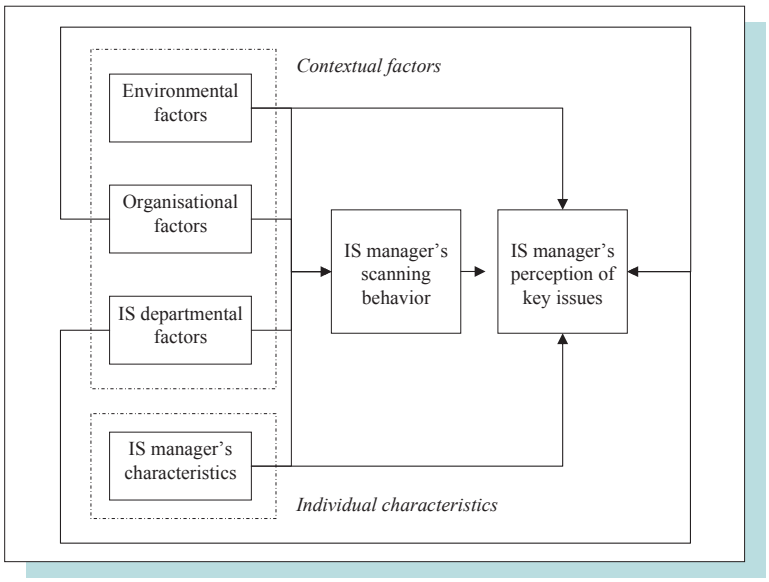

FIGURE 2 Factors influencing the IS manager's perception of key issues (adopted from Watson 1990)

A further specification of the SISP process is presented (Newkirk & Lederer 2006). Direct reference to the overall selection and prioritization of projects as subsets of the strategy formulation phase is made. Newkirk & Lederer (2006) account for the changes in IT strategies by increasingly building on the orchestration of a selection of standardized system. This highlights the selection strategy as one of the most important elements of the strategy formulation phase.

The point at which top management should be involved as strategy formulators in the strategy execution related to IT is stressed (Burn & Szeto 2000). It was found that there is no significant difference in how business and IT managers perceive the strategic alignment of IT and business, which may be a kind of consensus on how the IT strategy should be formulated (Burn & Szeto 2000). The CIO is not necessarily an active player in strategy formulation, given that there is a good understanding of the role of IT by the people involved (Van der Zee & De Jong 1999).

Formalized processes for assessing IT investments are key elements in successful investments (Neirotti & Paolucci 2007). Grover & Segars (2005) stressed the necessity of achieving a high level of formalization in the entire SISP process with the evaluation of IT investments as a subset of this process. A different approach is taken by referring to the decisions related to IT investments as acts of faith rather than as a rational process (Bannister & Remenyi 2000). There is a misunderstanding of the actual decision process, which is influenced by a number of less than rational factors like personal

values and opinions of close workmates (Bannister & Remenyi 2000). One of the most significant benefits of introducing the system was a more formalized process for IT investments as such (Irani & Love 2000).

The use of formalized methods for making investment decision in relation to IT differs depending on the type of technology to be invested in (Ryan & Harrison 2000). With technologies and initiatives that affect the core of the business in focus, the use of more formalized methods is predominant (Ryan & Harrison 2000).

There is a direct link between IT expenditures and firm gross profit, but not on performance measures such as return on equity of return on assets (Shin 2001). As the IT profession matures, the pattern for success is being increasingly refined and requires CIOs to communicate both risk and return in business terms (Hunter & Westerman 2009).

The research approach to the potential value of IT starts from general accounts (Peppard 1999, Sambamurthy et al. 2003, Shin 2001). More specific research examines accounts supply chain management (Malhotra et al. 2005, Subramani 2004), customer relationship management (Karahanna et al. 2006), and e-business (Barua et al. 2004).

Any attempt to find a direct link between the value-added of IT and firm profitability is destined for failure (Bharadwaj 2000). The strategic focus related to IT is highlighted instead of having focus only on cost reduction in large entities (Levy et al. 2001). Bardhan et al. (2004) presented a nested real options value model that takes into account the possible interdependencies among current project.

Last, the function of the senior IS executive—better known as the CIO—is increasingly called into question, if not called on the carpet. In 1994, Gullivan found that CIOs are leaving their posts in increasing numbers because they are unable to communicate their visions for using IT to transform the business or unable to effect change in the organization to harness the potential of technology.

The roles of CIOs continued to evolve in 2009. In the current economy, it has become more important than ever for CIOs to be proactive with their business partners in identifying opportunities for leveraging IT to reduce business costs while also identifying opportunities to reduce IT costs (Luftman & Ben-Zvi 2010a).

Jayatilaka et al. (2003) constructed an integrated theoretical model combining disparate views such as the resource-based view, transaction cost economics, resource dependency, and the knowledge-based view of the company. Knowledge utilization in particular is positively affected by the move toward an application outsourcing agreement, since this creates a higher degree of flexibility and provides access to more qualified knowledge (Jayatilaka et al. 2003).

An accounting perspective on the management of IS is taken and further on is concluded that the overall corporate management of IT should be

balanced in a number of different management control systems for optimal control (O'Connor & Martinsons 2006). There has been a substantial increase in the use of corporate-finance-influenced models of evaluation of IT investments (Benaroch et al. 2007).

Karimi et al. (2000) explored the functions and roles of management information systems steering committees in the IT management in organizations. Steering committee functions require insight into both the business and IT by combining the benefits of IT with the overall corporate objectives (Karimi et al. 2000).

Business planning and the evaluation of IT results are integrated on the corporate level (Van der Zee & De Jong 1999). A balanced business scorecard is evaluated with the conclusion that information systems are a good way to communicate IT benefits to business managers (Van der Zee & De Jong 1999). Corporate insight into the benefits of IT is also explored (Chen & Edgington 2005, Francalanci & Galal 1998, Ross et al. 1999, Taudes et al. 2000).

An activity-based approach to justify IT investments has been taken (Peacock & Tanniru 2005). The practice of cost allocation through direct chargeback of business-unit-specific investments is applied (Broadbent et al. 1999). The key finding of IT chargeback is increased and improved communication within IT and business (Ross et al. 1999).

Sourcing alternatives for data centers were researched. The results were similar, with smaller data centers outperforming larger ones (Lacity & Willcocks 1998).

As can be seen in Table 5, share of respondents is 100% on group interviews conducted by Ihalainen (2010) for parameters "time is a critical factor" and "IT governance is a change facilitator".

TABLE 5 IT governance's change management analysis based on group interviews (Ihalainen 2010)

Parameter	Share of respondents
Time is a critical factor.	100%
IT governance is a change facilitator.	100%
There is a need for change management methods.	75%
IT governance has an important role in change.	75%
IT governance has competencies needed for change.	75%
Time is not recognized enough in the planning phase.	50%

2.3 Key issues in IT management

Since its inception in 1980, the Society for Information Management (SIM) has used its survey to help IT leaders around the globe understand important issues and trends. SIM has published sets of survey results since its foundation. SIM's

and others' research articles related to key issues of CIOs are gathered in Table 6. As can be seen, *MIS Quarterly* has been the dominant player as a publisher.

There have been commonalities in the research done during the past decades of key issues for executives or key issues in information systems management. The top ten issues have been almost the same. As researchers stated in the early 1990s, enhancing business and key information strategy alignment will remain a key challenge for both business and information managers in the future (Broadbent & Weill 1993).

TABLE 6 Key issues in IT management articles

Title of the article	Authors	Publisher
SMIS members: a membership analysis	(Ball & Harris 1982)	MIS Quarterly
Key information systems issues for the 1980's	(Dickson et al. 1984)	MIS Quarterly
Key issues in information systems management	(Brancheau & Wetherbe 1987)	MIS Quarterly
What chief executives and senior managers want from their it departments	(Moynihan 1990)	MIS Quarterly
Influences on the is manager's perceptions of key issues: information scanning and the relationship with the CEO	(Watson 1990)	MIS Quarterly
Information systems management issues for the 1990's	(Niederman et al. 1991)	MIS Quarterly
Key issues in information systems management: 1994-95 SIM Delphi results	(Brancheau et al. 1996)	MIS Quarterly
Key issues in information systems management: an international perspective	(Watson et al. 1997)	Journal of Management Information Systems
Key issues in information systems management surveys: methodological issues and choices in a Norwegian context	(Gottschalk et al. 1997)	Scandinavian Journal of Information Systems
Key issues for IT executives	(Luftman & McLean 2004)	MIS Quarterly
Key issues for IT executives 2004	(Luftman 2005)	MIS Quarterly
Key issues for IT executives 2005	(Luftman et al. 2006)	MIS Quarterly
Key issues for CIOs in South Africa	(Johnston et al. 2007)	The Electronic Journal on Information Systems in Developing Countries
Key issues for IT executives 2007	(Luftman & Kempaiah 2008)	MIS Quarterly
Key issues for IT executives 2008	(Luftman et al. 2009)	MIS Quarterly
CIO roles and responsibilities: twenty-five years of evolution and change	(Chun & Mooney 2009)	Information & Management

Title of the article	Authors	Publisher
Key issues for IT executives 2009: difficult economy's impact on IT	(Luftman & Ben-Zvi 2010a)	MIS Quarterly
Key issues for IT executives 2010	(Luftman & Ben-Zvi 2010b)	MIS Quarterly Executive

CIOs are expected to prove their leadership role while they continue to struggle with cost reductions, business agility, and re-engineering. On the other hand, HR issues have dropped off the list in this recession. IT and business leaders need to work closely together in these troubled times, just as they should during times of growth. IT-business alignment is an ongoing concern—some things never change (Luftman & Ben-Zvi 2010a, Preston & Karahanna 2009). Rapid access to information is critical, and many chief executives acknowledge the potential of information technology and changing business models to improve business responsiveness (Scott 2004). It has been recognized for some time that CIOs function in a constantly changing environment, with IT driving the change. Given the large investment in information systems, the successful management of the organization's IT department is crucial (Remenyi et al. 2000). Financial resources, evaluating IT and IS opportunities and investment, and strategic alignment of IT and business strategies are among the issues that require management and consideration (Johnston et al. 2007).

In Table 7 there is presented a list of articles that points out the areas of concern related to IT management issues in significance order by reference. Importance of IT management issues is listed in Table 8. Key issues are enumerated by articles. The information of importance of issue is presented by numbering each issue in the list of issues within an article.

TABLE 7 Areas of concern related to IT management issues

Article	Concern Areas in order
Key Issues for IT Executives (Luftman & McLean 2004)	1. IT and business alignment 2. IT strategic planning 3. Security and privacy 4. Attracting, developing, and retaining IT professionals 5. Measuring the value of IT investments
Key Issues for IT Executives 2004 (Luftman 2005)	1. IT and business alignment 2. Attracting, developing, retaining IT professionals 3. Security and privacy 4. IT strategic planning 5. Speed and agility

Article	Concern Areas in order
Key Issues for IT Executives 2005 (Luftman et al. 2006)	1. IT and business alignment 2. Attracting, developing, and retaining IT professionals 3. Security and privacy (tied with above) 4. IT strategic planning 5. Business process reengineering
Key Issues for CIOs in South Africa (Johnston et al. 2007)	1. Challenges facing South African businesses 2. Key issues among CIOs within South Africa 3. Comparison of results with previous studies
Key Issues for IT Executives 2007 (Luftman & Kempaiah 2008)	1. Management concerns 2. Application and technology developments 3. Organizational issues (IT budgets, IT staff salaries, headcount and recruitment, CIO issues, and IT organization structure) 4. Enablers and inhibitors of business-IT alignment
Key Issues for IT Executives 2008 (Luftman et al. 2009)	1. Management concerns 2. Application and technology developments 3. Organizational issues (e.g., IT budgets, IT staff salaries, headcount and recruitment, CIO issues, and IT organization structure)
Key Issues for IT Executives 2009: Difficult Economy's Impact on IT (Luftman et al. 2010)	1. Management concerns 2. Application and technology investments 3. Organizational issues (e.g., IT budgets, IT staff salaries, CIO issues, and IT organization structure)

TABLE 8 Importance of IT management issues

Article	Key issues (in order of importance)
SMIS Members: A Membership Analysis (Ball & Harris 1982)	1. MIS long-range planning and integration 2. Gauging MIS effectiveness 3. Impact of communications on MIS 4. The developing role of the information resource manager 5. Decision support systems 6. Office of the future management 7. Employee training and career path development 8. Education of non-MIS management 9. Centralization vs. decentralization of MIS functions 10. Employee job satisfaction
Key Information Systems Issues for the 1980's (Dickson et al. 1984)	1. Improved IS planning 2. Facilitation and management of end-user computing 3. Integration of data processing, office automation, and telecommunications 4. Improved software development and

Article	Key issues (in order of importance)
	quality 5. Measuring and improving IS effectiveness and productivity 6. Facilitation of organizational learning and usage of information systems technologies 7. Aligning the IS organization with that of the enterprise 8. Specification, recruitment, and development of IS human resources 9. Effective use of the organization's data resources 10. Development and implementation of decision support systems
Key Issues in Information Systems Management (Brancheau & Wetherbe 1987)	1. Strategic planning 2. Competitive advantage 3. Organizational learning 4. IS's role & contribution 5. Alignment in organization 6. End-user computing 7. Data as a corporate resource 8. Information architecture 9. Measuring effectiveness 10. Integrating data processing, office automation, factory automation, telecommunications
What Chief Executives and Senior Managers Want from Their IT Departments (Moynihan 1990)	1. Level of data-sharing across systems and departments 2. Quality of planning for information technology and the link with business planning 3. Appropriateness of corporate policy for information technology in divisions 4. Appropriateness of the style of case making needed to get approval for major proposals on information technology 5. Quality of users' commitment and contribution to systems development projects 6. Degree to which key processes are supported by state-of-the-art systems 7. Extent to which information technology is being used to gain competitive advantage 8. Quality of in-house technical skills in information technology 9. Level of use of current office automation and communications technology 10. Speed of implementation of new systems and responsiveness of the information systems department
Influences on the IS Manager's Perceptions of Key Issues: Information Scanning and the Relationship With the CEO (Watson 1990)	1. IS strategic planning 2. Human resources 3. Information architecture 4. Software development 5. Alignment with organization

Article	Key issues (in order of importance)
Information Systems Management Issues for the 1990's (Niederman et al. 1991)	1. Developing an information architecture 2. Making effective use of data resources 3. Improving IS strategic planning 4. Specifying, recruiting, and developing IS human resources 5. Facilitating organizational learning and use of IS technologies 6. Building a responsive IT infrastructure 7. Aligning the IS organization with that of the enterprise 8. Using information systems for competitive advantage 9. Improving the quality of software development 10. Planning and implementing a telecommunications system
Key Issues in Information Systems Management: 1994-95 SIM Delphi Results (Brancheau et al. 1996)	1. Building a responsive IT infrastructure 2. Facilitating and managing business process redesign 3. Developing and managing distributed systems 4. Developing and implementing an information architecture 5. Planning and managing communication networks 6. Improving the effectiveness of software development 7. Making effective use of data 8. Resource 9. Recruiting and developing IS human resources 10. Aligning the IS organization within the enterprise 11. Improving IS strategic planning
Key Issues in Information Systems Management: An International Perspective (Watson et al. 1997)	1. Strategic planning 2. IS organizational alignment 3. Information architecture 4. Competitive advantage 5. Data as a resource 6. Human resources 7. Security and control 8. Integrating technology 9. Software development 10. IS's role and contribution
Key Issues for IT Executives (Luftman & McLean 2004)	1. IT and business alignment 2. IT strategic planning 3. Security and privacy 4. Attracting, developing, and retaining IT professionals 5. Measuring the value of IT investments 6. Measuring the performance of the IT organization 7. Creating an information architecture 8. Complexity reduction 9. Speed and agility

Article	Key issues (in order of importance)
	10. IT governance
Key Issues for IT Executives 2004 (Luftman 2005)	1. IT and business alignment 2. Attracting, developing, and retaining IT professionals 3. Security and privacy 4. IT strategic planning 5. Speed and agility 6. Government regulations 7. Complexity reduction 8. Measuring the performance of the IT organization 9. Creating an information architecture 10. IT governance
Key Issues for IT Executives 2005 (Luftman et al. 2006)	1. IT and business alignment 2. Attracting, developing, and retaining IT professionals 3. Security and privacy 4. IT strategic planning 5. Business process reengineering 6. Introducing rapid business solutions 7. Measuring the value of IT investments 8. True return on IT investments 9. Complexity reduction 10. IT governance 11. Project management capabilities
Key Issues for CIOs in South Africa (Johnston et al. 2007)	1. Security and control 2. Building a responsive IT infrastructure 3. IT value management 4. Service delivery 5. Improving IS strategic planning 6. Disaster recovery 7. Using IS for competitive advantage 8. Aligning the IS organization within the enterprise 9. Making effective use of the data resource 10. Developing and implementing an information architecture
Key Issues for IT Executives 2007 (Luftman & Kempaiah 2008)	1. Attracting, developing, and retaining IT professionals 2. IT and business alignment 3. Building business skills in IT 4. Reducing the cost of doing business 5. Improving IT quality 6. Security and privacy 7. Managing change 8. IT strategic planning 9. Making better use of information 10. The evolving CIO leadership role
Key Issues for IT Executives 2008 (Luftman et al. 2009)	1. IT and business alignment 2. Building business skills in IT 3. IT strategic planning 4. Attracting new IT professionals 5. Making better use of information

Article	Key issues (in order of importance)
	6. Managing change 7. Reducing the cost of doing business 8. Improving IT quality 9. Retaining IT professionals 10. Security and privacy
CIO roles and responsibilities: Twenty-five years of evolution and change (Chun & Mooney 2009)	1. CIOs have oriented and tailored their roles and responsibilities to match the IS infrastructure and strategy of the firm, having a profound impact on the evolution of IS executives' roles and responsibilities 2. The CIO has settled into one of two distinctive roles: (1) an executive who focuses on invigorating the firm's IT infrastructure to achieve an ROI on the company's IT investments, and (2) another who is tasked with increasing revenue generation and the visioning and implementation of new IS throughout the corporation for business innovation 3. The degree to which a firm's strategy and processes are IT enabled has a profound influence on the CIO's ability to change and evolve in his/her roles and responsibilities 4. The degree to which a firm's IS architecture infrastructure is standardized has a profound influence on the CIO's ability to change and expand his/her roles
Key Issues for IT Executives 2009: Difficult Economy's Impact on IT (Luftman et al. 2010)	1. Business productivity and cost reduction 2. IT and business alignment 3. Business agility and speed to market 4. Business process re-engineering 5. IT cost reduction 6. IT reliability and efficiency 7. IT strategic planning 8. Revenue-generating IT innovations 9. Security and privacy 10. CIO leadership role

As can be seen in Table 8, the list of key issues varies quite a lot depending on the article. There exists some key issues that are highly important like IT and business alignment in the beginning of the 2000 century.

Gottschalk et al. (1997) published an article discussing about selected problems related to key issues. The summary on this is presented in Table 9.

CIOs described their role in the 1980s and as being "behind-the-scenes technicians." Then in the 1990s, the perception of CIO's changed to "innovators attempting to climb the corporate ladder." Following this, at least some CIOs were viewed as top-level executives responsible for managing and leveraging technology to provide value to the business (Chun & Mooney 2009). See Table 10 for more information of this development.

In the research of CIOs in information systems, the CIO decision-making process has not been researched thoroughly. The relevant themes for CIO decision making that were found in the review process are IT governance, the role of the CIO, and key issues in IT management. The literature review shows that there is a gap in CIO research.

TABLE 9 Selected problems related to key issues (Gottschalk et al. 1997)

Problem	Description
Time	Key issues change over time; critical issues in the early 1990s differed from critical issues in the late 1990s. Therefore, the use of previous key issues lists in new surveys has limitations.
Fashion	The IS profession is notable for its fashion swings. In the last few years hot topics have included outsourcing, business process redesign, and the Internet.
Events	Certain events strongly influence ranking, such as the Year 2000 issue.
Overlaps	Some issues are not defined properly to avoid overlap with other issue(s).
Granularity	While some issues refer to broad general problems, other issues refer to more narrow and specific concerns.
Theory	Application of theory is lacking in selection of key issues.
Clarity	Some issues are not formulated and communicated properly to understand the contents of the issues.
Causality	Some issues might, although ranked as unimportant, represent important drivers of other key issues. For example, recruiting and developing IS human resources might be an important driver of building an IT architecture.

TABLE 10 Developments of recent years that have impacted the roles and responsibilities of the CIO (Chun & Mooney 2009)

Activator	Issue
Chief operating officer (COO)	COOs (and other C-level executives) have begun to assume responsibility for the strategic thinking around IT deployment and use, taking over many of the responsibilities previously allocated to senior IT executives. This is especially true in firms where IT has become deeply woven into the fabric of business processes and operations. However, the COO may not have the IT knowledge or skills needed to understand the implications of technological changes or the implementation of IT initiatives internal and external to the firm.
Chief technology officer (CTO)	A new executive position of "chief technology officer" has emerged. People in this position have assumed some of the technology architecture planning, infrastructure planning, and operational responsibilities of the CIO.
Legislation	The introduction of new laws and regulations, such as the 2009 Banking Act, the Sarbanes-Oxley Act, and the Health

	Insurance Portability and Accountability Act (HIPPA) in the United States, have forced firms to engage in governance and compliance activities around their IT resources and activities.
Contracting out	There has been significant growth in IT outsourcing. At the extreme, the work of entire IT organizations is being transferred to external service providers. Three variants of IT outsourcing are currently receiving attention: utility computing, business process outsourcing, and offshoring. Together, these have had a significant impact on the nature of the activities that fell within the CIO's domain.
From in-house development to off-the-shelf buying	Many organizations are now inclined to buy, rather than build, IT applications. Developing systems on time, to specification, and within budget was traditionally one of the primary management responsibilities of the CIO.

3 THEORETICAL FRAMEWORK

This chapter describes the theoretical framework in detail and covers issues related to the process theory. A number of frameworks have been put forward to describe the phases of decision making. Here I will introduce the theories that are relevant in my study. First, I start with dimensions of the process approach, followed by the families of ideal-type theories of social change. Then, I explain the process theories of organizational development and change. In the second subsection I will review of prominent management decision making theories in management science.

3.1 Process theories

Human beings cannot gather information without in some way simultaneously developing alternatives, so they cannot avoid evaluating these alternatives right away, and in doing this they are forced to a decision. This is a package of operations, and the succession of these packages over time constitutes the total decision-making process (Mintzberg et al. 1976).

First, define the meaning of the process. Then clarify the theory of the process and finally design research to observe the strategy process a way that is consistent with one's definition and theory of the process (Van de Ven 1992).

In particular, three meanings of process are often used: a logic that explains a causal relationship between independent and dependent variables, a category of concepts or variables that refers to actions of individuals or organizations, and a sequence of events that describes how things change over time (Van de Ven 1992).

A rational process of decision making is typically viewed as a sequence of separable stages (need recognition, search, screen, and choice activities) ordered in time and with transition routines to make adjustments between stages (March & Simon 1958).

Many researchers consider a paper's theoretical contribution to be the main measure of its quality (Straub et al. 1994). Recently concerted attention has been placed on adapting and extending theory from other fields and on building own theories (Markus & Saunders 2007, Truex et al. 2006). As a working definition, the statement that a theory is an account of some empirical phenomenon could be used (Weber 2010). All theoretical accounts consist of at least two elements: concepts and relationships among concepts (Burton-Jones et al. 2011). Theorizing is how we think about the relationships among the elements in the world that occupy our research attention (Van Maanen et al. 2007). A theory is a set of statements about the relationship(s) between two or more concepts or constructs (Jaccard & Jacoby 2009).

Table 11 shows a classification of the dimensions of the process approach. First the dimensions are listed, and then the corresponding process approach for each dimension is explained.

TABLE 11 Dimensions of process approach (adapted from Burton-Jones et al. 2011)

Dimension	Process approach
Type of concepts	Entities that participate in or are affected by events
Change in concepts over time	Entities that change over time
Types of relationships	Sequences among events (typically probabilistic)
Time ordering in the relationships among concepts	Time ordering of events is important
"Causal" logic in the relationships among concepts	Causal logic based on necessary, final, formal, and efficient causality

People in their day-to-day lives do often think in terms of actors, events, and processes (Bruner 1991). Although the field has several accepted theories regarding IS adoption, there is less in the way of solid theory regarding performance outcomes from using IS. Thus, this is an area in need of theoretical attention (Burton-Jones et al. 2011, Burton-Jones et al. 2014).

Mohr (1982) felt the process approach is well suited to studying organizational change and advocated this approach. Just like the variance approach, the process approach has a long history independent from Mohr. Since Markus & Robey (1988) introduced this approach to IS, it has been used in a range of studies, but it is still used much less than the variance approach. For example, in their survey of IT impact research, Paré et al. (2008) found that only 20% of articles in leading IS journals used a process approach, and almost all of these articles were found in just one journal. In terms of theoretical concepts, the process approach focuses on entities participating in events. As Table 12 shows, the process approach assumes that entities change over time. For example, the introduction of a new system might make a user concerned about his job security. This might lead the user to react differently to other events (such as performance reviews) than he would have reacted in the absence of the new system (Burton-Jones et al. 2011).

In terms of theoretical relationships, the process approach focuses on accounting for an outcome by reference to a sequence of events. This sequence is typically assumed to be probabilistic (Markus & Robey 1988, Mohr 1982). For example, in the theory of Beaudry & Pinsonneault (2005), one of the outcomes is exiting the company. Beaudry & Pinsonneault (2005) explain that an "exit" occurs as a result of the following probabilistic sequence of events: the user becomes aware of an IT event, perceives it to be a threat, perceives that he or she has little control over it, and engages in self-preservation by exiting the company. The sequence is probabilistic rather than deterministic because it is possible that a different sequence of events might occur. For example, Beaudry & Pinsonneault (2005) explain that when users perceive IT events to be threats, many outcomes are possible, exit being just one. Finally, in relation to causal logic, the process approach is said to use necessary, final, formal, and efficient causality.

As Table 12 shows, time is an important element in the causal logic. For example, all users appraise IT. As with the variance approach, the concepts and relationships in the process approach can be assembled in many ways. For example, researchers can view entities as things that can influence events, such as organizations that act, or as things constituted by events, such as organizations constituted by patterns of actions. Likewise, researchers can distinguish routine events from events that start or end processes (Newman & Robey 1992) and can distinguish between events that can be examined in isolation and events that can only be understood as part of a series (Peterson 1998). Different researchers can also emphasize different elements of causality, for example, by placing more or less emphasis on final and formal causality depending on the extent to which actors have power in the context being studied (Burton-Jones et al. 2011).

Process theories might be seen as having three components: a set of starting conditions, a functional end-point, and an emergent process of change (Van de Ven 1992). As presented in Table 13, the families of ideal-type theories are categorized in four developmental theories. These are life cycle, evolution, dialectic, and teleology.

Van de Ven & Poole (1995) conducted an interdisciplinary literature review to identify alternative theories used to explain processes of change in social, biological, and physical sciences. By inductively examining the substance and intellectual heritage of these theories, Van de Ven & Poole (1995) found that most of them could be grouped into four basic schools of thought. Each of these four schools has a rich and long-standing intellectual tradition. These terminologies are referred as life cycle, teleology, dialectics, and evolution theories. Table 12 outlines the four types of process theories in terms of their members, event progression, generative mechanisms, and conditions under which they are likely to operate. These theories provide different accounts of the sequence of events that try to explain the process of change in an organizational entity.

