Using the ITIL process reference model for realizing IT Governance: An empirical investigation

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Abstract

ITIL is a popular framework for IT governance, but little academic research on ITIL exists. We investigate the overlap between ITIL and IT governance practices to illustrate ITIL's potential to stimulate IT governance. A field study shows that IT implementation success is particularly influenced by group efficacy and organizational resources, and to a lesser extent senior management involvement. Findings show that ITIL, as expected, is a framework that contributes to IT governance by stimulating process management practices.

Keywords: Information Technology Infrastructure; IT Service Management; ITIL; ITSM; IT Governance; online survey

1 Introduction

IT governance is defined as leadership and structures, processes, and relationships that ensure that the organization's IT sustains and extends its strategy and objectives (De Haes & Van Grembergen, 2009), and has been the focus of substantial attention from both academics and practitioners. Studies have found that IT governance positively affects IT performance (Weil & Ross, 2004). Companies have invested heavily in reference models and industry standards—such as COBIT, Prince2, ISO 9001, ISO /IEC 20000, and Val IT (Van Grembergen & DeHaes, 2008)—in order to achieve IT governance, and this trend is expected to continue (Buckby, Best, & Stewart, 2009). Whether firms can achieve IT governance by implementing such models and standards is an important question. Little evidence exists on their effects on IT governance. One reference model that has recently received particular attention from practitioners is ITIL. Despite its popularity, surprisingly few studies have investigated how ITIL as a framework can contribute to IT governance. Two questions seem especially relevant: does ITIL improve IT governance through better process management, and why do so many companies strive to implement ITIL?

Four considerations motivate our focus on ITIL and these questions. First, there is still little academic research available around reference models and industry standards for IT governance (Van Grembergen, 2009). This constitutes a gap in IT governance research. The prevalent global popularity of ITIL opens a challenging research opportunity, and more research on ITIL is called for (Conger, Winniford, & Erickson-Harris, 2008; McBride, 2009). Second, literature argues that ITIL supports IT governance (Ko & Fink, 2010; Selig, 2008), but a detailed assessment of this argument has not been

performed. Additionally, because of its focus on processes, ITIL implementation should theoretically play a significant role in increasing process management practices in the IT function, and thus stimulate IT governance. This relationship has not yet been subjected to investigation and empirical testing. Third, reports indicate that implementing ITIL is not straightforward, and research has found ITIL implementation to be a challenging undertaking (Cater-Steel & Pollard, 2008; Cater-Steel & Toleman, 2010; Iden, 2009; Pollard, Gupta, & Satzinger, 2010). Researchers have found that a number of factors are vital for implementation success (Iden & Langeland, 2010). However, these findings need theoretical validation. Fourth, literature suggests that the ITIL implementation progress depends on the environmental conditions, such as sector and business condition. For example, research has reported that large government organizations with a large IT workforce are the most advanced (Cater-Steel, Tan, & Toleman, 2009). However, such potential variations in the impact of ITIL implementation need to be empirically tested.

This field study focuses on ITIL implementation in the Nordic countries (Sweden, Denmark, Norway, and Finland). The reason for focusing on this region is that, to date, most of the empirical studies on ITIL are limited to Australia and the U.S. This calls for more research in other international settings. The four Nordic countries constitute an interesting opportunity, as Nordic companies have been especially active in adapting to ITIL and engaging with the IT Service Management Forum (itSMF). Although their combined population is less than twenty-five million, the four Nordic countries constitute about fifteen per cent of the total number of itSMF members internationally. We conduct a survey research because research on ITIL is dominated by case studies, and there is a need for more theory-based research in this area.

This paper addresses the gap in knowledge noted above. Our study contributes to the literature in two different ways. First, our study offers novel insight into how ITIL is positioned in relation to IT governance. Our investigation shows that ITIL offers solutions for a variety of the IT governance practices (De Haes & Van Grembergen, 2009), especially those categorized as processes. Second, this work demonstrates the relative importance of key organizational factors that enable ITIL implementation, as well as ITIL's consequences for the process management practices in the IT function. IT managers may address these findings when preparing and evaluating their ITIL initiatives.

This article proceeds as follows. First, we account for our theoretical basis. We derive and discuss hypotheses concerning the antecedents and process management consequences of ITIL implementation. Then, we describe a large field study undertaken to test our hypotheses, and present the results. The paper concludes by discussing key findings, implications for practice and future research, and limitations.

2 Theoretical basis

2.1 IT governance

IT governance focuses on the direction and control of IT, and can be deployed using a mixture of various structures, processes, and relational mechanisms situated at multiple layers in the organization (De Haes & Van Grembergen, 2009; Van Grembergen, De Haes, & Guldentops, 2003). A growing number of reference models and industry standards address IT governance (Buckby, et al., 2009). However, a comprehensive framework that covers and integrates all the practices necessary to plan, develop, and deploy a comprehensive IT governance approach in a firm does not exist (Gottschalk,

2006). Therefore, implementing IT governance means a firm must select the best or most suitable of all of the models and standards available, develop a blend of the best attributes of each of the frameworks, and tailor an approach that is realistic and sustainable (Selig, 2008). A company may, for example, use COBIT for IT audit and control, ISO 17799 for security management requirements, PRINCE2 for IT projects, the Balanced Scorecard for visions and strategies, and Val IT for IT investments.

2.2 IT governance practices and ITIL

As a reference model for IT governance, ITIL emphasizes the control of IT through processes (Taylor, 2007), and is strongly influenced by quality management and process reengineering (Galup, Quan, Dattero, & Conger, 2007). ITIL focuses on the flow of activities that cross organizational units, both inside and beyond the IT function. The objective is to maximize IT's ability to provide services that are cost effective and meet the needs and expectations of the business as manifested in the Service Level Agreement. Having grown from a collection of recommended IT processes, the latest version (3) focuses additionally on strategy, markets, capabilities, control, and governance (Taylor, 2007). ITIL covers more than operations, and aligns with the ISO standard ISO/IEC 20000.

ITIL is frequently presented as an enabler for IT governance (Ko & Fink, 2010; Selig, 2008; Van Grembergen & DeHaes, 2008). However, we have not been able to identify literature that analyses and assesses how ITIL enables IT governance practices. Based on an analysis and comparison of the complete ITIL version 3 volumes with De Haes and van Grembergen's validated list of IT governance practices (De Haes & Van Grembergen, 2009), we present an overview of how ITIL may serve as a framework for IT governance in Table 1. In the table, "index" refers to the structures (S1–S12), processes (P1–P11) and relational mechanisms (R1–R10) that are included in the IT governance reference literature.

Table 1: IT governance practices and corresponding ITIL practices

Index	IT governance practice	Corresponding ITIL area	Corresponding ITIL practice
S1	IT strategy committee at level of board of directors		
S2	IT expertise at level of board directors		
S3	(IT) audit committee at level of board of directors		
S4	CIO on executive committee		
S5	CIO reporting to CEO and /or COO		
S6	IT steering committee	Service design	IT steering group IT designer / architect
S7	IT governance function / officer	Service strategy	IT management
S8	Security / compliance / risk officer	Information security management IT service continuity management Risk management Crisis management	Security manager IT service continuity manager
S9	IT project steering committee	Release and deployment management Change management	Change advisory board
S10	IT security steering committee	Information security management	Information security manager
S11	Architecture steering committee	Service design	System management
S12	Integration of governance /alignment tasks in roles & responsibilities	Business relationship management	Business relationship manager

P1	Strategic information systems planning	Service lifecycle management Business service management Service portfolio management Demand management	Service improvement plan Service portfolio
P2	IT performance measurement	Continual service improvement Service level management Performance management Service capacity management	Balanced scorecard Service measurement and reporting Service level achievements
P3	Portfolio management	Service portfolio management	Service portfolio Application portfolio Asset management
P4	Charge back arrangements (TCO)	Financial management	Charging / chargeback
P5	Service level agreements	Service level management	Service level agreements Service catalogue manager Service level manager
P6	IT governance framework COBIT	Continual service improvement	COBIT
P7	IT governance assurance and self-assessment	Continual service improvement	ISO / IEC 20000 Audit
P8	Project governance / management methodologies	Continual service improvement Service transition	PMI and Prince2 Release management
P9	IT budget control and reporting	Service strategy	Financial management
P10	Benefits management and reporting	Release and deployment management Evaluation	Review Post implementation review Evaluation report
P11	COSO / ERM	Continual Service Improvement	The 7-step improvement process
R1	Job rotation		
R2	Co-location		
R3	Cross-training		
R4	Knowledge management	Knowledge management	Knowledge management
R5	Business / IT account management	Business relationship management	Business relationship manager Account manager
R6	Executive / senior management giving the good example		
R7	Informal meetings between business and IT executive		
R8	IT leadership	Service strategy	IT management
R9	Corporate internal communication addressing IT on a regular basis		
R10	IT governance awareness campaign		

Table 1 provides new insight into how ITIL is positioned in relation to IT governance. ITIL offers corresponding practices for as many as twenty of the thirty-three IT governance practices (De Haes & Van Grembergen, 2009). It is especially notable that ITIL facilitates all of the IT governance practices categorized as processes (P1–P11). Table 1 supports the proposition that by successfully implementing ITIL, companies can improve their process management activities and IT governance. However, ITIL is not inclusive when it comes to structural and relational practices. Here, firms must look to other reference models and industry standards.

Most organizations planning to implement ITIL will already have a set of existing practices established. ITIL implementation requires a four-step approach: 1) identifying the company's existing practices, 2) achieving competence in ITIL recommendations, 3) redesigning existing practices based on ITIL recommendations, and 4) realizing the outcomes and instigating process management. Most firms choose a single-process approach when implementing ITIL by prioritizing the user-centric areas like the service desk and incident management. From there, firms gradually continue with processes like service level management, change management, and problem management (Cater-Steel, et al., 2009;

Iden, 2010). The level of ITIL implementation increases in a company as more of the ITIL processes are deployed, and as the processes mature (Van Grembergen & DeHaes, 2008).

2.3 Prior research

One research question that has challenged researchers is what factors have the greatest impact on successful ITIL implementation. We used a literature review to identify important factors for success. These factors are presented in Table 2.

