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64

Princely Emili Ifinedo

Enterprise Resource Planning Systems Success Assessment: An Integrative Framework

JYVÄSKYLÄN YLIOPISTO

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UNIVERSITY OF JYVÄSKYLÄ

JYVÄSKYLÄ 2006

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ABSTRACT

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Enterprise Resource Planning (ERP) Systems are among the most popular information technology (IT) software being adopted in organizations globally; such systems offer strategic and operational improvements to firms. The increasing popularity of the system in organizations has resulted in several studies investigating their implementations; our study of the literature suggests that only few have discussed ERP beyond the implementation phase. Similarly, studies have shown that the practitioners using such systems often lack knowledge on which issues to pay attention to when assessing the success of such technologies. This thesis is designed to increase knowledge in ERP studies for both researchers with interests in the success assessment of such systems and for practitioners using them. We are dealing with three areas here: We intend to extend the available ERP success measurement models in the literature, provide empirical evidence of the nature of relationships between selected contingencies from both the external and internal environments of the organization, and to present the viewpoints of selected organizational stakeholder groups of ERP success (i.e., the evaluator's perspective). In order to discourse the foregoing issues we develop a research framework, which we have termed "An integrative framework for assessing ERP success". The nature of our research objectives means that positivist research tradition would be suitable for our study, and that is what we eventually employed; however, in addition, we used other approaches to facilitate insight. We conducted surveys in firms in Finland and Estonia, two small countries with a record for ERP systems implementations. In our main survey, we got responses from 62 key individuals in 44 diverse firms. With respect to the objectives of this thesis; first, we succeeded in extending the available ERP systems success measurement by incorporating two new, relevant dimensions of ERP success (i.e., *Vendor/Consultant Quality* and *Workgroup Impact*) not considered in the previous models. Second, we found that the selected contingencies in the studies positively influence ERP success. Third, regarding the perspective of the evaluator of ERP success we did not notice major significant statistical differences in our study. Overall, the findings of this study contribute to the growing body of knowledge on IS success assessment in general and to ERP success assessment in particular. It is envisaged that this study may serve as a base for future research in this area of studies. Practitioners will also benefit from the insights offered.

Keywords: Dimensions of ERP success, external environment, internal environment, contingencies, contingency theory, stakeholder theory, survey, case study, structural equation modeling

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K.7.1 The Computing Profession: *Occupations*
K.7.2 The Computing Profession: *Organizations*
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Helsinki
June 2006

FIGURES

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II. Ifinedo, P. 2006. Extending the Gable et al. Enterprise Systems Success Measurement Model: A Preliminary Study. Journal of Information Technology Management (JITM), 17(1), 14-33.

III. Ifinedo, P. 2006. An Empirical Analysis of the Relationships among the Dimensions in an Extended ERP Systems Success Measurement Model, (submitted to) European Journal of Operational Research (EJOR).

IV. Ifinedo, P. 2006. An Investigation of the Impacts of Some External Contextual Factors on ERP Systems Success Assessment: A Case of Firms in Baltic-Nordic Region. International Journal of Internet and Enterprise Management (IJIEM), 4(4), 355-378.

V. Ifinedo, P. 2006. Impacts of Firm Size, Organizational Goals and Mission, and Top Management Support on ERP Success: An Analysis. Business Process Management Journal (BPMJ). Forthcoming.

VI. Ifinedo, P. 2007. Interactions between Organizational Size, Culture, and Structure and Some IT Factors in the Context of ERP Success Assessment: An Exploratory Investigation. Journal of Computer Information Systems (JCIS). Forthcoming.

VII. Ifinedo, P. & Nahar, N. 2006. Interactions between contingency, organizational IT factors, and ERP success. Industrial Management & Data Systems (IMDS). Forthcoming.

VIII. Ifinedo, P. & Nahar, N. 2006. ERP Systems Success: An Empirical Analysis of How Two Organizational Stakeholder Groups Prioritize and Evaluate Relevant Measures. Enterprise Information Systems (EIS). Forthcoming.

IX. Ifinedo, P. & Nahar, N. 2006. Do Top and Mid-level Managers View Enterprise Resource Planning (ERP) Systems Success Measures Differently? International Journal of Management and Enterprise Development (IJMED), 3(6), 618-635.

1 INTRODUCTION

In this opening chapter we present the following: an overview of the study, the motivation of the research, the purpose of the study, the scope of the study, a summary of the research questions, the used research methodology, the significance of the study, and an overview of the structure of the thesis.

1.1 Overview of the study

Over the past three decades, organizations worldwide facing pressure from changing business environments have adopted (and are still adopting), sophisticated, off-the-shelf information technology (IT) applications rather than building their IT systems in-house (Gremillion & Pyburn, 1983; Lucas et al., 1988; Davenport, 1998; 2000; Markus & Tanis, 2000; Willcocks & Sykes, 2000; Lee 2001). For example, Lee (2001, p.1) states that "To survive in hyper-competitive markets, it is essential for the organization to adapt to rapidly changing business circumstances. Global organizations strive for agility and flexibility in order to cope with such changes in the *internal* and *external* environments." To confront the demands of changing business environments, organizations are increasingly turning their attention to a particular IT systems type known under a generic name: Enterprise Systems (ES). There are several types of Enterprise Systems, including Customer Relationship Management (CRM), Supply Chain Management (SCM), Supplier Relationship Management (SRM), Corporate Performance Management (CPM), and Enterprise Resources Planning (ERP) systems (see Markus & Tanis, 2000; Klaus et al., 2000; Møller, 2005). In this study, the focus is on ERP systems because of their popularity with information systems (IS) researchers (see Esteves & Pastor, 2001) and practitioners (Mabert et al., 2003; AMR Research, 2005) and because of their strategic/operational improvement capabilities enabling firms to tackle the ever-changing business environments (Davenport, 1998; 2000; Markus & Tanis, 2000; Mabert et al., 2003).

ERP systems are packaged, complex business suites designed to integrate business processes and functions in a real-time environment (Markus & Tanis, 2000; Klaus et al., 2000; Møller, 2005). Given the capability of ERP systems to tackle some of the difficulties facing modern organizations, some commentators have touted them as the "price of entry for running a business" (Kumar & van Hillegersberg, 2000, p.24). However, the opinions of some commentators in the late 1990s about the relevance and future of ERP systems in organizations differ from the comments attributed to Kumar and van Hillegersberg above. For example, Dempsey (1999) and Stein (1999) predicted that ERP would be dead in the near future. Nevertheless, data from recent IS studies and industry reports show that several thousands business organizations - large and small - around the world have adopted (and are still adopting) such technologies (van Everdingen et al., 2000; Klaus et al., 2000; Somers et al., 2000; Mabert et al., 2003; AMR Research, 1999; 2005). As organizations worldwide continue to acquire these systems, it comes as no surprise that much of the extant literature on ERP deals with issues relating to their adoption, implementation critical success factors (CSFs), and implementation methodologies (Bingi et al., 1999; Holland & Light, 1999; Esteves & Pastor, 2001; Hong & Kim, 2002).

In this study, we make an attempt to digress from what appears to be the focus of attention in most of the studies on ERP systems, which is the issues related to their implementation and adoption as noted in the preceding paragraph: we contribute to ERP studies with our discussion of the *success evaluations* of such systems at later stages in the acquisition process. We contend that for the body of knowledge on ERP systems to grow, researchers must not shy away from investigating other aspects of the system. To that end, this study is primarily motivated by the concern not to overlook such relevant issues in ERP studies (see Somers et al., 2000; Jacobs & Bendoly, 2003; Al-Mashari, 2003; Yu, 2005). Indeed, our study of the literature indicates that research on the ERP success assessment is sparsely represented in the IS literature compared to the other putative issues noted above. Furthermore, by concentrating on a particular group of IT systems, i.e., ERP, rather than generalizing our study to all ES (and IT systems in general), we hope that our effort would engender deeper understanding of such systems. DeLone and McLean (1992, p.88) recommend that researchers discussing IS assessment or evaluations issues should take into account the "individual characteristics of the system under investigation." ERP systems also have unique characteristics, and it is these that we will highlight in the course of this treatise.

Assessing the success or effectiveness of IS in general is a critical issue to researchers and practitioners alike (e.g., DeLone & McLean, 1992; Grover et al., 1996, Ballantine et al., 1997). IS evaluation, to some practitioners, is a nightmare because of the lack of knowledge regarding such issues. On the other hand, researchers offer little help to practitioners as the IS research community is often divided on which issues best represent IS success in general (e.g., Seddon, 1997; Ballantine et al., 1997; Rai et al., 2002, Gable et al., 2003; Iivari, 2005) and on what relevance should contingency factors such as size, culture, structure, and so forth (e.g., Saunders & Jones, 1992; Myers et al., 1997) have in such

discussions. We add to the debate on IS success evaluation literature, focusing on the development of an integrative framework specifically in the context of ERP systems that could be beneficial to practitioners wishing to assess the success of such systems. The proposed framework incorporates the dimensions of success, the influence of contingency factors as well as the perspective of the evaluator. We considered this approach because some influential researchers (e.g. Hamilton & Chervany, 1981; DeLone & McLean, 1992; Saunders & Jones, 1992; Ballantine et al., 1997) have implied that focusing on the dimensions of IS success alone might be insufficient to yield fully useful insights for the discourse of IS effectiveness or success. These researchers admonish others not to underemphasize the relevance of contextual or contingency factors nor the evaluator's perspective on such issues.