Many management scholars have adopted the metaphor of organic growth as a heuristic device to explain development in an organizational entity from its initiation to its termination. Witnesses, for example, have often used references to the life cycle of organizations, products, ventures, and stages in the development of individual careers, groups, and organizations. Life-cycle theories include developmentalism, biogenesis, ontogenesis, and a number of stage theories of child development, human development, moral development, organizational development, group decision-making stages, and new venture development. Next to teleology, the life cycle is perhaps the most common explanation of development in the management literature (Van de Ven & Poole 1995).

TABLE 12 Families of ideal-type theories of social change (adopted from Van de Ven & Poole 1995)

Family	Life cycle	Evolution	Dialectic	Teleology
Members	Developmentalism Ontogenesis Metamorphosis Stage & cyclical models	Darwinian evolution Mendelian genetics Saltationism Punctuated equilibrium	Conflict theory Dialectical materialism Pluralism Collective action	Goal setting, planning Functionalism Social construction Symbolic interaction
Key metaphor	Organic growth	Competitive survival	Opposition, conflict	Purposeful co-operation
Logic	Imminent program Prefigured sequence Compliant adaptation	Natural selection among competitors in a population	Contradictory forces Thesis, antithesis, synthesis	Envisioned end state Social construction Equifinality
Event progression	Linear & irreversible sequence of prescribed stages in unfolding of immanent potentials present at the beginning	Recurrent, cumulative, and probabilistic sequence of variation, selection, and retention events	Recurrent, discontinuous sequence of confrontation, conflict, and synthesis between contradictory values of events	Recurrent, discontinuous sequence of goal setting, implementation, and adaptation of means to reach desired end state
Generating force	Prefigured program/rule regulated by nature, logic, or institutions	Population scarcity Competition Commensalism	Conflict and confrontation between opposing forces, interests, or classes	Goal enactment consensus on means co-operation/symbiosis

According to life-cycle theory, change is imminent: that is, the developing entity has within it an underlying form, logic, program, or code that regulates the process of change and moves the entity from a given point of departure toward a subsequent end that is prefigured in the present state. According to Van de Ven & Poole (1995), the form that lies latent, premature, or homogeneous in the embryo or primitive state becomes progressively more realized, mature, and differentiated. External environmental events and processes can influence how the entity expresses itself, but they are always mediated by the immanent logic, rules, or programs that govern the entity's development.

The typical progression of change events in a life-cycle model is a unitary sequence (it follows a single sequence of stages or phases) that is cumulative (characteristics acquired in earlier stages are retained in later stages) and conjunctive (the stages are related such that they derive from a common underlying process). There is such a progression because the trajectory to the final end state is prefigured and requires a specific historical sequence of events. These events contribute a piece to the end product, and they must occur in a prescribed order, because each piece sets the stage for the next. Each stage of development is seen as a necessary precursor of succeeding stages (Van de Ven & Poole 1995).

Life-cycle theory parallels the approach of the gross anatomist in biology, who observes a sequence of developing fetuses, concluding that each successive stage evolved from the previous one. Each state logically presupposes the next, such as when the development of manipulative skills precedes writing. There is no reason to suppose organizational systems could not have such processes as well (Van de Ven & Poole 1995).

According to Van de Ven & Poole (1995), life-cycle theories of organizational entities often explain development in terms of institutional rules of programs that require developmental activities to progress in a prescribed sequence. Other life-cycle theories rely on logical or natural sequences in the development of organizational entities.

Another school of thought explains development by relying on teleology or the philosophical doctrine that the purpose of a goal is the final cause for guiding the movement of an entity. Teleological approach underlies many organizational theories of change, including functionalism, decision making, voluntarism, social construction, adaptive learning, and most models of strategic planning and goal setting.

According to teleology, the development of an organizational entity proceeds toward a goal or an end state. It is assumed that the entity is purposeful and adaptive; by itself or in interaction with others, the entity constructs an envisioned end state, takes action to reach it, and monitors the progress. Thus, proponents of this theory view development as a repetitive sequence of goal formulation, implementation, evaluation, and modification of goals based on what was learned of intended by the entity. The theory can operate for an individual or for a group of individuals or organizations who are sufficiently like-minded to act as a single collective entity. Teleology inherently affords creativity because the entity, consisting of an individual or group, has the possibility to enact whatever goals it likes (Van de Ven & Poole 1995).

Unlike life-cycle theory, teleology does not prescribe a necessary sequence of events or specify which trajectory the development of the organizational entity will follow. Hence, teleology theory implies a standard for judging change: development is something that moves the entity toward its final state. A set of teleological models incorporates the systems theory assumption of equifinality. There is no prefigured rule, logical necessary direction, or set

sequence of stages in a teleological process. Proponents of this theory focus on the prerequisites for attaining the goal or end state: the functions that must be fulfilled, the accomplishments that must be achieved, or the components that must be built or obtained for the end state to be realized. These prerequisites can be used to assess whether an entity is developing; that is, it is growing more complex or more integrated, or it is filling a necessary set of functions. This assessment can be made because teleological theory posits an envisioned end state for an entity as well as observation of the movement toward the end state vis-à-vis the standard (Van de Ven & Poole 1995).

Although teleology stresses the purposiveness of the actor or unit as the motor for change, it also recognizes limits on action. The organization's environment and resources constrain what it can accomplish. Some of these constraints are embodied in prerequisites defined by institutions and other actors in the entity's environment. Individuals do not override natural laws or environmental constraints, but they make use of such laws or constraints to accomplish their purposes (Van de Ven & Poole 1995).

An entity that has attained its goal does not necessarily stay in permanent equilibrium. Goals are socially reconstructed and enacted based on past actions. Influences in the external environment or within the entity itself may create instabilities that push development in a new direction. Theories that rely on a teleological process cannot specify which trajectory the development of an organizational entity will follow. Proponents of such theories can at best list a set of possible paths and then rely on norms of decision rationality or action rationality to prescribe specific directions.

A third school, dialectical theory, begins with the Hegelian assumption that the organizational entity exists in a pluralistic world of colliding events, forces, or contradictory values that compete with themselves for domination and control. These oppositions may be internal to an organizational entity because it may have several conflicting goals or interest groups competing for priority. Also, oppositions may be external to the organizational entity as it pursues directions that collide with the direction of other organizations. In any case, a dialectical theory requires two or more distinct entities that embody these oppositions to confront and engage one another in conflict (Van de Ven & Poole 1995).

In the dialectical process theory, stability and change are explained by reference to the balance of power between opposing entities. Struggles and accommodations that maintain the status quo between oppositions produce stability. Change occurs when these opposing values, forces, or events gain sufficient power to confront and engage the status quo. The relative power of an antithesis may mobilize an organizational entity to a sufficient degree to challenge the current thesis of the state of affairs and set the stage for producing a synthesis. An entity subscribing to a thesis may be challenged by an opposing entity with an antithesis, and the resolution of the conflict produces a synthesis. Over time, this synthesis can become the new thesis as the dialectical process

continues. By its very nature, the synthesis is a novel construction that departs from both the thesis and the antithesis (Van de Ven & Poole 1995).

According to Van de Ven & Poole (1995), there is no assurance that dialectical conflicts produce creative syntheses. Sometimes an opposition group mobilizes sufficient power to simply overthrow and replace the status quo. Thus many firms also persist by maintaining sufficient power to suppress and prevent the mobilization of opposition groups. In the bargaining and conflict management literature, the desired creative synthesis is one that represents a win-win solution, whereas either the maintenance of the thesis or its replacement with an antithesis is often treated as a win-lose outcome of a conflict engagement. In terms of organizational change, maintenance of the status quo represents stability, but its replacement with either the antithesis or the synthesis represents a change, for the better or worse.

A fourth school is evolutionary theory. Although evolution is sometimes equated with change, evolution is seen in a more restrictive sense to focus on cumulative changes in structural forms of populations of organizational entities across communities, industries, or society at large. As in biological evolution, change proceeds through a continuous cycle of variations, selection, and retention. Variations, the creations of novel forms of organizations, are often viewed to emerge by blind or random chance; they just happen. Selection of an organization occurs principally through competition for the scarce base of an environmental niche. Retention involves forces that perpetuate and maintain certain organizational forms, and it serves to counteract the self-reinforcing loop between variations and selection. Variations simulated the selection of new organizational forms, but retention maintained previous forms and practices. Thus, evolution explains change as a recurrent, cumulative, and probabilistic progression of variation, selection, and retention of organizational entities. This motor was prescribed in the sense that one can specify the actuarial probabilities of the changing demographic characteristics of the population of entities inhabiting a niche. Although one cannot predict which entity will survive or fail, the overall population persists and evolves over time, according to the specified population dynamics (Van de Ven & Poole 1995).

In organization and management applications, evolutionary theory often depicts global changes in organizational populations, although the evolutionary model was adopted to explain strategy making within organizations, and parts of evolutionary theory were applied at a microlevel to explain the social-psychological processes of organizing. Whatever the organizational level, an evolutionary model can be used to focus on processes of variation, selection, and retention among numerous organizational entities (Van de Ven & Poole 1995) .

Alternative theories of organizational evolution can be distinguished in terms of how traits are inherited, the rate of change, and the unit of analysis.

Darwinian theorists emphasize a continuous and gradual process of evolution. Whether change proceeds at a gradual or saltation rate is an

empirical matter. Thus the rate of change does not fundamentally alter the theory of evolution as it has been adopted by organization and management scholars (Van de Ven & Poole 1995).

Life-cycle, teleology, dialectical, and evolutionary theories provide four internationally consistent accounts of change processes in organizational entities. It is useful to emphasize four distinguishing characteristics in the preceding discussion of the four theories. In Table 13 the process theory models of organizational development and change are listed and described.

A typology of change process theories is presented in Figure 3. Life-cycle, teleology, dialectical, and evolutionary theories provide four internally consistent accounts of change processes in organizational entities.

In each theory:

- Process is viewed as a different cycle of change events
- That is governed by a different "motor" or generating mechanism
- That operates on a different unit of analysis and
- Represents a different mode of change.

TABLE 13 Process theories of organizational development and change (Van de Ven & Poole 1995)

Name of the model	Description of the model
life-cycle	A life-cycle model depicts the process of change in an entity as progressing through a necessary sequence of stages. An institutional, natural, or logical program prescribes the specific contents of these stages.
teleological	A teleological model views development as a cycle of goal formulation, implementation, evaluation, and modification of goals based on what was learned by the entity. This sequence emerges through the purposeful social constructions among individuals within the entity.
dialectical	In a dialectical model of development, conflict emerges between entities espousing an opposing thesis and antithesis that collide to produce a synthesis, which in time becomes the thesis for the next cycle of a dialectical progression. Confrontation and conflict between opposing entities generate this dialectical cycle.
evolutionary	An evolutionary model of development consists of a repetitive sequence of variation, selection, and retention events among entities in a designated population. Competition for scarce environmental resources between entities inhabiting a population generates this evolutionary cycle.

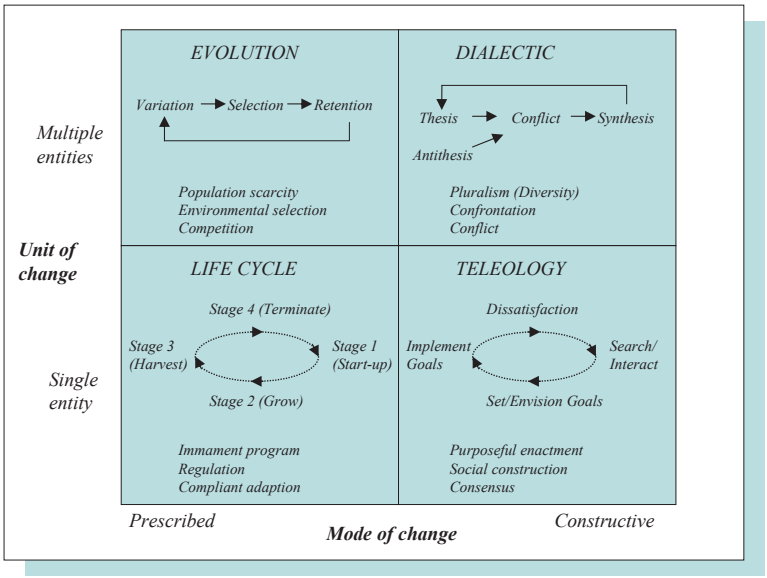

FIGURE 3 Process theories of organizational development and change (Van de Ven & Poole 1995)

Figure 3 provides a metatheoretical scheme for illustrating and distinguishing the four ideal-type theories in terms of these four characteristics. As the cells of Figure 4 illustrate, in each theory the process of development is viewed as unfolding in a fundamentally different progression of change events and is governed by a different motor.

Figure 3 shows two analytical dimensions that are useful for classifying these developmental progressions in the four ideal-type process theories: the unit and mode of change.

Change and developmental processes go on at many organizational levels, including the individual, group, organization, population, and even larger communities of organizations. This nesting of entities into larger organizational entities creates a hierarchical system of levels. Figure 4 collapses this nested hierarchy of levels based on whether the change in question focuses on the development of a single organizational entity or on the interactions between two or more entities. This classification highlights two different angles for studying change at any given organizational level: international development of a single organizational entity by examining its historical processes of change, adaption, and replication, and the relationships between numerous entities to understand ecological processes of competition, cooperation, conflict, and other forms of interaction. It distinguished between interactions among organizational entities in an ecological hierarchy and the adaptation and replication processes within the genealogical history of an entity.

Evolutionary and dialectical theories operate on multiple entities. Evolutionary forces are defined in terms of the impact they have on populations and have no meaning at the level of the individual entity. Dialectical theories require at least two entities to fill the roles of thesis and antithesis. Even if researchers conceptualize the dialectic as occurring within a single person or organization, the motor focuses on the interaction between two entities: the child and his or her environment. The explanatory model is thus dropped a level, and entities are distinguished within the child's mind and the world. Notwithstanding level, the explanation must distinguish at least two entities that engage the dialectic.

Conversely, life-cycle and teleological theories operate on a single entity. Life-cycle theory explains development as a function of potentials immanent within the entity. Although environment and other entities may shape how this immanence is manifested, they are strictly secondary (Van de Ven & Poole 1995).

The real push to development comes from within the single, whole developing entity. Teleological theories, too, require only a single entity's goals to explain development. A teleological theory can operate among many members of an organization when there is sufficient consensus among the members to permit them to act as a single organizational entity. Similar to life-cycle theory, interactions between entities may influence the course of development, but this is subsidiary to the teleological motor that drives individual entities to enact an envisioned end state.

Thus, as long as the entity undergoing change is a discrete entity, one can decompose the entity within a nested organizational hierarchy to examine its members or one can aggregate the entity into its larger system without losing any of the theory's explanatory power. However, if researchers decide to examine processes of change between several distinct organizational entities, they move to either a dialectical or evolutionary theory, because they must specify the laws, rules, or processes by which the entities interact.

The four motors can also be distinguished in terms of whether the sequence of change events is prescribed a priori by either deterministic or probabilistic laws, or whether the progression is constructed and emerges as the change process unfolds. A prescribed mode of change channels the development of entities in a prespecified direction, typically of maintaining and incrementally adapting their forms in a stable, predictable way. A constructive mode of change generates unprecedented, novel forms that, in retrospect, often are discontinuous and unpredictable departures from the past. A prescribed mode evokes a sequence of change events in accord with a pre-established program or action routine. A constructive mode, in contrast, produces new action routines that may create an original formulation of the entity. Life-cycle and evolutionary theories operate in a prescribed modality, while teleological and dialectical theories operate in a constructive modality.

A prescribed mode tends to create first-order change, or change within an existing framework that produces variations on a theme. The processes that produce these variations are prescribed and predictable because they are patterned on the previous state. Over the longer term, small changes may cumulate to produce a larger change in degree or quality of the entity. The uncertainty experienced by people undergoing such changes is relatively low because they typically perceive sufficient continuity to anticipate and discern the direction of change.

Life-cycle and evolutionary theories incorporate a prescribed mode of change. During the life cycle, the immanent form is realized by steps, and although some steps may seem like a radical morphogenic change, there is an underlying continuity due to the immanent form, logic, program, or code that derives development. Due to their immanent motor, very seldom do frame-breaking changes of mutations arise in life-cycle models. Evolutionary accounts rely on the statistical accumulation of small individual events to gradually change the nature of the larger population. Although a person tends to think of mutations as sudden, dramatic changes, in actuality the evolutionary system operates according to prescribed rules that determine whether the mutation takes effect and change occurs. The apparent exception to this statement, punctuated equilibrium, actually conforms to a prescribed mode of change on closer examination. In the punctuated equilibrium model of biological evolution, species emergence at the microlevel is sudden, but diffusion of species that ultimately alters the characteristics of populations occurs through many individual events spread over quite long periods of time. The application of punctuated equilibrium models to organizational change departs from this account and is actually a mixture of two of the theory types.

A constructive mode tends to generate second-order change, which is a break with the past basic assumptions or framework. The process is emergent as new goals are enacted. It can produce highly novel features; the outcome is unpredictable because it is discontinuous with the past. Those undergoing such changes may experience a high degree of uncertainty and a need to make sense of the changes. From a biological perspective, a constructive mode of change as a phylogenetic process was characterized, which led to the generation of originals and the emergence of new species.

Teleological and dialectical motors incorporate a constructive mode of development. By their very nature, teleological processes seek to diverge from the current order: a process that has as its goal to preserve the status quo would be a theory of statics, not dynamics. Because goals can be changed at the will of the entity and because the prerequisites may be attained in many ways, teleological theories project a situation that is in principle unpredictable and may result in discontinuity. As a result, a teleological motor projects fundamental and novel changes in the entity.

Many theories that draw on teleology also explicate gradual processes by which the goals are realized. Gradual accounts of goal implementation actually

combine two of the ideal types, teleological theory and life-cycle theory, to form a composite model. In its pure form, the twin features of intentionality and the ability to change goals at will make teleological theories inherently emergent and creative.

Dialectical theory also incorporates a constructive mode of change, and the sequence by which the thesis and antithesis confront and engage each other in a conflict struggle is highly uncertain; events leading to confrontation of opposites and resolutions may occur intermittently over the course of development. The result is a synthesis that breaks the current frame and represents second-order change. It produces a revolutionary change, resulting in a new entity that is an original rather than the reproduction of some prior state or entity (Van de Ven & Poole 1995).

3.2 Management decision making theories

Management science (MS) has been defined as helping people make better decisions (Anderson et al. 2015). Clearly, decision-making is at the heart of a manager's role in any organization. Get the decisions right and the organization continues to succeed. There's increasingly fierce competition – in the public sector as well as private sector; customers require more and more but want to pay less; technological changes continue to gather speed; financial pressures mean that costs and productivity are constantly under scrutiny. Organizations are under pressure to do things better, do them faster and do them for less in terms of costs. Making the right decisions under such pressures is not easy task (Anderson et al. 2015).

In today's tight business environment organizations and managers are looking for structured, logical and evidence-based ways of making decisions rather than relying solely on intuition, personal experience and gut-feel. MS applies advanced analytical methods to business decision problems. MS is very much focused on the practical, real world (Anderson et al. 2015).

The need for effective decision-making and high quality decisions is common to any field. The requirement is particularly acute in business where the quality of management decision-making directly affects the performance of the organization. Decision making processes are related to decision success (Dean 1996).

Two elements are necessary to the development of expertise in management decision: one is experience and the other one is a decision making model that relates to the reality of the organization and its environment. (Franklin II 2013)

In strategic decision-making research, the first results were introduced in the late 50s (March & Simon 1958). These results can be seen as still relevant today, as a rational process of decision making is typically viewed as a sequence

of separable stages (need recognition, search, screen, and choice activities) ordered in time and with transitions that make adjustments between stages.

Research studies in strategic decision making, have recognized decision making as a process (Eisenhardt & Zbaracki 1992). These studies (Saaty 1990, Amason 1996, Saaty 1990, Dean & Sharfman 1996, (Druker 2003) (Amason 1996) show that many decisions follow the basic phases of problem identification, development, and selection, but that they cycle through the various stages, frequently repeating, often going deeper, and always following different paths in fits and starts. The complexity of the problem and the conflict among the decision makers usually influence the curve of the decision route (Eisenhardt & Zbaracki 1992).

In the field of organization management research, Saaty (1990) offers a multicriteria decision-making approach in which factors are arranged in a hierarchical structure. Saaty's (1990) suggestion that, the most creative task in making a decision is choosing the factors that are important for that decision. In this research, article also indicates that, in the analytic hierarchy process, factors are arranged, once they are selected, in a hierarchic structure descending from an overall goal to the criteria, subcriteria, and alternatives in successive levels (Saaty 1990).

4 RESEARCH METHODOLOGY

In this chapter the research methodology of my study is presented. According to Järvinen (2000), the research question leads the selection of a research approach. Based on the taxonomy proposed by Järvinen (2000), my study can be seeing to belong to the category of new theory.

I start this chapter with a description of the research approach and methods. Then I continue with an overview of qualitative research, interpretive research, and hermeneutics. Interviewing as a technique for qualitative data collection is described. Then phenomenography as a qualitative technique for data analysis is presented. Finally, notation techniques for process modeling are explained.

4.1 Research approach and methods

For the researcher it is a challenging task to select the most appropriate research strategy and method for the research, because there are often many different possibilities. The importance of critical awareness is stressed; choosing a method is not a simple task and may lead to the research being stereotyped or distorted. In Table 14 I have summarized the theories and methods used in this research.

TABLE 14 Research methods used

Phase	Strategy	Reasoning
Research strategy	Flexible, qualitative, theory building	Research topic
Research theory	Process theory	Decision making is a process-oriented action
Research methodology	Qualitative research, interpretive	Interview material, rigor
Interview	Semi-structured interview	Collecting data, complementary questions
Data processing	NVivo	Tool for organizing and coding data
Analysis	Phenomenography	Focus on CIO as a decision maker
Notation	Accurate modeling	Tool for drawing process & model

4.2 Overview of qualitative research

Orlikowski and Baroudi (1991) in their highly cites article divided IS research into positivist, interpretive, and critical research. According to view of Orlikowski and Baroudi (1991), my research is interpretive.

Research is a creative activity leading to the production of new knowledge. The knowledge produced is new in the sense that the facts, the interpretation of those facts, or the theories used to explain them might not have been used in a particular way before in that specific discipline (Myers 2008).

Research methods can be classified in various ways. However, one of the most common distinctions is between qualitative and quantitative research methods, where qualitative methods typically use text and quantitative research relies on numbers (Myers & Avison 1997).

Qualitative research involves the use of qualitative data, such as interviews, documents, and participant observation data, to understand and explain social phenomena. There has been a general shift in IS research away from technological to managerial and organizational issues, and hence an increasing interest in the application of qualitative research methods (Myers & Avison 1997).

Qualitative research methods were developed in the social sciences to enable researchers to study social and cultural phenomena. Examples of qualitative methods are action research, case study research, and ethnography. Qualitative data sources include observation and participant observation in the field, interviews and questionnaires, documents and texts, and the researcher's impressions and reactions (Myers 2008).

TABLE 15 Strengths and weaknesses of qualitative research (Johnson & Onwuegbuzie 2004)

Strengths	Weaknesses
The data are based on the participants' own categories of meaning.	Knowledge produced may not be generalizable to other people in other settings (i.e., findings may be unique to the relatively few people included in the research study).
It is useful for studying a limited number of cases in depth.	It is difficult to make quantitative predictions.
It is useful for describing complex phenomena.	It is more difficult to test hypotheses and theories.
It provides individual case information.	It may have lower credibility with some administrators and commissioners of programs.
It allows conducting cross-case comparisons and analysis.	It generally takes more time to collect the data when compared to quantitative research.
It provides understanding and description of people's personal experiences of phenomena (i.e., the "emic" or insider's viewpoint).	Data analysis is often time consuming.
It can describe, in rich detail, phenomena as they are situated and embedded in local contexts.	The results are more easily influenced by the researcher's personal biases and idiosyncrasies.
The researcher identifies contextual and setting factors as they relate to the phenomenon of interest.	
The researcher can study dynamic processes (i.e., documenting sequential patterns and change).	
The researcher can use the primarily qualitative method of "grounded theory" to generate inductively a tentative but explanatory theory about a phenomenon.	
It can determine how participants interpret "constructs" (e.g., self-esteem, IQ).	
Data are usually collected in naturalistic settings.	
Qualitative approaches are responsive to local situations, conditions, and stakeholders' needs.	
Qualitative researchers are responsive to changes that occur during the conduct of a study (especially during extended fieldwork) and may shift the focus of their studies as a result.	
Qualitative data in the words and categories of participants lend themselves to exploring how and why phenomena occur.	
One can use an important case to demonstrate vividly a phenomenon to the readers of a report.	
It can determine idiographic causation (i.e., determination of causes of a particular event).	

The motivation for doing qualitative research, as opposed to quantitative research, comes from the observation that, if there is one thing that distinguishes humans from the natural world, it is our ability to talk and think. Qualitative research methods are designed to help researchers understand people and the social and cultural contexts within which they live (Myers & Avison 1997).

The goal of understanding a phenomenon from the point of view of the participants and its particular social and institutional context is largely lost when textual data are quantified (Kaplan & Maxwell 2005).

The most pertinent philosophical assumptions are those that relate to the underlying epistemology that guides the research. Epistemology refers to assumptions about knowledge and how it can be obtained (Hirschheim 1992).

Three categories have been suggested based on the underlying research on epistemology: positivist, interpretive, and critical (Chua 1986, Orlikowski & Baroudi 1991). There is considerable disagreement as to whether these research "paradigms" or underlying epistemologies are necessarily opposed or can be accommodated within the one study (Myers & Avison 1997).

It should be clear from the above that the word "qualitative" is not a synonym for "interpretive"—qualitative research may or may not be interpretive, depending upon the underlying philosophical assumptions of the researcher. It follows from this that the choice of a specific qualitative research method (such as the case study method) is independent of the underlying philosophical position adopted. (Myers & Avison 1997). Case study research can be positivist (Yin 2002), interpretive (Walsham 1993), or critical.

4.3 Interpretive research

The philosophical base of interpretive research (Berger & Luckmann 1967, Bernstein 1983, Gadamer 1975, Palmer 1969) is hermeneutics and phenomenology (Boland 1985). One article suggests a set of principles for the conduct and evaluation of interpretive research (Klein & Myers 1999). Interpretive studies generally attempt to understand phenomena through the meanings that people assign to them, and interpretive methods of research in IS are aimed at producing an understanding of the context of the information system and the process of how the information system influences and is influenced by the context (Walsham 1993). Interpretive research does not predefine dependent and independent variables but focuses on the full complexity of human sense making as the situation emerges (Kaplan & Maxwell 2005).

When the context of interpretation is pressed to its limits, hermeneutics becomes the philosophical analysis of what is involved in every act of understanding. In this context, hermeneutics becomes relevant not simply to the humanistic disciplines, in which linguistic and historical understanding are crucial, but to scientific forms of interpretation as well, for it asserts the principles involved in any and every act of interpretation (Palmer 1969).

4.4 Hermeneutics

Hermeneutics can be seen as an underlying philosophy or a specific mode of analysis (Bleicher 1980). As a mode of analysis, it suggests a way of understanding textual data (Bleicher 1980). In this work hermeneutics is used as a specific mode of analysis.

Hermeneutics suggests a way of understanding textual data. Hermeneutics is primarily concerned with the meaning of a text or text-analogue. The basic question in hermeneutics can be stated as: what is the meaning of this text (Gadamer 1976, Taylor 1976)?

If hermeneutic analysis were to be used in business and management, the object of the interpretive effort could become one of attempting to make sense of a company as a text-analogue.