Table 2: Review of factors influencing ITIL implementation identified by prior research

Hochstein et al., 2005	**Cater-Steel et al., 2005**	**Tan, Cater-Steel & Toleman, 2009**	**Iden, 2009**	**Pollard & Cater-Steel, 2009**	**Iden & Langeland, 2010**
Support from management	Commitment from senior management	Senior management support	Need for improvement strongly recognized	Top management support	Management must have ownership
Broad-based staff training	A champion to advocate and promote ITIL	Project champion	Openness about purpose, plans, and results	Training and staff awareness	Senior management must decide to implement ITIL
Continuity in project organization	Ability of IT staff to adopt to change	Relationships with vendors	Training and expertise	Interdepartmental communication and collaboration	Identify and involve key personnel
Demonstrate benefits through "quick wins"	Quality of staff allocated to ITIL	Change in corporate culture	Broad participation	ITIL-friendly culture	Senior management must have knowledge about process orientation
Internal communication and marketing	ITIL training for IT staff	Project governance and execution	A methodology for process change	Process as a priority	Start with a few ITIL processes
Strive for continuous improvement		Realization of benefits	Deliverables produced at group meetings only	Customer-focused metrics	Information to personnel and customers
Develop new process while in operation			Short timeline	Use of consultants	Provide competence in process thinking, and ITIL
				Timing and careful selection of an ITSM toolset	A modular ITSM system is needed

The research and the factors identified in Table 2 are based on different research methods, mainly descriptive studies. In general, questions regarding determinants for success were only one among several research themes in these studies. Therefore, it may be difficult to compare the results. However, our review points to existing theories and antecedents to implement strategic IT initiatives (Basu, Hartono, Lederer, & Sethi, 2002; Cerpa & Verner, 1998; Earl, 1993; Gottschalk, 1999): senior management involvement, organizational commitment, and group efficacy. These antecedents are discussed in the next section.

3 Antecedents and consequences

3.1 Antecedents to ITIL implementation

The first antecedent pertains to IT senior management. The key role of senior management in organization development success in general has been highlighted by many researchers (Dong, 2008;

Woolridge, Schmid, & Floyd, 2008). McDonough (2000) suggests that top managers help projects by a variety of means, such as demonstrating commitment, helping the team to surmount obstacles, making things happen and providing encouragement to the team. Similarly, Emmanuelides (1993) proposes that development projects depend heavily on top management for acquisition of necessary resources, approval of design proposals, securing of required legitimacy, and delegation of necessary decision-making authority. Within ITIL, senior management involvement means that top executives commit themselves to providing strong support for the project from its initiation to its end (Cater-Steel & Tan, 2005b; Hochstein, Tamm, & Brenner, 2005; Pollard & Cater-Steel, 2009). Top management must provide feedback and guidance throughout the implementation (Hochstein, et al., 2005). However, as identified Cater-Steel and Tan (2005b) and Tan, Cater-Steel, and Toleman (2009) it is essential that one person from the executive committee champions and advocates ITIL. This leads us to our first hypothesis:

H1: As senior management involvement in the ITIL project increases, so does the level of ITIL implementation.

The second antecedent relates to how the organization and its members commit themselves to the effort. Organizational commitment has been repeatedly identified as an important variable in understanding the behavior of employees in organizations (Mowday, Steers, & Porter, 1979). Although characterizations of organizational commitment vary, definitions tend to focus on employee behavior (Salancik, 1977; Staw, 1977) and attitude (Sheldon, 1971). High commitment presents itself in a strong belief in and acceptance of the firm's goals and values, and a willingness to exert considerable effort in reaching them. Within ITIL, commitment is indicated by the presence of sufficient resources (Tan, et al., 2009), involving key people in process design, and letting them stay on the implementation effort from start to finish in order to maintain continuity (Iden & Langeland, 2010). It is important for participants to recognize the need for improvement so that they try their hardest to implement ITIL (Iden, 2009). From this we can postulate:

H2: As organizational commitment to the ITIL project increases, so does the level of ITIL implementation.

The third antecedent relates to the characteristics of the ITIL project and the team's belief in its ability to perform effectively (Gibson, 1999). High efficacy perception enhances task performance (Sadri & Robertson, 1993). Through observational and self-reporting techniques, researchers have established that group efficacy is a meaningful and measurable group attribute and that levels of group efficacy vary among groups (Gibson, 1999). The level of group efficacy is often related to how much effort the group exerts, and researchers have found efficacy to be a determinant of group effectiveness (Gibson, 1999). This follows logically from social cognitive research regarding individual work behavior, which has demonstrated that the higher the level of self-efficacy, the better an individual performs (Bandura, 1997). With respect to ITIL implementation, group efficacy means that project members are sufficiently trained and that they possess sufficient knowledge about ITIL and process thinking (Cater-Steel & Tan, 2005b; Hochstein, et al., 2005; Iden & Langeland, 2010). It also means that they have the skills necessary to identify, analyze, and design processes by utilizing ITIL recommendations, and that they have a well-defined method for process development (Iden, 2009). Therefore, we can expect that:

H3: As group efficacy in the ITIL project increases, so does the level of ITIL implementation.

The fourth antecedent relates to the characteristics of the organization. We expect that sources of ITIL implementation success are also embedded in the resources and capabilities of the firm. In the resource-based view of the firm, competitive advantage is achieved through assembling and orchestrating difficult-to-copy resources, defined as a bundle of assets, capabilities, organizational process, firms attributes, information, and knowledge (Teece, Pisano, & Shuen, 1997). ITIL implementations with greater resources have more surplus power and therefore more latitude for progress and outcome. Based on this view, we anticipate that budget (the amount of economic resources made available for the ITIL effort), size (the number of staff and IT employees), and revenue (company income), will influence the firm's ability to implement ITIL. We also expect that experience with ITIL, reflected by the years since the initiative was taken, will affect ITIL implementation. From this we can expect that:

H4: As the organizational resources increase, so does the level of ITIL implementation.

3.2 Process management consequences of ITIL implementation

IT governance and ITIL each place heavy emphasis on the importance of processes and process management (Selig, 2008; Taylor, 2007; Van Grembergen & DeHaes, 2008). As we have discussed above, process is one of the three types of practices in IT governance, and process management is especially relevant for IT planning, project management, portfolio management, risk management, IT service delivery and support, and performance management. Process management in IT governance means that processes are well defined, documented, and measured (Selig, 2008). It also implies nominating process owners and assessing process maturity for improvement (Van Grembergen & DeHaes, 2008). For ITIL, as a process reference model, process management requires each process to be controlled so that they remain compliant with the objectives of both IT and business (Taylor, Case, & Spalding, 2007a). The literature offers various models for process management (Becker, Krugeler, & Rosemann, 2007; Gulledge & Sommer, 2002; Hammer & Stanton, 1999; Küng & Hagen, 2007; Pritchard & Armistead, 1999; van der Aalst, ter Hofstede, & Weske, 2003). For our investigations and analysis, we have, based on existing models, divided process management into seven distinctive but related practices: process standardization, process documentation, process ownership, process goals, process monitoring, process improvement, and process certification. Each of these is discussed below. We believe that as the ITIL implementation level increases, so will the level of process management in terms of the extent to which the seven process management practices are implemented.

The first practice is the standardization of the way a certain process is executed. The objective is that matching cases are handled in the same way; cases should follow the same predefined workflow, and are subject to the same organizational procedures and rules every time they occur (Hammer & Stanton, 1999). Standardization leads to predictability, both for staff and customers, and is often viewed as the first step towards process management (Rosemann & de Bruin, 2005; Van Grembergen & DeHaes, 2008). Process standardization is a fundamental principle of ITIL: there is one best way to handle a certain type of case, and this way should be followed by every function and every staff member (Taylor, 2007). For example, in order to comply with the negotiated standards set in the service level agreements, every request for change must follow the standardized change management process (Taylor, Lacy, & MacFarlane, 2007b). Case studies have identified process standardization as one of the main implementation effects of ITIL (Hochstein, et al., 2005). Therefore, we can expect that:

H5: As the ITIL implementation level increases, so does the level of process standardization.

Another practice of process management is that the characteristics of a process should be captured and documented (Ungan, 2006). Process documents describe the process by its activities, workflow, roles, resources, rules, and outcomes (Harmon, 2003). The purpose is to provide employees collectively with detailed information on how the process as a whole is executed, as well as the more detailed characteristics relevant to each role. Process documentation is also the basis for further refinement and improvement. ITIL consists of documented processes, and this is one of the attributes that make ITIL a reference model. The recommended practice for each process is documented according to a standard format, including process models. Likewise, implementing ITIL involves describing the new practices in standard document templates, as recognized by case studies (Cater-Steel, Toleman, & Tan, 2006b). Therefore, we can expect that:

H6: As the ITIL implementation level increases, so does the level of process documentation.

The establishment of process ownership is an additional practice (Harmon, 2003; Spanyi, 2006). Each process should have a process owner who is responsible for process performance and outcome. The process owner's primary tasks are to oversee the implementation of a new design, to follow up on its performance and to coordinate with functional managers and other process owners. (Hammer & Stanton, 1999). ITIL emphasizes the role of the process owner, and portrays the role comparably to the description above (Taylor, Lloyd, & Rudd, 2007c). Although the process owner is a novel role for many IT functions, organizations implementing ITIL have found it effective to appoint them (Cater-Steel, 2009; Tan, et al., 2009). This leads to the following hypothesis:

H7: As the ITIL implementation level increases, so does the level of process ownership.

Establishing explicit goals for process performance is a central practice. The process literature identifies a variety of relevant goals (Davenport & Beers, 1995; Garretson & Harmon, 2005; Kueng, 2000). Harrington (1991), for example, suggests goals for effectiveness, efficiency, and adaptability, but the literature offers alternative approaches (Kueng, 2000). ITIL includes the process goal in its definition of process (Berkhout, Harrow, Johnson, Lacy, Lloyd, Page, van Goethem, & van den Bent, 2000). According to ITIL, all processes should have explicit goals (Taylor, et al., 2007a). This leads to the following hypothesis:

H8: As the ITIL implementation level increases, so does the level of explicit process goals.