As we discuss the three issues (i.e., ERP success dimensions, the influence of contingency factors, and the evaluator's perspective) of concern to us (in our proposed integrative ERP success assessment framework), we develop relevant research questions to address specific aspects of the framework. Of note, this research effort benefits from relevant theories and models and we build upon relevant, prior literature on IT systems (including ERP) success evaluations. In light of the manner in which we investigate the issues of concern to us in this study, we deem the positivist research philosophy as the most suitable for approach our research effort. Accordingly, survey was the main research method used in this study. Essentially, the data used for the study comes from key organizational stakeholder groups, including business managers and in-house IT professionals. It is worth mentioning that the study concentrated on private sector organizations in two Northern European countries, i.e., Finland and Estonia, chosen to illustrate the issues. The two countries have similar cultural orientations and values (Hofstede, 1984; Mockaitis, 2002), and have a good record regarding the use of IT products for socio-economic development (WEF, 2004; CIA World Factbook, 2005; Ifinedo, 2005, Ifinedo & Davidrajuh, 2005). ERP systems have been adopted in the two countries since the late 1990s, (see van Everdingen et al., 2000; Laukkanen et al., 2005; Ifinedo, 2005; Ifinedo & Nahar, 2006f).

In summary, this study contributes to ERP studies and practice in the following three ways: We extend the available ERP systems success measurement model in the literature by incorporating two relevant dimensions of ERP success: *Vendor/Consultant Quality* and *Workgroup Impact*. These two dimensions, we argue, encompass aspects or characteristics of ERP systems (and their acquisitions) that should be considered when assessing or evaluating such systems. Regarding the influence or impact of the selected contextual factors (external and internal) on ERP success, we found that there is a positive relationships between industry climate, national climate, top management support, organizational culture, structure, and size, among others, on the one side, and ERP success on the other. Finally, our results indicate that the evaluator perspectives (as represented by differing hierarchical and occupational categories) in the context of ERP success assessment do not appear to differ significantly. The relevant implications of the study's findings for

practice and research are discussed, and we outline fruitful avenues for future research.

1.2 Motivation for the research

The motivation for this research is threefold. First, upon completing my first degree in Nigeria, I worked for a short period in 1994 for National Oil and Chemical Products Marketing Nigeria Ltd. (NOLCHEM) that markets oil products for Shell, Nigeria. My main task was to maintain the management information systems (MIS) of the firm in one of its district offices. At one point, the main headquarters in Lagos acquired what those of us in the district offices termed "that new management information systems (MIS)". The introduction of the "new MIS" led to organizational disharmony, bad relationships, and feelings of mistrust between the headquarters' MIS department in Lagos and the senior management in the district offices, including mine. The literature provides ample accounts of the sorts of scenarios that often accompany ERP implementations (e.g., Sumner, 1999; Esteves & Pastor, 2001; Markus & Tanis, 2000; Lee & Myers, 2004; Nandhakumar et al., 2005; Møller, 2005). At that time, I was not aware that our "new MIS" (*JD Edwards*) was an ERP system. As a result of the ensuing circumstances in the organization after the implementation of the system, I developed an interest to study (given the opportunity) the software that was adopted to replace our legacy MIS, yet creating tensions between several key actors in the organization. The opportunity to study an aspect of those sorts of systems presented itself to me mid-way into my Ph.D. studies.

Second, during the early part of my Ph.D. studies in 2003, upon reviewing the ERP literature, we (the author and his supervisor, Dr. N. Nahar) were particularly troubled about the imbalance in the ERP literature. We noticed that most of the researchers tend to focus on issues relating to the implementation and adoption of ERP systems with only a few investigating other aspects of the systems. In fact, the trend is still unchanged; in January 2006, we searched the database (eLibrary) of the Association for Information Systems (AIS) containing peer-reviewed articles and panel discussions for 5 major conferences, International Conference on Information Systems (ICIS), Americas Conference on Information Systems (AMCIS), European Conference on Information Systems (ECIS), Pacific Asia Conference on Information Systems (PACIS), and Bled eCommerce Conference, Slovenia (BLED), for a ten-year period between 1995-2005. Our search word "ERP" yielded 397 entries, of which 49% (195) were for works related to ERP "implementation" and "adoption". A repeat of the process with other popular databases (i.e., ABI Inform: ProQuest Direct, ScienceDirect, and Emerald) yielded comparable results. We also noticed that a large proportion of the remaining 51% concentrated on issues (e.g. project management, CSF) that some researchers (e.g., Willis & Willis-Brown, 2002;

Rikhardsson et al. 2004) consider belonging to the *first wave* of ERP research. Increasingly, emphasis is now beginning to shift to the *second wave* issues, including post-implementation management issues, and benefit realization, among others. In this respect, this thesis seeks to position itself in the emerging *second wave* of research. It is hoped that by focusing on the success or effectiveness of such systems at later stages in the acquisition process, knowledge in these matters for both researchers and practitioners will be increased.

Third, the author's spouse is Estonian; she works as an ERP application consultant in a large global IT firm with its headquarters in Helsinki, Finland. This advantage is highly valued as it offers the author two benefits: 1) The opportunity to keep his ERP research going with regular flow of discussions with a professional in that area. 2) The advantage of networking through his spouse with ERP adopting firms located in the two countries: Estonia and Finland.

1.3 Purpose of the study

Given the pervasiveness of ERP implementation worldwide, it is hoped that a study that aims to investigate the success of such systems in adopting firms would be of benefit both to practitioners using such systems and to researchers with interests in the technology. Management of firms that have adopted - or those with the intention to adopt - ERP will gain insights from such an effort highlighting relevant factors and relationships in the context of ERP success assessment. The focus on such issues is crucial for the two main reasons indicated above: assessing or evaluating the success of complex IT systems such as ERP in adopting organizations is difficult due to the complex nature of such technologies (Davenport, 1998; 2000; Markus & Tanis, 2000; Sedera et al., 2003a), and prior research have overlooked these areas. Further, some organizations appear to have given up the hope of evaluating the benefits or success of their ERP due to a lack of knowledge about the issues to pay attention to (see Robbins-Gioia, 2002; Ifinedo, 2005). At a general level, Kumar (1990) and Seddon et al. (2002) discuss the poor state of IS systems evaluations in organizations. Seddon et al. (2002, p.11) conclude, "…many firms do not conduct rigorous evaluations of all their IT investments", the state of affairs indicated perhaps being due to a lack of knowledge in such areas. Empirical evidence of this lack of knowledge regarding how firms assess the success or benefits of their ERP systems is provided in the survey of 232 respondents in American organizations that Robbins-Gioia (2002) conducted. The survey reports that "46% of the participants noted that while their organization had an ERP system in place …, they did not feel their organization understood how to use the system to improve the way they conduct business." Indirectly, this

information might be interpreted to mean that ERP adopting firms do not know what to assess or evaluate to ensure success with their systems.

Furthermore, research in the area of ERP systems success measurement, evaluations or assessment is just beginning to emerge (see for example, Nelson & Somers, 2001; Tan & Pan, 2002; Gable et al., 2003; Sedera et al., 2003a; Wu & Wang, 2005) when compared to the research on other aspects of ERP studies, as noted above. Some of these researchers studied ERP success by looking at the topic at the internal or organizational level (e.g., Nelson & Somers, 2001), others have concentrated on the development of ERP success measurement frameworks (Tan & Pan, 2002; Gable et al., 2003; Sedera et al., 2003a; Wu & Wang, 2005), and a few others examine some contextual factors or contingencies as antecedents of ERP success (Sedera et al., 2003c; Sehgal & Stewart, 2004). The relevance of the mentioned studies cannot be overemphasized as they extend our frontiers with regard to ERP systems. However, as studies focusing on ERP success are beginning to emerge, we argue that it is vital for such efforts to be organized, or at the least, presented, to bring forth some more insights. For the significance of the foregoing efforts in the ERP success assessment literature to be appreciated by both practitioners and researchers, the emergence of a theoretically-based framework that attempts to connect the various ERP systems success assessment issues will be welcoming.

To our knowledge, no such systematic framework exists. DeLone and McLean (1992) whose IT systems success evaluation or measurement model has become the most dominant framework for assessing IT systems success at the micro level (see Ballantine et al., 1997; Iivari, 2005) imply that an IT systems success assessment framework that incorporates the dimensions of success for IT systems at the organizational level as well as the influence of contingency variables such as size, structure, an so forth will offer significant insights. This would seem logical given that the essence of success assessment frameworks or models is to enlighten or enrich understanding. For example, a manager might want to know what relationship there is between the success of his or her acquired IT system (in this instance ERP) and his or her firm size or organizational culture. Thus, the overall objective of this study is to provide information on such issues. Finally, we are also aware of the growing body of literature (e.g., Hamilton & Chervany, 1981; Saunders & Jones, 1992; Grover et al., 1996; Myers et al., 1997; Shang & Seddon, 2002) in which it is argued that when discussing or examining IT systems success, the perspective of the evaluator must be duly considered. In brief, this present study benefits from the foregoing perspectives on the IT success evaluation or assessment that call for wider issues other than the dimensions of success to be considered. Against this backdrop, we summarize the four main objectives of this study as follows:

1. To propose an integrative ERP systems success assessment framework;

2. To extend a recently proposed ERP systems success measurement model;

3. To investigate the relationships between ERP systems success and some selected contingencies in the contextual environments (i.e., external and internal: organizational and technology [IT-related] factors);

4. To investigate the perceptions of ERP success from the viewpoints of differing organizational stakeholder groups.

Note that the first of these objectives connects all the issues of concern in this study. Apart from the fact that it provides an umbrella or guide for our current discourse, we also hope that the proposed integrative framework encompassing the three issues of concern to this thesis will permit practitioners and researchers to gain insights to ERP systems and their success assessment.