In diagnosing an episode of information system application failure, the IS professional and others doing the analysis face two challenges: (1) relevant data must be identified, collected and organized; and (2) the data must be analyzed and interpreted to form a coherent picture of the perspectives, actions, and events that resulted in the troubled or failed system. This article provides a diagnostic framework and interpretive analysis for performing a diagnosis. The premise underlying the diagnostic framework is that an information system is a social system that uses information technology. The social and technical dimensions in the diagnosis of an information system are represented in a two-dimensional framework. Once the data and comments about the failure have been organized in the framework, the process of interpretation follows procedures based on interpretive methods (hermeneutics). The framework and associated interpretive methods assist those making a diagnosis in applying two powerful bodies of knowledge to failure diagnosis—socio-technical systems and interpretive methods. The article describes the framework and interpretive process, explains the rationale for them, and demonstrates their use for a case situation (Davis et al. 1992).

4.5 Qualitative techniques for data collection—interviewing

The basic question that many qualitative scholars face is this: how can we draw valid meaning from qualitative data? What methods of analysis can we use that are practical, communicable, and non-self-deluding (Miles & Huberman 1994)?

In-depth interviewing contrasts sharply with quantitative research (Rubin & Rubin 2005).

One or more data collection techniques are typically used to collect research data. The empirical material examined by this study is gathered by interviewing or observing. Written data sources can include published and unpublished documents, company reports, memos, letters, reports, email

messages, faxes, newspaper articles and so forth (Denzin & Lincoln 2005, Myers & Avison 1997).

The qualitative interview is the most common and one of the most important data gathering tools in qualitative research. Myers and Newman (2007) have proposed guidelines for conducting a qualitative interview. In their article, a dramaturgical model of the qualitative interview is introduced with the focus on setting the scene. The model presupposes that the interview is a drama, and therefore interviewers should prepare themselves with that in mind. In other words, they should aim for an excellent performance (Myers & Newman 2007).

An interview approach can be structured, semi-structured, or unstructured. Semi-structured and unstructured interviewing uses an incomplete script and so requires flexibility, improvisation, and openness. Myers and Newman (2007) suggest that the qualitative interview is not as straightforward as it may look. The qualitative interview is an excellent means of gathering data, but it raises difficulties as well, which are often ignored (Myers & Newman 2007). (Myers & Newman 2007) list the following concerns:

- "Artificiality of the interview (The qualitative interview involves interrogating someone who is a complete stranger; it involves asking subjects to give or to create opinions under time pressure)"
- "Lack of trust (As the interviewer is a complete stranger, there is likely to be a concern on the part of the interviewee with regard to how much the interviewer can be trusted)"
- "Lack of time (The lack of time for the interview may mean that the data gathering is incomplete)"
- "Level of entry (The level at which the researcher enters the organization is crucial)"
- "Elite bias (A researcher may interview only certain people of high status (key informants) and therefore fail to gain an understanding of the broader situation)"
- "Hawthorne effects (Qualitative interviews are intrusive and can potentially change the situation)"
- "Constructing knowledge (Naıve interviewers may think that they are like sponges, simply soaking up data that is already there)"
- "Ambiguity of language (The meaning of our words is often ambiguous, and it is not always clear that subjects fully understand the questions)"
- "Interviews can go wrong (Interviews are fraught with fears, problems and pitfalls)"

The careful planning and formulation of clear research questions is the key to any successful research project (Berglund 2006). Berglund (2006) maintains that the aims of the inquiry must be well defined and the scholar must select a research approach—phenomenography or another way of performing

research—so that the research question and the actual research approach proposed by the investigator go hand in hand (Berglund 2006).

In my doctoral thesis, I specifically designed interviews to answer the questions of *why* and *how*. Interviewing is a conversation with a purpose (Lincoln & Guba 1985). One learns about the practice through the interviews. The active interview is guided by the interviewer and his research agenda (Holstein & Gubrium 1995). Generally, most researchers recognize interviews as social interactions, but the literature on interview strategy and technique remains primarily concerned with maximizing the flow of valid, reliable information while minimizing distortion of what the respondent knows (Holstein & Gubrium 1995). The interview can be a potential source of bias, misunderstandings, or errors. However, the corrective measure is simple: if the interviewer asks the questions understandably, the interviewee will provide the desired information.

4.6 Phenomenography as a qualitative technique for data analysis

In order to make sense of how people handle problems, situations, and the world, we have to understand the way in which they experience the problems, the situations, and the world they are handling or in relation to which they are acting. Accordingly, a capability to act in a certain way reflects a capability to experience something in a certain way (Marton et al. 1997).

This thesis uses phenomenography, which is a qualitative research method used when exploring conceptions (Osteraker 2002), as a research method of the study.

In phenomenography, the use of quotations is essential and makes the informants survive the analytic stage of a research process. This is because the use of quotations shows the informant's contribution to the text and transforms the role of the researcher into the role of a mouthpiece. The acceptance of variation, even the striving for it, made by phenomenographic researchers enables different voices to be heard in the material. Since a single statement can create a category, the voice of the subject is heard although the others do not share it (Osteraker 2002).

In phenomenography, variations in the empirical findings are something to strive for. This is because they increase the possibility to generalize the empirical findings. Within phenomenography, every statement is of equal value, independent of the number of informants sharing it. The number of categories and variation contributes to the possibility to generalize the theory, not the numbers within the category. "Considering the fact that a concept is the substance a person gives to a relation between him and his surrounding will make every conception of great value" (Osteraker 2002).

If a researcher does not put equal importance into all statements, there is an obvious risk that the interpretation is more a result of the researcher's pre-understanding than a result of lived experiences by the informants as stated in the interviewing text (Solér 1997). The aim is then to explore relations between the obtained categories in order to derive a meaningful structural model of the conceptions (Francis 1993).

Phenomenography is simply an attempt to capture critical differences in how we experience the world and how we learn to experience the world. It is nothing more and nothing else (Marton 1996).

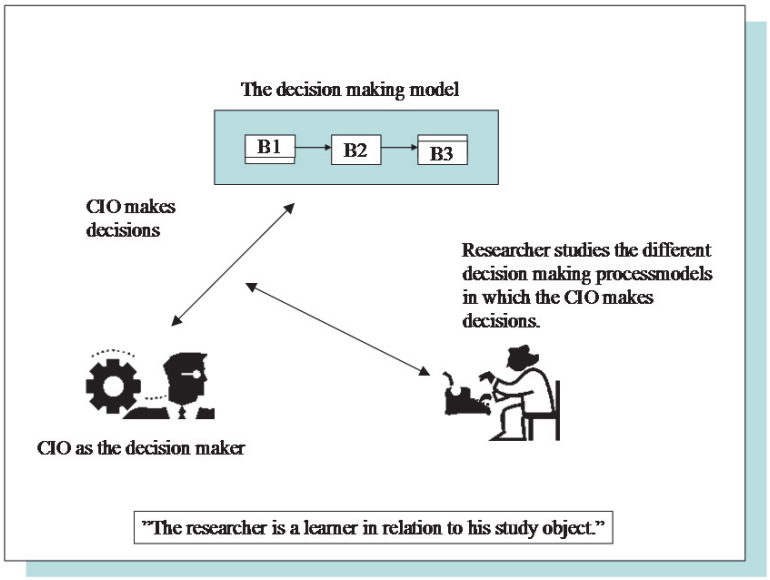

FIGURE 4 The perspective taken in phenomenographic research (adopted from Berglund 2006)

The relationship between the CIO and decision-making process is illustrated by the arrows in Figure 4. The phenomenographic researcher, who is interested in how the CIO performs decision making, studies the relationship between the CIO and the object of his decision making and describes the variation in how the object of decision making is experienced in a cohort.

The results of a phenomenographic research project do not describe individuals or individual decision making. Neither does phenomenographic research attempt to quantify the findings. Instead, the results are valid for a collective; the results simply summarize the different experiences of something that can be found in a CIO cohort.

A phenomenographic research project is data-driven, in the sense that the results grow in the researcher's interaction with data. The researcher avoids the

use of preset categories. Instead researcher goes in a dialogue with the data, first during interviews and later by reading and rereading the transcribed interviews.

As a result of this dialogue between researcher and data, a set of categories, often rather small, emerges. Each category then comes to describe a particular way in which the phenomenon under investigation is perceived. Together, the set of categories describes the variation in how the phenomenon is experienced. Since the categories describe different perceived aspects of the same phenomenon, they are logically related to each other, often in an inclusive structure. Were they not related, they would be categories of different phenomena (Berglund 2006).

A phenomenographic analysis is a slow and complex process full of hesitation and doubt, in which the researcher reads and rereads the transcribed statements of the CIOs, first as parts of the interviews and then as parts of the growing categories. The analysis can be visualized as a kind of sorting: First the interviews are cut into separate quotes, and then these quotes are sorted into piles. The piles are not predetermined, but they change and develop during the process, as a result of the researcher's interpretation of the data. When ready, the researcher has a rather small set of piles (often two to seven), each of which describes a certain way in which the phenomenon can be experienced. The researcher can explain in simple words what each pile means and where there is a clear structure between the piles. This structure confirms that the piles illuminate different aspects of one phenomenon (Berglund 2006).

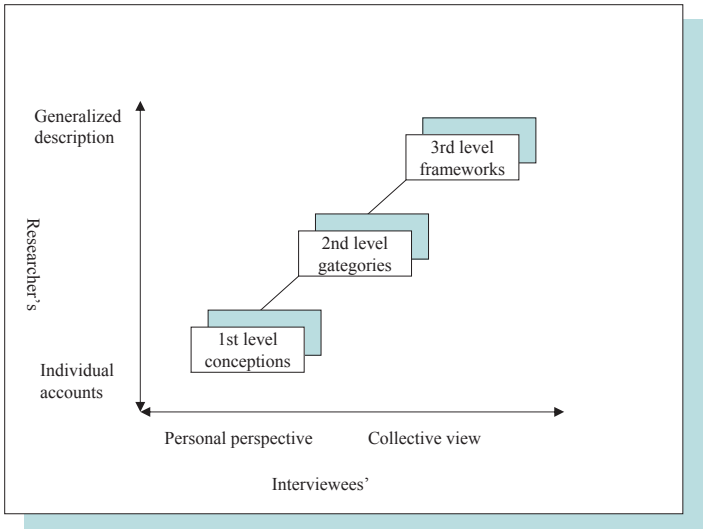

FIGURE 5 Representation of levels of data interpretation in phenomenography (Renström 1988)

It is stressed in phenomenography that the collective understanding is revealed through the variation of the respondents' different conceptions (Pang 2003). Then multiple perspectives are pursued within an individual's thoughts, which are subsequently connected as a collective view. As described in Figure 5, the first-level conceptions mean individual views without hierarchy or explanations of relations to other conceptions. Each of the resulting categories comes to describe a certain way in which the phenomenon under investigation is understood (second-level categories). Taken together, the categories describe the variety of understandings that can be found in a group (third-level frameworks). A framework is made up of the combinations of presented categories comprising thought forms or higher levels of understandings (Renström 1988). Since the categories illustrate different aspects of the same phenomenon, they are logically related to each other. In general, some categories offer a wider or richer perspective and often come to embrace others in an inclusive structure (Renström 1988). It tends also to be the case that for a given phenomenon, the categories of description are hierarchical (Marton et al. 1997). Commonly, the understanding of the novice will generally fit into the simplest category. As people become more expert with the phenomenon, they will often progress to higher-level understandings. In such cases, the highest level of understanding encompasses all the lower levels (Kaapu 2010).

Recently phenomenography has moved on from attempts to describe different levels of experiencing various phenomena to attempts to answer such questions as what is a way of experiencing something and "what is the actual difference between two ways of experiencing the same thing" (Pang 2003). This shift is probably emphasized because the phenomenographical approach is used also in disciplines other than education. Phenomenography has been adopted for several fields including business, health as well as computer science and IS (Kaapu 2010). In all these cases research focuses on learning within a disciplinary context (Marton 1986), so the way of experiencing something is more important than dealing with purely educational contexts (Pang 2003). This is also the situation in my dissertation, in which the contribution focuses on the IS field by studying CIOs and their understandings of IT governance and decision models.

I have aimed for reliability by keeping research diaries over the whole period of the research process and by using the NVIVO software application[1] when analyzing and classifying the empirical data.

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[1] NVivo is a qualitative data analysis computer software package that helps to organize and analyze complex unstructured data. More information about the software can be found at: http://www.qsrinternational.com/products_nvivo.aspx.

4.7 Notation techniques for process modeling

In the most general sense, a process is simply an ordered sequence of events. In human-designed systems, the events that constitute a process are designed and ordered to achieve some desired outcome. A business process, in particular, is an ordered sequence of events involving people, materials, energy, and equipment that is designed to achieve a defined business outcome.

The importance of business processes is self-evident. They not only define what the business does, but more importantly, they determine how well the business does what it does.

To be able to present decision making as a process, I introduce a basic process modeling language that is based on generic modeling concepts as described in (Workflow Management Coalition 1998). In this language, the process models are modeled using two types of objects: node and transition. A node is classified into two subclasses: task and choice/merge coordinator. Figure 6(a) shows a graphical representation of modeling objects.

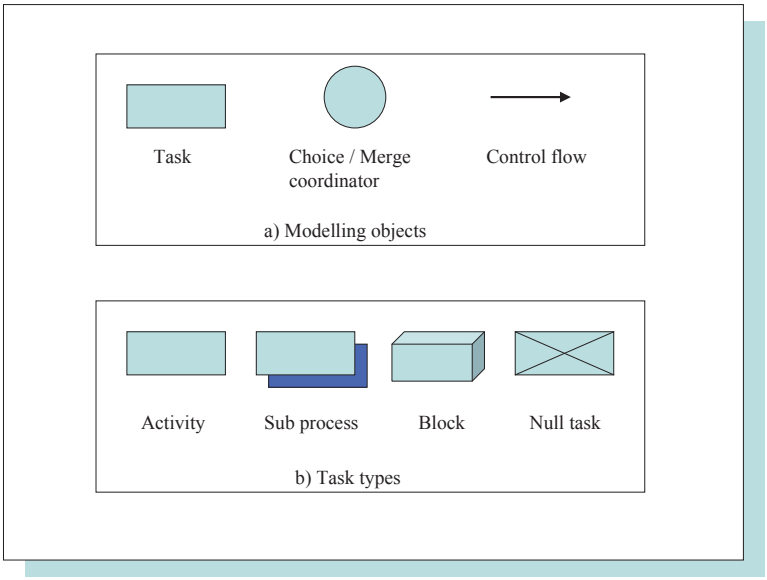

FIGURE 6 Process modeling objects and task types (Sadiq & Orlowska 2000)

A task, graphically represented by a rectangle, represents the work to be done to achieve some objectives. It is also used to implicitly build sequence, fork, and synchronizer structures. It is the primary object in workflow specifications and could represent both automated and manual activities. Tasks are performed by assigned performers. The workflow specifications place less emphasis on the

internal workings of tasks. Their aim is to capture the coordination requirements for performing a set of tasks for a given business process. They do, however, capture some information about the execution of tasks that are needed for coordination. All other modeling objects except the task are internal to the workflow management system and are used to specify the rules and constraints for the coordination of workflow execution. Tasks are further classified into four types: activity, sub process, block, and null task. An activity is an atomic piece of work coordinated by the workflow management system. The modeling and need for other three types of tasks will be discussed later in this section. Figure 6(b) shows graphical representation of task types.

A choice/merge coordinator, graphically represented by a circle, is used to explicitly build choice and merge structures. A transition links two nodes in the graph and is graphically represented by a directed edge. It shows the execution order and flow between its tail and head nodes. By connecting nodes with transitions through modeling structures, as shown in Figure 7, we build directed acyclic graphs called workflow graphs where nodes are represented by vertices and transitions are represented by directed edges. From now on, we will refer to vertices as nodes and edges as transitions.

Sequence is the most basic modeling structure and defines the ordering of task execution. It is constructed by connecting at the most one incoming and one outgoing transition to a task.

A fork (and-split) structure is used to represent concurrent paths within a workflow graph and is modeled by connecting two or more outgoing transitions to a task. A fork does not enforce concurrent execution of the nodes that follow its outgoing transitions. It merely models the execution independence between concurrent paths. At run-time, the forked nodes are triggered at the same time but they may be performed later any time independent from each other. At certain points in workflows, it is essential to wait for the completion of more than one concurrent execution path to proceed further. A synchronizer (and-join) structure, represented by attaching more than one incoming transition to a task, is applied to synchronize such concurrent paths. A task waits until all the incoming transitions have been triggered.

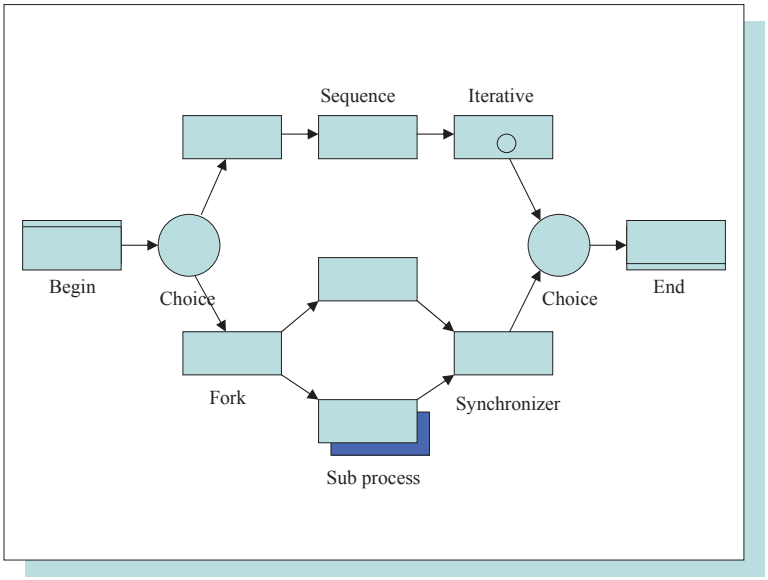

FIGURE 7 Process modeling structures (Sadiq & Orlowska 2000)

A choice (or-split) structure is used to model mutually exclusive alternative paths and is constructed by attaching two or more transitions to a choice/merge coordinator object. At run-time, the workflow selects one of the alternative execution paths for a given instance of the business process by activating one of the transitions originating from the choice coordinator object. The choice structure is exclusive and complete. The exclusive characteristic ensures that only one of the alternative paths is selected. The completeness characteristic guarantees that, if a choice coordinator object is activated, one of its outgoing flows will always be triggered. There are several ways to ensure at the workflow engine level that a choice structure always triggers exactly one of its outgoing transitions. Generally, the choice structure uses workflow control data to choose one of its outgoing transitions. One of the ways to model choice structure is to assign a Boolean transition condition to each of the outgoing transitions of the choice structure. (Sadiq & Orlowska 2000)

A merge (or-join) structure is "opposite" to the choice structure. It is applied to join mutually exclusive alternative paths into one path by attaching two or more incoming transitions to a merge coordinator object.

It is possible to use a choice/merge coordinator that represents a merge structure to represent a choice structure as well. Similarly, the same task object may be used to represent a fork structure, a synchronizer structure or both.

We have choice / merge coordinator object to explicitly model choice and merge structures. However, fork and synchronizer structures are represented implicitly by directly connecting transitions to task objects. More than one

outgoing transition from a task represents fork structure and more than one incoming transition to a task represents synchronizer structure. This approach keeps the resulting workflow model compact as well as graphically explicit. Nevertheless, in certain cases, it requires the use of null or router tasks to model proper coordination of flow and to conform to the syntactical correctness criteria of workflow structures. A null task is graphically represented by two shaded lines drawn between opposite corners of the rectangle and intersecting in the middle.

Since a workflow model is represented by a directed acyclic graph, it has at least one node that has no incoming transitions (source) and at least one node that has no outgoing transitions (sink). We call these begin and end nodes respectively. To uniquely identify a single end node for a workflow graph, we need to join all split structures. In such a case, a workflow graph contains only one begin and one end node. A workflow instance completes its execution after its end node has completed its execution. A bar at the top of a task or choice/merge coordinator represents a begin node. Similarly, a bar at the bottom represents an end node. (Sadiq & Orlowska 2000)

The nesting structure simplifies the workflow specifications through abstraction. Using this construct, it is possible to encapsulate a workflow specification into a task and then use that nested task in other workflow specifications. For each execution of a nested task, the underlying workflow is executed. In this modelling language is differentiated between two types of nesting structures: sub process and block. A sub process task links to an externally defined process definition. The externally defined process definition can instantiate independently as well as from the processes where it has been linked. A sub process task is graphically represented through a shaded rectangle under the task rectangle. A block task represents an "in-line" sub process definition. The sub process structure allows us to reuse process definition as part of other process definitions through sub process task nodes. A block is a restrictive form of a sub process since it is not a separate process definition that can be reused. Block is a useful structure in simplifying complex process definitions and in modeling blocked iteration. A block task is graphically represented through a block shape task rectangle. (Sadiq & Orlowska 2000)

The iteration structure is needed to model the repetition of a group of tasks within a workflow. One way to support iteration is through exit conditions. As long as a certain condition is not met, a particular task is repeatedly executed. The nesting structure could be used if there is a need to repeat a sub graph of the workflow model. A task that has an exit condition defined for iterative purposes is graphically represented through a small circle at the bottom right corner of the task rectangle.

A variety of process modeling languages exists both in research papers and commercial products.

5 RESEARCH SETTINGS

This chapter describes how the research settings for the study are laid out. To start with, the research description of study, the case information table, and a summary of the CIOs' education backgrounds are described. This is followed by a description of a summary of the CIOs' experience and a summary of their position within the organizational hierarchy. A summary of CIO organization members and a figure of global ICT governance structure are also provided.

I seek to theorize and extend knowledge on governing IT-related decision making by focusing on (1) the process by which an entity handles its IT key issues and (2) the interplay between competing values in key issues of IT decision making. Given this theoretical background, I provide a detailed account of a set of IT governance of key issues management and the role of CIOs, especially as related to current IT issues as a means to push IT management further. The empirical account of this paper is gathered to show all of the related forces in making IT decisions in entities by IT management.

In total I studied 21 cases that belong to the top 100 of Finnish dominant players. These CIOs were selected because they had a lot of personnel, a lot of customers, or both. This meant that they needed to have valid information systems in use. More than 21 interviews could have been done, but it was not necessary because the results of the interviews started to saturate. So there was no value in continuing to collect data.

Three case groups are defined: Public, Private, and Private&Public. See Table 16 for more information of these case group categories. One of these three case groups was from the Finnish public sector. The public case group includes only public organizations, which means that they are funded from the state budget or from other public resources like city and municipal taxation. Private&Public case group members are companies that are at least half owned by the state. The third case group is the private case group. The members of the private case group are private companies of which the state is not an owner. A summary of the 21 cases in the case groups can be seen in Table 16.

TABLE 16 Case information summary

Summary of cases	Public cases (funded and owned by the state of Finland)	Private&Public cases (owned by state of Finland at maximum 50 %)	Private cases
Number of cases	10 cases	3 cases	8 cases
Average number of personnel (among the case group)	6,100 workers	14,500 workers	12,900 workers
Average turnover (among the case group)		4,5 billion €	2,100 million €

As can be seen in Table 16, ten of 21 cases belong to the Public case group. Public case group members are a heterogeneous group since they are operating in different areas of public service production. There is an average of 6,100 persons working in these Public cases. The turnover was not provided in the public cases, so that field is left empty. In public organizations it is difficult to get the cost structure out or it is not comparable with other organizations. The Private&Public case group contains 3 members. They have an average of 14,500 workers and in average of 4,5 billion euros turnover. Eight cases were studied from the private sector. The Private cases on average employ 12,900 workers, and the turnover is 2,100 million euros on average.

In my cases the CIO is typically a university graduate with a degree in information sciences. The summary of education can be seen in Table 17. All the CIOs in this study completed some university studies. A couple of their degrees have nothing to do with business or IT; these CIOs belong to the Public case group. All the members of Private&Public case group have a master of science (engineering) degree.

TABLE 17 A summary of CIOs' education background

Education	Definition	Number of members in the group
Doctoral degree		3
Graduate-level degree		
	A master of science (engineering)	12
	A master of science (finance)	6
	A master of science (other degree)	2
	A combination of different degrees	4
Other education		1

As can be seen in Table 17, there were three doctoral degrees among the CIOs. A typical response from CIOs was that they had studied engineering and finance.

> "I feel being an engineer, but I also have financial studies completed." (Private&Public2, 2009)

As can be seen in a summary of CIOs' working experience (Table 18), many of the CIOs have the role of CIO for the very first time, and they usually have a long prior career inside the firm.

> "I started in the center of technology with the IT issues. In the 80's everything was my responsibility that related somehow to the very first personal computers, measuring systems, automation, and telecommunication starting from structuring the cables. … I haven't been deeply involved in information systems development or software coding, but they have aside my career all the time. Then at the beginning of 90's I had roles in the information service and patent office. Later on my response area included financial and human resources management. After that in the late 90's I was a head of internal IT services, and a centralized service unit was created. From the beginning of the 21st century I have had a role in IT governance as CIO." (Private&Public1, 2010)

As can be seen in the table of CIOs' experience (Table 18), the range of variation in years in the current CIO position is from 1 year to 11 years. The average number of years in the current CIO position is 4 years. The previous working experience shows that the largest number of previous CIO positions is 4 positions of CIO vacancy in different organizations. Table 18 points out also that the CIOs in the Private cases group have been working as CIOs the longest (from 4 to 10 years).

TABLE 18 A summary of the CIOs' experience

Cases	Description	Range of variation	Average
Summary of all cases	Years in current CIO position	From 1 to 11 years	4 years
	Number of CIO positions held	From 1 to 4 CIO positions	1.6 positions
	Total years in CIO positions	From 1 to 20 years	6.5 years
Summary of Public cases group	Years in current CIO position	From 1 to 6 years	3.8 years
	Number of CIO positions held	From 1 to 4 CIO positions	1.2 positions
	All years in CIO position	From 1 to 20 years	6 years
Summary of Private&Public cases group	Years in current CIO position	From 2 to 8 years	5.3 years
	Number of CIO positions held	From 1 to 3 CIO positions	1.7 positions
	All years in CIO position	From 6 to 10 years	8 years
Summary of Private cases group	Years in current CIO position	From 1 to 5 years	3.5 years
	Number of CIO positions held	From 1 to 3 CIO positions	1.8 positions
	Total years in CIO positions	From 4 to 10 years	6 years

This study shows that CIOs have a lower position within the organizational hierarchy in public entities than in privately owned companies (see Table 19).

> "I used to be a member of the executive board. Now I haven't been a member for a year. I would say that I have experienced that at the executive board level IT is visible only in large investments." (Private4, 2009)

> "The worst case scenario happens if the CIO is reporting to the CFO. Then IT is just a cost issue and seen as a mathematical function or number." (Public4, 2009)

TABLE 19 A summary of CIO position within the organizational hierarchy

Definition	CIO reporting to	Organizational levels to CEO
Public case group	Administrative manager (9), chief director (2)	2 or 3 levels
Private&Public case group	CFO (2), director of strategy (1)	2 levels
Private case group	CEO (1), CFO and deputy CEO (3), COO (1), CFO (2)	1 or 2 levels, one of the CIOs is a member of the executive board and two others used to be.

> "I have been thinking whether chief political officer (CPO) should be used instead of the chief information officer (CIO) title." (Public2, 2009)

> "I'm not officially a member of the executive board, but I have the possibility to join the meeting whenever I have issues to deliver." (Public6, 2012)

The level of outsourcing IT can be seen in Table 20. There are a couple of big companies with very small IT personnel organizations. The key issues have been insourced, but routine issues have been directed outside the company.