Monitoring is another process management practice (Harmon, 2003; Smith & Fingar, 2003). Process goals must be translated into performance indicators that can be monitored. Firms must continuously assess process performance and verify that goals are met (Hammer, 2007). ITIL mandates that processes be monitored in order to ensure that they comply with requirements (Taylor, et al., 2007a). Case studies confirm that such monitoring practices have been adopted by firms implementing ITIL (Cater-Steel, et al., 2006b). This leads to the following hypothesis:

H9: As the ITIL implementation level increases, so does the level of process monitoring.

Processes should be improved when monitoring reveals that they are not meeting the requirements set, or when new requirements arise (Harmon, 2003; Smith & Fingar, 2003). Improvement efforts

should be based on factual information. They can be minor adjustments to the existing layout, or can take the form of a large project if a major revision or a totally new design is required (Hammer & Stanton, 1999). Improvement is central in ITIL, and one set of standards is dedicated to continual improvement (Taylor, et al., 2007a). The main message is that once implemented, the ITIL processes should constantly be evaluated and improved in order to fulfill changing business needs. This leads to the following hypothesis:

H10: As the ITIL implementation level increases, so does the level of process improvement.

The last practice of process management included in this study is that the system of processes is certified according to an international standard. We acknowledge that this criterion is beyond most definitions of process management; however, several forces provide a strong impetus for firms to invest in process certification. International institutions such as ISO—International Organization for Standardization—argue that process certification is necessary in order to fulfill customer expectations and requirements for product and service quality (ISO, 2000). A certification gives evidence that processes are documented and that accountability has been defined, and is a strong indication that the firm has started to analyze processes and initiate change programs (Harmon, 2003). Two standards are especially applicable in accordance with ITIL: the general ISO 9000 quality standard and the area-specific standard ISO/IEC 20000 for IT service management. Research finds that there is an growing interest among ITIL firms in these standards (Cater-Steel, et al., 2009). This leads to the following hypothesis:

H11: As the ITIL implementation level increases, so does the level of process certification.

Figure 1 sums up the hypothesized relationships between antecedents to and consequences of ITIL implementation.

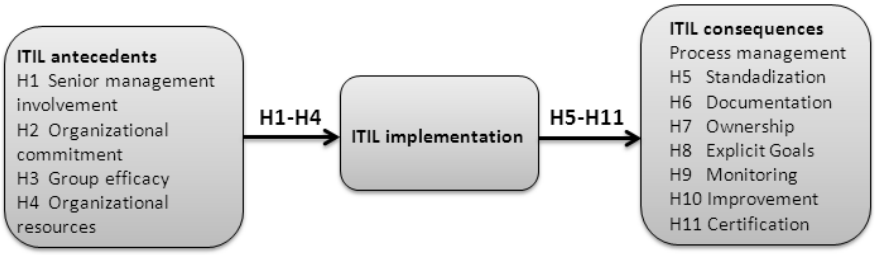

Figure 1: Hypothesized relationships involving antecedents and consequences of ITIL implementation

4 Research methods

4.1 Data collection

To test the hypotheses, an anonymous online survey was initiated in Finland, Sweden, Denmark, and Norway. The questionnaire was pretested on five respondents and wording was adjusted prior to the survey. The survey was conducted in English. The targeted sample was drawn from the members of the Nordic itSMF chapters who were using ITIL, resulting in a total of 5,943 active e-mail addresses. See Appendix 1 for the survey instrument.

4.2 Operationalization and measurement

The indicators of each of the elements of ITIL antecedents and consequences are described below.

Senior management involvement

Senior management involvement was measured using a reflective, two-item scale adapted from Basu et al. (2002) and by incorporating the perspectives of Wooldridge, Schmid and Floyd (2008). The items are "senior management provides continuous feedback and guidance to the ITIL-project" and "a member of senior management champions the ITIL-project". The respondents were asked to indicate the validity of the statements from 1) very low degree of validity, to 5) highly valid statement.

Organizational commitment

Organizational commitment was measured using a reflective, three-item scale adapted from Basu et al. (2002) and Locke et al. (1984). The items are "sufficient resources have been allocated for the ITIL project," "key people are staying on the ITIL project from its start to finish in order to maintain continuity," and "the ITIL project members are trying their hardest to implement ITIL." The respondents were asked to indicate the validity of the statements on a scale of 1 (very low degree of validity) to 5 (highly valid statement).

Group efficacy

Group efficacy was measured using a five-item, reflective scale based on Locke, et al. (Locke, et al., 1984), Gist (1987) and Gibson et al. (2000). Items chosen were "the ITIL-project has sufficient knowledge about ITIL and process thinking", "the ITIL-project is using a well-defined method for process development", "it is easy to understand ITIL's descriptions of best practices", "It is easy to develop our own processes based on ITIL" and "It is not a problem for us that the ITIL books are in English". The respondents were asked to indicate the validity of the statements on a scale of 1 (very low degree of validity) to 5 (highly valid statement).

Organizational resources

Resources in an organization represent many types of resources that do not necessarily correlate. As a result, they were operationalized into four formative indicators: number of years passed since the ITIL project was initialized reflects experience gained; the number of IT employees and total staff reflects personnel resources; and economic turnover reflects the company's income and financial situation. The respondents were asked to report which year the project started, and to specify numbers of IT staff, employees in total, and economic turnover from predefined scales. These indicators are based on previous work by Cater- Steel and colleagues, who have used them in several successive surveys in this context (Cater-Steel, Tan, & Toleman, 2006a; Cater-Steel, Tan, & Toleman, 2007; Cater-Steel, et al., 2009). See Table 3 for descriptive statistics and Appendix 1 for survey instrument.

ITIL implementation

ITIL implementation was operationalized using a twenty-five-item scale adapted from Cater-Steel et al. (Cater-Steel & Tan, 2005a; Iden, Steindal, & Stokke, 2007), and adjusted to represent all the activities in ITIL version 3: service strategy, service design, service transition, service operation, and continual service improvement (Taylor, 2007). The response format followed a five-point ordinal scale: not started (1), early (2), halfway (3), advanced (4), and completed (5). This list of twenty-five ITIL processes (items) represents a formative, composite scale addressing the processes included in each

company's ITIL implementation. The final measure of ITIL implementation is constructed formatively as a composite score of all twenty-five items for each firm. Since formative or reflective measurement is a characteristic of the indicators rather than the construct (Bollen, 2007), both reflective and formative indicators are relevant for inclusion. However, we were not able to identify reflective measurement scales of ITIL implementation in previous studies. Moreover, the ITIL processes represent actionable, but not necessarily correlated attributes of the phenomenon, which is necessary in reflective measurement. As a result, formative measurement was chosen for ITIL implementation.

Process management

Process management was operationalized into a formative scale with seven items adapted from the literature on organizational process management. This variable is formative in nature, since the different dimensions of process management represent activities that do not necessarily correlate. A company will typically focus on specific activities, resulting in a composite list of practices that represent its approach to process management. These may include "processes are standardized," "processes are documented," "process ownership is established," "goals for processes are set," "processes are monitored," "processes are improved," and "the IT department is certified." The respondents were asked to indicate the validity of the statements on a scale of 1 (very low degree of validity) to 5 (highly valid statement). The final measure of process management was constructed formatively as a combination of the scores of the seven indicators. Our choice of formative measurement of process management is a result of our focus on the specific activities that form process management in organizations, and these activities do not necessarily correlate as is needed in reflective measurement (see (Cenfetelli & Bassellier, 2009) for a discussion of reflective vs. formative measurement).

Control variables

The nature of the business and the business environment influence each company's ability to implement ITIL. As a result, we included business sector and business conditions as control variables. Business sector is operationalized with one indicator measuring whether the responding company represents the private sector (1) or the governmental sector (2). Business conditions are operationalized with one indicator. Respondents were asked to report their organization's situation during the ITIL implementation from a list of predefined conditions: stable, downsizing, increased workload, and restructuring of organization.

5 Data analysis and results

Of the 5,943 e-mails sent, 446 responses were returned: Finland 46, Sweden 150, Denmark 55, and Norway 193 (a response rate of 7.4%). We experienced a very low level of missing data (1.05%). Due to technical difficulties in estimating missing values in our data analysis tool (XLSTAT PLSPM) we chose the default procedure of mean imputation for these missing values.

The resulting sample covers many sectors, of which IT represents thirty-six per cent of the respondents. More than fifty per cent of the sample represents large companies with more than 2,000 employees. Nearly thirty per cent of the respondents work in firms with more than 300 IT professionals. Still, firms of various sizes and numbers of IT personnel are well represented. The respondents represent different roles in their ITIL projects, with project manager, project member, and process owner as the three most frequent roles. Around sixty per cent of the respondents possess ITIL training and certification at

the ITIL Foundation level, whereas twenty per cent have gained the ITIL intermediate and the ITIL expert levels. About sixty-five per cent of the respondents have at least four years of experience with ITIL. At the firm level, most firms have up to four years of experience with ITIL, reflecting the growing popularity of ITIL in the Nordic countries from 2006 to 2008. All in all, our sample represents a variety of firms and project characteristics, with many levels of ITIL implementation and process management activities. Table 3 provides an overview of the characteristics of the sample.

Table 3: Profile of responding organizations and respondents (*n* = 446)

Business sector	Percent
IT	36
Public government	21
Health and social affairs	7
Telecommunications	6
Finance and insurance	5
Education and research	5
Transport and logistics	5
Others	15
Turnover	Percent
Less than 5.0 million euro	7
Between 5.0 – 15.0 million euro	6
Between 15.5 – 50.0 million euro	10
More than 50.0 million euro	53
Don't know	24
Number of employees	Percent
More than 2000	52
500 – 2000	18
100 – 499	17
Less than 100	13
Number of IT employees	Percent
More than 300	29
Between 100 – 300	22
Between 50 – 99	13
Between 25 – 49	17
Less than 24	19
When was the ITIL project started?	Percent
2008 – 2009	25
2006 – 2007	34
2004 – 2005	25
Before 2003	16
Budget for ITIL project	Percent
Less than 50,000 euro	14
Between 50,000 – 100,000 euro	13
Between 100,000 – 300,000 euro	11
More than 300,000 euro	16
No budget	46
Respondent's role in ITIL project	Percent
Process owner	23
Project manager	22
Project member	22
Project owner	17
Process developer	16
Respondent's years of experience with ITIL	Percent
3 years or less	36
4 – 6	39
7 – 9	16
10 years or more	9

Descriptive statistics for the final sample are shown in Appendix 2.