1.4 Scope of the study

This dissertation is defined by the following boundaries and considerations:

- In this study, *ERP systems success* (sometimes used interchangeably with "ERP success") is different from *ERP implementation success* in that our concept of ERP success refers to the utilization of such systems to achieve organizational effectiveness (Hamilton & Chervany, 1981; Myers et al., 1997; Gable et al., 2003; Sedera & Tan, 2005). The term "success" in the IS domain has been used synonymously with effectiveness (DeLone & McLean, 1992; Myers et al., 1996; 1997; Weill & Olson, 1989; Thong et al., 1996; Markus & Tanis, 2000), and we concur with Thong et al. (1996, p.252) in that effectiveness of an IS can be "defined as the extent to which an information system actually contributes to achieving organizational goals." Our ERP success excludes such systems' technical installations success (Martin, 1998; Markus et al., 2000), whose measurement indicators include cost overruns, project management metrics, time estimates, etc. (Martin, 1998; Markus & Tanis, 2000; Hong & Kim, 2002). In short, our notion of *ERP success assessment* or evaluation refers to how the adoption of an ERP system has enhanced effectiveness in the adopting organization (see Gable et al., 2003).

- Here, our notion of ERP success primarily draws from the work of Gable and colleagues (i.e., Gable et al., 2003; Sedera & Gable, 2004; Sedera et al., 2003a) that was influenced by the work of DeLone & McLean (1992). This study excludes performance indicators (e.g., profit measures) from our discourse: the use of such measures has been criticized (Weill & Olson, 1989; DeLone & McLean, 1992) as such indicators may not be a good measure of system success in the adopting organizations (DeLone & McLean, 1992; Saarinen, 1996; Gable et al., 2003). In fact, DeLone and

McLean (1992, p.74) note that "MIS academic researchers have tended to avoid performance measures (except in laboratory studies) because of the difficulty of isolating the effect of the I/S effort from other effects which influence organizational performance." Nevertheless, researchers including Cotteleer (2001) and Masini (2003) have studied ERP systems vis-à-vis organizational performance, which is not the focus of this study.

- This study discusses ERP systems at a generic level by concentrating on its basic functionality (see Chapter 2 for the architecture of ERP systems) rather than distinguishing between top brands and mid-market ERP products. Empirical evidence exists suggesting that, in some respects, the benefits of ERP may be comparable even when systems' types differ (e.g., Mabert et al., 2003; Laukkanen et al., 2005). ERP systems classified as top brands have been noted to differ to the extent that each might offer different capabilities (Shang & Seddon, 2002); the same is true for mid-market products (Fisher et al., 2004). The foregoing partly explains our choice to include a variety of the systems in our study rather than select only a specific type of ERP. Moreover, in some respect, the inclusion of wide-ranging ERP systems in a particular study may permit the generalizability of results from such a study, for the software.

- This study concentrates on private organizations (firms) in two countries (i.e., Finland and Estonia); because our informal discussions with ERP users and professionals in the two countries tend to suggest that the adoption of ERP systems might be more widespread in private firms than in public sector organizations for the two countries (Ifinedo, 2005). Additionally, the few studies available on ERP success in the literature were conducted in public sector organizations (see Gable et al., 2003; Sedera & Gable, 2004); this study takes on ERP success from the perspective of private sector organizations and will add to the body of knowledge in the area where it is still lacking. Moreover, the operational environments of public and private sector organizations differ considerably (e.g., Mansour & Watson, 1980; Khandelwal, 2001; Ifinedo, 2006h), and findings from the former may not be applicable in the latter.

- Finally, because the study's unit of analysis is at the organization or firm level, we sampled viewpoints of key organizational informants, including senior and mid-level executives from both the business and technological (IT) part of the organization. These groups of respondents have been described as being among the most knowledgeable informants regarding ERP systems success evaluations in adopting organizations (Gable et al., 2003; Sedera et al., 2003a, b). Thus, the perspective being presented in this work excluded junior organizational employees.

1.5 The research questions summarized

In this section, we summarize the study's research questions as follows:

- The advent of ERP means that firms that want to meet the demands of changing business environments (e.g., Davenport, 2000; Lee, 2001) must not only use such systems, but also possess some knowledge on how to evaluate the success of such complex and costly systems. Useful frameworks to assist in that regard are now emerging. Of those that have been proposed and used is the Gable et al.'s (2003) ERP success measurement model that has received wider recognition than any other ERP success evaluation framework. First, their papers on the issue have received various Awards at AMCIS 2003 and ICIS 2004 conferences, and we learn from the lead author that one of the papers is undergoing its last round of review at the top-notch journal: MIS Quarterly. Second, the ERP success measurement model proposed by Gable et al. has been used in other studies (e.g., Sehgal & Stewart, 2004). In particular, ERP success dimension issues are at the heart of this thesis (it is the dependant variable in many of our investigations). Accordingly, we deem it is relevant to ask if the proposed ERP success measurement model proposed by Gable et al. (2003) is comprehensive before proceeding with the other aspects of our study. Thus, we pose our first research questions as follows:

Is the Gable et al.'s (2003) ERP success measurement model comprehensive? If not, can the model be extended to incorporate other relevant dimensions of success?

- Factors external to the organization as well as those internal to the organization may influence the success of IT systems being adopted (Ein-Dor & Segev, 1978, Rousseau, 1979; DeLone & McLean, 1992; Saunders & Jones, 1992; Ballantine et al., 1997; Myers et al., 1997; Somers et al., 2000). Specifically, contingency variables such as industry type, industry climate, national economic climate, organizational size, structure, culture, and top management support, among others have been noted to impact IT systems success (e.g., Ein-Dor & Segev, 1978; Johnston & Carrico, 1988; Porter & Millar, 1985; Glazer, 1991; Myers et al., 1997; Davenport, 1998; Somers et al., 2000). Essentially, this study investigates the relationships between these selected contingencies on the one hand and ERP success, on the other. The selected contingencies are offered as illustrative examples rather than exhaustive, and more importantly the selected contingencies are among those that have been noted in the literature as influencing ERP success (see e.g., Davenport, 1998, 2000; Somers et al., 2000; Willcocks & Sykes, 2000; Jones & Price, 2001; Krumbholz & Maiden, 2001; Sedera et al., 2003a; Morton & Hu, 2004; Buonanno et al., 2005;

Laukkanen et al., 2005). It is worth pointing out that Willcocks and Sykes (2000) particularly stress that researchers should not neglect technological or IT related issues related to ERP acquisitions as the inclusion of such issues would permit insights regarding the overall success of the software for adopting organizations. This brief discussion leads to our second research question, which is posed as follows:

What relationships exist between ERP systems success and some selected contingencies in the contextual environment (i.e., external and internal: organizational and technology [IT] related factors)?

- When investigating IT systems success evaluations, IS researchers (e.g., Hamilton & Chervany, 1981; Saunders & Jones, 1992; Grover et al., 1996; Myers et al., 1997; Shang & Seddon, 2002) drawing from the organizational effectiveness literature (e.g., Cameron & Whetten, 1983; Cameron, 1986) suggest that the perspective of the evaluator should be presented or taken into account. Considering that the research subjects in this study comprised of organizational members that can be classified by organizational hierarchy and occupation (profession), we seek to find out whether the study's participants when delineated along those categorizations would indicate comparable or dissimilar viewpoints on ERP success in their respective organizations. Following this brief discussion, we present the last research question in this study as follows:

Do different organizational stakeholder groups assess ERP systems success differently?

1.6 Summary of the research methodology and approach

In light of study's objectives, the quantitative research paradigm is considered the most suitable approach for the study (e.g., Straub, 1989; Saunders et al., 2000; Järvinen, 2001; Straub et al., 2004, 2005), and was used as the main research methodology. Accordingly, surveys were used to collect the required data. Upon obtaining the data for the study, we used statistical techniques, including structural equation modeling and non-parametric tests for our analysis. Due to the nature of data (i.e., a small-sized sample and non-normality), both statistical approaches were deemed relevant for analyzing our collected data. Researchers such as Gable (1994) and Sale et al. (2002) suggest that the use of qualitative research approaches in conjunction with the quantitative research paradigm might facilitate insight. Following this suggestion, this study, in addition to using surveys also conducted small-scaled case studies at an appropriate time in the research process to enhance understanding.

1.7 Significance of the study

To our knowledge, this effort is the first in the literature to focus on ERP systems success assessment in private sector organizations. To that end, the significance of our effort relates to the insights it offers to both practitioner and researcher communities from this particular angle. First, practitioners will gain a better understanding of the issues or factors to watch out for both at the internal (organizational) and the external level vis-à-vis the assessment of the success of their ERP systems. In some respect, the procedures used in this study and the insight we offer may help some practitioners overcome the purported lack of knowledge with regard to assessing the success or effectiveness of their acquired ERP systems and related technologies. They will also gain valuable knowledge about the influence of selected contingencies and the perspectives of organizational actors in relation to ERP success. Second, in light of the fact that this study represents an initial attempt to connect relevant issues in the context of the evaluation of ERP systems success, we hope that this study's contribution would significantly extend the frontiers of knowledge in this area of research. In particular, the findings and conclusions of the study could stimulate future fruitful investigations with respect to the evaluations of other ES (and other complex IT systems). It is also important to note that several findings in this study provide support for other viewpoints and observations in the IS success evaluation literature; this ultimately ensures that the cumulative knowledge and traditions in the IS domain is enriched. More importantly, the proposed integrative ERP success assessment framework of this work may serve as the foundation for the development of a *contingency theory for ERP success assessment*. Such a theory would have the potential to guide or influence future discussions about ERP systems success. Against this backdrop, we can say that the most significant contribution of this thesis does not lie in what it has achieved, so far, but in how it paves the way for the development of relevant future theoretical frameworks or concepts.

1.8 Structure of the thesis

The thesis is comprised of two parts. The first part deals with the introductory chapter that summarizes the following: The overview of the study, the motivation of the research, the purpose of the study, the scope of the study, a summary of the research questions, the used research methodology, the significance of the study, and the structure of the thesis. The second part of the thesis consists of the articles supporting the thesis, which are listed before the introductory chapter. Next, we provide detail of the chapters in the summary part as follows.