> "All the other IT functions have been outsourced, excluding brand and overall strategy." (Public5, 2009)

> "We are currently thinking where the edge exists in outsourcing functions." (Private4, 2009)

> "It's wise to keep a couple of IT contractors delivering simultaneously to ensure cost efficiency and independence." (Private&Public3, 2009)

TABLE 20 A summary of CIO organization members

Definition	Direct subordinates (on average within the case group)	Range of variation	Total number of own IT personnel (on average within the case group)	Range of variation
Summary of all cases	7.6 members	From 2 to 19 members	295.6 members	From 14 to 1950
Public case group	8 members	From 3 to 12 members	111.8 members	From 14 to 250 members
Private&Public case group	9 members	From 2 to 19 members	153.3 members	From 20 to 350 members
Private case group	6.7 members	From 3 to 10 members	520 members	From 30 to 1950 members

Figure 8 shows an instance of the global ICT governance structure. This structure is in principle used in one of the case companies and it could be used as an example of how to organize the global ICT governance. The governance structure is divided into three levels: strategic, tactical, and operational. At the strategic level the meaning is to improve the value of ICT. Various management and steering groups are typically at this level of the company's global ICT governance structure. The global ICT governance structure prioritizes and manages the applications, projects, and services of the organization. At the tactical level, the ICT process and technology knowledge is present. Actions related to ensuring performance are managed by area-specific development and coordination groups that contain participants from ICT and business units. The abbreviation "BA" means "business area." BA is involved in the top two levels of the global ICT governance structure. In the figure, corporate functions (CF) participate in the strategic- and tactical-level functions in the governance structure. The business area and corporate functions ensure that business competencies are involved in decision making at the corporate level regarding ICT-related key issues.

> "The continuity of business and related IT systems are at the most important level in the need hierarchy." (Private4, 2009)

> "It is important that IT governance is done together with business. The management of regions and business sectors should truly be involved in the IT process, otherwise IT functions will be isolated sooner or later." (Private1, 2009)

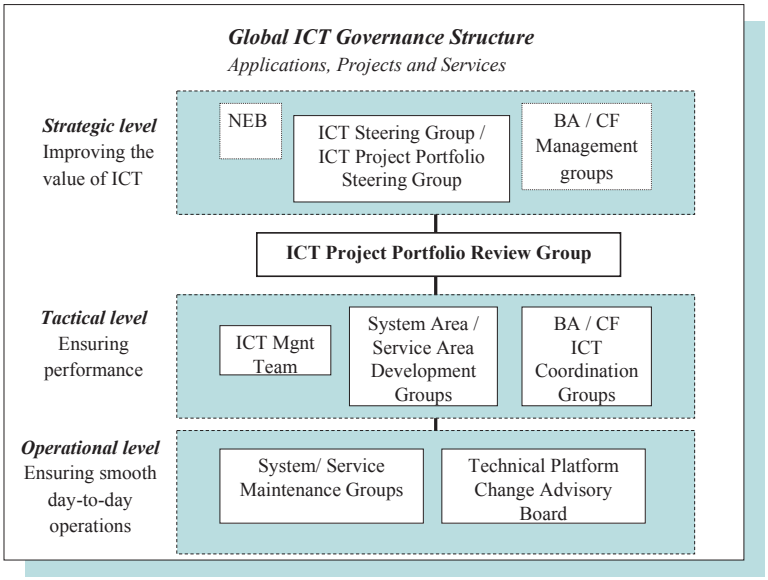

FIGURE 8 Global ICT Governance structure (Private&Public1)

The operational level is used for ensuring smooth day-to-day operations. At the operational level, the system and service maintenance group has the responsibility to run IT applications and procedures in a designated way and without unscheduled or unplanned interruptions. The technical platform change advisory board has the responsibility of taking new features and applications in use. In Figure 8 you can see that the "ICT project portfolio review group" is a key actor for starting big development projects in the organization. This kind of agreement and description is needed to ensure that ICT is aligned with the business, creates value for the company, and is not seen only as a cost factor.

> "The most important thing in the IT governance is the how IT governance is related to the main function of the company and how it is connected to the business." (Public4, 2009)

6 RESULTS

In this chapter the research results are described. These results are divided into three subchapters. To start, a figure describes the overall view of the CIO's role and illustrates the issues. This is followed by a description of the key issues related to the CIO and IT governance maturities. Finally, the process model for IT decision making is discussed.

One issue that strongly influences the role of the CIO is the model of IT management. When the model is centralized, the CIO has a firm grip on all IT personnel. The distributed model makes the CIO's line management influence weaker, as some of the IT personnel are under other organizations. In this case the IT governance agreement is important. This agreement clarifies different stakeholders' responsibilities and power regarding IT issues and personnel.

What characteristics does the perfect CIO need? A CIO must have technical, economical, and operational know-how. Leadership and management expertise are absolutely required for a CIO. Effective and versatile negotiation and communication ability are also required. A CIO should have a degree in technology or business. The perfect CIO also has had a long career in IT management. Figure 9 is a drawing that illustrates a CIO trying to manage an organization's IT issues.

The role of the CIO needs to be documented. Typically, plenty of agreements and documents are used to define the IT governance model and the organization's decision-making process. IT strategy and IT policy are written out for most organizations. IT strategy should be a part of the organization's overall strategy or at least have a clear interface to the organizational strategy.

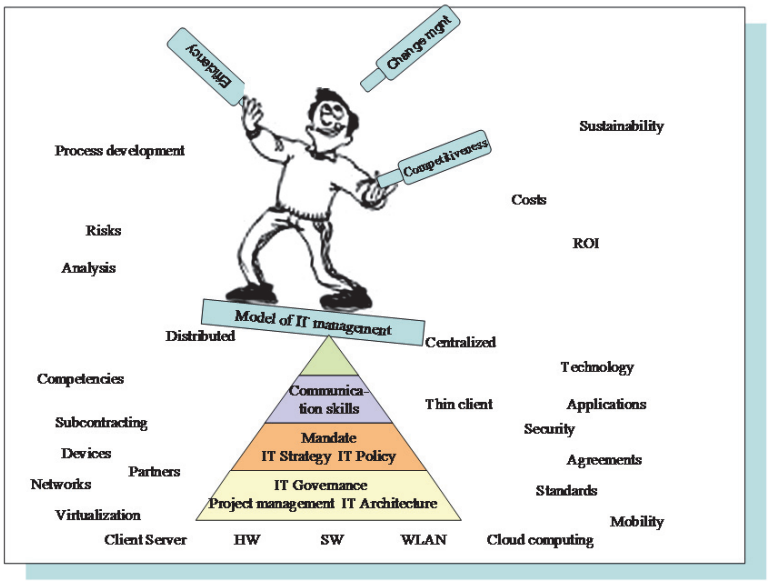

FIGURE 9 Overall view of the role of the CIO and related issues

Some IT-related issues are named in Figure 9. Issues related to hardware (e.g., technology, device, network, client, server, HW, WLAN, and thin client in Figure 9) build up the organization's basic operational foundation. Proper software and applications complement the IT environment. The IT architecture document defines concepts such as the network topology and interfaces.

The issues that the CIO thinks about include costs, performance, suitability, and ROI. Risk analysis and security checks also need to be considered.

Examples of current issues that are somehow related to sustainability include virtualization and cloud computing. These reduce both the size of computer machine rooms and the consumption of electricity.

When arranging the organization's IT model, the core competencies are listed. The essential competencies are kept inside the organization, but others could be outsourced or subcontracted.

A CIO is a change facilitator. The competitiveness and efficiency issues put demands on the organization's functional process improvement. The CIO is a key player in this development task. A CIO fixes operational problems using complementary IT solutions.

6.1 Key issues

Key issues on the CIO's agenda include mostly cost reductions and change management issues. Ongoing tasks include IT platform development and the alignment of IT with the business. As can be seen it Table 21, the cost issue is relevant for all Private case group members. The centralization of IT also happens often, and as an exception to the rule, Private2 had ongoing distribution of its IT organization. Distribution of IT was done to enable the sale of that part of the entity.

TABLE 21 Key issues in case groups.

Key issue		Number of instances in total (number of mentions by the CIOs)
Cost reduction		11 of 21 cases
	Summary of Public case group	3 of 10 cases
	Summary of Private&Public case group	None
	Summary of Private case group	All 8 of 8 cases
Change management (organizational or governance-related change)		13 of 21 cases
	Summary of Public case group	5 of 10 cases
	Summary of Private&Public case group	2 of 3 cases
	Summary of Private case group	6 of 8 cases
IT and business alignment		6 of 21 cases
	Summary of Public case group	None
	Summary of Private&Public case group	None
	Summary of Private case group	6 of 8 cases
IT architecture building		4 of 21 cases
	Summary of Public case group	4 of 10 cases
	Summary of Private&Public case group	None
	Summary of Private case group	None
IT platform building		8 of 21 cases
	Summary of Public case group	3 of 10 cases
	Summary of Private&Public case group	2 of 3 cases
	Summary of Private case group	3 of 8 cases
Centralization		9 of 21 cases
	Summary of Public case group	5 of 10 cases
	Summary of Private&Public case group	2 of 3 cases
	Summary of Private case group	2 of 8 cases
International / global operations		9 of 21 cases
	Summary of Public case group	1 of 10 cases
	Summary of Private&Public case group	2 of 3 cases
	Summary of Private case group	6 of 8 cases

> "Currently I have no understanding of the IT mandate or needs since the IT strategy has not been commented on at all for a year by executive board members. I suppose we are doing well since the business is running." (Private7, 2012)

In Public cases group there were a lot of centralization actions going on. The reason behind the centralization is Finnish government, reorganization of targets and cost reduction issues.

> "We are not doing IT investment projects, but we are doing business development projects. There is a clear difference. Then corporate IT is not seen only as a cost reduction function." (Private8, 2012)

In three cases (Private3, Private9, and Private&Public3), the CIO had created the whole IT governance model for the company.

As can been seen in Table 21, the key issues are concentrated in a couple of areas. The second-most common issue (11 of 21 cases) in these organizations was cost reduction, which means that the cost of IT in general needs to be reduced. Cost reduction can be seen as an improvement action. The process could be sped up with an IT investment, or resources could be saved by making an IT investment for the process. This procedure can be seen as a long-term cost reduction for the organization.

> "Strong cost reduction issues ongoing on the one hand, saving by using information technology, and on the other hand, saving from information technology budget." (Private2, 2009)

The most common issue (13 of 21 cases) was change management. When a change occurs in an organization, its information systems are affected either through a change in the operational process or because information systems are supporting the change. This change is often related to organizational or managerial issues in the information systems organization itself. The information systems organization is such an important factor for the business as a whole that it needs to be streamlined now and then.

> "The structure of IT governance has been blown out and rebuilt again. The structure was changed from a distributed model to a more centralized one." (Private3, 2010)

IT and business alignment issues were important for 6 companies out of 21. Only companies in the Private case group (6 of 8) had this issue. The Private case group means that government does not own any shares in the company. For private companies, business alignment is seen as important. I wonder why this is not the case in other case groups. Shouldn't all IT be aligned with its home organization?

> "Our development actions include always some IT facilitated improvement. So it can be stated in practice, we do not have any more development without utilizing IT." (Public10, 2011)

The IT architecture-building process was important in 6 cases of 21, especially for Public case group members. IT architecture is an essential part of an organization's IT governance. IT architecture streamlines the information system-related information, communication, and networking solutions. The allowed technical solutions are selected because the solid architecture is more secure and expandable. It also needs less resourcing to keep up to date.

IT platform building was a key issue in 8 cases of 21. IT platform building is a common issue across all case groups. It is the least common in private cases (3 of 8 cases). IT platform building is a key action related to good IT governance. It guides and informs future investments in hardware and software applications and systems.

> "Flexible ICT means that the costs follow business volume and you are not stuck with stiff cost structure. This is the aim for the company to remove one of its IT related typical black spots." (Private5, 2009)

A key issue in 9 of 21 cases was centralization, which means that resources (human resources) are concentrated under a solid organizational structure. The main idea behind centralization is to save resources and provide uniform services. Centralization is a more common issue for public companies (5 of 10 cases) than for other reference groups.

International or global operations are a key issue for 6 of 8 companies in the private case group. In total, 9 of 21 companies stated that international global operations were an issue.

6.2 IT governance maturities

By interviewing CIOs, I got interesting data. When the transcripts were analyzed and coded, the outcome space was found. In Figure 10, the maturity matrix of the company's IT functions is presented. The CIOs experienced their IT strategic maturity in one of six ways:

- C1 - Just a cost factor
- C3 - Mandatory
- C5 - Enhancing the operational compatibility
- C2 - Enabling compatibility
- C4 - Facilitating operational development
- C6 - Accelerating new market and business improvement

Company management sets the targets for IT functions. The CIO shares the value of the company's IT function, which is an important factor in the organization's effectiveness and cost structure.

> "Information technology is a very critical success factor for our business." (Private1, 2009)

> "Truly critical factors for our business are the means how IT can be utilized." (Private5, 2009)

> "IT is one of the key elements of our business decision-making and processes." (Private3, 2010)

Typically, in a company in which the CIO is reporting to the CFO, the IT function is seen as a cost factor. C1 category also means that the expenses are followed strictly and reduced continuously. The C3 category is cost-centric as well, but there, the meaning of the IT function is also seen as securing the company's basic function. Companies in which the CIO experiences IT function belong to the C5 category, as the operational compatibility is enhanced by reducing the cost structure.

> "The most simplified model of governance is constructed in two levels. The levels are operations and management. IT governance is the management level." (Public4, 2009)

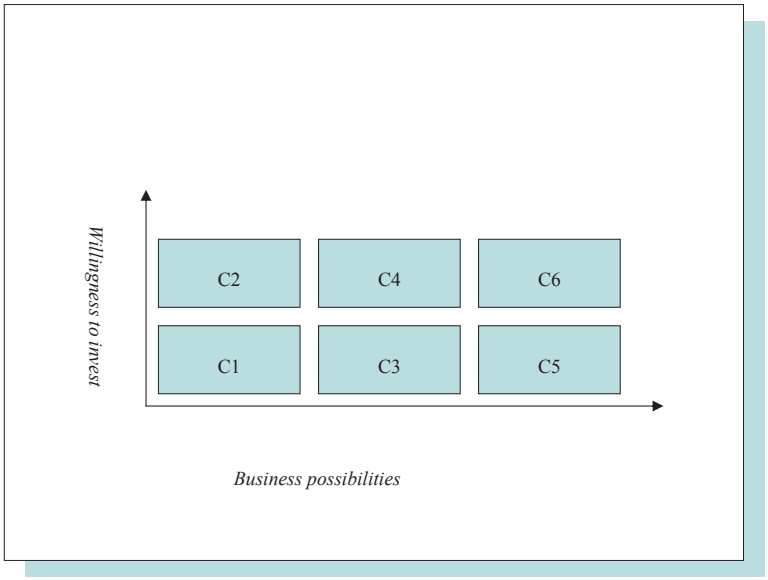

FIGURE 10 The maturity matrix of the IT function

Figure 10 shows the maturity matrix of the IT function. This matrix explains how CIOs report the IT functions of their firms. The C2 category is the one in which the IT function is seen not only as a cost factor but as the enabler of the firm's compatibility. The C2 category highlights the role of the facilitator in operational development. In the companies for which the CIO is in the C6 category, the IT function is seen as an accelerator for the new market and new business development. Companies whose IT functions belong in the C6 category are taking advantage of IT function. The CIO also has a mandate to participate in executive board meetings.

> "The most important thing in the IT governance is how IT governance is related to the main function of the company and how it is connected to the business." (Public4, 2009)

> "The worst case is where IT is seen as a mandatory evil and target is to cut the costs." (Public4, 2009)

> "Another key issue is how IT governance is built. IT must be an instrument for developing operations and not just a technical experiment forum." (Public4, 2009)

The maturity levels in the IT governance definition, as experienced by CIOs, are

- D1 – IT governance is independent.
- D2 – IT governance is inherited from corporate governance.
- D3 – IT governance is included in corporate governance.
- D4 – IT governance is not needed.
- D5 – Corporate governance is enough for company.

> "IT governance is an additional projection of corporate governance." (Private&Public1, 2010)

CIOs experience the updating definition, process, and schedule of IT governance in the following ways:

- E1 – Once written, it will stay the same.
- E2 – It needs long-term updates.
- E3 – It must be kept synchronized with corporate governance.
- E4 – It must be maintained annually according to the governance description.
- E5 – It must be kept up to date

The maturity steps in the creation of IT governance and IT strategy, as reflected in the IT alignment, are presented in Figure 11.

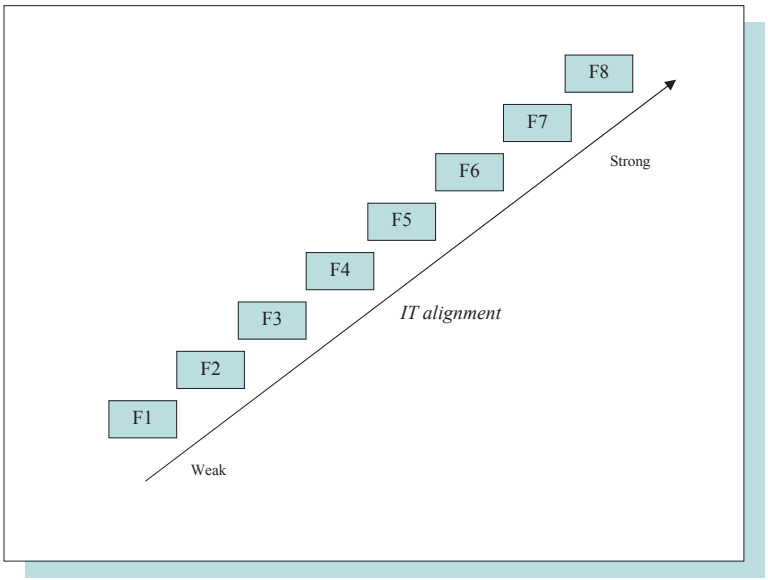

FIGURE 11 The maturity steps in creation of the company's IT governance and IT strategy.

Here is the list of maturity steps in terms of how the CIO experiences them:

- F1 – CIO's task
- F2 – CIO's task with IT management team
- F3 – IT management team's task
- F4 – CIO's task, attempt to involve boss
- F5 – CIO's task, upper management committed
- F6 – Upper management rules
- F7 – Business management drives input
- F8 – As cooperation of top management and CIO

> "Existing management structure is used for IT governance-related decisions. Company's executive board is one example of this decision making structure that is defined in corporate governance." (Private&Public, 2010)

> "It is important that IT governance is done together with business. The management of regions and business sectors should truly be involved in the IT process otherwise IT function will be isolated sooner or later." (Private1, 2009)

> "IT governance states how IT is led from the viewpoint of the business." (Private4, 2009)

> "IT governance defines the shared understanding and gets functions organized." (Private5, 2009)

> "IT governance describes the process of prioritization of IT development. This process ensures good development and expected results" (Private6, 2009)

> "I think that there is definitely a risk that business keeps away from function that clearly belongs to it. I have noticed that business tries to delegate the improvement and change of the actions to the IT department."(Private2, 2009)

> "One key issue of the IT governance is to clarify the roles of actors: what is the role of IT and what is the role of business."(Private2, 2009)

Category F1 means that the CIO writes these messages independently. Upper management's role is only to approve; it is not interested in IT at all. In category F2, the IT management team is participating with the CIO in this effort. However, upper management is still not interested in IT. The F3 category presents the situation in which the IT management team writes the IT governance and IT strategy descriptions. In this case, the CIO is not competent, and upper management is not interested in IT. In class F4, the CIO tries to involve own boss with this task. In category F5, the upper management of the company is interested and committed to the creation of the IT governance and IT strategy. In this case, IT alignment is already stronger than it was in previous categories. In category F6, upper management rules IT governance. In this class, the upper management may have IT competencies or IT may be seen as a cost factor. In F7, business management is more strongly affecting creation. The

business management of the company is driving input to IT governance. Upper management is interested, and IT is seen as a competitive factor. In category F8 IT alignment is the strongest, and top management is doing this with the CIO. The upper managers and business managers are cooperating effectively with the CIO.

6.3 Process model for IT decision making

I have drafted a basic top-level process model for IT decision making (see Figure 12). The model generalizes the identified and analyzed IT management structures of my case organizations.

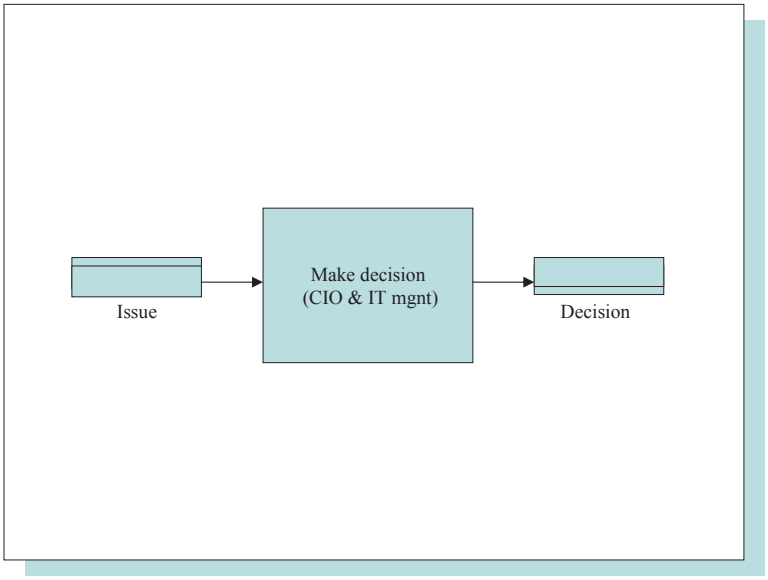

FIGURE 12 IT decision-making model (top-level, generalized version)

This IT decision-making model, as shown in Figure 12, begins with an issue and ends with a decision. In the middle of the process, the activity "Make decision" includes the IT-related decision-making process with all its subprocesses, sub-activities, and related authorities. In this figure, the top-level process is described on the general level, and it is valid for all interviewed organizations. The amount of IT issues and the process behind the decision making varies a lot within organizations. The basic assumption is that every issue has some kind of status in the process. The CIO has a central role in the IT decision-making

model. The role of the CIO is dependent on his mandate and the organization's IT management model.

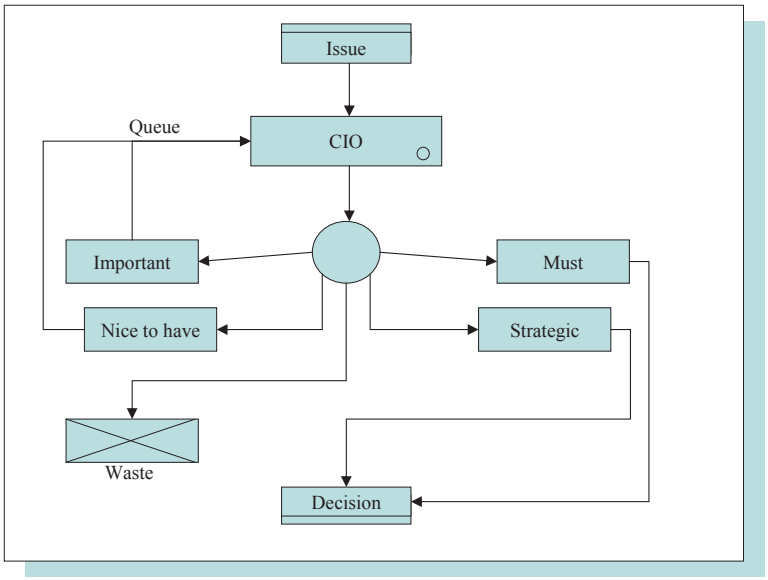

FIGURE 13 IT decision-making model showing high-level categorization of issues.

As defined in Figure 13 the high-level categorization of the issues can be divided into five groups. The groups are "Must," "Strategic," "Important," "Nice To Have," and "Null Task." A "Must" issue is an urgent task that needs to be done to continue the organization's activities. "Strategic" issues are related to the organization's long-term plans, and they are vital for the future. Important issues may be realized sooner or later, as they are not fundamental; they are also looped back to the CIO. Issues may be processed many times before they become "Must" or "Strategic" issues. A "Null Task" is a waste; in this case, issues are forgotten and are not implemented.

> "Law-originated issues generate the majority of our things that need to be implemented." (Public8, 2011)

According to interview data, the issues have a different kind of urgency and importance, which is dependent on the issue's effect on the organization's continuity. The law-related and IT functionality-related issues are fundamental to the organization's business are handled as priority issues, and they often break the decision-making model's structure. These priority-labeled issues are completed quickly. On the other hand, the priority issues are handled through decision-making subprocesses such as the IT architecture review process and

the cost efficiency planning process. The information security and risk validation subprocesses also cannot be forgotten.

This top-level IT decision-making model, as shown in Figure 14, names the main activities that identified from the analyzed research data. In practice, the "Make decision" activity (conducted by both the CIO & IT management) in Figure 14 was divided into four main sub-activities: "Describe," "Plan," "Resource & Schedule," and "Audit & Supervise."

After each activity, there is a change of getting a "Reject" decision. The "Continue" choice indicates approval and means that the next activity can be started according to the decision-making process.

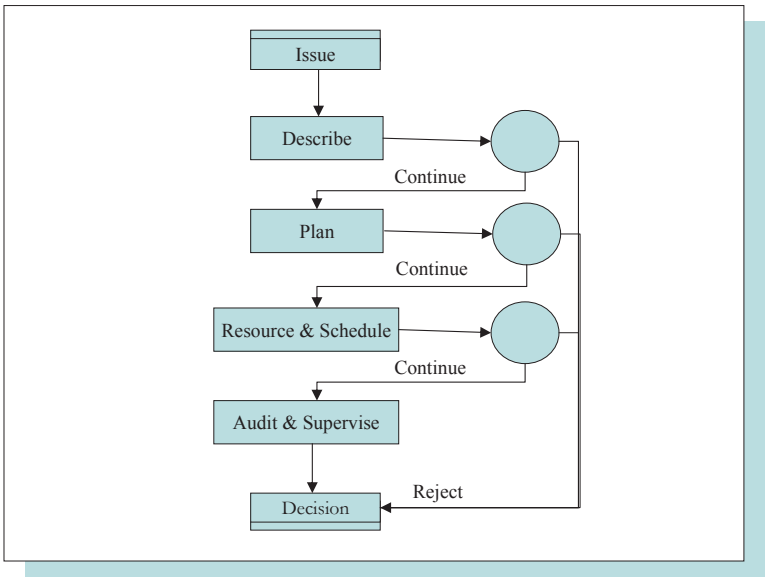

FIGURE 14 IT decision-making model for the "Make decision" activity

The "Describe" activity is shown in Figure 15. The main idea of this activity is to get a written proposal, including detailed reasoning and benefits for the issue that is being handled. The overall description gets started. As a result of this activity, an investment proposal or a development initiative is written. This activity includes return on investment (ROI) calculations, an IT architecture and technical compatibility check, and priority estimation for the issue.

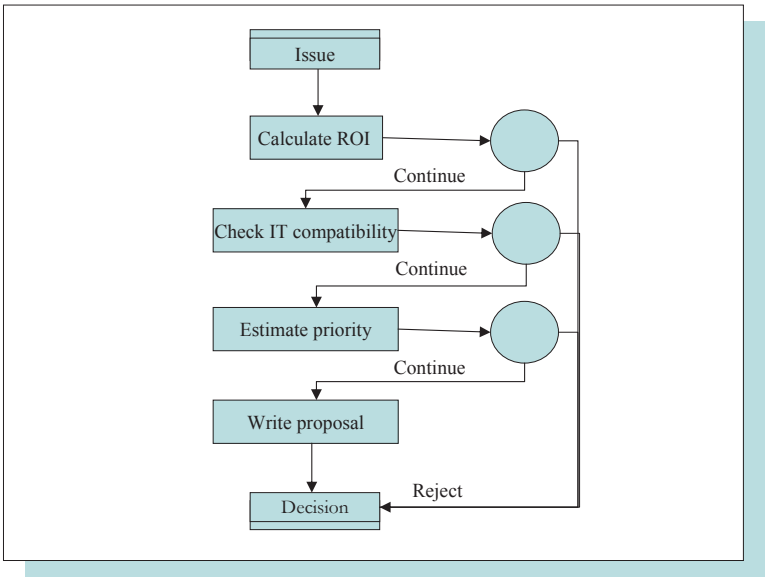

FIGURE 15 IT decision-making model for "Describe" in the "Make decision" activity

The "Describe" activity is a very important phase in the decision-making process in which the overall business and other values are evaluated. Business case description is a typical activity in investment-related decision-making processes. Business cases include at least the customer, the production, and the financial and overall impressiveness of the issue. Motivation and advantage are also found in this phase of the decision-making process.