5.1 Instrument validation and test of hypotheses

Data analysis and hypothesis testing were performed using partial least squares analysis with the XLSTAT-PLSPM package. Partial least square (PLS) has the ability to handle formative as well as reflective indicators of variables in the same model, in our research for the organizational resources, ITIL implementation, and process management. PLS can also handle more complex research models than other full-information, covariance-based tools (Chin, 2010).

Tests of measurement quality

Formative and reflective indicators must be evaluated using different criteria for measurement quality, as indicated in guidelines suggested by Götz et al. (2010), Gefen and Straub (2005), Straub et al. (2004) and Cenfetelli and Bassellier (2009). Tables 4–6 sum up the results of the different procedures for validation of formative and reflective indicators. The first step in validating formative indicators involves content validity, as suggested by Straub et al. (2004). Content validity indicates whether the indicators appropriately capture the full domain and scope of the construct. Götz et al. (2010) argue that selecting formative indicators based on a combination of previously published work and subsequent qualitative assessment through interviews, expert statements, etc. will increase the likelihood of content validity. Here, we have combined these procedures. The twenty-five indicators of ITIL implementation were adapted from Cater-Steel and Tan (2005a) and Iden et al. (2007). These indicators have been used and refined through qualitative feedback in many successive surveys each year since 2005, and the results from 2009 produced similar results as in previous years (Cater-Steel, et al., 2009). The indicators cover the processes found in ITIL version 3, thus representing all the processes described within this last version of the ITIL framework (service strategy, service design, service transition, service operation, and continual service improvement). Six of the seven indicators of process management are adopted from Eikebrokk et al. (2008), who documented construct validity of the indicators through a two-step procedure from exploratory factor analysis to convergent validity of each dimension through coefficient alpha. The last indicator targets whether the IT department is certified, and represents a new indicator that has not yet been tested for psychometric properties in this context. All in all, we believe the indicators have sufficient content validity and adequately capture the theoretical content and domain of our variables.

The second step of formative indicator validation addresses multicollinearity. Since formative indicators form the variance of their latent variable through regression analysis, multicollinearity can be a serious threat to validity (Diamantopoulos & Winklhofer, 2001; Petter, Straub, & Rai, 2007). Table 4 below lists the cross-loadings between indicators and different formative latent variables. The table shows low degrees of overlap between indicators of different constructs, thus indicating no serious problems with multicollinearity.

Table 4: Validation of multicollinearity (cross-loadings) of formative indicators

	Org. Resources	ITIL Impl.	Process Management
Org. Resources			
Year initiated	**0.920**	0.330	0.218
IT employees	**0.626**	0.225	0.175
Staff in total	**0.340**	0.122	0.102
Turnover	**0.319**	0.115	0.120
ITIL Implementation			
Service catalogue management	0.088	**0.415**	0.315

Service level management	0.227	**0.692**	0.495
Capacity management	0.182	**0.566**	0.423
Availability management	0.192	**0.594**	0.454
IT service continuity management	0.183	**0.557**	0.413
Information security management	0.192	**0.549**	0.392
Supplier management	0.190	**0.485**	0.352
Transition planning and support	0.172	**0.581**	0.431
Change management	0.293	**0.761**	0.524
Configuration management	0.218	**0.595**	0.424
Release and deployment mgmt	0.210	**0.611**	0.461
Service validation and testing	0.183	**0.572**	0.408
Evaluation	0.164	**0.592**	0.456
Knowledge management	0.108	**0.519**	0.395
Event management	0.133	**0.504**	0.367
Incident management	0.287	**0.788**	0.543
Problem management	0.208	**0.657**	0.480
Request fulfillment	0.106	**0.554**	0.418
Access management	0.185	**0.593**	0.422
Service desk	0.216	**0.597**	0.383
Service strategy	0.100	**0.507**	0.398
Life cycle principle	0.137	**0.538**	0.400
Continual service improvement	0.183	**0.620**	0.442
Financial management	0.208	**0.526**	0.340
Service portfolio management	0.130	**0.515**	0.387
Process Management			
Processes standardized	0.196	0.511	**0.728**
Processes documented	0.226	0.558	**0.794**
Process ownership established	0.165	0.530	**0.755**
Explicit goals are established	0.180	0.460	**0.655**
Goal achievement monitored	0.145	0.485	**0.690**
Processes improved	0.074	0.448	**0.638**
IT department certified	0.163	0.386	**0.549**

The last step in evaluating formative indicators is based on guidelines proposed by Cenfetelli and Bassellier (2009), who address the number of formative indicators for each construct, and the weights and relative contribution of each indicator. With a large number of formative indicators it is likely that their relative contribution decreases and some will have non-significant weights. According to Cenfetelli and Bassellier (2009), the strategy to handle many non-significant indicators must be based on the purpose of the study and involves grouping of indicators into sub constructs or second order constructs, or keeping all indicators in forming a single construct. Here, our goal is to investigate the relationship between many different activities within ITIL implementation and process management. Grouping of indicators into higher level constructs could hide interesting relationships between the activities involved that could inform subsequent theorizing. As a result, we chose to keep the individual indicators and in more detail investigate their relative contribution, which is reported under the hypotheses tests section. Appendix 3 shows the significance, loadings and relative weights of the formative indicators.

Our research model includes three constructs with two or more reflective indicators: senior management involvement, organizational commitment, and group efficacy. The validity of these constructs and their indicators will be tested through procedures that focus on their construct validity in terms of convergent and discriminant validity. In contrast to the validity tests for formative indicators and constructs, all the validity tests here focus on the inter-correlation between reflective indicators. Previously, confirmatory factor analyses by Basu et al. (2002) validated the indicators of

senior management involvement and organizational commitment, and found sufficient convergent and discriminant validity. The indicators of group efficacy are adopted from Bandura (1997) and Gibson et al. (Gibson, 1999; Gibson, et al., 2000), and very few validation tests exist for these measures used in this context. As is evident from Table 5, we find sufficient discriminant and convergent validity both at the indicator and construct level. Table 5 shows discriminant and convergent validity at the construct level for the reflective constructs in our study. The AVE for each construct is higher than the cross-loadings between constructs. This indicates that each construct accounts for more common variance in its set of indicators than between constructs, which means that the constructs have sufficient discriminant validity. Having established uni-dimensionality, coefficient alpha will show the convergent validity or reliability of the constructs. Coefficient alphas above 0.6 for exploratory purposes and above 0.7 for confirmatory purposes are considered acceptable. Here, coefficient alphas are very close to the recommended level of 0.7 for our reflective constructs, indicating sufficient convergent validity at the construct level.

Table 5: Validation of constructs measured with reflective indicators

	Senior Mgmt. Involvement	Org. Commitment	Group Efficacy
Org. Commitment	0.303	**1**	0.207
Group Efficacy	0.083	0.207	**1**
Mean Communalities (AVE)	0.828	0.615	0.451
Coefficient Alpha	0.790	0.689	0.681

When evaluating reliability at the indicator level, all standardized loadings of the reflective indicators should be significant and above 0.7 for most indicators. Table 6 shows that all indicators have significant standardized loadings, and that these are above 0.7 for most indicators for a given construct. This indicates that the indicators represent more systematic variance than error variance, which is the case for senior management involvement and for organizational commitment. For group efficacy, two out of five indicators are above the recommended level of 0.7, whereas two indicators are above 0.6 and one indicator above 0.5. In summary, the validation tests show sufficient measurement quality at the construct level and slightly below the recommended level for some indicators for group efficacy. Since our research represents an early stage of theory development in this field, the results are acceptable.

Table 6: Validation of reflective indicators

Constructs	Indicators	Stand. Loadings	T-value
Senior Mgmt. Involvement	Mgmt. feedback	0.913	53,275
	Mgmt. champion	0.907	41,843
Org. Commitment	Resources	0.865	23,721
	Key people staying	0.841	28,283
	Trying their hardest	0.625	9,158
Group Efficacy	Sufficient knowledge	0.658	13,894
	Well-defined method	0.528	7,970
	Easy to understand ITIL	0.725	18,915
	Easy to develop own processes	0.789	27,385
	English no problem	0.629	10,745

Tests of hypotheses

Figure 2 shows the research model with control variables, path coefficients, degree of support of the hypotheses, and explained variance. Overall, the research model is able to predict ITIL implementation and process management with R-squares of 0.31 and 0.49 respectively. The overall goodness of fit index, GoF (Tenenhaus, Amato, & Vinzi, 2004), is at the recommended level of 0.9 for the relative model fit (0.899), measurement model (0.945), and structural model (0.951), thus indicating an acceptable overall fit between the research model and the empirical data (Vinzi, Trinchera, & Amato, 2010).

Our hypotheses from H1 to H4 describe positive relationships between antecedents to ITIL implementation and the degree of ITIL being implemented. H1 states that a positive relationship will exist between senior management involvement and ITIL implementation, which was supported (0.095; P=0.047). H2 expects a positive relationship between organizational commitment and ITIL implementation, which was not supported. H3 describes a positive relationship between group efficacy and ITIL implementation, which received strong support (0.336; P<0.001). H4 states that as organizational resources increases, so does ITIL implementation, and this received strong empirical support (0.324; P<0.001). Organizational resources were measured with four formative indicators of which all had significant loadings. The weights of these indicators reflect the relative importance of their impact on the explanatory power of the structural model. Experience with ITIL (year initiated) was the most important dimension (0.341; P<0.00), followed by IT employees (0.245; P<0.01). The indicators Staff in total and Turnover had no impact when controlling for the influence of Experience and Staff in total. Appendix 3 lists the standardized loadings, weights and level of significance for these indicators.

Our research model included two control variables, sector and business condition, which were believed to influence ITIL implementation. Sector measured whether the responding companies belonged to the private sector (1) or to the public sector (2). Sector had a significant and negative (-0.093; P=0.020) relationship with ITIL implementation, indicating that as the share of public companies increased in our sample, the level of ITIL implementation decreased. Business condition controlled for the degree of organizational stability during the ITIL implementation project, but showed no significant relationship with ITIL implementation. Figure 2 sums up the tests of the hypotheses.