Chapter 2 presents a review of the relevant background literature. We highlight the development of the study's framework (that guides the discourse) as well as present the research questions and hypotheses. Chapter 3 discusses the research methodology, data collection efforts, the research contexts, and statistical tools and techniques used in the study. Chapter 4 presents the summaries of the included articles. Finally, Chapter 5 concludes the thesis by discussing the study's contributions, its major findings, its limitations, and directions for future research. Other relevant details not included in the body of the thesis are kept in the Appendices.

2 BACKGROUND, RESEARCH QUESTIONS AND HYPOTHESES

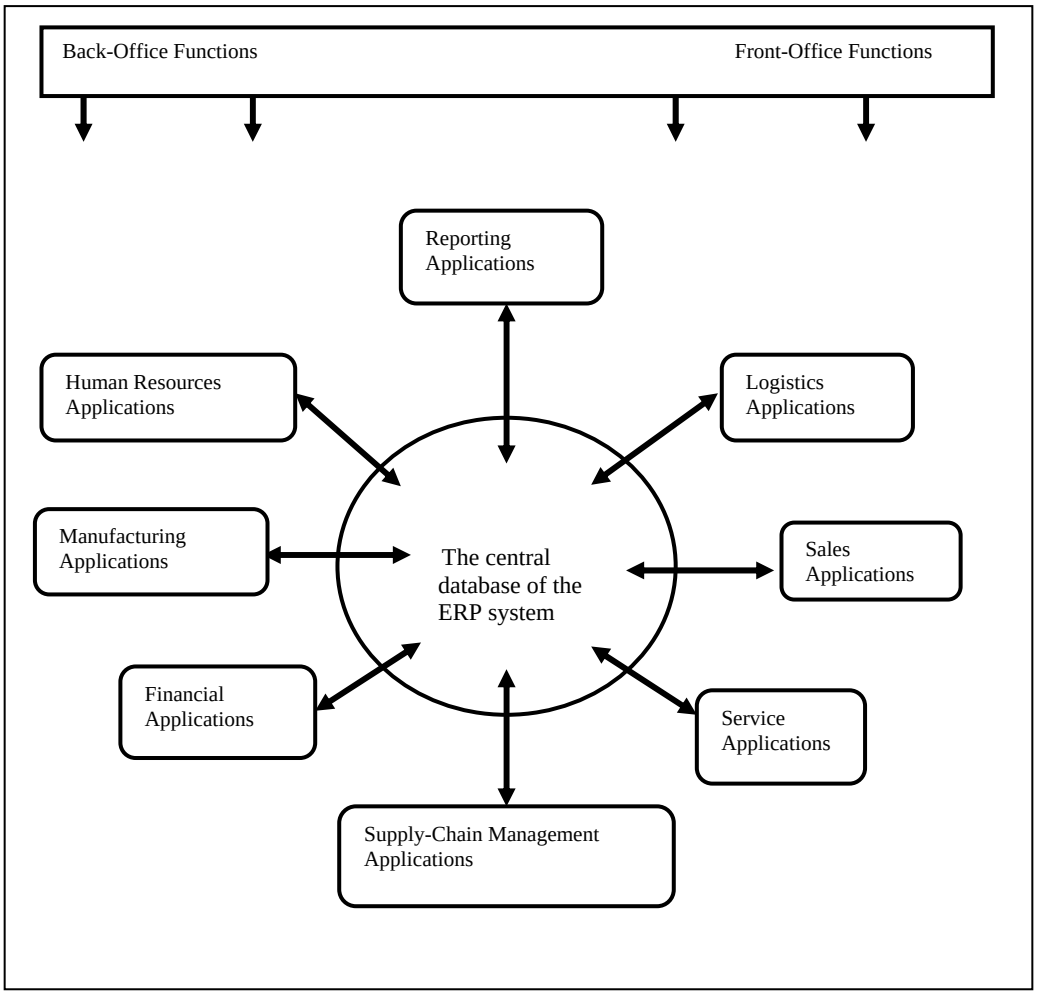
In the first part of this chapter we provide background information about the ERP software and its evolution. The second part presents the development of the research framework used in the study. The third part highlights the research questions and hypotheses for the various parts of the research framework.

2.1 What is ERP?

Many a time, authors describe the functionality of ERP systems because there is no singularly accepted definition of such systems. Examples of these abound in the literature; however, for brevity's sake we include just a few of them: Davenport (2000, p.1-2) describes ERP systems as information systems capable of supporting the "flow of information seamlessly across diverse business functions, business units, and geographic boundaries." He adds that ERP systems are doing within the organization what the Internet is doing for communication between organizations. Klaus et al. (2000, p.141) describe ERP systems as "… comprehensive, packaged software solutions [that] seek to integrate the complete range of a business's processes and functions in order to present a holistic view of the business from a single information and IT architecture." Nah et al. (2001, p.285) describe an ERP system as "a packaged business software system that enables a company to manage the efficient and effective use of resources (materials, human resources, finance, etc.) by providing a total, integrated solution for the organization's information-processing needs. It supports a process-oriented view of the business as well as business processes standardized across the enterprise." Finally, O'Leary (2000, p.27) describes ERP systems as "computer-based systems designed to process an organization's transactions and facilitate integrated and real-time planning, production, and customer response." Based on the preceding descriptions, we may conclude that an ERP is a complex business IT package designed to integrate business processes and functions, and it is capable of presenting a

holistic view of a business by permitting the sharing of common data and practices in a real-time environment. Essentiality, an ERP system builds on one database to ensure information quality (i.e., regardless of where the data is input, it becomes available to every organizational member real-time).

To illustrate the anatomy of an ERP system (Figure 1), we adapt the schematic illustrations provided by Davenport (1998) and Cotteleer (2001). According to Davenport (1998, p.124), "At the heart of an [ERP] system is a central database that draws data from and feeds data into a series of applications supporting diverse company functions. Using a single database dramatically streamlines the flow of information throughout a business." As noted above, ERP systems' adoption is growing in both large and small organizations desiring to increase productivity, reduce organizational costs, improve customer service, lay a foundation for e-commerce and e-business, increase flexibility, and make tacit knowledge explicit, among others (Markus & Tanis, 2000; Klaus et al., 2000; Davenport, 2000; van Everdingen et al., 2000; Nahar & Savolainen, 2000; Nahar 2001; Mabert et al., 2003).



Source: Adapted from Davenport (1998) and Cotteleer (2001)

FIGURE 1 The anatomy of an ERP system

2.2 Evolution of ERP

ERP systems have their roots in Materials Requirements Planning (MRP) of the 1970's (Davenport, 1998; Wortmann et al., 2000; Chung & Snyder, 2000). Basically, MRP were simple inventory control systems that were limited to the factory materials and planning (Orlicky, 1975). These systems comprised of a set of procedures and decision rules designed to translate a master production schedule into time-phased net requirements (Orlicky, 1975; Barker, 2001). In the early 1980s, these systems incorporated additional procedures to those previously available. The expanded MRP that was called Manufacturing Resource Planning (MRP II) has capabilities to accommodate and integrate the primary functions of the enterprise or organization, i.e., production, marketing, sales, and finance (Wortmann et al., 2000; Barker, 2001; Muscatello, 2002; Abdinnour-Helm et al., 2003; Mohamed & Fadlalla, 2005). The emergence of MRP II was attributed to the fact that MRP was incapable of responding to the rapidly changing environments (Chung and Snyder, 2000; Barker, 2001), to the unnecessary time spent implementing the mechanics of MRP systems (Abdinnour-Helm et al., 2003), and to the lack of communication between the business units (Kalakota & Whinston, 1997; Wortmann et al., 2000; Davenport, 1998; 2000). Moreover, these systems were run on mainframes (Muscatello, 2002).

Although, MRP II made significant strides in bringing together disparate units within the organization, it was by no means an easy task because of the system runs' operating systems differed for each unit. This gave rise to various problems related to interoperability, interfacing, and protocols incompatibility (Wortmann et al., 2000; Davenport, 1998; Abdinnour-Helm et al., 2003; Mohamed & Fadlalla, 2005); thus MRP II failed in becoming a true enterprise wide system (Chung and Snyder, 2000). To overcome the shortcomings in MRP II, a new class of applications known as "enterprise resource planning" (ERP) systems, a term coined by Gartner Group of Stamford, California, started evolving. According to some researchers, such as Themistocleous and Irani (2002), ERP systems were in fact introduced to overcome some of the integration problems associated with the preceding systems. Muscatello (2002) notes that during the early days, MRP II and ERP were used interchangeably, and that the distinction became clearer when SAP AG introduced its R/3 software in 1994. He adds "The release of R/3 also marked a shift in technology platforms from the mainframes to the increasingly popular UNIX-based client-server architecture" (p.10). We have not set out herein to uphold the "perfection" of ERP systems; on the contrary, we are aware of the shortcomings of such systems even where they show advantages over prior systems (see e.g., DeSisto 1997; Sammon et al., 2003). For example, DeSisto (1997) suggest that firms adopting ERP systems have reported high order error rates, incorrect billing, and so forth. Sammon et al. (2003) discuss the poor informational quality of ERP systems. More generally, many authors have written about the difficulties of implementing ERP systems (e.g., Davenport, 1998, 2000; Cliffe,

1999; Markus & Tanis, 2000; Abdinnour-Helm et al., 2003). In brief, the adoption of ERP systems across the world has not turned out to be the panacea for organizations wishing to improve their operational/strategic capabilities (Markus & Tanis, 2000). Soh et al. (2000) comment that the demand for ERP systems has not resulted in significant organizational improvements for adopting organizations (see also META Group, 1999; Pyun, 2002).