"Calculate ROI" is a critical factor for most investment proposals. In this phase, profitability gets reasoning.

One example of the basic documentation for IT management is the IT architecture description. In this description, overall IT-related technical issues are stated, including software and hardware issues. The "Check IT compatibility" activity involves getting rid of technically unsuitable issues.

The "Estimate priority" activity handles business continuity threats. A high priority might result from reasoning about business-related, vulnerable IT systems, which, if they become broken, will not be usable without quick responses and corrective actions.

> "I have noticed that if the information systems are working well and business can be done, as a CIO you might have time for fulfilling other IT needs. I refer with this to the A.H. Maslow's theory the basic need hierarchy. The continuity of business and related IT systems are at the most important level in the need hierarchy." (Private4, 2009)

The "Plan" activity has been expanded upon in Figure 16. This activity is an iterative part of the decision-making process. This phase might involve proposing several ways to implement a solution to an issue. Each reasonable

alternative is then described. The implementation cost for each alternative is estimated, and the justifications are enumerated. The "Plan" activity is done as many times as there are ways to resolve the issue. There could be several possibilities for getting the resources for issue implementation. This is dependent on the way the organization's IT has been structured; for example, are there any IT personnel available?

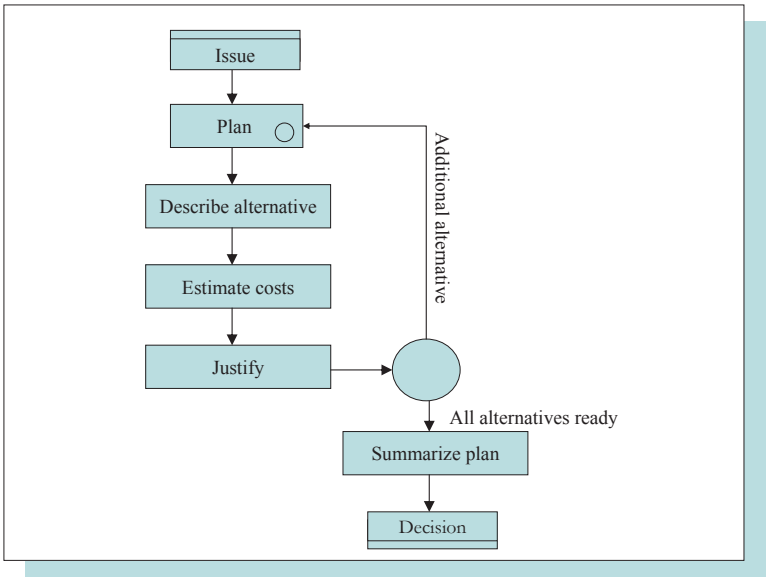

FIGURE 16 IT decision-making model for "Plan" in the "Make decision" activity

The "Plan" activity concludes by summarizing the plan and choosing the alternative for the next phases of the decision-making process.

The financial planning and timetable is described in the "Resource & Schedule" activity. See Figure 17 for activities that are related to this phase of the decision-making process. The "Resource" activity is essential for securing competent and valid internal and external resources for the issue. This is not only a human resource activity but a larger resourcing question that involves the physical environment and the required equipment.

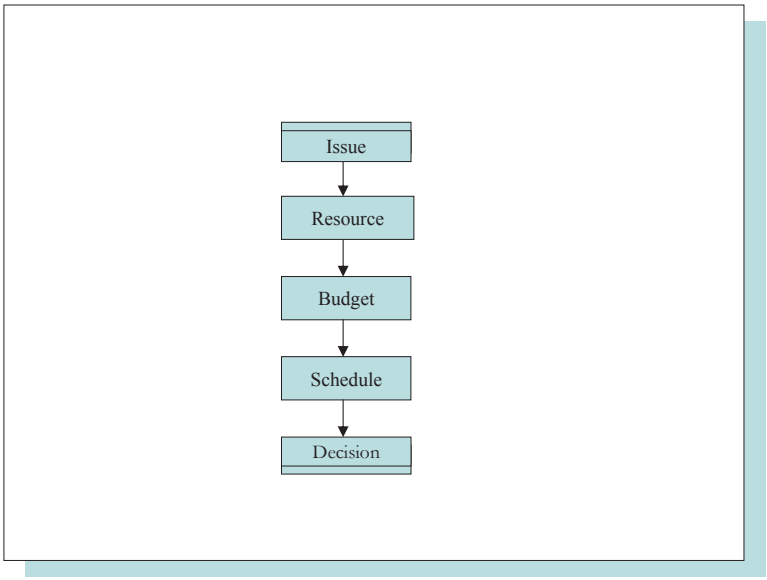

FIGURE 17 IT decision-making model for "Resource and schedule" in the "Make decision" activity

The "Budget" activity classifies the cost of items and the funding for them. The budget and timetable are put together to get the scheduled implementation for the issue. The scheduling task is dependent upon financing and other resources.

The "Audit & Supervise" activity is deeply related to the decision-making model. See Figure 18 for the overall process model of the "Audit and supervise" activity. In this activity, the dependencies of the issue are reviewed. The activity called "Check dependencies" takes care of dependencies (for example, within the organization, the issue may depend on resources or on the development projects). Different projects might be competing for competent personnel or subcontractors.

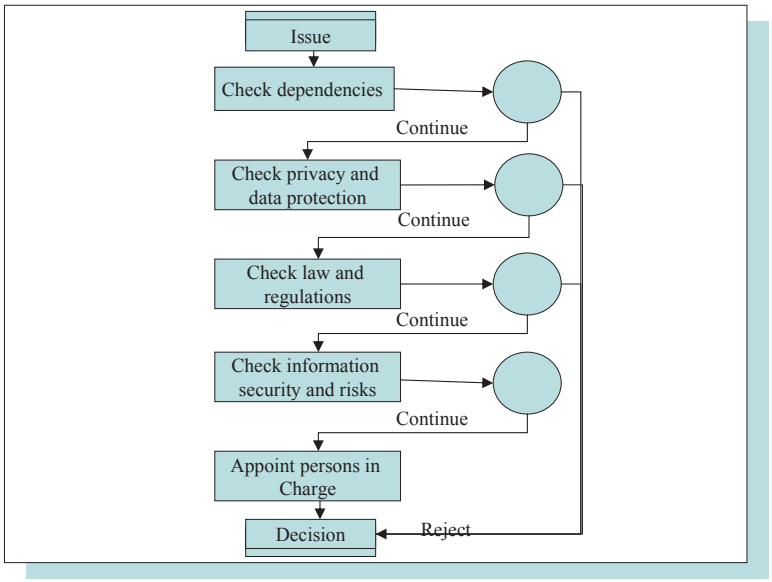

FIGURE 18 IT decision-making model ("Make decision," "Audit and supervise" activity)

The "Check dependencies" activity is followed by a choice function. It is possible that the issue is rejected or postponed because of a critical dependency. The following activity, called "Check privacy and data protection," verifies protection-related issues. This activity might require a statement from a privacy protection authority, for example. This privacy-checking procedure is based on the organization's governance model.

Laws and regulations are very important sources of IT issues for many public organizations. Laws affect the contents of the issues in many cases. Annually, laws require new maintenance tasks for IT systems. These legal changes are obligatory for facilitating future operations; otherwise illegal operations could end the business.

Information security is vital. The "Check information security and risks" activity is an important aspect of the IT decision-making model. In addition, information security risks are important to examine. This risk analysis is a continuous task.

The "Appointing persons in charge" task is also part of the IT decision-making process, in which the operational organization is nominated. Responsible persons are put in place, and the needed governance model is created.

7 TOWARDS A PROCESS THEORY FOR CIO DECISION MAKING

In this chapter, I first discuss how CIO decision making is different from management decision making in general, and why there is a need for specific CIO decision making process. Then, I present an empirically structured CIO decision-making process model. The model describes the CIO decision-making process based on the analyzed empirical data. With these results, I take the first steps toward a process theory for CIO decision making.

The process approach has a long history. Since (Markus & Robey 1988) introduced this approach to IS, it has been used in a range of studies.

The CIO decision-making process is based on empirical and theoretical findings. The theoretical framework of this study relies on process theories, as was written in chapter 3. A working definition could be used to state that a theory is an account of some empirical phenomenon (Weber 2010). In this study, the phenomenon to be described is the CIO as a decision maker.

Based on interviews and other evidence, I found that a decision-making model for handling issues is a complex matter involving a developmental progression and reciprocal interactions between factors and CIOs. To capture such issues, a process theory approach is useful. The next section describes the proposed process theory, which was inductively derived from the interviews.

7.1 What is specific to CIO decision making?

It is no surprise that the management decision making processes have been studied in other research disciplines. Management decision making processes are of absolute relevance to a candidate CIO decision making process that will be later on introduced. In this section, I would try to make case why theoretical backgrounds from decision making in general (in management science) are not fully applicable to the decision making processes of CIOs.

The research motivation of my study is based on the absence of studies focusing on the decision making processes of CIOs. I argue that CIO decisions have certain characteristics, which general (management) decision processes do not capture well enough.

As researchers stated in the early 1990s, enhancing business and key information strategy alignment will remain a key challenge for both business and information managers in the future (Broadbent & Weill 1993).

CIOs are expected to prove their leadership role while they continue to struggle with cost reductions, business agility, and re-engineering. IT-business alignment is an ongoing concern—some things never change (Luftman & Ben-Zvi 2010a, Preston & Karahanna 2009). Rapid access to information is critical, and many chief executives acknowledge the potential of information technology and changing business models to improve business responsiveness (Scott 2004). It has been recognized for some time that CIOs function in a constantly changing environment, with IT driving the change. Given the large investment in information systems, the successful management of the organization's IT department is crucial (Remenyi et al. 2000). Financial resources, evaluating IT and IS opportunities and investment, and strategic alignment of IT and business strategies are among the issues that require management and consideration (Johnston et al. 2007).

As have been introduced in section 2.3 CIOs do have a specific range of issues to be managed. These issues are often strongly related to the vital information systems, real-time continuity (not to be interrupted) of business processes and strategic decision making. Therefore, other management decision making processes or general management decision processes cannot be adopted to the CIO decision making as such.

7.2 The components of CIO decision making theory

Table 22 introduces the theory components: the stages, the factors, and the transition conditions. There are two types of transition options: forward or backward. If a transition option is fulfilled, the process takes the next stage. My empirical results suggest that the process consists of six stages: (1) Begin, (2) Describe, (3) Plan, (4) Resource & Schedule, (5) Audit & Supervise, and (6) Decide. This decision-making process describes the CIO's decision to continue or reject the issue at each stage.

TABLE 22 CIO decision-making process elements

Stage	Factor	Transition condition	
		Forward	Backward
1. Begin	Issue		
2. Describe		Issue	
	Return On Investment		
	IT compatibility		
	Priority estimation		
	Proposal text		
3. Plan		Proposal	Rejection
	Plan A		
	Plan B, Plan C, …		
	Cost estimates		
	Justification		
	Summary		
4.Resource &		Proposal+	Rejection
Schedule	Budget		
	Resourcing plan		
	Financial planning and timetable		
5. Audit & Supervise		Proposal++	Rejection
	Dependency check		
	Privacy & data protection		
	Laws & regulations		
	Information security & risks		
	Key human resource allocation		
6. Decide	Conditions fulfilled	Proposal+++	Rejection

7.2.1 "Begin" stage

The very first stage in this process is "Begin." The process is started when the first issue is set. The transition to this stage happens when the issue is stated. After this stage, the next stage is always the "Describe" stage. This transition occurs if the CIO decides to continue the decision-making process.

7.2.2 "Describe" stage

In this stage, several factors are processed: "Return on investment," "IT compatibility," "Priority estimation," and "Proposal text." All these factors are taken into account when processing the current issue. The first version of the proposal is written as a result of the "Describe" stage.

The next stage is the "Plan" stage.

7.2.3 "Plan" stage

In this stage, a set of planning actions are taken. Depending on the issue, there might be several plans (called A, B, etc.). Each of these plans is processed (see Table 23). This "Plan" activity is an iterative part of the decision-making process.

This phase might involve proposing several ways to implement a solution to an issue. Each reasonable alternative is then described. The implementation cost for each alternative is estimated, and the justifications are listed. The "Plan" activity is done as many times as there are ways to resolve the issue. There could be several possibilities for getting the resources for issue implementation.

The Proposal+ version is a transition condition for the "Resource & Schedule" stage. If Proposal+ is ready, and all the factors are present in the proposal, the process proceeds to the next stage. Another option for a transition condition is rejection. This means that the issue will not proceed to the next stage. The proposal is further managed during the entire CIO decision process.

7.2.4 "Resource & Schedule" stage

In the "Resource & Schedule" stage, the issue's processing is continued. The factors "Budget," "Resourcing plan," "Financial planning" and "Timetable" are handled during the "Resource & Schedule" stage. Factors are processed individually. As a result of the stage, the Proposal++ version is delivered. Then the CIO decision-making process can take the next step to the following stage, "Audit & Supervise." Another transition condition for current issue is rejection; if this occurs, the issue will not proceed.

The "Audit & Supervise" stage is followed by the "Resource & Schedule" stage. The transition condition for this step in the CIO decision-making process is Proposal++ version of the issue's proposal text.

7.2.5 "Audit & Supervise" stage

In this stage the following factors are gone through: "Dependency check," "Privacy & data protection," "Law & regulations," "Information security & risks" and "Key human resource allocation." The "Audit & supervise" activity is deeply related to the decision-making model. In this activity, the dependencies of the issue are reviewed. The activity called "Check dependencies" takes care of dependencies (for example, within the organization, the issue may depend on resources or on the development projects). Different projects might be competing for competent personnel or subcontractors. The "Check dependencies" activity is followed by a choice function. It is possible that the issue is rejected or postponed because of a critical dependency. The following activity, called "Check privacy and data protection," verifies protection-related issues. This activity might require a statement from a privacy protection authority, for example. This privacy-checking procedure is based on the organization's governance model.

Laws & regulations are very important sources of IT issues for many public organizations. Laws affect the contents of the issues in many cases. Annually, laws require new maintenance tasks for IT systems. These legal changes are obligatory for facilitating future operations; otherwise illegal operations could end the business.

Information security is vital. The "Check information security and risks" activity is an important aspect of the IT decision-making model. In addition, information security risks are important to examine.

The "Appointing persons in charge" task is also part of the IT decision-making process, in which the operational organization is created. Responsible persons are put in position, and the needed governance model is done. As you can see in Figure 19, the last step of this CIO decision-making process is the "End" stage. At the conclusion of the previous stage, the Proposal+++ version is ready.

7.2.6 "Decide" stage

The resulting proposal includes all the transition conditions, and the issue is handled (for now) by the CIO. The CIO decision-making process is presented with notation techniques in Figure 19. The process proceeds from the left ("Begin" stage) to the right. The timeline is also from left to right. Based on the research material, the CIOs prefer to have a proper manner with which handle the issues. By having a clear process in place, it's easier to communicate the way the issues are managed by the CIO. The process description also defines what actions will be taken and what kind of information is needed for making decisions. The CIO decision-making process is reflected by the role of CIO within the IT governance.

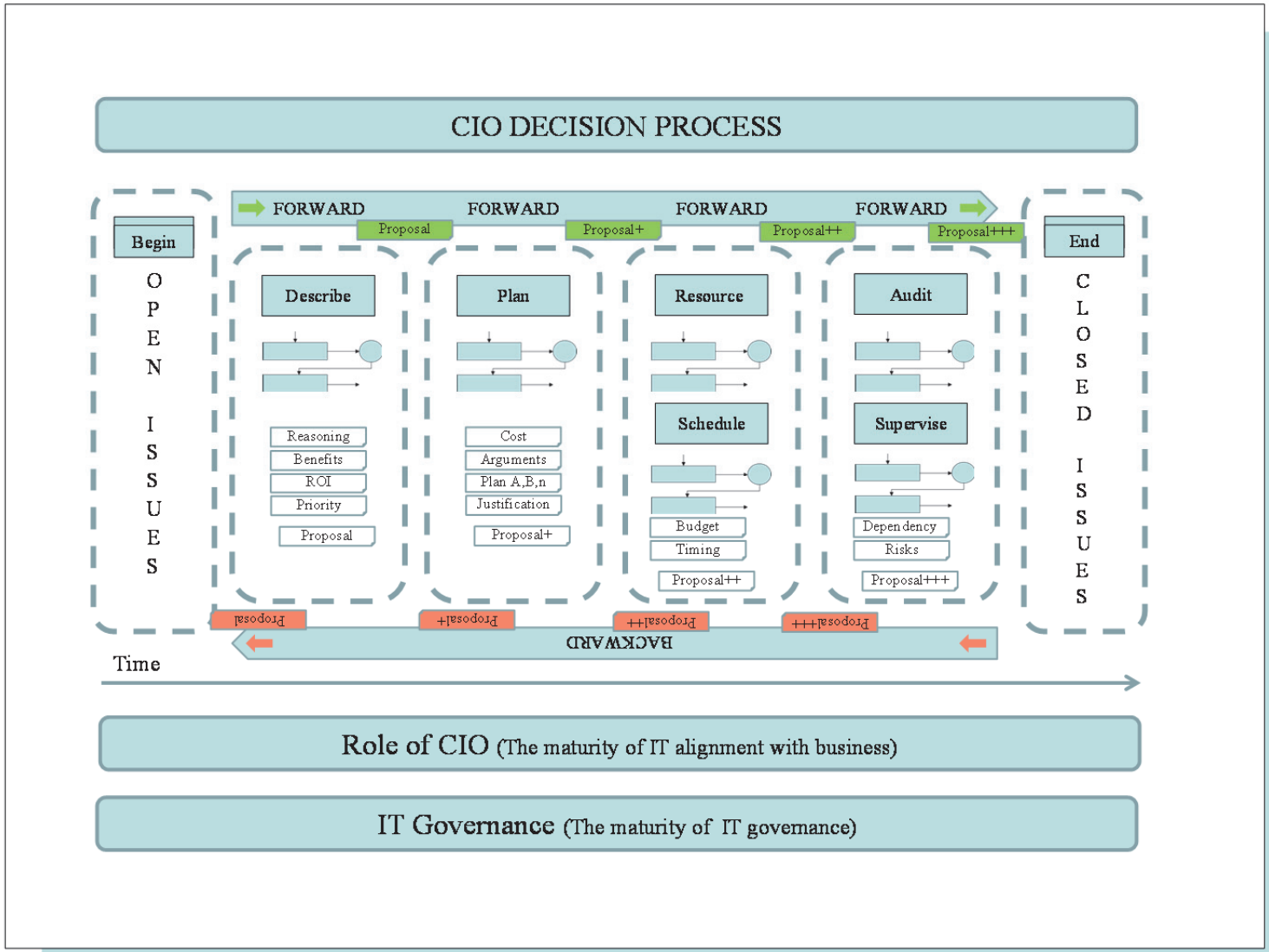

FIGURE 19 The CIO decision-making process

7.3 The Process Theory of CIO Decision-Making in Light of Meta-Theories

In this section, I reflect the process theory back to the process meta-theories created by (Van de Ven & Poole 1995) in order to pinpoint the exact theoretical paradigms underlying my process theory (see table 23). This in useful in order to understand what kind of process theory is developed.

As (Mintzberg et al. 1976) stated, human beings cannot gather information without in some way simultaneously developing alternatives. An association to this can be noted in the "Plan" stage of the CIO decision-making process. CIOs cannot avoid immediately evaluating these alternatives, and in doing so, they are forced to make a decision. This is a package of operations, and the succession of these packages over time constitutes the total decision-making process.

When building up the CIO decision-making process, as (Van de Ven 1992) wrote, you need to take the following actions. First, define the meaning of the process. In my case, the meaning is identifying how the CIO acts making doing decisions and determining the stages, factors, and transition conditions. The next step is to clarify the theory of the process. As a clarification, the CIO decision-making process was drawn using notation technics.

In particular, as (Van de Ven 1992) stated, three meanings of process are often used: (1) a logic that explains a causal relationship between independent and dependent variables, (2) a category of concepts or variables that refers to actions of individuals or organizations, and (3) a sequence of events that describes how things change over time. In my study of a proposed CIO decision-making process, the meaning of this process is near a category of concepts that refer to individual actions. In my study, the individual in question is the CIO, and the category consists of the stage and the factor. In addition, as (March & Simon 1958) published, a rational process of decision making is typically viewed as a sequence of separable stages; in my study, the stages are (1) Begin, (2) Describe, (3) Plan, (4) Resource & Schedule, (5) Audit & Supervise, and (6) Decide. These stages are ordered chronologically and use transition routines (called "transition conditions" in my study) to make adjustments between stages.

This study's results are in agreement with the results of (Straub et al. 1994), who considered a paper's theoretical contribution to be the main measure of its quality. The CIO decision-making process is an example of proposing my own theory. In recent research, concerted attention has been placed on adapting and extending theories from other fields and on building new theories (Markus & Saunders 2007, Truex et al. 2006). My theory of the CIO decision-making process is an account of an empirical phenomenon. Furthermore, as Burton-Jones et al. (2011) stated, all theoretical accounts consist of at least two elements: "concepts" and "relationships among concepts." Theorizing is how we think

about the relationships among the elements that occupy our research attention (Van Maanen et al. 2007). A theory is a set of statements about the relationships between two or more concepts or constructs (Jaccard & Jacoby 2009).

People, in their day-to-day lives, often think in terms of actors, events, and processes (Bruner 1991). Although the field has several accepted theories regarding information systems adoption, there is less in the way of solid theory regarding the performance outcomes of these systems. Thus, this is an area in need of theoretical attention (Burton-Jones et al. 2011). The theory of information system adoption is related strongly to CIO and IT governance.

The process approach focuses on entities participating in events. The process approach assumes that entities change over time. In terms of theoretical relationships, the process approach focuses on accounting for an outcome by reference to a sequence of events. This sequence is typically assumed to be probabilistic (Markus & Robey 1988, Mohr 1982). In my study, this argument is supported. In relation to causal logic, the process approach is a necessary, final, formal, and efficient causality. Time is an important element in the causal logic.

Process theories can be seen as having three components: a set of starting conditions, a functional endpoint, and an emergent process of change (Van de Ven 1992). The families of ideal-type theories are categorized in four developmental theories: life-cycle, evolutionary, dialectic, and teleological.

Van de Ven & Poole (1995) conducted an interdisciplinary literature review to identify alternative theories used to explain processes of change in the social, biological, and physical sciences. By inductively examining the substance and intellectual heritage of these theories, (Van de Ven & Poole 1995) found that most could be grouped into four basic schools of thought. Each of these four schools has a rich and long-standing intellectual tradition. These terminologies are referred as life-cycle, teleological, dialectic, and evolutionary theories. Table 23 outlines the four types of process theories in terms of their members. In this table, the CIO decision-making process reflections are highlighted by underlining the text and stages that are found in that process. These theories provide different accounts of the sequence of events to explain the process of change in an organizational entity.

Table 24 outlines the four types of process theories in terms of their key metaphors. The CIO decision-making process reflections are highlighted by underlining the text and stages that are found in that process. Table 25 outlines the four types of process theories in terms of their generative logics. Table 26 outlines the four types of process theories in terms of their event progressions and the conditions under which they are likely to operate.

Table 27 outlines the four types of process theories in terms of their generative mechanisms and the conditions under which they are likely to operate. The CIO decision-making process reflections are highlighted by underlining the text and stages that are found in that process.

TABLE 23 CIO decision-making process reflections with members of ideal-type theories of social change (adapted from Van de Ven & Poole 1995)

Family	Life-cycle	Evolutionary	Dialectic	Teleological
Members	Developmentalism Ontogenesis Metamorphosis Stage & cyclical models	Darwinian evolution Mendelian genetics Saltationism Punctuated equilibrium	Conflict theory Dialectical Materialism Pluralism Collective action	Goal setting, Planning Functionalism Social construction Symbolic interaction

TABLE 24 CIO decision-making process reflections with key metaphors of ideal-type theories of social change (adapted from Van de Ven & Poole 1995)

Family	Life-cycle	Evolutionary	Dialectic	Teleological
Key metaphor	Organic growth	Competitive survival	Opposition, conflict	Purposeful cooperation

TABLE 25 CIO decision-making process reflections with logics of ideal-type theories of social change (adapted from Van de Ven & Poole 1995)

Family	Life-cycle	Evolutionary	Dialectic	Teleological
Logic	Imminent program Prefigured sequence Compliant adaptation	Natural selection among competitors in a population	Contradictory forces Thesis, antithesis, synthesis Social construction Equifinality	Envisioned end state

TABLE 26 CIO decision-making process reflections with event progressions of ideal-type theories of social change (adapted from Van de Ven & Poole 1995)

Family	Life-cycle	Evolutionary	Dialectic	Teleological
Event progression	Linear & irreversible sequence of prescribed stages in unfolding of immanent potentials present at the beginning	Recurrent, cumulative & probabilistic sequence of variation, selection, & retention events	Recurrent, discontinuous sequence of confrontation, conflict, and synthesis between contradictory values of events	Recurrent, discontinuous sequence of goal setting, implementation and adaptation of means to reach desired end state

TABLE 27 CIO decision-making process reflections with generating forces of ideal-type theories of social change (adapted from Van de Ven & Poole 1995)

Family	Life-cycle	Evolutionary	Dialectic	Teleological
Generating force	Prefigured program/rule regulated by nature, logic or institutions	Population scarcity Competition Commensalism	Conflict & confrontation between opposing forces, interests or classes	Goal enactment consensus on means co-operation/symbiosis

Van de Ven & Poole (1995) introduce the four basic types of process theories described above. They contend that all specific theories of organizational change and development can be built from one or more of the four basic types. Although some theories can be reduced to one of the types, most are predicated on the interplay of two or more types.

The four basic theories provide useful standards to evaluate the form, completeness, and tightness of specific developmental theories. By using this method of evaluation, the existence of the primitive motors can be tested in order to see which motor fits the complex phenomenon being examined.

I hereby define the process as a progression with the order and sequence of events in the entity over time. Here, "process" refers either to 1) the underlying logic that explains a causal relationship between independent and dependent variables in a variance theory or 2) a category of concepts for organizational actions, such as work flows, decision-making techniques, or methods for strategy making.

Meta-theory of Van de Ven

In these paragraphs I present the issues raised by each theory element. Each element from life-cycle theory to evolutionary theory to teleological theory to dialectical theory will be discussed here.

The elements of life-cycle theory

The metaphor of organic growth is a heuristic device that explains development of an organizational entity from its initiation to its termination. After teleology theory, life-cycle theory is perhaps the most common explanation of development in the management literature. Change is imminent according to life-cycle theory. The entity moves from a given point of departure toward a subsequent end that is prefigured in the present state.

The typical progression of change events in a life-cycle model is a unitary sequence. It follows a single sequence of stages or phases. This sequence has a cumulative meaning in that characteristics acquired in earlier stages are retained in later stages. In the typical life-cycle model, the stages are related as they derive from a common underlying process.