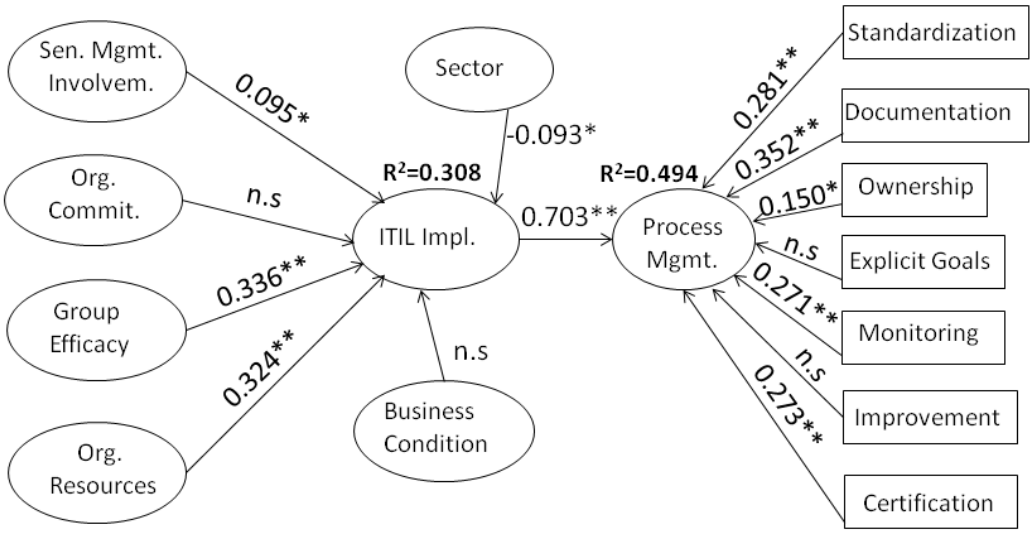

Figure 2: Results of hypotheses tests with explained variance, significant path coefficients, and regression weights for dimensions of process management

Our research model includes seven hypotheses describing the relationship between ITIL implementation and process management. Process management was measured with seven formative indicators reflecting these hypotheses. The indicator loadings were significant for all these indicators, showing that they are all useful indicators of process management. Their weights reveal their individual contribution to the explanatory ability of the structural model when other indicators are controlled for. A significant weight implies support for the hypothesis involving the indicator, and the relative size of the weights for the indicators will reflect the relative importance of these indicators of process management. H5 expects a positive relationship between ITIL implementation and standardization of processes, which was strongly supported (0.281; P<0.001). H6 states that as the level of ITIL implementation increases, so will the degree of documented processes, and this was strongly supported (0.352; P<0.001). H7 expects the same positive relationship between ITIL implementation and process ownership, and this was supported (0.150; P<0.04). H8 expects ITIL implementation to be positively related to the degree of explicit process goals being established. This was not empirically supported. H9 states that as ITIL implementation increases, so will the degree of processes being monitored, and this was strongly supported (0.271; P<0.001). H10 expects that as the implementation level of ITIL increases, so will the level of processes improvement achieved. This was not supported. Finally, H11 states that as the degree of ITIL implementation increases in our sample, so will the degree of IT departments being certified, and this was strongly supported (0.273; P<0.001). Of these seven activities of process management, the weights indicate that process documentation contributes most to the predictive ability of our research model, followed by process standardization, processes being monitored, and process ownership established. Table 7 sums up the results from the hypotheses tests. Appendix 3 sums up the weights and levels of significance for the seven hypotheses from H5 to H11.

In interpreting how the formative indicators contribute to the results of the structural model we follow the procedures suggested by (Cenfetelli & Bassellier, 2009) who suggest that the absolute and relative contributions from each indicator for each construct should be investigated, as well as the occurrence of negative and positive indicator weights. The large number of formative indicators for ITIL

implementation and process management results in relatively low weight for some indicators due to the upper limit in explaining the variance of the construct. The weights indicate the unique contribution of each indicator, controlling for the other indicators. A low or non-significant weight does not imply that this specific indicator is unimportant, but rather that the indicator overlap with other indicators, despite controlling for multicollinearity. The indicator loadings for ITIL implementation and Process management are all significant, indicating that all indicators relate to their constructs, but their weights show that many indicators do not contribute beyond the influence of other formative indicators.

None of the significant indicator weights are negative, indicating no substantial suppressor effects. The indicator "explicit goals are set" has a negative albeit non-significant weight and could potentially overlap with the indicator "goals are being monitored".

Table 7: Summary of hypotheses tests

Hypotheses	Independent variables	Dependent variables	Support
Antecedents to ITIL Implementation			
H1	Senior Mgmt. Involvement	ITIL Implementation	Yes
H2	Organizational Commitment	ITIL Implementation	No
H3	Group Efficacy	ITIL Implementation	Yes
H4	Organizational Resources	ITIL Implementation	Yes
Process Management Consequences of ITIL implementation			
H5	ITIL Implementation	Standardization	Yes
H6	ITIL Implementation	Documentation	Yes
H7	ITIL Implementation	Ownership	Yes
H8	ITIL Implementation	Explicit Goals	No
H9	ITIL Implementation	Monitoring	Yes
H10	ITIL Implementation	Improvement	No
H11	ITIL Implementation	Certification	Yes

6 Discussion

The goal of this research was to understand how ITIL implementation affects IT governance through process management. We argued that ITIL and IT governance share many similar practices, and that to understand consequences of ITIL implementation on process management, we also need to understand important organizational antecedents influencing the ability to implement ITIL. In our theoretical model we tested eleven hypotheses relating four antecedents and seven consequences of ITIL implementation. We found empirical support for our proposed theoretical model using empirical data from 446 Nordic companies.

This study makes three important contributions. First, by combining the literature on ITIL and IT governance we contribute to the IT governance literature (Buckby, et al., 2009; De Haes & Van Grembergen, 2009; Van Grembergen & DeHaes, 2008) by revealing how ITIL can serve as a framework for IT governance in supporting several important processes and relational mechanisms. These relationships between ITIL and IT governance have received little attention in previous research. Our research reveals the influence of important organizational antecedents on ITIL implementation, and the related consequences for process management and IT governance.

Second, we contribute to the literature on ITIL implementation by identifying important organizational antecedents that can influence the ability to implement ITIL. We found support for the relevance of these antecedents through a review of the literature on ITIL implementation, and we empirically demonstrated the influence of three out of four antecedents on ITIL implementation. This contribution responds to the call for more research and theory development within ITIL (Galup, et al., 2007; McNaughton, Ray, & Lewis, 2010; Winniford, Conger, & Erickson-Harris, 2009).

Third, we contribute to the literature on organizational process management (e.g. (Hammer, 2007; Hammer & Stanton, 1999; Harmon, 2003; Rosemann & de Bruin, 2005) by uncovering how ITIL, as a process reference model, might stimulate the use of process management practices. Our empirical data provides one of the few empirical tests of this connection, showing significant positive relationships between ITIL implementation and five out of seven process management practices.

6.1 Theoretical Implications

Antecedents to ITIL implementation

This study found three important antecedents influencing the level of ITIL implementation. Of these, group efficacy contributed most (45.4%) to explaining the variability of ITIL implementation, followed by organizational resources (37.7%) and senior management involvement (7.6%). Organizational resources contain four dimensions, and experience with ITIL and the number of IT employees were significant. These findings contradict earlier ITIL studies that show senior management involvement as the single most important factor for ITIL implementation success (e.g. (Iden & Langeland, 2010)). Our study suggests that the ITIL project group's training, skills, and experience with ITIL is the most influential antecedent, followed by the number of IT employees. This is interesting, but also explainable. Research has found ITIL implementation to be a challenging undertaking, and several competencies and skills are required (Cater-Steel & Pollard, 2008; Cater-Steel & Toleman, 2010; Iden, 2009; Pollard, et al., 2010). The emphasis on project group empowerment combined with senior management involvement opens up possibilities for future research on the allocation of authority and decision-making in the ITIL implementation project. Strong management involvement could be counter-productive to project group initiative and creativity; on the other hand, strong group efficacy may lead management to decide their involvement is less needed. Research on total quality management has found strong management leadership to be positively associated with employee empowerment (Ugboro & Obeng, 2000).

The strong role of organizational resources in our findings points to the possible relevance of other organizational resources. Further research could investigate this in more detail by extending our theoretical model with other organizational capabilities and competencies, including IT planning and relationship competence (Eikebrokk & Olsen, 2007; Feeny & Willcocks, 1998).

Process management consequences

Our empirical results confirm ITIL's instrumental role in establishing process management in organizations. Companies in our sample seemed to mature by implementing ITIL processes into establishing process management. Documentation, standardization, and monitoring dominated the

process management practices that were positively influenced by ITIL implementation, whereas explicit goals and improvement were not significant. This implies that firms are more focused on achieving control, rather than instigating new process designs or continuous improvement. Future studies should investigate whether there is a natural course of maturation above the levels we have found in our material and into continuous improvement as part of IT governance (Van Grembergen & DeHaes, 2008). There is also a need to study in more detail whether differences in how far companies reach in IT governance with the help of different frameworks (such as ITIL, Cobit, Balanced scorecard, and others) can be explained by characteristics of the frameworks themselves, or by differences in ambitions and organizational capabilities.

Given the significant standardized loadings of all the formative indicators of the ITIL-processes, further studies should investigate if some indicators could be joined together in meaningful sub constructs, or whether any second order constructs could better explain the observed indicator structure.

Contextual influences

Our findings reveal that public firms do not implement ITIL to the same extent as private firms. This contrasts earlier findings where large government organizations with a large IT workforce are the most advanced in implementing ITIL (Cater-Steel, et al., 2009). Our findings are surprising, given ITIL's historical roots in the public sector (van Bon, 2002). We investigated the degree of organizational stability as another contextual difference that could influence ITIL implementation, but found no significant relationship between level of organizational stability and ITIL implementation progress. This is surprising, since seventy-two per cent of the companies in our sample reported being in an unstable situation. Future research could further examine antecedents and consequences by studying implementation behavior in public and private companies.