Indeed, in many instances, the acquisition of ERP has resulted in misfortunes for some organizations. The experiences of Dell Computer and FoxMeyer have been cited widely (Davenport, 1998). Little wonder why some executives suggested that the adoption of ERP could be harmful to the organization (Cliffe, 1999), and others predicted the death of ERP (e.g., Stein, 1999; Dempsey, 1999). Despite the problems seen with ERP acquisitions and use, they remain the largest IT investments made by firms globally (Davenport, 1998; 2000; Bingi et al., 1999; Markus & Tanis, 2000; AMR Research, 2005). In fact, the market for ERP systems has been growing since their introduction (in their current form in 1988) (Muscatello, 2002). In 1998, the revenues to the vendors of these software was approximately USD$16.6 billion (AMR Research, 1999); the revenue rapidly shot up to US$47.8 billion in 2004, and it is expected to grow to US$64.8 billion by 2009 (AMR Research, 2005). The top vendors include SAP, Oracle, and Intentia. These upward trends in the revenues accruing to the providers of these systems offer insights on the popularity of this type of software for organizations.

2.3 The research framework and its development

As clarified earlier, our discussion will be guided by a framework that connects ERP systems success measurement, evaluator's perspective, and the impacts of contingency factors. In developing the research framework (Figure 2) we consulted the relevant literature for frameworks highlighting IT impacts and benefits on the organizations, including the IT impacts framework (Scott Morton, 1991), Balanced Scorecard (Kaplan & Norton, 1992), a contingency theory for IS assessment (Myers et al., 1997), IS function performance evaluation framework (Saunders & Jones, 1992), a conceptual model of ERP implementation (Somers et al., 2000), and ERP systems benefits framework (Shang & Seddon (2002). We found that the frameworks of Saunders and Jones (1992), Myers et al. (1997), and Somers et al. (2000) would be relevant for our discourse, and we present more information about each below. It is important to mention that a similar study of ERP impacts or success by Sedera et al. (2002) also noted the pertinence of two of the three frameworks in their work.

Before discussing the development of each aspect of the framework, it is important to be explicit about the terms we use (and in which contexts). By "*ERP systems success measurement*", we refer to the aspect of this study dealing with the measures or items that can be used to evaluate the success of the ERP

software; incidentally, this is the heart of the conceptualized framework (Figure 2). Further, the research framework incorporates the impacts of *contingency factors*. We concur with definition of "contingency" as provided by Donaldson (2001, p.7) where he states that a contingency is "any variable that moderates the effect of an organizational characteristic on organizational performance." The framework recognizes that useful insights could emerge when ERP systems success assessment takes into account the *perspective of the evaluator*, which in this study represents the viewpoints of the selected organizational members.

The framework (Figure 2) highlights the impact of the contingency variables on the dependent variable that is the ERP systems success. The dotted lines are used to separate the environmental contexts (i.e., external and internal). The broken line arrow shows the impact of contingencies in the external environment on ERP success. The solid arrows show the impact of organizational variables, including technology (IT) related issues on ERP success, and the curved lines depict the interacting effects or the moderating roles between some elements in both the technology (IT) related and organizational variables (We will come to the full discussion about this later).

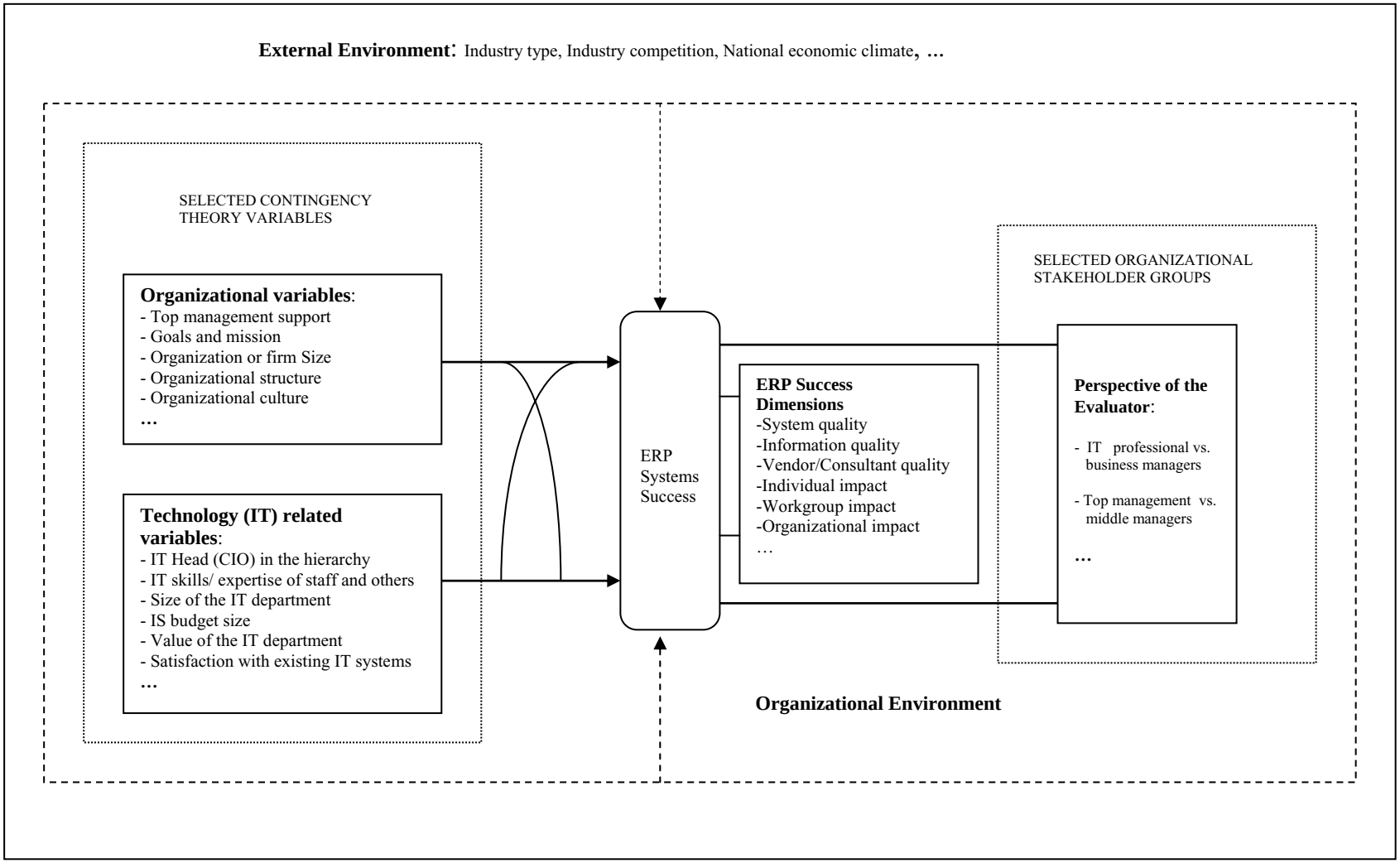


FIGURE 2 The research framework

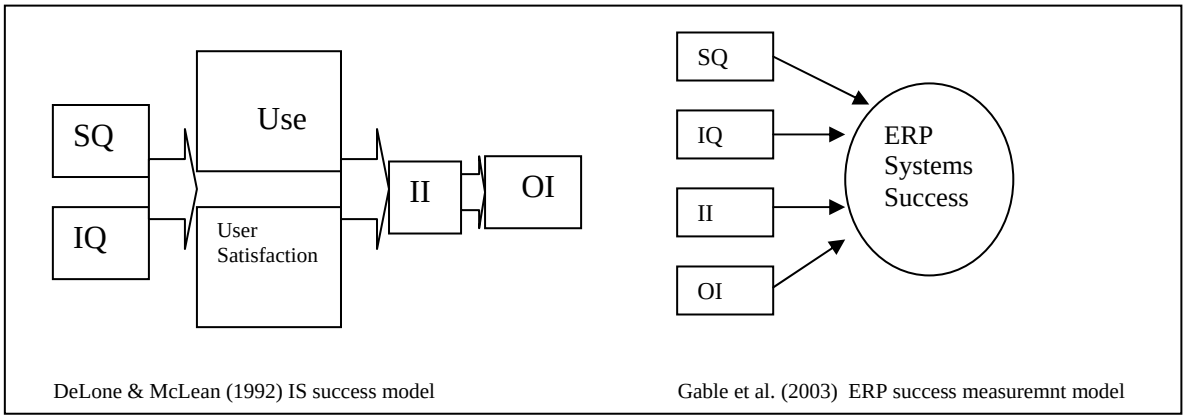
For fear of not cluttering the diagrammatic illustration, we decided to restrict ourselves to only two curved lines to indicate such interactions. The dimensions of ERP success and perspective of the evaluator are shown in Figure 2 as well. Importantly, we divided organizational factors in two parts: organizational and technology (IT issues), because it is likely that more insights will emerge from such an approach. Researchers, including Willcocks and Sykes (2000) stress that ERP initiatives have both technological and business implications and would be enlightening if viewed in that light. Similarly, Weill and Olson (1989) argue that studies using the contingency theory or approach should not only consider the business-related contingencies such as size, culture, and so forth: a deeper understanding of the impact of contingencies on organizational performance (in our case ERP success) might emerge when researchers "appreciate the interactions of the various aspects of MIS" (Ibid, p.79). Next, we discuss each aspect of the research framework and the related prior theoretical base and frameworks that informed its development.

With respect to the ERP success measurement aspect of the research framework, we drew from the IS success evaluation literature. In that area of study, the work of DeLone and McLean (1992) is regarded as the most influential model for assessing IT systems success at the micro or internal level (Iivari, 2005; Ballantine et al. 1997). DeLone and McLean (1992) conducted an extensive review of the IS success evaluation literature and came up with their model, which is comprised of six inter-related and interdependent dimensions of IS success. The dimensions are *Use*, *User satisfaction*, *System Quality* (SQ), *Information Quality* (IQ), *Individual Impact* (II), and *Organizational Impact* (OI). The DeLone and McLean (1992) IS success measurement model is shown in Figure 3. With regard to ERP success measurement model, Gable et al. (2003) drew from the DeLone and Mclean model to develop an additive model that redefines the original dimensions. In brief, Gable and colleagues eliminated (through multi-stage data collection and statistical analysis) the *Use* and *User satisfaction* dimensions. Arguments against dropping these also appear in Saarinen (1996) and Seddon (1997). Importantly, *Use* can only be a measure of success where IS use is not mandatory, a fact that DeLone and McLean (1992) themselves pointed out by noting that, "…usage, either actual or perceived, is only pertinent when such use is voluntary" (p.68). Indeed, participants in our case studies concerning ERP success assessment in the region of this study indicated that ERP use for them is mandatory (Ifinedo, 2005; Ifinedo & Nahar, 2006f).