Each of these events contributes to the final product and occurs in a prescribed order, because each piece sets the stage for the next. Each stage of development is seen as a necessary precursor of the succeeding stages.

The elements of teleology theory

Teleology theory is a philosophical doctrine that claims that purpose or goal is the final cause that guides the movement of an entity. This approach underlies many organizational theories of change, including functionalism, decision making, strategic planning, and goal setting.

According to teleology theory, the development of an organizational entity proceeds toward a goal or an end state. It is assumed that the entity is purposeful and adaptive; by itself or in interaction with others, the entity constructs an envisioned end state, takes action to reach it, and monitors the progress. The theory can operate for an individual or for a group of individuals or organizations who are sufficiently like-minded to act as a single collective entity. Teleology theory inherently implies creativity because the entity, consisting of an individual or group, has the freedom to enact whatever goals it likes.

Unlike life-cycle theory, teleology theory does not prescribe a necessary sequence of events or specify the trajectory of development that the organizational entity will follow. However, the theory implies a standard for judging change: development is something that moves the entity toward its final state. Some teleological models incorporate the systems theory assumption of equifinality, meaning that there are equally effective ways to achieve a goal.

The elements of dialectical theory

The basis of dialectical theory is that the organizational entity exists in a pluralistic world of colliding events, forces, or contradictory values that compete with each other for domination and control. These oppositions may be internal or external to an organizational entity. For example, the entity may have several conflicting goals or interest groups competing for priority or direction, which may collide with the direction of other organizations. Change occurs when these opposing values, forces, or events gain sufficient power to confront and engage the status quo.

The elements of evolutionary theory

Evolutionary theory focuses on cumulative changes in the structural forms and populations of organizational entities across communities and industries in society at large. Change proceeds through a continuous cycle of variation, selection, and retention.

The selection of an organization occurs principally through competition for scarce resources. The environment selects entities that best fit the resource base of an environmental niche.

Evolution explains change as a recurrent, cumulative, and probabilistic progression of variation, selection, and retention of organizational entities.

Whatever the organizational level, an evolutionary model can be used to focus on processes of variation, selection, and retention among numerous

organizational entities. Traits are acquired within a generation through learning and imitation.

However, there is an apparent problem with the notion that four distinct theories exist: many theories draw on one ideal model combining these four basic models. As a result, a composite model needs to be defined.

TABLE 28 CIO decision process reflections with generating forces of ideal-type theories of social change (adapted from Van de Ven & Poole 1995)

	Life Cycle	Teleological	Evolutional	Dialectical
Unit of Change	**Single entity**	**Single entity**	Multiple entities	Multiple entities
Mode of Change	**Prescribed**	Constructive	**Prescribed**	Constructive
Conditions for operation	A singular, discrete entity exists that undergoes change, yet maintains its identity throughout the process. The entity passes through stages distinguishable in form or function. A program, routine, rule or code exists in nature, social institutions, or logic that determines the stages of development and governs progression through the stages.	An individual or group exists that acts as a singular, discrete entity, which engages in reflexively monitored action to socially construct and cognitively share a common end state or goal. The entity may envision its end state of development before or after actions it may take and the goal may be set explicitly or implicitly. However, the process of social construction or sense making, decision making, and goal setting must be identifiable. A set of requirements and constraints exists to attain the goal and the activities and developmental transitions undertaken by the entity contribute to meeting these requirements and constraints.	A population of entities exists in a commensalistic relationship (i.e., in a physical or social venue with limited resources each entity needs for its survival). Identifiable mechanisms exist for variation, selection, and retention of entities in the population. Macropopulation characteristics set the parameters for microlevel variation, selection, and retention mechanism.	At least two entities exist (each with its own discrete entity) that oppose or contradict one another. The opposing entities must confront each other and engage in a conflict or struggle through some physical or social venue, in which the opposition plays itself out. The outcome of the conflict must consist either of a new entity that is different from the previous two, or (in degenerate cases) the defeat of one entity by the other or a stalemate among the entities.

	Life Cycle	Teleological	Evolutional	Dialectical
Key metaphor	Organic growth	Purposeful cooperation	Competitive survival	Opposition. Conflict
Event progression	Linear & irreversible sequence of prescribed stages in unfolding of immanent potentials present at the beginning.	Recurrent, discontinuous sequence of goal setting, implementation, and adaption of means to reach desired end state.	Recurrent, cumulative & probabilistic sequence of variation, selection, & retention events.	Recurrent, discontinuous sequence of confrontation, conflict, and synthesis between contradictory values or events
Generating force	Prefigured program/rule regulated by nature, logic, or institutions	Goal enactment consensus on means cooperation/symbiosis.	Population scarcity Competition Commensalism	Conflict & confrontation between opposing forces, interests, or classes.

The decision-making process entails a teleological type of process theory. The CIO has an influence on what happens at each stage. The process will not proceed without the CIO's actions. In the case of the CIO's decision-making process, the generating force is a goal of the CIO. Thus, it is only the CIO who makes the transitions from one stage to another in the decision-making process, i.e., the decision to continue to the next stage is due to the CIO's decisions. Event progression in the process entails a life-cycle type of process theory: the event progression is linear, irreversible, cumulative, and recurrent. The process is linear and irreversible, since it is chronological and has a prescribed sequence of described stages. The process is cumulative, since each stage has its own process attributes that it retains in later stages.

In the decision-making process, the event progression entails a teleological type of process theory: the event progression is a non-linear, partly cumulative, divergent, and recurrent process.

8 DISCUSSION

In this thesis, the goal was to theorize and extend the current knowledge on governing IT-related decision making by focusing on: the process by which an entity handles its IT key issues and the interplay between competing values in key issues of IT decision making. In total, I interviewed 21 CIOs of the top Finnish organizations for this thesis. In each interview we discussed the concerns of the CIO, the role of the CIO, and the way that decisions are made.

In this chapter I will discuss the findings of the research, sum up its significance and relevance, and identify its implications for research and practice. First, in this chapter the selected key findings of research are discussed under section 8.1. The key findings are discussed in comparison with related research results in IS. My findings are also reflected in other relevant disciplines, such as organizational management and strategic decision making.

I then move on to discuss the limitations (section 8.2), practical implications (section 8.3), and finally, questions that would benefit from future research, based on my findings (Section 8.4).

8.1 Research findings

I would like to highlight contributions based on my empirical research. First I will discuss the finding—for instance, the fact that CIO decision making is a process. I'll state the contribution of this finding in terms of IS research. I will then discuss the extent to which my findings are new, i.e., the contribution they make compared to related work.

8.1.1 CIO decision making is a process

As a result of this study and the interview findings, I introduce a candidate or a tentative process for CIO decision making. The candidate process clarifies the

management of IT issues from the perspective of CIO, since it guides the order of actions and "facts" that are involved in the CIO decision-making task.

First, my results indicate that the same reasons (or factors) do not influence CIOs' decision making every time. Instead, my findings suggest that CIOs go through different stages when forming their decision whether or not to proceed with an issue in the decision-making process. My empirical results suggest that, with respect to the issues that CIOs choose to handle in their decision making, CIOs are at different stages in the decision-making process and at each stage a different set of factors influence their decisions. This finding is different from mainstream CIO research in IS, which views CIO actions as without stages. In my IS research, I have not found a corresponding stage-based decision-making model. In that sense, this is a new finding for IS research.

The earlier research in administrative science supports the notion that a set of plans are needed as human beings cannot gather information without in some way simultaneously developing alternatives. Therefore, they cannot avoid evaluating these alternatives right away, and in doing so, they are forced to make a decision. This is a package of operations, and the succession of these packages over time constitutes the total decision-making process (Mintzberg et al. 1976).

In this research, I have followed Van De Ven's (1992) principles for building up the CIO decision-making process. Van De Ven (1992) states that the meaning of the process needs to be defined first. Then, the theory of process should be clarified, and finally, the research should be designed to observe the strategy process in such a way that is consistent with one's definition and theory of the process (Van de Ven 1992).

In strategic decision-making research, the first results were introduced in the late 50s (March & Simon 1958). These results are still relevant today, as a rational process of decision making is typically viewed as a sequence of separable stages (need recognition, search, screen, and choice activities) ordered in time and with transitions that make adjustments between stages.

While my findings are new in the case of the CIO decision-making process, process-related findings have been reported elsewhere in other areas of IS research. These areas include the IS development process (Madsen et al. 2006, McLeod & Doolin 2011), IS development issues (Newman & Robey 1992, Robey & Newman 1996), ERP implementation process (Lyytinen et al. 2009), software development processes (Thummadi et al. 2011), and virtual team development (Sarker & Sahay 2003). There are some process theories in the IS literature regarding the themes associated to the CIO role (i.e., IT governance). For example an article on how IT creates business value: a process theory synthesis (Soh & Markus 1995).

While no research currently exists on CIO decision-making processes in IS (to the best of my knowledge), research studies in other disciplines, such as strategic decision making, have recognized decision making as a process (Eisenhardt & Zbaracki 1992). These studies (Saaty 1990, Amason 1996, Dean &

Sharfman 1996, Druker 2003) show that many decisions follow the basic phases of problem identification, development, and selection, but that they cycle through the various stages, frequently repeating, often going deeper, and always following different paths in fits and starts. The complexity of the problem and the conflict among the decision makers usually influence the curve of the decision route (Eisenhardt & Zbaracki 1992).

8.1.2 CIO decision making is a model with stages

Before introducing my findings, I would first like to give some background to the decision-making model and key management issues. Top management often conducts the strategic planning of IT. Factors influencing the IS manager's perception of key issues have been analyzed in the literature (Watson 1990). The model depicted is very broad in scope and is beyond the reach of a single piece of research. As there has been little prior work done in this area, this attempt to understand the origin of key issues focuses on a small but important segment of the full model (Watson 1990).

In my study, when I was describing the process derived from previous research data, I discovered that the CIO decision model has a couple of stages and transition conditions. In sum, the CIO decision model includes 6 stages.

Based on IS research, I have not found a corresponding decision-making model for CIOs' issue management. In this sense, my findings are new in the domain of IS research. With this model, CIO decision making can be further studied and improved for different purposes. However, in management science and elsewhere, different stages are recognized. For example, Simon (1960) introduced a decision-making model in the field of management research. According to Simon, there are four different stages in decision making: intelligence, design, choice, and implementation. In my decision model, there are six stages, namely, begin, describe, plan, recourse and schedule, audit and supervise, and decision. Intelligence relates to the identification of the problem needing to be solved. Describing the issue could be roughly related to intelligence in Simon's model. This requires the individual problem solver to gather information about the area under scrutiny. In my CIO decision model, the plan stage could be seen to correspond with Simon's design and choice stages, as Simon's design refers to the alternative solutions the individual problem solver uses to solve the identified problem. This stage often requires obtaining additional information beyond what was collected during the intelligence stage. Choice consists of choosing among the various alternative solutions identified in the design stage—for example, those things identified in the CIO decision model as the plan stage transition criteria. This results in various plans to select from. This stage may also require obtaining additional information beyond what was collected during the intelligence and design stages. In my CIO decision model, the resource and schedule and the audit and supervise stages are related to the implementation phase. In Simon's model, implementation relates to the execution of the solution chosen in the previous

stage. It also includes the continuous reporting on the progress of the chosen solution. If my findings are compared to Simon's model, one can see that his model is a general model of decision making that does not focus on a CIO decision model in particular. My model is meant for CIOs to manage IT issues.

In the field of organization management research, Saaty (1990) offers a multicriteria decision-making approach in which factors are arranged in a hierarchical structure. This shares a feature of my decision-making model, as it is hierarchical. Saaty's suggestion that, the most creative task in making a decision is choosing the factors that are important for that decision is also in line with my findings. In this research, Saaty also indicates that, in the analytic hierarchy process, factors are arranged, once they are selected, in a hierarchic structure descending from an overall goal to the criteria, subcriteria, and alternatives in successive levels (Saaty 1990).

8.1.3 Even low-quality information is better than no information

According to my study, the information obtained by CIOs has a crucial impact on their decisions. In my research interviews, I found that any amount of information (even low-quality information) might be more important for CIOs than dealing with no information at all. It is clear that access to accurate and real-time information during and after the CIO decision-making process leads to the possibility that CIOs continue to handle the issue stream.

In earlier research it has been stated that rapid access to information is critical, and many chief executives acknowledge the potential of information technology and changing business models to improve business responsiveness (Scott 2004).

I have not found any previous work that reports the finding that even low-quality information is better than no information. As an example of research where high-quality information is stated to be better than low-quality information, I could cite Setia et al. (2013) article. Low-quality information will hinder executives' effective decision making when it comes to understanding and evaluating customer-oriented routines. Hence, with higher-quality information, executives are more likely to associate customer-oriented routines with enhanced productivity (Setia et al. 2013).

8.1.4 IT alignment is a key issue for private companies and not for public companies

In my study I found that IT and business alignment were seen as important in private companies and less important in public companies. Out of 8 private companies, 6 supported this finding, while no public organization listed IT alignment as important.

IT becomes not only a success factor for survival and prosperity but also an opportunity to differentiate and to achieve a competitive advantage. IT also offers a means for increasing productivity (Van Grembergen et al. 2004a).

One explanation of the importance of IT alignment for private companies might be the fact that achieving alignment is a constant struggle (Chan 1997, Hussin et al. 2002). The notion of strategic alignment is a part of the concept of ideal patterns of alignment and their influence on business performance (Bergeron et al. 2004).

Recent research suggests that, while IT and business alignment have been improving, and there is a strong correlation between alignment maturity and an organization's performance, there are still challenges that need to be addressed (Luftman et al. 2010). Interestingly, in my study, none of the CIOs, whether in public or private companies, mentioned the alignment of IT and business at all. I found this very strange, as alignment appeared to be a key issue in many research papers in the past (Luftman & McLean 2004, Luftman 2005, Luftman et al. 2006).

Earlier research in IS clearly found that there is no significant difference in how business and IT managers perceive the strategic alignment of IT and business, which may be a kind of consensus in terms of how IT strategy should be formulated (Burn & Szeto 2000). In my research this happened only in the case of private groups.

One study addresses the theoretically neglected interplay between organizational IT architecture and IT governance structures in shaping IT alignment (Tiwana & Konsynski 2009). Prior research has often narrowly viewed IT alignment as a "static end-state" where IT strategy exhibits a fit with organizational imperatives (Sabherwal et al. 2001). I also found that maintaining IT alignment is a dynamic, ongoing process driven by adaptive correction of emergent misfits between IT activities and perpetually evolving organizational imperatives (Hirschheim & Sabherwal 2001).

Leveraging IT successfully to transform the enterprise and to create products and services with added value has become a universal business competency (Guldentops 2003). From this viewpoint, the IT department moves from a commodity service provider to a strategic partner.

As researchers stated at the beginning of the 90s, enhancing business and key information strategy alignment will remain a key challenge for both business and information managers in the future (Broadbent & Weill 1993). IT-business alignment is an ongoing concern—some things never change (Luftman & Ben-Zvi 2010a, Preston & Karahanna 2009). Strategic alignment of IT and business strategies are among the issues that require management and consideration (Johnston et al. 2007).

8.1.5 IT as cost reduction enabler

My empirical material shows that key issues of the CIO's agenda include mostly cost-reduction issues. More than a half of the cases were struggling with these issues and most of them were in public organizations.

Cost reduction means that the cost of IT in general needs to be decreased. Also, cost reduction can be seen as an improvement action. It can involve

speeding up the process of doing things or improving resources using an IT investment. This kind of procedure can be seen as a cost reduction for the organization in the long run.

Researchers have studied top management's lack of corporate insight and failure to take responsibility and have claimed that these factors may explain failures in IT investment (Sohal & Ng 1998). On the other hand, such failures could be explained by an over-emphasis on cost reduction by top management, indicating a perspective that sees IT as more of a cost than a possible benefit (Jiang & Klein 2000).

In many cases, strong cost reduction issues are ongoing—on the one hand, creating savings from investing in and using more efficient information technology, and on the other hand, creating savings from an information technology budget.

A positive relationship has been identified between the strategic pay-off of IT-related investments and the level of social embeddedness of the technology as such (Chatfield & Yetton 2000). It has been shown that the more involved the top manager is in the everyday use of the technology, the more active the manager will be and, hence, the more successful the investment will be (Chatfield & Yetton 2000). A different approach is taken when focusing on cost allocation through chargeback mechanisms as a means of achieving successful line of sight and communication between IS and business (Ross et al. 1999). As they found in their empirical investigation, many companies have significant deficiencies in their cost allocation practices (Ross et al. 1999).

According to my findings, a CIO should be able to communicate in the company that we are not doing IT investment projects, but we are doing business development projects. Then corporate IT is not seen only as a cost reduction function, but as the facilitator too.

Studies suggest that any attempt to find a direct link between firm profitability and the value-added nature of IT is often a failure (Bharadwaj 2000). The strategic focus related to IT has been highlighted rather than focusing only on cost reduction in large entities (Levy et al. 2001).

As my research points out, top management understands best the numbers of dollars. Perhaps, in IS, a model should be imported from organizational management. In the management discipline, there is something called the AHP (the analytic hierarchy process), which generates relative ratio scales of measurement. The measures can be calculated and numerically compared to others. The AHP, with its relative measurement, offers a guide to the outcome of manipulations based on combining different measurements from a standard scale such as a criterion of benefits and costs, both measured in dollars, and used to select a best alternative (Saaty 1990). On the other hand, using this kind of measurement requires a lot of resources and know-how to use the information.

8.1.6 Change management as a key issue

A change is occurring in organizations and information systems. This change seems to be happening in terms of operational processes, and information systems are supporting this change. Change is often related to organizational or managerial issues for information systems and organizations themselves. Information system organization and information systems are important factors that businesses need to streamline often. My empirical material shows that key issues of the CIO's agenda mostly include change management issues. Of the cases, 13 were struggling with this issue.

An example of a big change is when the structure of IT governance has been totally changed and rebuilt from pieces. In this example, the structure was changed from a distributed model to a more centralized one.

The increased discussion of IT governance is evidence of the growing interest in IT in management culture. Information technology should not be stressed too much, since IT has a lot of other meanings as well, such as change management in organizations (Gottschalk 2001). One researcher's analysis of change management of IT governance based on group interviews demonstrated that there is a need for change management methods (Ihalainen 2010).

Key issues have been listed since the beginning of the 80s (Ball & Harris 1982, Brancheau & Wetherbe 1987, Dickson et al. 1984). In 2007, a list of the top 10 concerns related to the issue of managing change was introduced (Luftman & Kempaiah 2008). In another survey (Luftman et al. 2009), this issue was also listed in the top 10, but in more recent articles, it cannot be found anywhere in the list of top issues (Luftman & Ben-Zvi 2010a, Luftman & Ben-Zvi 2010b, Luftman & Derksen 2012).

IT organization is in the business of managing change. IT is constantly being driven by changing demands from the business as well as by changes in technologies. IT can drive or enable changes in the business. The objective is to improve the effectiveness of people involved while also minimizing the negative effects of change for the business. Managing change should be included as a key issue of strategic planning and IT governance. A large percentage of IT systems fail to deliver the benefits because the process of managing change was not appropriately addressed (Luftman & Kempaiah 2008).

8.1.7 IT Platform development as a key issue

My empirical material points out that IT platform development is listed as a new key issue. To the best of my knowledge, no earlier key issue list has mentioned this kind of platform development issue (Brancheau & Wetherbe 1987, Dickson et al. 1984, Luftman & Ben-Zvi 2010a, Luftman & Ben-Zvi 2010b).

IT platform building is a key issue for 8 cases out of 21. IT platform building is quite a common issue in the case of all groups. It is the least common in 3 out of 8 of private groups. IT platform building is a key action

related to good governance of IT. The IT platform is the foundation for all business applications. Proper IT governance guides inform future investment for hardware and software applications and systems.

My research material states that the decision processes surrounding investments in innovative IT platforms are complicated by uncertainty about expected payoffs and irreversibilities in the cost of implementation. Different options should be considered to properly structure the evaluation and management of investment opportunities, and thereby, capture the value of managerial flexibility.

According to my findings, flexible ICT means that the costs follow a business' volume, which means that a business is not stuck with a stiff cost structure. It is the aim for the company to remove one of the typical IT-related black spots.

While I found no research studies of IT platforms as an issue in CIOs' agendas, one finding that is somewhat close to my findings relates to information architecture. In the 90s in the United States, Brancheau et al. (1996) found that global information architecture was used to identify the major information categories used within an enterprise and their relationships to business processes. An infrastructure cannot be responsive if data are scattered throughout the network without a plan. Similarly, software cannot integrate across functions nor distribute across networks without a clear plan for doing so. An information architecture provides a way to coordinate these activities (Brancheau et al. 1996). An IT platform is a base to which complementary things can be added. The IT platform can be reused and completed with other add-ons. Information architecture, on the other hand, describes the whole architecture.

8.1.8 The CIO is hired from within the organization

One of my findings relates to whether CIOs are recruited internally (from within the organization) or externally. According to my research findings, when CIOs are occupying the role for the first time, they usually have a long prior career inside the firm.

To illustrate this, let me use the example of a story of one CIO's prior career inside a company: this person started working on technology and IT issues. In the 80s, everything was this person's responsibility, including the very first personal computer, measuring systems, automation, and telecommunication, beginning with structuring the cable. At this time, the individual was not deeply involved in information systems development or software coding but did have a side career in these fields. At the beginning of the 90s, this person worked in information services at a patent office. Later on, the individual's work involved financial and human resources management. After that, in the late 90s, the individual was the head of internal IT services, and a centralized service unit was created. From the beginning of the twentieth century, the individual had a role in IT governance as a CIO.

According to my research findings, the CIO is expected to play the role of bridging business and IT as well as management and IT. This expectation seems to be reflected in the survey results, particularly in the answers relating to CIOs' past careers. The rate of the responding companies in which the CIOs have worked in the information systems department from the beginning of their careers is small (20%). In many responding companies, people well versed in business processes and operations assumed CIO positions, such as those from corporate planning departments (27%), financial departments, and front-line operations (Yodokawa 2006).

Only 28% of CIO replacements in Europe were recruited from outside the company, while the figures were 56% and 37% for North America and Asia/Pacific respectively (Gottschalk & Taylor 2000).

8.1.9 CIO's work closely with the executive board in private companies

Mainstream adoption of the concept of the CIO's role appeared in the beginning of the 1980s when the CIO was portrayed as the corporate savior who was to align the worlds of technology and business (Grover et al. 1993). CIOs were described as the new breed of information managers and were considered businessmen first, managers second, and technologists third (Synnott 1987). CIOs were first appointed to major US corporations from the beginning of the 1980s.

The results of my study show that, in privately owned companies, the CIO is the highest rank in a hierarchy. As proof of their strong position in organizations, CIOs report to the CEO, the deputy CEO, or the CFO and have the possibility of participating in or delivering material to the executive board meetings. In public and in private and public groups, there are at least 2 levels between CIO and CEO. In public groups, the CIO reports to the administrative manager in 9 out of 11 cases, while in private and public groups, the CIO reports to the CFO in 2 out of 3 cases.

Every 2 in 3 CIOs report to the CEO or CFO in large companies in the United States (Luftman & Kempaiah 2008). Half of CIOs reported to the CEO in 2009 (Luftman & Ben-Zvi 2010a). The ideal CIO reporting structure (whether the CIO reports to the CEO or the CFO) is yet to be identified. There is an intuitive assumption among some proponents of IT that the CIO should always report to the CEO to promote the importance of IT and the CIO's clout in the firm, while some adversaries of IT call for a CIO-CFO reporting structure to keep a tab on IT spending (Banker et al. 2011).

As my results show, on the other hand, the IT alignment is a key issue in the case of private groups. This could mean that, inside this group, the IT is seen as an important facilitator and a competitive factor, and in the case of public groups, IT is seen, more or less, as a cost factor.

The CIO leadership role is evolving due to drastic changes brought about by new technologies, compliance issues, and the increasing impact IT is having on businesses. Organizations expect their CIOs to be more accountable,

especially when it comes to improving the performance of IT in the business, aligning IT and business units, and putting proper governance practices and policies in place (Luftman & Kempaiah 2008).

CIOs are deeply embedded in business organizations, helping CEOs to strategize and helping business unit leaders to implement strategies (Chun & Mooney 2009).

The CIOs of a business are seen as the primary stakeholders of the IT strategy, and hence, the champions of strategy formulation (Lee & Myers 2004).

8.1.10 Routines are outsourced

In some of my research cases, the CIOs believed that the competencies that are essential for an organization are kept inside the organization, whereas others can be outsourced or subcontracted. There are a couple of big companies with a very small number of IT personnel.

IT outsourcing has been defined as handing over the management of some or all of an organization's IT, IS, and related services to a third party (Willcocks et al. 1995). Since the beginning of the 90s, academic research on IS outsourcing has evolved rapidly (Dibbern et al. 2004).

The field of outsourcing research has grown due to the growth of the empirical world in which outsourcing actions have taken place. Key issues have been insourced, while routine issues have been moved outside of companies. The edge of the outsourcing is being found. How large a share of the tasks can be outsourced? What happens if the brand is kept in its own hands? What is the critical level of tasks to be kept inside the company before a company loses its know-how, its ability to take necessary actions, and its ability to retain enough independence to exert the power to make decisions regarding information and the business environment?

Given that IT is increasingly regarded as a cost center, the CIO is under constant pressure to cut the costs of IS operations in order to avoid outsourcing (Magnusson 2010).

In one of my research cases, all IT functions were outsourced except the brand and overall strategy management.

There has been a significant growth in IT outsourcing. At the extreme, the work of the entire IT organization is being transferred to external service providers. Three variants of IT outsourcing are currently receiving attention: utility computing, business process outsourcing, and offshoring. Together, these have a significant impact on the nature of the activities that have fallen within the CIO's domain (Chun & Mooney 2009). I have not found outsourcing research where the exact routines are highlighted with an outsourcing focus.

8.1.11 Three levels of global ICT governance structure

According to my research data, companies with international functions have three levels in their global ICT governance structure. These three levels are as follows: strategic, tactical, and operational. The operational level ensures smooth day-to-day operations, the tactical level ensures performance, and the strategic level improves the value of IT.

After analyzing the data gathered from my interviews with CIOs, I noticed that the continuity of functions and related IT systems exists at the most important level in the hierarchy. It is important that IT governance is done together with business. The management of regions and business sectors should be truly involved in the IT process; otherwise, the IT function will be isolated sooner or later. This kind of agreement and description is needed to ensure that ICT is aligned with business, that it creates value for the company, and that it is not seen only as a cost factor. As an outcome of my research, I believe that the most important issue in IT governance is how IT governance is related to the main function of the company and how it is connected to the business.

The issues related to the necessary settings for successful management of IT have been dealt with variously as strategic information systems planning (SISP) (Lederer & Sethi 1988), information resource management (IRM) (Lewis et al. 1995), and IS management (ISM) (Brancheau et al. 1996, Watson et al. 1997). However, these authors have focused on the internal efficiency of IS and the operational/tactical layers governing the IS resource (Weill & Ross 2004). Besides issues related to structure (Dearden 1965) and the loci of responsibility (Schwarz & Hirschheim 2003), more recent developments in IT Governance have turned toward organizing logic (Bettis & Prahalad 1986), authority patterns (Sambamurthy & Zmud 1999), and capabilities (Feeny & Willcocks 1998).

IT governance is the overall agreement in the organization in terms of how IT-related matters are managed and who participates in decision making. Governance issues (Daily et al. 2003) related to organizing IS are often portrayed as highly complex and cumbersome (Schwarz & Hirschheim 2003). Despite this portrayal, research into the phenomenon of IT governance has been relatively limited (Sambamurthy & Zmud 2000). To the best of my knowledge, no previous research in the current era has studied this phenomenon. I have not found results that have the same kind of definition of three levels of global ICT strategic structure with a strategic, tactical, and operational level.