One important aspect of the organizational context is the organizational culture, which might influence ITIL implementation progress (Iden, 2009; Pollard & Cater-Steel, 2009; Tan, et al., 2009). Similarly, factors found in prior studies deserve further investigations, including the effects of introducing ITIL software (Iden, 2009; Pollard & Cater-Steel, 2009), hiring external competence (Pollard & Cater-Steel, 2009), interdepartmental communication and collaboration (Hochstein, et al., 2005; Pollard & Cater-Steel, 2009), the format of the project model used (Hochstein, et al., 2005; Iden, 2009), and involving the business domain in the implementation effort.

Additionally, future studies should devote time to methodological issues, such as instrument development for measuring levels of ITIL implementation, ITIL software utilization, ITIL competence among staff, and the use of ITIL terms among personnel.

6.2 Implications for practice

Our results clearly demonstrate the potential of increasing IT governance through implementing the ITIL framework. IT managers should acknowledge this and investigate further the number of structures, processes, and relational mechanisms recommended in ITIL and that fit with agreed IT governance practices (De Haes & Van Grembergen, 2009). Our analysis illustrates how IT governance involves the operational level of the IT function, and that IT governance can be obtained by enhancing areas concerned with delivery and support of IT services on a daily basis (Van Grembergen, et al., 2003).

The strong influence of organizational resources found in our study confirms the general view of ITIL implementation as a demanding activity in need of substantial resources. In particular, the strong influence of experience with ITIL and sufficient IT personnel is a signal to practitioners that dedicating resources is a necessary but not sufficient condition to successful implementation of ITIL and IT governance. Our findings verify prior ITIL research: large firms, especially those with a large IT workforce, are leading in ITIL implementation.

Our theoretical model and findings can serve as guidelines for IT managers who are planning to adopt, or already adopting, ITIL. Group efficacy is the most important determinant of ITIL implementation progress, regardless of sector and business condition. IT managers should strive to empower project group members with the necessary competencies and skills. Attention must also be given to securing senior management involvement. IT managers must consider how they can build process management based on the seven practices.

Finally, there is an ongoing debate among practitioners at ITIL conferences and in social media whether ITIL is suitable for small and medium-sized firms. Our data shows no significant differences between companies as measured by their total number of employees or monetary resources. Rather, the important antecedents are related to their ITIL project group and the number of IT employees. As a result, we suggest that IT managers in charge of small IT functions should be especially conscious of whether to implement ITIL, and should not embark on this journey without considering whether important antecedents are supportive.

6.3 Limitations

The research on ITIL as an approach to IT governance is in an early stage of theory development. Despite its contributions, our study has several limitations. Our sample consists exclusively of Nordic companies, which belong to a common cultural sphere with certain conditions for organizational development (Hofstede, 1997). This influences perspectives and practices for ITIL and process management. As a result, the findings in our study may not be generalized to other global settings. Our study has an over-representation of larger enterprises within IT and public government. The high percentage of large firms with many resources could create a too-positive picture of the relationship between ITIL and process management, and the high percentage of public government firms may influence the level of ITIL and process management implementation in our material. Further, because the administrations of the Nordic chapters of itSMF were unable to select only one member per company, and because participation is anonymous, in some cases, there may be more than one respondent representing the same company.

The respondents were exclusively persons involved in ITIL implementation, and could be biased when characterizing their projects. Employees in other roles may have other views on relevant information regarding ITIL and IT governance.

Our operationalization of ITIL implementation involves 25 different processes. Due to the high number of processes involved their weights might become negative or non-significant.
Future studies should investigate the nature of the ITIL implementation processes and whether different processes can be grouped together and better reveal their relative contribution on ITIL implementation.

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References

Bandura, A. (1997). *Self-efficacy: The exercise of control*. New York: Springer-Verlag.

Basu, V., Hartono, E., Lederer, A. L., & Sethi, V. (2002). The impact of organizational commitment, senior management involvement, and team involvement on strategic information systems planning. *Information & Management, 39*(6), 513-524.

Becker, J., Krugeler, M., & Rosemann, M. (Eds.). (2007). *Process Management: A Guide for the Design of Business Processes* (2 ed.). Berlin: Springer.

Berkhout, M., Harrow, R., Johnson, B., Lacy, S., Lloyd, V., Page, D., van Goethem, M., & van den Bent, H. (2000). *Service Support*. London: The Stationary Office.

Bollen, K. A. (2007). Interpretational confounding is due to misspecification, not to type of indicator: Comment on Howell, Breivik, and Wilcox (2007). *Psychological Methods, 12*(2), 219-228.

Buckby, S., Best, P., & Stewart, J. (2009). The current state of information technology governance literature. In A. Cater-Steel (Ed.), *Information Technology Governance and Service Management: Frameworks and Adaptations*. Hershey, USA: ISI Global.

Cater-Steel, A. (2009). IT service departments struggle to adopt a service-oriented philosophy. *International journal of information systems in the service sector, 1*(2), 69-77.

Cater-Steel, A., & Pollard, C. (2008). *Conflicting views on ITIL implementation: managed as a project - or business as usual?* Paper presented at the 2008 Information Resources Management Association (IRMA) International Conference, Niagara Falls, Ontario, Canada. http://eprints.usq.edu.au/4230/

Cater-Steel, A., & Tan, W.-G. (2005a). Implementation of IT Infrastructure Library (ITIL) in Australia: Progress and success factors. Toowoomba, Australia: Department of Information Systems, Faculty of Business. University of Southern Queensland.

Cater-Steel, A., & Tan, W.-G. (2005b). *Implementation of IT infrastructure library (ITIL) in Australia: progress and success factors*. Paper presented at the 2005 IT Governance International Conference, Auckland, New Zealand. http://eprints.usq.edu.au/998/

Cater-Steel, A., Tan, W.-G., & Toleman, M. (2006a). itSMF Australia 2006 Conference: Summary Report of ITSM Standards and Frameworks Survey. Toowoomba, Australia: University of Southern Queensland.

Cater-Steel, A., Tan, W.-G., & Toleman, M. (2007). itSMF Australia 2007 Conference: Summary Report of ITSM Standards and Frameworks Survey. Toowoomba, Australia: University of Southern Queensland.

Cater-Steel, A., Tan, W.-G., & Toleman, M. (2009). itSMF Australia 2009 Conference: Summary Report of ITSM Standards and Frameworks Survey. Toowoomba, Australia: University of Southern Queensland.

Cater-Steel, A., & Toleman, M. (2010). IT service management standards: education challenges. In K. Jakobs (Ed.), *New applications in IT standards: developments and progress* (pp. 225-241). Hershey PA, USA: Information Science Reference (IGI Global).

Cater-Steel, A., Toleman, M., & Tan, W.-G. (2006b, 6-8 December). *Transforming IT service management - the ITIL impact.* Paper presented at the 17th Australasian Conference on Information Systems, Adelaide, Australia.

Cenfetelli, R. T., & Bassellier, G. (2009). Interpretation of formative measurement in information systems research. *MIS Quarterly, 33*(4), 689-707.

Cerpa, N., & Verner, J. M. (1998). Case study: The effect of IS maturity on information systems strategic planning. *Information & Management, 34*(4), 199-208.

Chin, W. W. (2010). How to Write Up and Report PLS Analyses. In E. Vinzi, W. W. Chin, H. J. & W. H. (Eds.), *Handbook of Partial Least Squares; Concepts, Methods and Application*. New York: Springer.

Conger, S., Winniford, M., & Erickson-Harris, L. (2008, 14-17 August). *Service Management in Operations.* Paper presented at the Fourteenth Americas Conference on Information Systems, Toronto, ON, Canada.

Davenport, T. H., & Beers, M. C. (1995). Managing Information about Processes. *Journal of Management Information Systems, 12*(1), 57-80.

De Haes, S., & Van Grembergen, W. (2009). An exploratory study into IT governance implementations and its impact on business/IT alignment. *Information Systems Management, 26*(2), 123-137.

Diamantopoulos, A., & Winklhofer, H. M. (2001). Index Construction with Formative Indicators: An Alternative to Scale Development. *Journal of Marketing Research, 38*(2), 269-277.

Dong, L. (2008). Exploring the impact of top management support of enterprise systems implementations outcomes; two case studies. *Business Process Management Journal, 14*(2), 204-218.

Earl, M. J. (1993). Experiences in Strategic Information Systems Planning. *MIS Quarterly, 17*(1), 1-24.

Eikebrokk, T. R., Iden, J., Olsen, D. H., & Opdahl, A. L. (2008, June 9.-11.). *Towards a model of process-modelling practice: quantitative validation and results.* Paper presented at the 16th European Conference on Information Systems, Paris.

Eikebrokk, T. R., & Olsen, D. H. (2007). An empirical investigation of competency factors affecting e-business success in European SMEs. *Information & Management, 44*(4), 364-383.

Emmanuelides, P. A. (1993). Towards an integrative framework of performance in product development projects. *Journal of Engineering and Technology Management, 10*(363-392).

Feeny, D. F., & Willcocks, L. P. (1998). Core IS capabilities for exploiting information technology. *Sloan Management Review, 39*(3), 9-21.

Galup, S. D., Quan, J., J., Dattero, R., & Conger, S. (2007). *Information technology service management: An emerging area for academic research and pedagogical development*. Paper presented at the Proceedings of the 2007 ACM SIGMIS CPR conference on Computer personnel research: The global information technology workforce, St. Louis, Missouri, USA.

Garretson, P., & Harmon, P. (2005). How Boeing A&T Manages Business Processes *BPTrends* (Vol. November, pp. 1-13).

Gefen, D., & Straub, D. (2005). A Practical Guide to Factorial Validity Using PLS-Graph: Tutorial and Annotated Example. *Communications of the Association for Information Systems, 16*(1), 91-109.

Gibson, C. B. (1999). Do They Do What They Believe They Can? Group Efficacy and Group Effectiveness across Tasks and Cultures. *The Academy of Management Journal, 42*(2), 138-152.

Gibson, C. B., Randel, A. E., & Earley, P. C. (2000). Understanding Group Efficacy: An Empirical Test of Multiple Assessment Methods. *Group Organization Management, 25*(1), 67-97. doi: 10.1177/1059601100251005

Gist, M. E. (1987). Self-Efficacy: Implications for Organizational Behavior and Human Resource Management. *The Academy of Management Review, 12*(3), 472-485.