With regard to the *User satisfaction* success dimension that is eliminated in the ERP success measurement model proposed by Gable et al. (2003), another study by these researchers conclude that "The statistical analysis of the 310 responses [that they received] and the content analysis of the 16 instruments [that they used] suggest the appropriateness of treating *User satisfaction* as an overarching measure of success rather than a dimension of success" (Sedera and Tan (2005, p.963). In this regard, *User satisfaction* was not expunged in its entirety from this study, *per se*. A closer look revealed that some measures commonly used for IS end-user satisfaction evaluation (e.g., Ives et al., 1983;

Doll & Torkzadeh, 1988) also appear in our instrument (please see the Appendix 7) to underscore its relevance as suggested by DeLone and McLean (1992). Thus, the ERP success dimensions retained in Gable and colleagues' model are: *System Quality* (SQ), *Information Quality* (IQ), *Individual Impact* (II) and *Organizational Impact* (OI). Their model is also shown in Figure 3.

Other ERP success measurement models have been proposed (Markus & Tanis, 2000, Tan & Pan, 2002; Wu & Wang, 2005), but the Gable et al.s' model has gained a wider recognition, as noted above; unlike the other models proposed by other researchers (e.g., Tan & Pan, 2002), the Gable et al.'s model has its roots in the DeLone and Mclean (1992) IS success measurement model, which is recognized by IS researchers as an important reference point of IS success evaluation research. A closer look at Figure 3 shows that two other dimensions of ERP success are highlighted – these are the extensions that we made to the effort of Gable et al. (2003), which will be discussed in other parts of this work.



Legend: SQ = Systems Quality, IQ = Information Quality, II = Individual Impact, OI = Organizational Impact

FIGURE 3 Illustrations of IS success measurement model by DeLone and McLean (1992) and ERP success model of Gable et al. (2003)

Both the DeLone and Mclean IS success measurement and the Gable et al.'s ERP success measurement models discussed above are relevant for evaluating the effectiveness or success of an acquired IT system (including ERP) at the organizational level. These models do not include or consider other relevant contextual or environmental influences. In their famous work, DeLone and McLean (1992) caution researchers not only to focus on the dimensions of IT systems success, but to also consider other contingency factors. They comment:

> "Researchers should systematically combine individual measures from the I/S success categories to create a comprehensive measurement instrument. The selection of success measures should also consider contingency variables, such as the independent variables being researched; the organizational strategy, structure, size, and the environment of the

> organization being studied; the technology being used; and the task and individual characteristics of the system under investigation" (Ibid, p.87-88).

DeLone and McLean (1992) as well as other researchers, including Saunders and Jones (1992), Myers et al. (1997), and Ballantine et al. (1997) assert that deeper understanding could emerge when the contextual influences are duly considered in the discourse of IT systems success evaluations or assessment. Duncan (1972) provides a distinction between contexts when he writes, "…the internal environment consists of those relevant physical and social factors within the boundaries of the organization … the external environment consists of those relevant physical and social factors outside the boundaries of the organization…" (Ibid, p.314).

Against the backdrop of not downplaying the relevance of the influence of contingencies in the assessment of the performance - success or effectiveness - of the IS function, Saunders and Jones (1992) include contingency variables in their study on the performance of the IS function. The researchers investigate both the organizational factors such as top management support, size, mission, industry, and so forth as well as the peculiar dimensions that might improve the effectiveness or success of the IS function. They proposed an evaluation model which they term "IS Function Performance Evaluation Model" (Figure 4). The relevance of the Saunders and Jones (1992) to this study rests on the extent to which it provides support to the view that a conceptual model or framework can be developed to include both the impact of contingencies factors and the dimensions of effectiveness or success. In the same vein, Willcocks and Sykes (2000) have discussed the role of the IT function in ERP acquisitions and Sedera et al. (2002, p.600) have also used a combination of the Saunders and Jones (1992), DeLone and McLean (1992), and the Myers et al. (1997) frameworks to discuss the impacts and success of ERP systems in Australian public sector organizations. We discussed the DeLone and McLean (1992) IS success evaluation briefly above; next we introduce the Myers et al. (1997) framework.

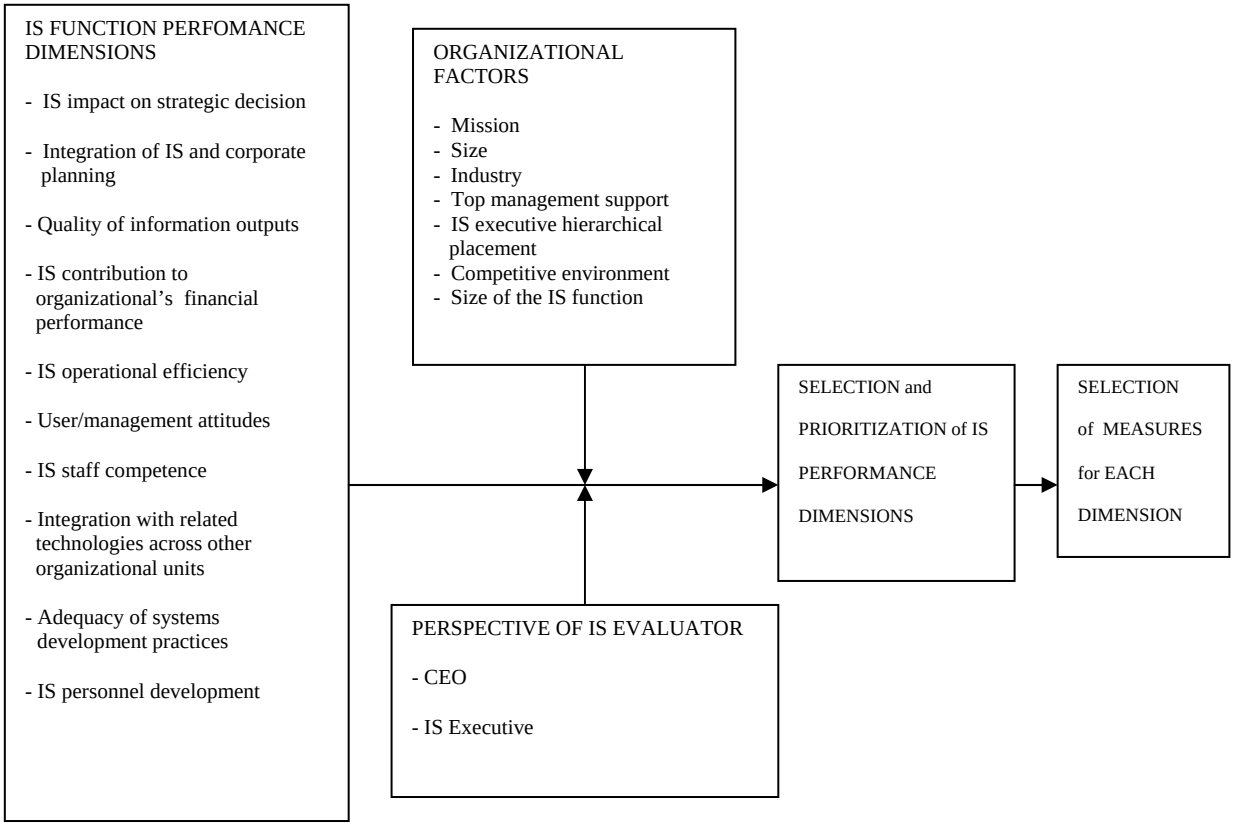


FIGURE 4 The IS function performance evaluation model by Saunders and Jones (1992)

Building on the work of Saunders and Jones (1992), the framework of the "contingency theory of IS assessment" was developed by Myers et al. (1997). It is shown in Figure 5. Essentially, the framework extends the Saunders and Jones framework in the context of the assessment of quality and productivity of the IS function. The Myers et al. model also recognizes the pertinence of both contingency factors and the dimensions of IS success. The framework of Myers et al. (1997) re-organizes the dimensions of success for the IS function to include the six dimensions of IS success that DeLone and McLean (1992) had elaborated. The Myers et al.'s framework includes two new dimensions: *Service Quality* and *Workgroup Impact*, which they note are pertinent to their discourse.