8.2 Limitations

As in any study of this kind, it is important to recognize the study's limitations in terms of its theory, method, and findings. The limitations also help to identify opportunities for gaining further knowledge and understanding future research related to this important topic.

The first limitation of my study is the fact that it is subject to the typical limitations for qualitative studies (Lee & Baskerville 2003, Seddon & Scheepers 2012). While the number of interviews can be seen as small, especially compared to studies that use statistical surveys, it must be stressed that the key factor for interview studies is the point of saturation, as opposed to a high N or a certain predefined number of interviews (Seale 1999). Naturally, the saturation point is different for different contexts, and hence, no required number of interviews can be predefined. For example, Sarker et al. (2006) interviewed 8 people, while Olsson et al. (2008) interviewed 22. In my study, the interviews were stopped after 21 interviews, because saturation was achieved.

My second limitation concerns the selection of the interviewees. This research is limited in the same way as many qualitative interview studies published in top IS journals (e.g., Dibbern et al. 2008, Olsson et al. 2008, Levina & Vaast 2008, Strong & Volkoff 2010): the research study's subjects were not selected randomly. Again, scholars who have the perspective of favoring statistical surveys may argue that having a larger number of interviews with randomly selected decision makers would improve the work and give stronger support to its results. However, again, such an assumption about the sample and the random sample is only valid for statistical surveys where the idea is to select a representative sample that would reflect the characteristics of the population. They are not as meaningful when it comes to the paradigm of interpretive qualitative research (Lee & Baskerville 2003, Seddon & Scheepers 2012).

As a third limitation, the key boundary conditions are tied to the stages of a CIO's decision-making process. If these change, the theory no longer works.

Furthermore, the study subjects were from Finland, and therefore, it is reasonable to question whether the results would be comparable if the study was performed in a different society or culture. I assume that in a global context and in any high-technology society, similar results could be found.

Additionally, the study did not take into account the CIO's age, gender, educational background, or learning progress. These, of course, have some effects and CIOs may be classified using these characteristics. One might also find common features in each class. However, in this research the aim was to see behind these traditional classifications of CIOs. The focus was on the decision-making process and attributes related to issues.

Finally, the study adopts the viewpoint that the CIO is a decision maker. Hence, the study did not explore, for example, the surroundings of the CIO or the implications that the CIO's actions have on the decision model in the long run.

8.3 Practical implications

This section outlines the recommendations for practice based on my research findings. More precisely, I will suggest six implications for practice.

First, my findings suggest that the Finnish public sector does not understand how to take advantage of IT. This view is based on my finding that the public sector organizations do not align IT with operations and corporate governance. Moreover, they do not actively share information with the CIO. The CIO does not typically participate in executive board meetings. The public sector in Finland shares the idea widely that IT is just a cost factor.

I offer a number of specific recommendations on how to improve IT governance in Finland. The first principle is: get a competent expert involved who is specialized in IT and business alignment. You can recruit a person for yourself or subcontract a specialist outside the organization. Second, make a roadmap. This outlines where goals are enumerated and sufficient resources are ensured. Third, create a schedule to take the required steps. An accurate timetable with tasks and resources should be included. Fourth, if you want a competitive benefit, you need to take risks. This means that you should run pilots with products that are not yet mature or available to everybody. Fifth, cooperate with research and development organizations such as VTT and universities. Sixth, do international networking and get partners in other states; participate in EU Horizon programs as an end-user organization.

My second implication for practice concerns how organizations should see the role of CIO as a change facilitator. By enabling change to happen, IT can create an opportunity for companies to enhance their daily operations and reach long-term strategic goals. Novel IT governance helps businesses to recognize their needs. In this way, IT can deliver the best convenient solutions. What does a company need to do to make this happen? First, check your corporate governance and how IT is taken into account. Is IT mentioned at all or are there clear definitions and functions for IT? How is IT governance updated? Does top management participate? They should!

My third implication for practice is a recommendation to use my CIO decision-making process in organizations. More precisely, organizations can tailor IT to their specific use and, in this way, benefit from it. The way of utilizing a predefined model is a good way to start. When following the described six stages and transition conditions of the proposed CIO decision-making model in this thesis, you will be able to manage your issues one by one. In each stage, you'll have a documented status of the issue. For example, in the

plan stage, the task is to create different proposals (if there are any choices to make) as to how to solve the case. At the end of the plan stage, the last action is to select the most suitable proposal. A good example of issue management in the proposed CIO decision-making model is the dependency check and the calculation of ROI. With these checks, you can make sure what the impacts are and how long it will take to get the invested money back. Then, IT management might be in order. The decision-making model will clarify the handling of IT issues in companies by documenting issues and following up on changes.

As the fourth implication, IT platform development can be seen as a way to stabilize your use of information technology. New versions and releases of devices, software applications, and network solutions are being developed and used. Organizations have noticed that a solid base (IT platform) is needed to take new assets on board. A platform can be defined as something that has, as its content, the selected SW components and HW units.

Fifth, my findings regarding recruitment of the CIO from within the company as opposed to outside the company suggest that organizations often hire their CIOs from within the company. Perhaps this is good way to ensure that the new CIO knows the organization and personnel and has contacts already. This way of hiring is safe from the viewpoint of continuity and allows IT to be managed in a way that it has been up until the point of the hire. On the other hand, by hiring in this way, the company loses the opportunity to improve and bring new thinking into the organization.

The sixth implication for practice relates to outsourcing. Outsourcing is a way to manage and balance IT resources. In some cases it can be used to refresh an organization's own productivity and find out an alternative way to manage IT issues. Outsourcing is seen to cut fixed costs. As a good starting point, IT functions that can be outsourced include the helpdesk, training, or HW maintenance.

8.4 Implications for research

Based on my empirical results, I suggest 11 implications for future research about CIO decision making.

My practical implications (implications for practice) state that the Finnish public sector does not take advantage of IT. This view is based on my finding that public sector organizations do not align IT with operations and corporate governance. It should be studied as to why these organizations do not take advantage of IT in this way. Moreover, why do they not actively share information with CIOs, and why do CIOs not typically participate in executive board meetings?

One of my implications for research relates to outsourcing. I have not found outsourcing research in which routines are highlighted as the focus of outsourcing. Outsourcing is a way to manage and balance the resources of IT.

In some cases it can be used to refresh productivity and find an alternative way to manage IT issues. Outsourcing is seen to cut fixed costs. A good starting point to outsource IT functions could be the helpdesk, training, or HW maintenance. It could also be further researched how these outsourced routines have changed.

My empirical material suggests that IT platform development is a new key issue for companies. Earlier key issue research does not mention this kind of platform development issue (Brancheau & Wetherbe 1987, Dickson et al. 1984, Luftman & Ben-Zvi 2010a, Luftman & Ben-Zvi 2010b). This study could be replicated in Scandinavian countries to find out if there are similar results in these other Nordic countries.

As an implication for future research, IT governance could be researched more, as I will specify next. Governance issues (Daily et al. 2003) related to organizing IS are often portrayed as highly complex and cumbersome (Schwarz & Hirschheim 2003). Despite this portrayal, research into the phenomenon of IT governance has been relatively limited (Sambamurthy & Zmud 2000). To the best of my knowledge, no previous research results have organized the global ICT strategic structure according to three levels: strategic, tactical, and operational.

Using low-quality information for CIO decision making has also not been studied. As an example of research where high-quality information is studied, low-quality information can be seen to hinder the effective decision making of executives and their understanding and evaluation of customer-oriented routines. Hence, with higher-quality information, executives are more likely to associate customer-oriented routines with enhanced productivity (Setia et al. 2013). I have not found any previous studies that report that even low-quality information is better than no information at all. The kinds of situations in which low-quality information can be used and why it should be used needs to be researched further.

My research implication about recruitment of CIOs from within as opposed to outside the organization suggests that organizations often hire CIOs from within the organization. Perhaps this is a good way to ensure that new CIOs are familiar with the organization and the personnel and have contacts already. This way of the hiring is safe from the viewpoint of continuity and allows IT management to continue as it has been performed up until the point of the hire. On the other hand, by hiring the CIO in this way, changes might be prevented that could otherwise improve and bring new thinking into the organization. The exact reasoning behind the selection of a new CIO could be researched further.

As my research points out, top management best understands the value of dollars. Perhaps IS should use a model derived from organizational management. In the management discipline, there is something called the AHP (the analytic hierarchy process), which generates relative ratio scales of measurement. The measures are calculated and numerically compared to others.

The AHP, with its relative measurement, offers a guide to the outcome of manipulations based on combining different measurements from a standard scale such as a criterion of benefits and costs, both measured in dollars, and used to select a best alternative (Saaty 1990). On the other hand, using this kind of measurement requires many resources and know-how. Nevertheless, it is worth trying. The AHP method could be used to measure and analyze CIO's key issues.

My study subjects were from Finland, and it is reasonable to question whether the results can be found in other societies and cultures. I assume that, in a global context and in any high-technology societies, I would expect similar results. The CIO decision-making research could be replicated in different cultures and countries.

I had divided my 21 study subjects to the three groups: private, public, and public and private. In future research, other groups could be used to compare the results between different groups.

Additionally, the study did not take into account the CIO's age, gender, educational background, or learning progress, for example. These may have some effects and CIOs may be classified using these characteristics, and common features may be found inside each class. However, in this research the aim was to see behind these traditional classifications of CIOs. The focus was on the decision-making process, including the attributes related to the relevant issues. Whether the CIO's age, gender, educational background, or learning progress have a role on the CIO's decision making could also be studied further.

Finally, my study adopts the viewpoint that the CIO is a decision maker. Hence, the study did not explore, for example, the surroundings of the CIO or what implications the CIO's actions have for the decision-making model in the long run. In the future this could be studied in greater detail.

9 CONCLUSION

In this chapter, the findings and the significance and relevance of the research are summarized. The limitations of the study are discussed and further ideas are presented.

Society is dependent on information systems and technology. Information technology has provided new possibilities. However, technology does not only guarantee success. The crucial issue is how IT can be used to support the business benefits or goals of an organization. Usually, the CIO is one of the most important people in an organization. The CIO is not only responsible for the uninterrupted operational performance in terms of IT functions. Another key issue for the CIO is to provide IT services that can support new value creation (Grover et al. 1993, Lee & Myers 2004, Schwarz & Hirschheim 2003). In other words, the CIO's main task is to keep business running, to align IT with business (Hirschheim & Sabherwal 2001), and to communicate IT with other stakeholders inside and outside the organization (Grover et al. 1993, Ross et al. 1999).

Against this background, in my thesis I have tried to theorize and extend previous knowledge on governing IT related decision making by focusing on: the process by which an entity handles its IT key issues and the interplay between competing values in IT decision making. Past CIO research in information systems has concentrated on IT governance, the role of the CIO, and key issues in IT management. There have been several studies determining the key concerns of managers of information systems (Brancheau & Wetherbe 1987, Brancheau et al. 1996, Chun & Mooney 2009, Davenport & Buday 1988, Dickson et al. 1984, Gottschalk et al. 1997, Johnston et al. 2007, Moynihan 1990, Niederman et al. 1991, Rao et al. 1987, Watson et al. 1997). Key issues for IT executives have been studied annually since 2003 (Luftman & McLean 2004, Luftman 2005, Luftman et al. 2006, Luftman & Kempaiah 2008, Luftman et al. 2009, Luftman & Ben-Zvi 2010a). Also, IT value creation (Gupta 1991, McAfee & Brynjolfsson 2008) and IT governance have received the attention of IS scholars (Schwarz & Hirschheim 2003).

Despite the fact that these studies have increased our understanding of a number of important issues, including the key concerns of CIOs, IT value creation, and IT governance (to name a few), I have found no previous research that has examined the decision-making process of CIOs. This is surprising, especially considering the number of common activities of CIOs, whether these relate to key issues, IT governance, IT value creation, decision-making, or selection among alternative choices. For example, (Sambamurthy & Zmud 2000) note that the CIO research focus has been on the best practices for various organizational contingencies. However, the selection of the best practices require managerial judgment, context fitting, and hence, decision making (Siponen 2006). I argue that in order to support CIOs, it is important to know how CIOs make decisions. Therefore, it is no surprise that in other research disciplines, management processes have been studied, including strategic decision making (Eisenhardt & Zbaracki 1992), how to make a decision using the analytic hierarchy process (Saaty 1990), and whether the decision process matters (Dean & Sharfman 1996).

Therefore, the aim of this thesis was to contribute to the understanding of the CIO's decision making. However, before we can do that, we need to understand the context, namely the key issues of CIOs. The agenda of the CIO is studied with a particular focus on the factors influencing the CIO's perception of key issues.

A key result of my study is the creation of a process for CIO decision making. I found 11 research findings, 6 managerial implications, and 11 research implications. For IS research, this process provides a new understanding of how CIOs deal with any issue. In practice, this gives other CIOs a reference point to evaluate their own decision-making processes.

APPENDICES

APPENDIX 1 List of interviews conducted for the study

TABLE 29 Interviews conducted for public group case.

Company	Interviewee	Interviewer	Date	Size of the audio file	Pages
Public1	CIO	Jouko Selkälä	23.9.2009	49,5 MB	10
Public2	CIO	Jouko Selkälä	16.9.2009	41 MB	16
Public3	CIO	Jouko Selkälä	29.10.2009	54,8 MB	12
Public4	CIO	Jouko Selkälä	22.12.2009	25,3 MB	10
Public5	CIO	Jouko Selkälä	8.9.2009	54,9 MB	11
Public6	CIO	Jouko Selkälä	7.2.2012	40,2 MB	10
Public7	CIO	Jouko Selkälä	20.2.2012	45 MB	11
Public8	CIO	Jouko Selkälä	11.1.2012	42,9 MB	10
Public9	CIO	Jouko Selkälä	1.2.2012	57,6 MB	13
Public10	CIO	Jouko Selkälä	29.12.2011	53,8 MB	12

TABLE 30 Interviews conducted for private (state owns at least 50% of the company) group case.

Company	Interviewee	Interviewer	Date	Size of the audio file	Pages
Private&Public1	CIO	Jouko Selkälä	10.3.2010	27.7 MB	10
Public&Public2	CIO	Jouko Selkälä	18.3.2010	85,3 MB	18
Public&Public3	CIO	Jouko Selkälä	18.12.2009	37,8 MB	17

TABLE 31 Interviews conducted for private group case.

Company	Interviewee	Interviewer	Date	Size of the audio file	Pages
Private1	CIO	Jouko Selkälä	22.12.2009	25,1 MB	9
Private2	CIO	Jouko Selkälä	21.12.2009	32,8 MB	10
Private3	CIO	Jouko Selkälä	17.3.2010	29,5 MB	11
Private4	CIO	Jouko Selkälä	23.9.2009	79,9 MB	15
Private5	CIO	Jouko Selkälä	21.12.2009	29,6 MB	9
Private6	CIO	Jouko Selkälä	14.12.2009	17,1 MB	7
Private7	CIO	Jouko Selkälä	13.1.2012	50,3 MB	13
Private8	CIO	Jouko Selkälä	10.2.2012	55,3 MB	13

APPENDIX 2 Interview protocol and questions (a semi-structured model)

This study was conducted in a semi-structured way. Interviews were based on open questions (questions like "tell me about yourself," "tell me about IT governance in your company," "how are IT decisions made and why is the process like that"). If any information was left out when the CIO answered the open questions, complementary questions were asked according to this interview protocol and the question's list.

Phase 1. Introduction

This research is conducted to develop an understanding of how and why the role of the CIO is changing, what the key issues are, what the used decision-making model is relative to IT decisions, how the process has been developed, and why.

The following interview will concern the CIO's background, experience, role, and responsibilities. IT governance is gathered widely, as well as key issues of IT and the organization's model of IT and related functions.

Phase 2. Details on key informant and firm (complementary list of questions)

Personal information

Name and title
Position and job description
When started in this role?
Organizational level, surrounding organization
Reporting directions
Length of service with the company and industry
Educational background
Nature of prior professional experience, career, previous roles

Role of CIO

Describe briefly your job, duties, and responsibilities.
Who is setting targets / goals for IT-function?
What are your IT/CIO main contacts in your organization?
Who is your boss? His/her job description.

How is the status of IT/CIO function set? Is it a vital factor in your company or is it more like a complementary / service function?

IT governance (decision-making model)

How is IT governance / IT strategy created? Who participates, whose responsibility it is? Why is it organized like that?
What is the role of IT function?

What kind of IT governance organization do you have? What kind of changes have there been or will be? What is the original reason for these changes?
Who are your clients? How many clients do you have?
Have you a kind of product-based concept to respond to the client's needs? Otherwise, how do you operate?
Is your service model organized using a centralized, distributed, or hybrid model? Why is it like this?
What does IT governance mean? In general.
What kind of roles there are? Who has a role in IT governance and why?
Should somebody be more interested in IT governance and participate in it somehow?
What are the business goals of IT function / IT governance? Are there any?
How would you like to change the setup of IT Governance? Or how would you like to develop it?
Your typical working day? The tasks…
Can you name your responsibilities?
How many subordinates do you have? How many of them are direct/reporting to you?
Do you follow the IT governance by some metrics? What are the metrics? Are they based on some standards? Who is setting metrics/measures?
Are standards used in general? ITIL, Cobit, Spice, CMM, or other. Do you recognize these?
For what are these standards used?

IT management

How have you organized your IT actions? Do you have a lot of cooperation projects such as partnering, subcontracting, or offshoring? Why is it organized like this?
Have you had any insourcing or outsourcing actions? Why and how?
Do you have subcontracting? Why and how has it been organized?

Key issues

What are the current key issues at your desk? What are the near future plans in general?
What kind of pressures are relevant at the moment? Any cost, resource, schedule, or other pressures?
What kind of development programs are going on or being planned?

Decision making

How do you make IT-related decisions? What is the model like? Why it is like this?
How do the issues proceed in your desk? Why is this the way to manage decisions? What is the reasoning behind?

Do you have the power to make decisions? Are there any restrictions? Who participates in decision making? What are the other entities?

Other

What is the IT budget?
Do you collect feedback from your customers?
What is the biggest issue there? In customer feedback.
Is it possible to get competitive advantages from IT? Or is it possible to save costs from IT? If so, how…
Since you have a lot experience. In what kind of business do you think that IT is typically a competitive factor?
Can you utilize this in your own company?
How are the costs distributed in terms of IT function, salaries, hardware, software, …
Is information security an issue? Risks, challenges…
How is information security organized in your company, own unit, or organization? Why is it organized like this?
How do you take advantage of IT in your own work? What is missing? What would you like to have more?
What else would you like to say?
What is your recommendation for the next interviewee?

Many thanks!

APPENDIX 3 List of codes used for classifying and analyzing the empirical data in NVivo.

Tree Node	Child Level 1	Child Level 2	Definition
Multi case study			
	Public case group		This group Includes the cases that can be categorized as public cases, i.e., the state of Finland funds and owns these entities.
		Public1	Case 1 of public case group
		Public2	Case 2 of public case group
		Public3	Case 3 of public case group
		Public4	Case 4 of public case group
		Public5	Case 5 of public case group
		Public6	Case 6 of public case group
		Public7	Case 7 of public case group
		Public8	Case 8 of public case group
		Public9	Case 9 of public case group
		Public10	Case 10 of public case group
	Private&Public case group		This group Includes the cases that can be categorized as private and public cases, i.e., the state of Finland owns more than 50% of these entities.
		Private&Public1	Case 1 of private and public case group
		Private&Public2	Case 2 of private and public case group
		Private&Public3	Case 3 of private and public case group
	Private case group		This group Includes the cases that can be categorized as private cases.
		Private1	Case 1 of private and public case group
		Private2	Case 2 of private and public case group
		Private3	Case 3 of private and public case group
		Private4	Case 4 of private and public case group
		Private5	Case 5 of private and public case group
		Private6	Case 6 of private and public case group
		Private7	Case 7 of private and public case group
		Private8	Case 8 of private and public case group
CIO			
	Education		
	Experience		
	Level in organization		
	Organization		
	Role of CIO		
	Subordinates		
IT management			
	Description		

Tree Node	Child Level 1	Child Level 2	Definition
	IT management model		
		Distributed	
		Centralized	
		Hybrid	
	The meaning of the IT organization		
		Supporting function	
		Key function	
	IT structure		
	Resourcing		
		Own resources	
		Partnering	
		Strategic issues in resourcing	Might include issues like outsourcing, off-shoring, insourcing, partnering
	IT security		
	Size of the IT function		
	Standards and models		
	Top slogans		
	Key issues		
Key issues			
	Cost reduction		
	Change management		
		organizational governance	
	IT and business alignment		
	IT architecture building		
	IT platform building		
	Centralization		
	International / global operations		
IT governance			
	Maturity (C)	The CIOs experienced their IT strategic maturity	
		Just a cost factor (C1)	
		The enabler of the compatibility (C2)	
		Mandatory (C3)	
		The facilitator for the operational development (C4)	
		Enhances the operational compatibility (C5)	
		The accelerator for new market and business improvement (C6)	
	Levels (D)	The maturity of levels of the definition of IT governance as	

Tree Node	Child Level 1	Child Level 2	Definition
		experienced by CIOs.	
		IT governance is independent (D1)	
		IT governance is inherited from corporate governance (D2)	
		IT governance is included in corporate governance (D3)	
		IT governance is not needed (D4)	
		Corporate governance is enough for the company (D5)	
	Maintenance (E)	How CIOs experience the updating definition, process, and schedule of IT governance.	
		E1 – Once written and it will do	
		E2 – Long term updates	
		E3 – Maintaining synchronized with corporate governance	
		E4 – Maintained annually according to the governance description	
		E5 – Kept up to date	
	Steps (F)	Maturity steps according to how CIOs experience them.	
		F1 – CIO's task	
		F2 – CIO's task with IT management team	
		F3 – IT management team's task	
		F4 – CIO's task, attempt to involve boss	
		F5 – CIO's task, upper management committed	
		F6 – Upper management rules	
		F7 – Business management drives input	
		F8 – Cooperation of	

Tree Node	Child Level 1	Child Level 2	Definition
		top management and CIO	
Decision making			
	Model elements		
		Key issues categories	
			Must
			Strategic
			Important
			Nice to have
			Waste
		Description	
			ROI
			IT compatibility
			Priority
			Textual proposal
		Plan	
			Visualization
			Costs
			Justification
			Summary
		Resource & Schedule	
			Resources
			Budget
			Timetable
		Audit & Supervise	
			Dependencies
			Privacy and data protection
			Laws and regulations
			Security and risks
			Organization

REFERENCES

Abbott A (1988) The system of professions: An essay on the division of expert labor. University of Chicago Press, Chicago.

Ahituv N, Neumann S & Zviran M (1989) Factors affecting the policy for distributing computing resources. MIS Quarterly 13(4): 389-401.

Ahuja MK, Chudoba K, Kacmar C, McKnight D & George J (2007) IT road warriors: Balancing work family conflict, job autonomy, and work overload to mitigate turnover intentions. MIS Quarterly 31(1): 1-17.

Amason AC (1996) Distinguishing the effects of functional and dysfunctional conflict on strategic decision making: Resolving a paradox for top management teams. Academy of Management Journal 39(1): 123-148.

Anderson D, Sweeney D, Williams T, Camm J & Cochran J (2015) An introduction to management science: quantitative approaches to decision making. Cengage Learning.

Avison D, Jones J, Powell P & Wilson D (2004) Using and validating the strategic alignment model. Journal of Strategic Information Systems 13(3): 223-246.

Avison D, Cuthbertson C & Powell P (1999) The paradox of information systems: Strategic value and low status. Journal of Strategic Information Systems 8(4): 419-445.

Ball L & Harris R (1982) SMIS members: a membership analysis. MIS Quarterly 6(1): 19-38.

Banker RD, Hu N, Pavlou PA & Luftman J (2011) CIO reporting structure, strategic positioning, and firm performance. MIS Quarterly 35(2): 487-504.

Bannister F & Remenyi D (2000) Acts of faith: instinct, value and IT investment decisions. Journal of Information Technology 15(3): 231-241.

Baroudi JJ (1985) The impact of role variables on IS personnel work attitudes and intentions. MIS Quarterly 9(4): 341-356.

Bartol KM & Martin DC (1982) Managing information systems personnel: A review of the literature and managerial implications. MIS Quarterly 6: 49-70.

Barua A, Konana P, Whinston AB & Yin F (2004) An empirical investigation of net-enabled business value. MIS Quarterly 28(4): 585-620.

Beaudry A & Pinsonneault A (2005) Understanding user responses to information technology: A coping model of user adaptation. MIS Quarterly 29(3): 493-524.

Benaroch M, Jeffery M, Kauffman RJ & Shah S (2007) Option-based risk management: a field study of sequential information technology investment decisions. Journal of Management Information Systems 24(2): 103-140.

Benjamin RI, Dickinson Jr C & Rockart JF (1985) Changing role of the corporate information systems officer. MIS Quarterly 9(3): 177-188.

Benjamin RI & Levinson E (1993) A framework for managing IT-enabled change. Sloan Management Review 34(4): 23–33.

Berger PL & Luckmann T (1967) The Social Construction of Reality: A Treatise in the Sociology of Knowledge. Allen Lane/The Penguin Press, London.

Bergeron F, Raymond L & Rivard S (2004) Ideal patterns of strategic alignment and business performance. Information & Management 41(8): 1003-1020.

Berglund A (2006) Phenomenography as a way to research learning in computing. Bulletin of the National Advisory Committee on Computing Qualifications, BACIT 4(1).

Bernstein RJ (1983) Beyond objectivism and relativism: Science, hermeneutics, and praxis. University of Pennsylvania Press.

Bettis RA & Prahalad CK (1986) The dominant logic: A new linkage between diversity and performance. Strategic Management Journal 7(6): 485-501.

Bharadwaj AS (2000) A resource-based perspective on information technology capability and firm performance: an empirical investigation. MIS Quarterly 24(1): 169-196.

Bleicher J (1980) Contemporary hermeneutics: Hermeneutics as method, philosophy and critique. Routledge & Kegan Paul. London.

Boland R (1985) Phenomenology: A preferred approach to research on information systems. In Research Methods in Information Systems, North-Holland, Amsterdam, pp. 193-201.

Boynton AC, Jacobs GC & Zmud RW (1992) Whose responsibility is IT management. Sloan Management Review 33(4): 32-38.

Brancheau JC, Janz BD & Wetherbe JC (1996) Key issues in information systems management: 1994-95 SIM Delphi results. MIS Quarterly 20(2): 225-242.

Brancheau JC & Wetherbe JC (1987) Key issues in information systems -- 1986. MIS Quarterly 11(1): 23-45.

Broadbent M & Weill P (1993) Improving business and information strategy alignment: Learning from the banking industry. IBM Systems Journal 32(1): 162-179.

Broadbent M, Weill P & St. Clair D (1999) The implications of information technology infrastructure for business process redesign. MIS Quarterly 23(2): 159-182.

Brown AE & Grant GG (2005) Framing the frameworks: A review of IT governance research. Communications of the Association for Information Systems 15: 696-712.

Brown CV & Magill SL (1994) Alignment of the IS functions with the enterprise: Toward a model of antecedents. MIS Quarterly 18(4): 371-403.

Bruner J (1991) The narrative construction of reality. Critical Inquiry 18(1): 1-21.

Burn JM & Szeto C (2000) A comparison of the views of business and IT management on success factors for strategic alignment. Information & Management 37(4): 197-216.

Burton-Jones A, McLean ER & Monod E (2011) On approaches to building theories: Process, variance and systems. Working paper, Sauder School of Business, UBC.

Burton-Jones A, McLean ER & Monod E (2015) Theoretical perspectives in IS research: from variance and process to conceptual latitude and conceptual fit. European Journal of Information Systems 24(6): 664–679

Camillus JC & Lederer AL (1985) Corporate strategy and the design of computerized information systems. Sloan Management Review 26(3): 35-42.