Gottschalk, P. (1999). Implementation predictors of strategic information systems plans. *Information & Management, 36*(2), 77-91.

Gottschalk, P. (2006). Implementing IT Governance. In P. Gottschalk (Ed.), *E-Business Strategy, Sourcing and Governance*. Hershey: Idea Group Publishing.

Gulledge, T. R., & Sommer, R. A. (2002). Business process management: public sector implications. *Business Process Management Journal, 8*(4), 364-376.

Götz, O., Liehr-Gobbers, K., & Krafft, M. (2010). Evaluation of Structural Equation Models Using the Partial Least Squares (PLS) Approach. In V. E. Vinzi, W. W. Chin, J. Henseler & H. Wang (Eds.), *Handbook of Partial Least Squares; Concepts, Methods and Application*. New York: Springer.

Hammer, M. (2007). The Process Audit. *Harvard Business Review, April*, 111-123.

Hammer, M., & Stanton, S. (1999). How Process Enterprises Really Work. *Harvard Business Review, November-December*, 108-118.

Harmon, P. (2003). *Business Process Change. A Manager's Guide to Improving, Redesigning, and Automating Processes*. San Francisco: Morgan Kaufmann Publishers.

Harrington, H. J. (1991). *Business Process Improvement. The Breakthrough Strategy for Total Quality, Productivity, and Competitiveness*. New York: McGraw-Hill.

Hochstein, A., Tamm, G., & Brenner, W. (2005). *Service-Oriented IT Management: Benefit, Cost and Success Factors.* Paper presented at the European Conference on Information Systems, Regensburg, Germany.

Hofstede, G. (1997). *Cultures and organizations. Software of the mind* (2 ed.). New York: McGraw-Hill.

Iden, J. (2009). Implementing IT Service Management. Lessons from a University IT Department. In A. Cater-Steel (Ed.), *Information Technology Governance and Service Management: Frameworks and Adaptations*. Hershey, USA: IGI Global.

Iden, J. (2010, November 23.-24.). *The adoption of ITIL in the Nordic countries: a survey.* Paper presented at the Norsk konferanse for organiasjoners bruk av IT (NOKOBIT), Gjøvik, Norway.

Iden, J., & Langeland, L. (2010). Setting the Stage for a Successful ITIL Adoption: A Delphi Study of IT Experts in the Norwegian Armed Forces. *Information Systems Management, 27*(2), 103-112.

Iden, J., Steindal, F., & Stokke, B. (2007). *The Implementation of IT Infrastructure Library (ITIL) in Norway: Progress, success factors and benefits.* Paper presented at the Norsk konferanse for organisasjoners bruk av informasjonsteknologi. NOKOBIT 2007, Trondheim.

ISO. (2000). *Quality management systems*. Bruxells: International Organization for Standardization.

Ko, D., & Fink, D. (2010). Information technology governance: An evaluation of the theory-practice gap. *Corporate Governance, 10*(5), 662-674.

Kueng, P. (2000). Process performance measurement system: a tool to support process-based organizations. *Total Quality Management, 11*(1), 67-85.

Küng, P., & Hagen, C. (2007). The fruits of Business Process Management: an experience report from a Swiss bank. *Business Process Management Journal, 13*(4), 477-487.

Locke, E. A., Fredrick, E., Bobko, P., & Lee, C. (1984). Effect of self-efficacy, goals, and task strategies on task performances. *Journal of Applied Psychology, 69*, 241–251.

McBride, N. (2009). Exploring service issues within the IT organisation: Four mini-case studies. *International Journal of Information Management, 29*(3), 237-243.

McDonough III, E. F. (2000). Investigation of factors contributing to the success of cross-functional teams. *Journal of Product Innovation Management, 17*, 221-235.

McNaughton, B., Ray, P., & Lewis, L. (2010). Designing an evaluation framework for IT service management. *Information & Management, 47*(4), 219-225.

Mowday, R. T., Steers, R. M., & Porter, L. W. (1979). The measurement of organizational commitment. *Journal of Vocational Behavior, 14*(2), 224-247.

Petter, S., Straub, D., & Rai, A. (2007). Specifying Formative Iindicators in Information Systems Research. *MIS Quarterly, 31*(4), 623-656.

Pollard, C., & Cater-Steel, A. (2009). Justifications, Strategies, and Critical Success Factors in Successful ITIL Implementations in U.S. and Australian Companies: An Exploratory Study. *Information Systems Management, 26*(2), 164 - 175.

Pollard, C. E., Gupta, D., & Satzinger, J. W. (2010). Teaching Systems Development: A Compelling Case for Integrating the SDLC with the ITSM Lifecycle. *Information Systems Management, 27*(2), 113 - 122.

Pritchard, J.-P., & Armistead, C. (1999). Business process management - lessons from European business. *Business Process Management Journal, 5*(1), 10-32.

Rosemann, M., & de Bruin, T. (2005, May 26-28). *Towards a Business Process Management Maturity Model.* Paper presented at the 13th European Conference on Information Systems, Regensburd, Germany.

Sadri, G., & Robertson, I. T. (1993). Self-efficacy and work-related behaviour: A review and meta-analysis. *Applied Psychology: An International Review, 42*, 139-152.

Salancik, G. R. (1977). Commitment and the control of organizational behaviour and belief. In B. M. Staw & G. R. Salancik (Eds.), *New directions in organizational behaviour*. Chicago: St. Clair Press.

Selig, G. J. (2008). *Implementing IT Governance. A Practical Guide to Global Best Practices in IT Management*. Zaltbommel: Van Haren Publishing.

Sheldon, M. E. (1971). Investments and involvements as mechanisms producing commitment to the organization. *Administrative Science Quarterly, 16*, 142-150.

Smith, H., & Fingar, P. (2003). *Business Process Management - The Third Wave*. Tampa: Meghan-Kiffer Press.

Spanyi, A. (2006). *More for Less. The Power of Process Management*. Tampa: Meghan-Kiffer Press.

Staw, B. M. (1977). *Two sides of commitment*. Paper presented at the Academy of Management, Orlando, Florida.

Straub, D., Boudreau, M.-C., & Gefen, D. (2004). Validation guidelines for IS positivist research. *Communications of AIS, 13*, 380-427.

Tan, W.-G., Cater-Steel, A., & Toleman, M. (2009). Implementing IT service management: A case study focusing on critical success factors. *Journal of Computer Information Systems, 50*(2), 1-12.

Taylor, S. (2007). *The Official Introduction to the ITIL Service Lifecycle*. London: The Stationary Office.

Taylor, S., Case, G., & Spalding, G. (2007a). *Continual Service Improvement*. London: The Stationary Office.

Taylor, S., Lacy, S., & MacFarlane, I. (2007b). *Service Transition*. London: The Stationary Office.

Taylor, S., Lloyd, V., & Rudd, C. (2007c). *Service Design*. London: The Stationary Office.

Teece, D., Pisano, G., & Shuen, A. (1997). Dynamic Capabilities and Strategic Management. *Strategic Management Journal, 18*(7), 509-533.

Tenenhaus, M., Amato, S., & Vinzi, E. (2004). *A Global Goodness-of-Fit Index for PLS Structural Equations Modelling.* Paper presented at the Proceedings of the XLII SIS Scientific Meeting. CLEUP, Padova.

Ugboro, I. O., & Obeng, K. (2000). Top management leadership, employee empowerment, job satisfaction, and customer satisfaction in TQM organizations: an empirical study. *Journal of Quality Management, 5*(2), 247-272.

Ungan, M. C. (2006). Standardization through process documentation. *Business Process Management Journal, 12*(2), 135-148.

van Bon, J. (2002). *IT Service Management: An introduction*. London: Addison-Wesley.

van der Aalst, W. M. P., ter Hofstede, A. H. M., & Weske, M. (2003). *Business Process Management: A Survey.* Paper presented at the Business Process Management, Eindhoven, The Netherlands.

Van Grembergen, W. (2009). Foreword. In A. Cater-Steel (Ed.), *Information Technology Governance and Service Management. Frameworks and Adaptions*. Hershey, USA: IG Global.

Van Grembergen, W., De Haes, S., & Guldentops, E. (2003). Stuctures, Processes and Relational Mechanisms for IT Governance. In W. Van Grembergen (Ed.), *Strategies for Information Technology Governance*. Hershey: PA: Idea Group Publishing.

Van Grembergen, W., & DeHaes, S. (2008). *Implementing Information Technology Governance: Models, Practices and Cases*. Hershey: IGI Publishing.

Vinzi, V. E., Trinchera, L., & Amato, S. (2010). PLS Path Modeling: From Foundations to Recent Developments and Open Issues for Model Assessment and Improvement. In V. E. Vinzi, W. W. Chin, J. Henseler & H. Wang (Eds.), *Handbook of Partial Least Squares; Concepts, Methods and Application*. New York: Springer.

Weil, P., & Ross, J. W. (2004). *IT Governance. How top performers manage IT decisions rights for superior results*. Boston: Harvard Business School Press.

Winniford, M., Conger, S., & Erickson-Harris, L. (2009). Confusion in the Ranks: IT Service Management Practice and Terminology. *Information Systems Management, 26*(2), 153 - 163.

Woolridge, B., Schmid, T., & Floyd, S. W. (2008). The middle management persepctive on strategy process: contribution, synthesis, and future research. *Journal of Management, 34*(6), 1190-1221.

Appendix 1: Survey instrument

1: Which ITSM forum are you a member of?

1. itSMF Denmark
2. itSMF Finland
3. itSMF Norway
4. itSMF Sweden

2: What is your role in the ITIL project?

1. Project owner
2. Project manager
3. Project member
4. Process developer
5. Process owner

3: Are you ITIL certified?

1. No certification
2. ITIL Foundation
3. ITIL Intermediate
4. ITIL Expert
5. ITIL Master

4: How many years have you been working with ITIL?

5: Why did you decide to implement ITIL?

1. Leading organizations are using ITIL
2. ITIL is based on best practice
3. Our customers expect us to use ITIL
4. ITIL will improve our professional standard
5. ITIL will improve our IT service focus
6. ITIL will reduce our IT costs
7. ITIL will improve customer satisfaction

1: Low validity to 5: Highly valid

6: Who took the initiative to introduce ITIL?