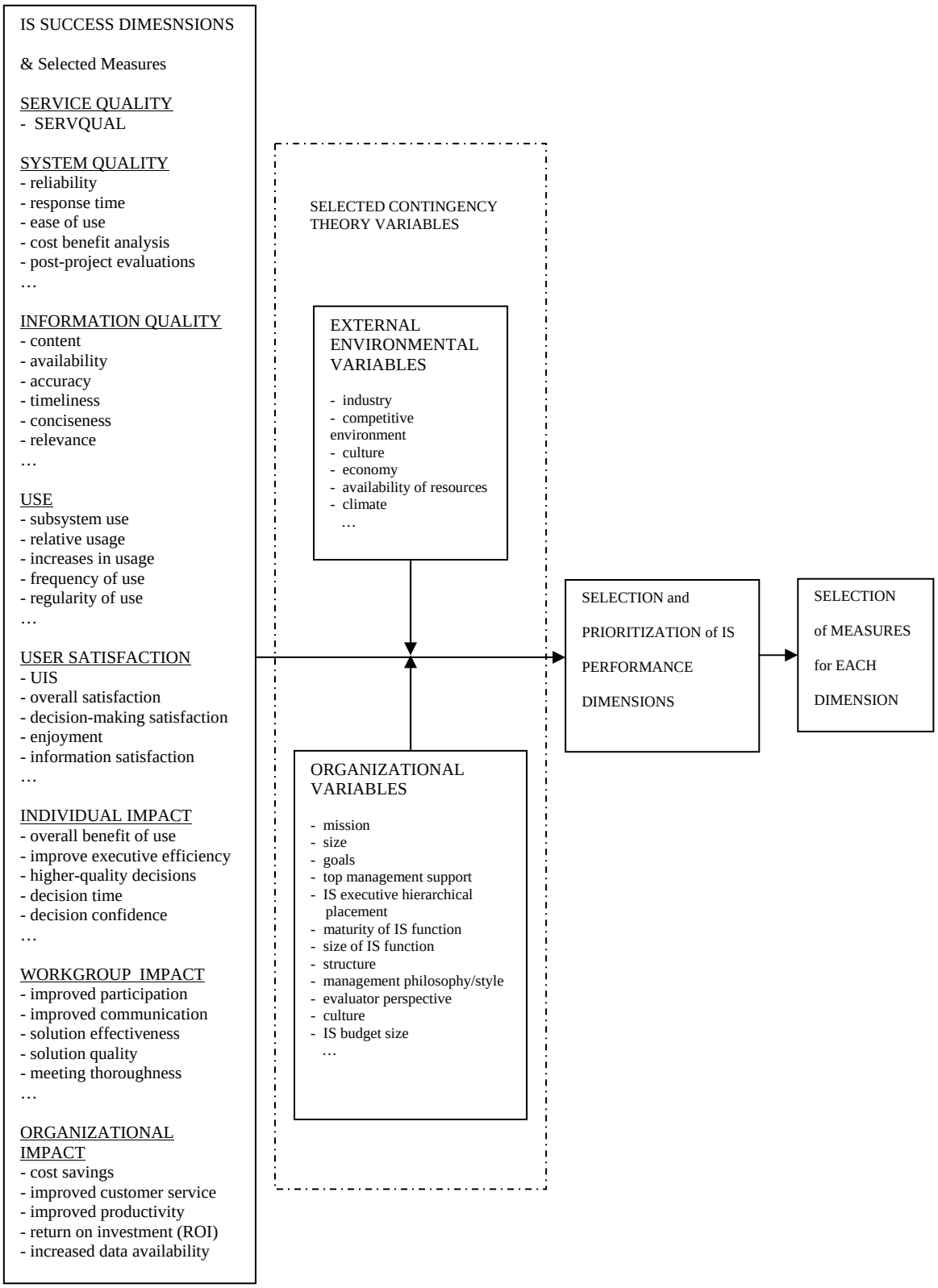


FIGURE 5 The contingency theory of IS assessment framework by Myers et al. (1997)

Additionally, Myers et al. clearly delineate "external environmental variables" from the organizational factors, which Saunders and Jones (1992) did not do; thus, by separating the contextual levels into two main parts, their approach provides support to our conceptualization in Figure 2. As briefly stated above, prior literature (e.g. Duncan, 1972) suggests that such delineations are necessary for insights.

With regard to ERP systems in particular, we borrowed from the model proposed by Somers et al. (2000) that includes contextual factors such as industry type, size, structure, and so forth, which these researchers imply are critical in achieving positive outcomes from ERP acquisitions. The Somers et al.'s framework is shown in Figure 6. It is apparent that these authors are suggesting that the value (or success in our own case) that adopting firms would obtain from their ERP software could depend on the extent to which there is a match between the process, contexts, and contingency factors. We contend that the Somers et al.'s (2000) model is rooted in the contingency approach, which is similar to ours. Furthermore, to the extent that our research framework (Figure 2) is similar to their model, the two frameworks in the context of ERP systems are characterized by views that seem to be indicating that the success (or value) of such systems can be influenced positively by contingencies. More importantly, we noted that the selected variables in this study are offered as illustrative rather than exhaustive examples; in that regard, this study benefits from the Somers et al.'s framework from which we got some of our variables, including industry type, competitiveness, among others. We also argue that at a general level, the conceptualization in Figure 6 by Somers et al. (2000), to some degree, provide support to the viewpoints espoused by Saunders and Jones (1992) and Myers et al. (1997) indicating that an understanding of the success or effectiveness of IS systems or functions can be enhanced whenever contingency factors or issues are adequately considered.

Third, increasingly researchers (e.g., Saunders & Jones, 1992; Myers et al., 1997; Grover et al., 1996; Sedera et al., 2004) discussing IT systems success or effectiveness evaluations have drawn upon the organizational effectiveness literature in Management Science (e.g., Cameron & Whetten, 1983; Cameron, 1986). Following the arguments offered by the foregoing researchers, we make an attempt to include the perspective of the evaluator in this research framework just as Saunders and Jones (1992) and Myers et al. (1997) did with their frameworks (see the illustrations above). In fact, our research framework (Figure 2) draws from prior efforts; nonetheless, we would like to point out that it does more than provide a guide for our discourse. Unlike the prior frameworks that informed its development, it provides empiric information about the nature of the relationships between its different constituting parts. Our study did not only indicate that certain variables, for example, industry type or organizational culture, are crucial in achieving success with a system, we also attempted to provide empirical evidence in that regard.

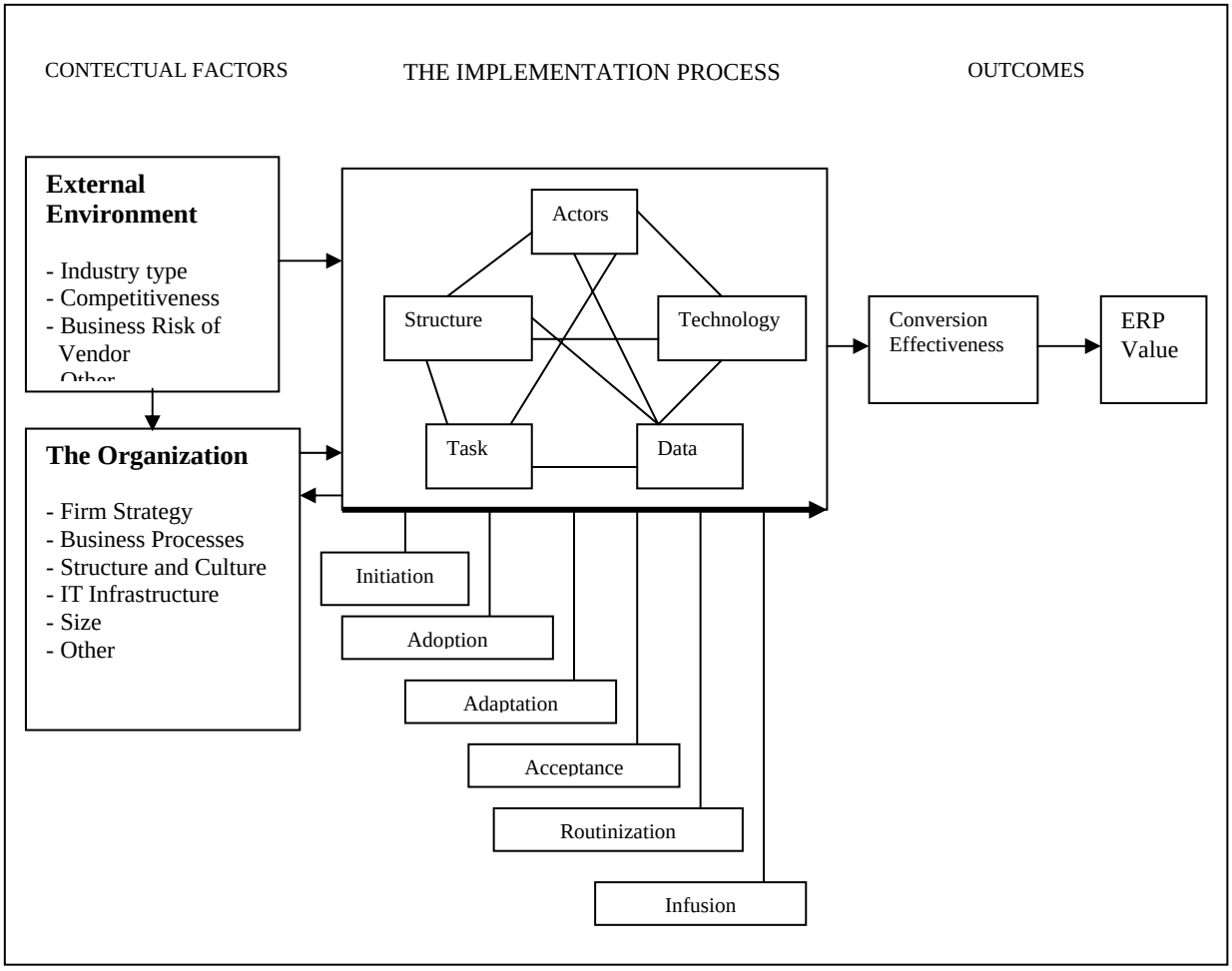


FIGURE 6 A conceptual model of ERP implementation that incorporates contextual factors proposed by Somers et al. (2000)

2.4 Theoretical foundations of the research framework

Quite often, researchers in the IS literature develop and use models or frameworks without grounding them in relevant theories. Saunders and Jones (1992) did not provide a theoretical background to their framework, although one could easily ground their framework in the Contingency Theory or approach. Myers et al. (1997) were more explicit as they related their own framework to the Contingency Theory.