Carr NG (2004) IT doesn't matter. IEEE Eng Manage Rev 32(1): 24-32.

Chan H (1997) Barclay, & Copeland (1997) YE Chan, SL Huff, DW Barclay and DG Copeland, Business strategic orientation, information systems strategic orientation, and strategic alignment. Information Systems Research 8(2): 125–150.

Chatfield AT & Yetton P (2000) Strategic payoff from EDI as a function of EDI embeddedness. Journal of Management Information Systems 16(4): 195-224.

Chen ANK & Edgington TM (2005) Assessing value in organizational knowledge creation: Considerations for knowledge workers. MIS Quarterly 29(2): 279-309.

Chua WF (1986) Radical developments in accounting thought. Accounting Review 61(4): 601-632.

Chun M & Mooney J (2009) CIO roles and responsibilities: Twenty-five years of evolution and change. Information & Management 46(6): 323-334.

Cragg P, King M & Hussin H (2002) IT alignment and firm performance in small manufacturing firms. Journal of Strategic Information Systems 11(2): 109-132.

Cross J, Earl MJ & Sampler JL (1997) Transformation of the IT function at British Petroleum. MIS Quarterly 21(4): 401-423.

Croteau AM & Bergeron F (2001) An information technology trilogy: business strategy, technological deployment and organizational performance. Journal of Strategic Information Systems 10(2): 77-99.

Daily CM, Dalton DR & Cannella Jr AA (2003) Corporate governance: Decades of dialogue and data. Academy of Management Review 28(3): 371-382.

Davenport T & Buday R (1988) Critical issues in information systems management in 1988. Index Group .

Davenport TH (1998) Putting the enterprise into the enterprise system. Harvard Business Review 76(4): 121-131.

Davis GB, Lee AS, Nickles KR, Chatterjee S, Hartung R & Wu Y (1992) Diagnosis of an information system failure: A framework and interpretive process. Information & Management 23(5): 293-318.

Dean JW & Sharfman MP (1996) Does decision process matter? A study of strategic decision-making effectiveness. Academy of Management Journal 39(2): 368-392.

Dearden J (1965) How to organize the information systems. Harvard Business Review 42(2): 65-73.

Denzin NK & Lincoln YS (2005) The Sage handbook of qualitative research. Sage Publications.

Devaraj S & Kohli R (2000) Information technology payoff in the health-care industry: a longitudinal study. Journal of Management Information Systems 16(4): 41-67.

Dibbern J, Goles T, Hirschheim R & Jayatilaka B (2004) Information systems outsourcing: a survey and analysis of the literature. ACM SIGMIS Database 35(4): 6-102.

Dickson GW, Leitheiser RL, Wetherbe JC & Nechis M (1984) Key information systems issues for the 1980's. MIS Quarterly 8(3): 135-159.

Druker J (2003) Strategy and human resource management. Emerald Group Publishing Limited.

Ein-Dor P & Segev E (1978) Organizational context and the success of management information systems. Management Science 24(10): 1064-1077.

Ein-Dor P & Segev E (1982) Organizational context and MIS structure: Some empirical evidence. MIS Quarterly 6(3): 55-68.

Eisenhardt KM & Zbaracki MJ (1992) Strategic decision making. Strategic Manage Journal 13(S2): 17-37.

Feeny DF & Willcocks LP (1998) Core IS capabilities for exploiting information technology. Sloan Management Review 39(3): 9-21.

Francalanci C & Galal H (1998) Information technology and worker composition: Determinants of productivity in the life insurance industry. MIS Quarterly 22(2): 227-241.

Francis H (1993) Advancing phenomenography: Questions of method. Nordisk Pedagogik 13(2): 68-75.

Franklin II CL (2013) Developing expertise in management decision-making. Academy of Strategic Management Journal 12(1): 21.

Freidson E (1986) Professional Powers: A Study of the Institutionalization of Formal Knowledge. University of Chicago Press, Chicago.

Gadamer HG (1975) Truth and method (G. Barden & J. Cumming, Trans.). Seabury, New York.

Gadamer HG (1976) The historicity of understanding. Critical sociology. In Selected Readings, Penguin, Harmondsworth, pp. 117-133.

Goldstein DK & Rockart JF (1984) An examination of work-related correlates of job satisfaction in programmer/analysts. MIS Quarterly 8(2): 103-115.

Gottschalk P (2000) Studies of key issues in IS management around the world. International Journal of Information Management 20(3): 169-180.

Gottschalk P (2001) The changing roles of IT leaders. In Strategic Information Technology: Opportunities for Competitive Advantage, IGI Global, pp. 169-184.

Gottschalk P, Christensen BH & Watson RT (1997) Key issues in information systems management surveys: methodological issues and choices in a Norwegian context. Scandinavian Journal of Information Systems 9: 57-66.

Gottschalk P & Taylor NJ (2000) Strategic management of IS/IT functions: the role of the CIO. In Proceedings of the 33rd Hawaii International Conference on System Sciences - 2000. IEEE: 10 pp.

Grover V, Jeong SR, Kettinger WJ & Lee CC (1993) The chief information officer: A study of managerial roles. Journal of Management Information System 10(2): 107-130.

Guldentops E (2003) IT Governance: Part and Parcel of Corporate Governance, CIO Summit. European Financial Management and Marketing Conference, Brussels.

Gupta JND, Sharma SK & Hsu J (2004) An overview of knowledge management. In Creating Knowledge Based Organizations, IGI Global, pp. 1-28.

Gupta YP (1991) The chief executive officer and the chief information officer: the strategic partnership. Journal of Information Technology 6(3): 128-139.

Hirschheim R & Sabherwal R (2001) Detours in the path toward strategic information systems alignment. California Management Review 44(1): 87-108.

Hirschheim R (1992) Information systems epistemology: an historical perspective. In Galliers, R. (ed.), Information Systems Research : Issues, Methods and Practical Guidelines, Blackweel Scientific Publications, London, pp. 28-60.

Holstein JA & Gubrium JF (1995) The active interview. Sage Publications.

Hunter R & Westerman G (2009) Gartner Says CIOs Must Communicate Risk and Return in Business Terms.
URL: http://www.gartner.com/it/page.jsp?id=1212213.

Huotari M & Savolainen R (2003) Tietohallintoa vai tietojohtamista? Tutkimusalan identiteettiä etsimässä.
URL: http://ojs.tsv.fi/index.php/inf/article/view/2191/2029.

Hussin H, King M & Cragg P (2002) IT alignment in small firms. European Journal of Information Systems 11(2): 108-127.

Ihalainen H (2010) Tietohallinto osana julkishallinnon sähköistyvää muutosta (IT governance as a part of change in information systems). Ph.D. thesis, Acta Electronica Universitatis Lapponiensis, 62.

Irani Z & Love PED (2000) The propagation of technology management taxonomies for evaluating investments in information systems. Journal of Management Information Systems 17(3): 161-177.

Jaccard J & Jacoby J (2009) Theory construction and model-building skills: A practical guide for social scientists. Guilford Press.

Jalonen H (2008) Informaatio-ohjaus tietojohtamisen näkökulmasta. Informaatiotutkimus 27(2): 34-47.

Jarvenpaa SL & Leidner DE (1997) An information company in Mexico: extending the resource-based view of the firm. In ICIS '97 Proceedings of the Eighteenth International Conference on Information Systems. Association for Information Systems, Atlanta, GA, pp. 399-410.

Järvinen P (2000) Research questions guiding selection of an appropriate research method. In Proceedings of the 8th European Conference on Information Systems (ECIS), pp. 124-131.

Jayatilaka B, Schwarz A & Hirschheim R (2003) Determinants of ASP choice: an integrated perspective. European Journal of Information Systems 12(3): 210-224.

Jeffrey M & Leliveld I (2003) IT portfolio management. Challenges and best practices. Technical report, Kellogg School of Management.

Jiang JJ & Klein G (2000) Effects of downsizing policies on IS survivors' attitude and career management. Information & Management 38(1): 35-45.

Johnson RB & Onwuegbuzie AJ (2004) Mixed methods research: A research paradigm whose time has come. Educational Researcher 33(7): 14-26.

Johnston K, Muganda N & Theys K (2007) Key issues for CIOs in South Africa. Electronic Journal of Information Systems in Developing Countries 30(3): 1-11.

Kaapu T (2010) Reaching the diversity of users' understandings: a methodological renewal. PhD Thesis, Tampere University Press, http://urn.fi/urn:isbn:978-951-44-8198-7.

Kaplan B & Maxwell J (2005) Qualitative research methods for evaluating computer information systems. In Evaluating the Organizational Impact of Healthcare Information Systems, Springer, pp. 30-55.

Karahanna E, Agarwal R & Angst C (2006) Reconceptualizing compatibility beliefs in technology acceptance research. MIS Quarterly 30(4): 781-804.

Karimi J, Bhattacherjee A, Gupta YP & Somers TM (2000) The effects of MIS steering committees on information technology management sophistication. Journal of Management Information Systems 17(2): 207-230.

Kayworth T & Sambamurthy V (2000) Managing the information technology infrastructure. Baylor Business Review 18(1): 13-15.

Kearns G & Lederer A (2000) The effect of strategic alignment on the use of IS-based resources for competitive advantage. Journal of Strategic Information Systems 9(4): 265-293.

Klein HK & Myers MD (1999) A set of principles for conducting and evaluating interpretive field studies in information systems. MIS Quarterly 23(1): 67-93.

Lacity MC & Willcocks LP (1998) An empirical investigation of information technology sourcing practices: lessons from experience. MIS Quarterly 22(3): 363-408.

Lederer AL & Mendelow AL (1988) Convincing top management of the strategic potential of information systems. MIS Quarterly 12(4): 525-534.

Lederer AL & Sethi V (1988) The implementation of strategic information systems planning methodologies. MIS Quarterly 12(3): 445-461.

Lee JC & Myers MD (2004) Dominant actors, political agendas, and strategic shifts over time: a critical ethnography of an enterprise systems implementation. Journal of Strategic Information Systems 13(4): 355-374.

Levy M, Powell P & Yetton P (2001) SMEs: aligning IS and the strategic context. Journal of Information Technology 16(3): 133-144.

Lewis BR, Snyder CA & Rainer Jr RK (1995) An empirical assessment of the information resource management construct. Journal of Management Information System 12(1): 199-223.

Lin C & Pervan G (2003) The practice of IS/IT benefits management in large Australian organizations. Information & Management 41(1): 13-24.

Lincoln YS & Guba EG (1985) Naturalistic inquiry. Sage Publications.

Lopes A & Galletta D (1997) Resource-based theory and a structural perspective of strategy applied to the provision of internet services. In Proceedings of the Third Americas Conference on Information Systems (AMCIS 1997), Paper 229.

Luftman J (2005) Key issues for IT executives 2004. MIS Quarterly Executive 4(2): 269-285.

Luftman J & Ben-Zvi T (2010a) Key issues for IT executives 2009: Difficult economy's impact on IT. MIS Quarterly Executive 9(1): 49-59.

Luftman J, Ben-Zvi T, Dwivedi R & Rigoni EH (2010) IT governance: an alignment maturity perspective. International Journal on IT/Business Alignment and Governance 1(2), 13 pp.

Luftman J & Derksen B (2012) Key issues for IT executives 2012: Doing more with less. MIS Quarterly Executive 11(4): 207-218.

Luftman J & Kempaiah R (2008) Key issues for IT executives 2007. MIS Quarterly Executive 7(2): 99-112.

Luftman J, Kempaiah R & Nash E (2006) Key issues for IT executives 2005. MIS Quarterly Executive 5(2): 81-99.

Luftman J, Kempaiah R & Rigoni EH (2009) Key issues for IT executives 2008. MIS Quarterly Executive 8(3): 151-159.

Luftman J & McLean ER (2004) Key issues for IT executives. MIS Quarterly Executive 3(2): 89-104.

Luftman J & Ben-Zvi T (2010b) Key issues for IT executives 2010: judicious IT investments continue post-recession. MIS Quarterly Executive 9(4): 263-273.

Lyytinen K, Newman M & Al-Muharfi ARA (2009) Institutionalizing enterprise resource planning in the Saudi steel industry: A punctuated socio-technical analysis. Journal of Information Technology 24(4): 286-304.

Madsen S, Kautz K & Vidgen R (2006) A framework for understanding how a unique and local IS development method emerges in practice. European Journal of Information Systems 15(2): 225-238.

Magnusson J (2010) Unpackaging IT governance. PhD thesis, School of Business, Economics and Law, University of Gothenburg, BAS Publishing.

Main TJ & Short JE (1989) Managing the merger: building partnership through IT planning at the new Baxter. MIS Quarterly 13(4): 469-484.

Malhotra A, Gosain S & El Sawy OA (2005) Absorptive capacity configurations in supply chains: gearing for partner-enabled market knowledge creation. MIS Quarterly 29(1): 145-187.

March JG & Simon HA (1958) Organizations. John Wiley & Sons, New York.

Markus ML & Robey D (1988) Information technology and organizational change: causal structure in theory and research. Management Science 34(5): 583-598.

Markus ML & Saunders C (2007) Editor's comments -- Looking for a few good concepts… and theories… for the information systems field. MIS Quarterly 31(1).

Marton F (1996) Cognosco ergo sum: Reflections on reflections. In Reflections on Phenomenography: Toward a Methodology? University of Göteborg, pp. 163-202.

Marton F, Booth S & Booth SA (1997) Learning and awareness. Lawrence Erlbaum.

McAfee A & Brynjolfsson E (2008) Investing in the IT that makes a competitive difference. Harvard Business Review 86(7/8): 98-107.

McLeod L & Doolin B (2011) Information systems development as situated socio-technical change: a process approach. European Journal of Information Systems 21(2): 176-191.

Miles MB & Huberman AM (1994) Qualitative data analysis: An expanded sourcebook. SAGE Publications.

Min S, Suh E & Kim S (1999) An integrated approach toward strategic information systems planning. Journal of Strategic Information Systems 8(4): 373-394.

Mintzberg H (1978) Patterns in strategy formation. Management Science 24(9): 934-948.

Mintzberg H, Raisinghani D & Theoret A (1976) The structure of "unstructured" decision processes. Administrative Science Quarterly 21(2): 246-275.

Mitra S (2005) Information technology as an enabler of growth in firms: An empirical assessment. Journal of Management Information Systems 22(2): 279-300.

Mohr LB (1982) Explaining organizational behavior. Jossey-Bass, San Francisco.

Moynihan T (1990) What chief executives and senior managers want from their IT departments. MIS Quarterly 14(1): 15-25.

Myers MD (2008) Qualitative research in business and management. Sage Publications.

Myers MD & Avison D (1997) Qualitative research in information systems. MIS Quarterly 21(2): 241-242.

Myers MD & Newman M (2007) The qualitative interview in IS research: Examining the craft. Information and Organization 17(1): 2-26.

Neirotti P & Paolucci E (2007) Assessing the strategic value of Information Technology: An analysis on the insurance sector. Information and Management 44(6): 568-582.

Newkirk HE & Lederer AL (2006) The effectiveness of strategic information systems planning under environmental uncertainty. Information & Management 43(4): 481-501.

Newman M & Robey D (1992) A social process model of user-analyst relationships. Mis Quarterly 16(2): 249-266.

Niederman F, Brancheau JC & Wetherbe JC (1991) Information Systems Management Issues for the 1990s. MIS Quarterly 15(4): 475-500.

O'Connor NG & Martinsons MG (2006) Management of information systems: insights from accounting research. Information & Management 43(8): 1014-1024.

Olson MH & Chervany NL (1980) The relationship between organizational characteristics and the structure of the information services function. MIS Quarterly 4(2): 57-68.

Orlikowski WJ & Baroudi JJ (1988) The information systems profession: myth or reality? Office Technology and People 4(1): 13-30.

Orlikowski WJ & Baroudi JJ (1991) Studying information technology in organizations: Research approaches and assumptions. Information systems research 2(1): 1-28.

Osteraker M (2002) Phenomenography as a research method in management research. In 2nd Annual EURAM Conference on Innovative Research in Management, European Academy of Management (EURAM), Stockholm.

Palmer RE (1969) Hermeneutics: Interpretation theory in Schleiermacher, Dilthey, Heidegger and Gadamer. Northwestern University Press.

Pang MF (2003) Two faces of variation: on continuity in the phenomenographic movement. Scandinavian Journal of Educational Research 47(2): 145-156.

Papp R (2001) Strategic information technology: opportunities for competitive advantage. IGI Global.

Paré G, Bourdeau S, Marsan J, Nach H & Shuraida S (2008) Re-examining the causal structure of information technology impact research. European Journal of Information Systems 17(4): 403-416.

Peacock E & Tanniru M (2005) Activity-based justification of IT investments. Information & Management 42(3): 415-424.

Peppard J (1999) Information management in the global enterprise: an organising framework. European Journal of Information Systems 8(2): 77-94.

Peterson MF (1998) Embedded organizational events: The units of process in organization science. Organization Science 9(1): 16-33.

Peterson RR (2003) Integration strategies and tactics for information technology governance. In Strategies for Information Technology Governance, IGI Global, pp. 37-80.

Piccoli G & Ives B (2005) Review: IT-dependent strategic initiatives and sustained competitive advantage: A review and synthesis of the literature. MIS Quarterly 29(4): 747-776.

Pinsonneault A & Rivard S (1998) Information technology and the nature of managerial work: from the productivity paradox to the Icarus paradox? MIS Quarterly 22(3): 287-311.

Powell TC & Dent-Micallef A (1997) Information technology as competitive advantage: The role of human, business, and technology resources. Strategic Manage Journal 18(5): 375-405.

Prahalad C & Krishnan M (2002) The dynamic synchronization of strategy and information technology. MIT Sloan Management Review 43(4): 24-33.

Preston D & Karahanna E (2009) How to Develop a Shared Vision: The Key to IS Strategic Alignment. MIS Quarterly Executive 8(1): 1-8.

Quan JJ, Qing H & Hart PJ (2004) Information technology investments and firms' performance—a duopoly perspective. Journal of Management Information Systems 20(3): 121-158.

Rao K, Huff F & Davis G (1987) Critical issues in the management of information systems: a comparison of Singapore and the USA. Information Technology 1(3): 11–19.

Reich BH & Benbasat I (2000) Factors that influence the social dimension of alignment between business and information technology objectives. MIS Quarterly 24(1): 81-113.

Remenyi D, Lubbe S & Van Heerden J (2000) Some ad hoc information systems issues in South Africa for the new millennium and suggestions as to how to deal with them. Information Technology for Development 9(3): 163-174.

Renström L (1988) Conceptions of matter. A phenomenographic approach. University of Göteborg.

Robey D & Newman M (1996) Sequential patterns in information systems development: an application of a social process model. ACM Transactions on Information Systems (TOIS) 14(1): 30-63.

Rocheleau B (2003) Politics, accountability, and governmental information systems. In Public Information Technology: Policy and Management Issues, IGI Global, pp. 20-52.

Rockart JF, Ball L & Bullen CV (1982) Future role of the information systems executive. MIS Quarterly 6(Special Issue): 1-14.

Rockart JF, Earl MJ & Ross JW (1996) Eight imperatives for the new IT organization. Sloan Management Review 38(1): 43.

Ross JW, Beath CM & Goodhue DL (1998) Develop long-term competitiveness through IT assets. IEEE Engineering Management Review 26(2): 37-47.

Ross JW, Vitale MR & Beath CM (1999) The untapped potential of IT chargeback. MIS Quarterly 23(2): 215-237.

Ross JW & Weill P (2005) A matrixed approach to designind it governance. MIT Sloan Management Review 46(2): 26.

Rubin HJ & Rubin I (2005) Qualitative interviewing: The art of hearing data. Sage Publications.

Ryan SD & Harrison DA (2000) Considering social subsystem costs and benefits in information technology investment decisions: a view from the field on anticipated payoffs. Journal of Management Information Systems 16(4): 11-40.

Saaty TL (1990) How to make a decision: the analytic hierarchy process. European Journal of Operational Research 48(1): 9-26.

Sabherwal R, Hirschheim R & Goles T (2001) The dynamics of alignment: Insights from a punctuated equilibrium model. Organization Science 12(2): 179-197.

Sadiq W & Orlowska ME (2000) Analyzing process models using graph reduction techniques. Information Systems 25(2): 117-134.

Sambamurthy V, Bharadwaj A & Grover V (2003) Shaping agility through digital options: Reconceptualizing the role of information technology in contemporary firms. MIS Quarterly 27(2): 237-263.

Sambamurthy V & Zmud RW (2000) Research commentary: The organizing logic for an enterprise's IT activities in the digital era -- A prognosis of practice and a call for research. Information Systems Research 11(2): 105-114.

Sambamurthy V & Zmud RW (1999) Arrangements for information technology governance: A theory of multiple contingencies. MIS Quarterly 23(2): 261.

Santalainen T (2005) Strateginen ajattelu. Talentum, Helsinki. (in Finnish)

Santhanam R & Hartono E (2003) Issues in linking information technology capability to firm performance. MIS Quarterly 27(1): 125-153.

Sarker S & Sahay S (2003) Understanding virtual team development: An interpretive study. Journal of the Association for Information Systems 4(1): 1-38.

Schwarz A & Hirschheim R (2003) An extended platform logic perspective of IT governance: managing perceptions and activities of IT. Journal of Strategic Information Systems 12(2): 129-166.

Scott I (2004) CEOs more aware of IT's potential.
URL: http://www.gartner.com/it/page.jsp?id=1212213.

Seddon PB & Scheepers R (2012) Towards the improved treatment of generalization of knowledge claims in IS research: Drawing general conclusions from samples. European Journal of Information Systems 21(1): 6-21.

Setia P, Venkatesh V & Joglekar S (2013) Leveraging digital technologies: How information quality leads to localized capabilities and customer service performance. MIS Quarterly 37(2): 565-590.

Shin N (2001) The impact of information technology on financial performance: the importance of strategic choice. European Journal of Information Systems 10(4): 227-236.

Simon HA (1960) The new science of management decision. Harper, New York.

Siponen M (2006) Information security standards focus on the existence of process, not its content. Communications of the ACM 49(8): 97-100.

Sircar S, Turnbow JL & Bordoloi B (2000) A framework for assessing the relationship between information technology investments and firm performance. Journal of Management Information Systems 16(4): 69-97.

Slaughter SA, Levine L, Ramesh B, Pries-Heje J & Baskerville R (2006) Aligning software processes with strategy. MIS Quarterly 30(4): 891-918.

Soh C & Markus ML (1995) How IT creates business value: a process theory synthesis. In Proceedings of the Sixteenth International Conference on Information Systems, Association for Information Systems, Atlanta, GA, pp. 29--41.

Sohal AS & Fitzpatrick P (2002) IT governance and management in large Australian organisations. International Journal of Production Economics 75(1-2): 97-112.

Sohal AS & Ng L (1998) The role and impact of information technology in Australian business. Journal of Information Technology 13(3): 201-217.

Solér C (1997) Att köpa miljövänliga dagligvaror. Doctoral thesis, University of Gothenburg.

Staples DS, Wong I & Seddon PB (2002) Having expectations of information systems benefits that match received benefits: does it really matter? Information & Management 40(2): 115-131.

Straub DW, Ang S & Evaristo R (1994) Normative standards for IS research. ACM SIGMIS Database 25(1): 21-34.

Subramani M (2004) How do suppliers benefit from information technology use in supply chain relationships? MIS Quarterly 28(1): 45-73.

Symons C (2005) IT governance framework: Structures, processes, and communication. Report, Forrester Research, Inc., available at: www.forrester.com.

Synnott WR (1987) The emerging chief information officer. Information Management Review 3(1): 21-35.

Tallon PP & Kraemer KL (2003) Investigating the relationship between strategic alignment and IT business value: the discovery of a paradox. In Creating Business Value with Information Technology: Challenges and Solutions, IGI Global, pp. 1-22.

Tallon PP, Kraemer KL & Gurbaxani V (2000) Executives' perceptions of the business value of information technology: A process-oriented approach. Journal of Management Information Systems 16(4): 145-173.

Taudes A, Feurstein M & Mild A (2000) Options analysis of software platform decisions: a case study. MIS Quarterly 24(2): 227-243.

Tavakolian H (1989) Linking the information technology structure with organizational competitive strategy: A survey. MIS Quarterly 13(3): 309-317.

Taylor C (1976) Hermeneutics and politics. In Critical Sociology, Selected Readings, Penguin Books, Harmondsworth, pp. 153-193.

Thummadi B, Shiv O, Berente N & Lyytinen K (2011) Enacted software development routines based on waterfall and agile software methods: Socio-technical event sequence study. In Service-Oriented Perspectives in Design Science Research, Lecture Notes in Computer Science 6629, Springer, pp. 207-222.

Tiwana A & Konsynski B (2009) Complementarities between organizational IT architecture and governance structure. Information Systems Research 21(2): 288-304.

Truex D, Holmström J & Keil M (2006) Theorizing in information systems research: A reflexive analysis of the adaptation of theory in information systems research. Journal of the Association for Information Systems 7(12): 797-821.

Van de Ven AH (1992) Suggestions for studying strategy process: A research note. Strategic Management Journal 13(5): 169-188.

Van de Ven AH & Poole MS (1995) Explaining development and change in organizations. Academy of Management Review 20(3): 510-540.

Van der Zee J & De Jong B (1999) Alignment is not enough: integrating business and information technology management with the balanced business scorecard. Journal of Management Information Systems 16(2): 137-158.

Van Grembergen W, De Haes S & Guldentops E (2004a) Structures, processes and relational mechanisms for IT governance. In Strategies for Information Technology Governance, IGI Global, pp. 1-36.

Van Grembergen W, Saull R & De Haes S (2004b) Linking the IT balanced scorecard to the business objectives at a major Canadian financial group. In Strategies for Information Technology Governance, IGI Global, pp. 129-151.

Van Maanen J, Sørensen JB & Mitchell TR (2007) Introduction to special topic forum: The interplay between theory and method. Academy of Management Review 32(4): 1145-1154.

Venkatraman N (1999) Valuing the IS contribution to the business. Computer Sciences Corporation.

Wade M & Hulland J (2004) Review: The resource-based view and information systems research: Review, extension, and suggestions for future research. MIS Quarterly 28(1): 107-142.

Walsham G (1993) Interpreting information systems in organizations. John Wiley & Sons, New York.

Watson RT (1990) Influences on the IS manager's perceptions of key issues: information scanning and the relationship with the CEO. MIS Quarterly 14(2): 217-231.

Watson RT, Kelly GG, Galliers RD & Brancheau JC (1997) Key issues in information systems management: an international perspective. Journal of Management Information Systems 13(4): 91-115.

Weber R (2010) Theory building in the information systems discipline: Some critical reflections. In Information Systems Foundations: Theory Building in Information Systems, Australian National University Press, pp. 1-20.

Webster J & Watson RT (2002) Analyzing the past to prepare for the future: Writing a literature review. MIS Quarterly 26(2): 13-23.

Weill P & Aral S (2006) Generating premium returns on your IT investments. MIT Sloan Management Review 47(2): 39.

Weill P & Ross JW (2004) IT governance: How top performers manage IT decision rights for superior results. Harvard Business School Press.
Willcocks L, Fitzgerald G & Feeny D (1995) Outsourcing IT: The strategic implications. Long Range Plann 28(5): 59-70.
Workflow Management Coalition (1998) Interface 1: Process definition interchange -- Process model, Document Number WfMC TC-1016-P.
Yin R (2002) Case study research: Design and methods. 3rd ed., Sage Publications.
Yodokawa K (2006) Evolving IT utilization by enterprises towards 2010. NRI Papers 105, Nomura Research Institute.