1. CIO / IT top manager
2. IT Operations manager
3. A middle manager
4. Member of the staff
5. A process owner
6. Quality / process management department
7. External consultant
8. Business relationship manager

7: In what year was your ITIL-project initiated?

8: How big is your overall budget for the ITIL-project?

1. Less than 50.000 EUR
2. 50.000–100.000 EUR
3. 100.000–300.000 EUR
4. More than 300.000 EUR
5. No specific budget

9: What percentage of your budget will be spent on the following?

1. External consultants
2. ITIL software
3. ITIL training

10: Please rank the following statements concerning Senior Management Involvement, Organizational Commitment and Group Efficacy:

Senior Management Involvement
- Senior management provides continuous feedback and guidance
- A member of senior management champions the project
- Senior management introduced the ITIL project

Organizational Commitment
- Sufficient resources have been allocated for the ITIL project
- Key people are staying on the ITIL project from its start to finish in order to maintain continuity

Group Efficacy
- The ITIL project has sufficient knowledge about ITIL and process thinking
- The ITIL project is using a well-defined method for process development
- The ITIL project members are trying their hardest to implement ITIL

1: Low validity to 5: Highly valid

11: Please rate your implementation progress with Service Strategy and Continual Service Improvement.
- Financial Management
- Service Portfolio Management
- Continual Service Improvement)
- Service Strategy
- The ITIL service lifecycle principle

Not started (0%), Early stage, Half way (50%), Advanced stage, Completed (100%)

12: Please rate your implementation progress with Service Design
- Service Catalogue Management
- Service Level Management
- Capacity Management
- Availability Management
- IT Service Continuity Management
- Information Security Management
- Supplier Management

Not started (0%), Early stage, Half way (50%), Advanced stage, Completed (100%)

13: Please rate your implementation progress with Service Transition
- Transition Planning and Support
- Change Management
- Service Asset and Configuration Management
- Release and Deployment Management
- Service Validation and Testing
- Evaluation
- Knowledge Management

Not started (0%), Early stage, Half way (50%), Advanced stage, Completed (100%)

14: Please rate your implementation progress with Service Operation
- Event Management
- Incident Management
- Request Fulfillment
- Problem Management
- Access Management
- Service Desk

Not started (0%), Early stage, Half way (50%), Advanced stage, Completed (100%)

15: What benefits have the ITIL-implementation provided to your organization?

- Customer satisfaction has been improved
- User satisfaction has been improved
- Focus on IT services has been improved
- Professional standard has been improved
- IT costs have been reduced
- Roles and responsibilities have been clarified
- The processes in the IT-department have been standardized
- The processes in the IT-department have been improved

1: Low validity to 5: Highly valid

16: What results have the ITIL-implementation provided to your organization?

- The processes in the IT department have been documented
- Process ownership is now well established
- Process ownership is now well established
- Explicit goals are now set for the processes
- Goal achievement for the processes is now systematically monitored
- The IT department is now certified (ISO 9000 or ISO 20000)

1: Low validity to 5: Highly valid

17: How do you evaluate your ITIL project?

- The project has managed to stay within budget
- The project has managed to stay within time limits
- Management is satisfied with the ITIL implementation
- IT staff is satisfied with the ITIL implementation

1: Low validity to 5: Highly valid

18: How do you evaluate ITIL?

- It is easy to understand ITIL's descriptions of best practice
- It is easy to develop our own processes based on ITIL
- It is not a problem for us that the ITIL books are in English
- The ITIL framework feels suitable for our organization's size

1: Low validity to 5: Highly valid

19: To what extend has ITIL met the expectations of your organization?

1. Not sure
2. We are disappointed with ITIL
3. ITIL met our expectations
4. ITIL exceeded our expectations
5. Too early to tell

20: Did your organization consider interrupting the ITIL-project during the implementation?

1. Yes
2. No

If yes to 20: 21: What was the main reason for not wanting to implement ITIL?

1. ITIL does not fit the size of our organization
2. ITIL is taking resources from core operations
3. Lack of knowledge
4. Hard to see the benefits
5. Hard to choose ITSM technology

22: How would you describe your organization's business conditions during the ITIL implementation?

1. Stable
2. Increased workload
3. Downsizing

4. Restructuring of organization
5. Other, please specify:

23: To which business sector does your organization belong?
1. Public sector
2. Private sector

24: Approximately how many full-time IT professionals are employed in your organization?
1. Less than 10
2. 10 – 24
3. 25 – 49
4. 50 – 99
5. 100 – 300
6. More than 300

25: Approximately how many staff in total does your organization employ?
1. Less than 25
2. 25 – 49
3. 50 – 99
4. 100 – 499
5. 500 – 2000
6. More than 2000

26: What is the annual turnover of your organization?
1. Less than 2.5 million EUR
2. 2.5 – 5 million EUR
3. 5 - 15 million EUR
4. 15 - 50 million EUR
5. More than 50 million
6. Don't know

Appendix 2: Descriptive statistics

Variable	Minimum	Maximum	Mean	Std. dev.
Senior Mgmt. Involvement				
Mgmt. feedback	1.000	5.000	2.877	1.164
Mgmt. champion	1.000	5.000	3.288	1.256
Organizational Commitment				
Resources	1.000	5.000	3.134	1.110
Key people staying	1.000	5.000	3.367	1.064
Trying their hardest	1.000	5.000	3.664	0.919
Group Efficacy				
Sufficient knowledge	1.000	5.000	3.684	0.929
Well defined methods	1.000	5.000	3.389	0.961
Easy to understand ITIL	1.000	5.000	3.418	0.961
Easy to develop own processes	1.000	5.000	3.307	0.957
English no problem	1.000	5.000	3.575	1.217
Organizational Resources				
Year initiated	1.000	16.000	4.283	2.367
IT employees	1.000	6.000	4.164	1.600
Staff in total	1.000	6.000	4.940	1.418
Turnover	1.000	5.000	4.392	0.961
ITIL Implementation				
Service catalogue management	1.000	5.000	2.544	1.012
Service level management	1.000	5.000	2.956	1.030
Capacity management	1.000	5,000	1.954	0.954
Availability management	1.000	5.000	2.032	1.007
IT Service continuity management	1.000	5.000	2.317	1.062
Information security management	1.000	5.000	2.324	1.123
Supplier management	1.000	5.000	2.044	1.030
Transition planning and support	1.000	5.000	2.258	1.103
Change management	1.000	5.000	3.349	1.095
Configuration management	1.000	5.000	2.450	0.986
Release and deployment mgmt.	1.000	5.000	2.552	1.075
Service validation and testing	1.000	5.000	2.177	1.063
Evaluation	1.000	5.000	1.833	0.911
Knowledge management	1.000	5.000	1.976	0.962
Event management	1.000	5.000	2.478	1.239
Incident management	1.000	5.000	3.944	0.925
Problem management	1.000	5.000	3.095	1.135
Request fulfillment	1.000	5.000	2.769	1.179
Access management	1.000	5.000	2.375	1.172
Service desk	1.000	5.000	3.963	0.973
Service strategy	1.000	5.000	2.158	1.014
Lifecycle principle	1.000	5.000	1.993	0.963
Continual service improvement	1.000	5.000	2.098	0.996
Financial management	1.000	5.000	2.070	1.142
Service portfolio management	1.000	5.000	2.016	0.954
Process Management				
Processes standardized	1.000	5.000	3.506	0.921
Processes documented	1.000	5.000	3.429	0.966
Process ownership established	1.000	5.000	3.374	1.076
Explicit goals are established	1.000	5.000	2.988	0.977
Goal achievement monitored	1.000	5.000	2.667	1.068
Processes improved	1.000	5.000	3.590	0.907
IT department certified	1.000	5.000	1.680	1.178
Control Variables				
Sector	1.000	2.000	1.243	0.399
Business condition	1.000	4.000	2.255	1.099

Appendix 3: Indicator loadings and weights, formative indicators

Latent Variable	Indicator	Stand. loading	T-value	Weight	T-value
Org. Resources	Year initiated	0.920	15.716	0.341	7.482
	IT employees	0.626	5.503	0.245	2.639
	Staff in total	0.340	2.287	0.008	0.056
	Turnover	0.319	1.952	0.024	0.110
ITIL Implementation	Service catalogue management	0.415	7.286	-0.094	-1.575
	Service level management	0.692	15.530	0.198	2.904
	Capacity management	0.566	10.952	-0.021	-0.201
	Availability management	0.594	12.329	0.090	0.953
	IT service continuity management	0.557	10.414	0.017	0.222
	Information security management	0.549	9.709	0.035	0.475
	Supplier management	0.485	8.583	0.102	1.403
	Transition planning and support	0.581	12.222	-0.007	-0.108
	Change management	0.761	20.399	0.271	4.503
	Configuration management	0.595	12.691	0.009	0.134
	Release and deployment management	0.611	12.491	0.048	0.647
	Service validation and testing	0.572	11.851	-0.022	-0.275
	Evaluation	0.592	11.914	0.189	2.199
	Knowledge management	0.519	7.596	0.055	0.733
	Event management	0.504	10.991	-0.027	-0.632
	Incident management	0.788	20.546	0.488	6.438
	Problem management	0.657	15.686	-0.021	-0.337
	Request fulfillment	0.554	12.476	0.039	0.711
	Access management	0.593	13.275	-0.017	-0.316
	Service desk	0.597	10.892	0.004	0.047
	Service strategy	0.507	8.843	-0.067	-0.838
	Lifecycle principle	0.538	9.707	0.007	0.086
	Continual service improvement	0.620	13.067	0.167	1.846
	Financial management	0.526	9.700	0.061	1.146
	Service portfolio management	0.515	9.216	-0.105	-1.292
Process Management	Processes standardized	0.728	14.886	0.281	2.099
	Processes documented	0.794	18.200	0.352	3.777
	Process ownership established	0.755	18.709	0.150	1.795
	Explicit goals are established	0.655	13.173	-0.051	-0.561
	Goal achievement monitored	0.690	13.885	0.271	3.510
	Processes improved	0.638	10.395	0.130	1.563
	IT department certified	0.549	9.907	0.273	5.668