In this study, as the two levels in the research framework are composed of contextual factors or contingencies such as size, culture, structure, and so forth. We assert that the Contingency Theory (CT) developed by Lawrence and Lorsch (1967) is particularly relevant to our work. The Contingency Theory posits that organizational effectiveness (in this instance ERP effectiveness or success) can result from the matching of organizational characteristics with contingency factors. About a decade ago and earlier, this theory was the most dominant in the IS and Management Science literature. Weill and Olson, (1989,

p.59) note "Of the 177 articles during the period studied, 59 percent were empirical and over 70 percent of these were judged to follow a contingency model." The authors also highlighted the shortcomings in CT; these include its limitations in explaining interactions between variables, which at best it merely describes (see also Schoonhoven, 1981). CT assumes the existence of rational actors and often researchers using it narrow their focus to deterministic models (i.e., only the arrows representing a required association are shown and the effects of other factors are ignored) (Weill & Olson, 1989). Due to the limitations in CT and its gradually diminishing influence among researchers in IS and related field, Weill and Olson (1989) encourage the use of other theories to explain aspects of organizational behavior.

With respect to our research framework, another theoretical base that can arguably be considered relevant is the Stakeholder Theory (ST) that was proposed by Freeman (1984). ST posits that sustainable success rests upon a systematic consideration of the views of all key stakeholders of which organizations are made up (Pouloudi & Whitley, 1997; Lyytinen et al., 1998). The Stakeholder Theory considers two perspectives: inside-in (employees, managers) and inside-out (others: shareholders, partners). We narrow our scope in this study to the former. In the extant IS literature, stakeholders have been identified based on a particular research purpose. For example, Lyytinen et al. (1998) describe stakeholders as actors that can set forward claims or benefit from IT systems development issues. Singletary et al. (2003) identified stakeholders as managers, IT professionals, and end users. Thus, ST could facilitate insights when ERP success is to be discussed from the point of view of differing organizational stakeholder groups, which appear to be similar to the dictates of the organizational effectiveness literature in which "the perspective of the evaluator" is esteemed (Cameron, 1986). However, there are shortcomings in ST as well. Due to its origins, it tends to focus more on control and governance structures in corporations than on how organizational actors relate with each other. In discussing the cracks in ST, Weiss (2006, p.5) asserts that "ST grounds its view of the moral issues surrounding the enterprise in the issue of the control and governance of large corporations." Phillips (2004) sums the limitations of ST by noting that historically ST has been plagued by questions on how to allocate management resources, including time, energy, etc. to other stakeholder groups in the corporation. He adds "While there is no determinate algorithm, ST can provide some broad direction on making these decisions" (p.3). Importantly, we point out, in each of the included articles, where each of the two theories discussed may be applicable.

Further, in critiquing the CT, Weill and Olson (1989, p.62) note that a diversity of theories related to organizational behavior and performance are currently being used in the literature. Some of the theories they list include resource dependency theory (Pfeffer & Salancik, 1978), institutionalism theory (Meyer & Rowan, 1977; Scott, 1995), and organizational demography theory (Pfeffer, 1983), amongst others. The resource dependency theory posits that organizational actors lacking essential resources will establish relationships with others to obtain such needed resources. Thus, organization success, in the

context of this theory defines the extent to which power is maximized by competing entities. In brief, the institutional theory deals with deeper aspects of social structure. Essentially, it emphasizes issues related to rules, norms, myths, and routines that become established as authoritative guidelines for social behavior (Meyer & Rowan, 1977; Scott, 1995). The organizational demography theory proposed by Pfeffer (1983) deals with how organizational members are affected by issues related to the frequency and type of administrator succession, performance and innovation adaptability, unionization, distribution of power across cohorts, and so forth. On the surface, one might argue that given the fact the unit of analysis of this study is at the firm level, some of these theories might seem applicable in our study. Nonetheless, we used none of the foregoing three theories or any others apart from CT and ST that we described above, because we believe that our research objectives are in tune with the dictates of these two theories.

2.5 The research questions and hypotheses

In this sub-section, we present in-depth discussions about the research questions and hypotheses formulated to address specific aspects of the research framework that was discussed in the preceding section.

As ERP systems spread globally (Davenport, 1998; Bingi et al., 1999; Markus & Tanis, 2000; Mabert et al., 2003; AMR Research, 2005), it is logical to expect that adopting firms would, at some point in time, desire to measure the success or effectiveness of their acquired ERP systems (Gable et al., 2003; Sedera et al., 2003a, Ifinedo, 2005). Put simply, adopting organizations would seek deeper understanding on how well their systems have enabled organizational goals to be met. (Recall our notion of ERP success that precludes profitability indicators). For some practitioners, assessing the success of ERP systems may be difficult, as noted earlier, because such systems are inherently complex (e.g., Robbins-Gioia, 2002; Markus & Tanis, 2000, Sedera el al., 2003a). Lack of knowledge about what to assess has been reported to be causing problems for some adopting organizations (e.g., Robbins-Gioia, 2002; Ifinedo, 2005).

Furthermore, IS research in this area is in its early stages (Gable et al., 2003; Sedera et al., 2003a; Sedera & Gable, 2004). A review of the literature reveals that few researchers have investigated ERP systems success issues in general (see Markus & Tanis, 2000; Nelson & Somers, 2001; Tan & Pan, 2003; Gable et al., 2003; Sedera et al., 2003a, b; Wu & Wang, 2005). For example, Nelson and Somers (2001) and to some extent, Wu and Wang (2005) have discussed ERP systems success by using the end-user satisfaction instrument (Ives et al., 1983). Despite, the popularity of that instrument among IS researchers, criticisms have been leveled at its limited focus (e.g., Saarinen, 1996). Specifically, Tan and Pan (2002) develop a framework for ERP systems success assessment by including both technical and strategic valuation of ERP

systems success, but using their framework as the base of our study might be difficult, because the model that they propose has not been validated. In their framework, Markus and Tanis (2000) elaborate on enterprise systems success wherein a variety of factors including the phases of implementations, performance metrics, and outcomes are discussed. However, Markus and Tanis (2000, p.200) note that their "theoretical framework … is too broad in scope for direct empirical testing. As indicated earlier the ERP systems success measurement proposed by Gable et al. (2003) provide perhaps the most comprehensive ERP systems success measurement model to date, and we noted that their model is validated and considered to be a good contribution to knowledge in this area of research. Thus, we concluded that their model can serve as the foundation upon which we can build our inquiry about ERP success assessment. However, with its *four-dimension* (i.e., *System Quality*, *Information Quality*, *Individual Impact*, and *Organizational Impact*) conceptualization of ERP success, we need to inquire whether the Gable et al.'s model is comprehensive in its operationalization of ERP systems success. In our attempt to finding out whether their model could have overlooked relevant items or issues, we pose the first research question as follows:

Research question one (RQ1): Is the Gable et al.'s (2003) ERP success measurement model comprehensive? If not, can the model be extended to incorporate other relevant dimensions of success?

Some may ask: Why develop and extend new IS success measurement models for ERP when similar frameworks already exist. We believe this is necessary and justified because the implementation of ERP system is different from that of any other IT systems (Davenport, 2000; Markus & Tanis, 2000). ERP implementations include technological, operational, managerial, strategic, and organizational constructed components (Markus & Tanis, 2000; Al-Mashari et al., 2003; Yu, 2005) and as a consequence, success measurement models used for other typical IT systems' evaluation may not be adequate for ERP systems (Yu, 2005; Ifinedo, 2006f). Indeed, DeLone and McLean (1992) stress that researchers should take into account the specific characteristics of the IT system under investigation when evaluating its success for organizations. Against this backdrop, we assert that ERP success measurement proposed by Gable et al. (2003) might have overlooked two relevant issues that may seem relevant in the context of ERP success assessment. Indeed, Ifinedo (2006f) argues that any ERP success measurement model should include dimension related to *Workgroup Impact* because ERP systems are often adopted to overcome the shortcomings of other IT systems, including MRP systems that ended up isolating the enterprise into islands of information (Davenport, 2000; Abdinnour-Helm et al., 2003). Realistically, ERP systems harmonize processes from the different departments within the organization and thus it is to be expected that their impacts would be palpable across the various sub-units, workgroups, and departments in the organization. Therefore, organizations should assess the success of such

systems at functional levels as well. In fact, other researchers including Myers et al. (1996) have made similar calls in the past and Barua et al. (1995, p.20) found "that the most important significant contributions of IT investments occur at low organizational levels where they are implemented."

Another issue that is equally important relate to the providers of the systems. Again, we argue that the engagement of poor quality ERP systems providers "can become a negative influence or even a curse which [drags] the entire company into a spiral of ineffectiveness" (Yu, 2005, p.117). Markus and Tanis (2000) note that when the quality of the providers (vendors and consultants) have not been perceived to be high for the adopting organization, dire consequences have resulted (in severe cases, the firm may have suffered serious operational performance leading to loss of business and bankruptcy). Other ERP researchers, including Wu and Wang (2005) have actually incorporated a similar dimension, i.e., "customer/supplier service provider" as an ERP success measure. Importantly, we grouped both vendors and consultants together because Sedera et al. (2003b, p.1411) found that "consultant and vendor items loaded together yielding a new factor named external knowledge player." Other IS studies (e.g., Bajwa et al., 1998) have similarly grouped both vendors and consultants. Thus, *Vendor/Consultant Quality* (VQ) is relevant for ERP success measurement model.

That said, in expanding the research question above, we develop the following sub-questions (SRQ) to provide insight.

SRQ1: Is "ERP systems success measurement model" a second-order factor as suggested by Sedera and Gable (2004)?
SRQ2: Which dimension(s) might serve as the best surrogate of ERP success?
SRQ3: What is the nature of the relationships between the dimensions of ERP success?

With respect to the interrelationships between the dimensions of ERP success, we formulated relevant hypotheses (H1- H10) to examine such.

2.5.1 Hypotheses related to the interrelationships between the dimensions of ERP success

Researchers (e.g., Thong et al., 1996; Bajwa et al., 1998) confirmed positive relationships between the quality of external expertise and IT system success at a general level. Particularly, studies by Gefen and Ridings, (2002), Sedera et al. (2003b), Gefen (2004), and Ko et al. (2005) suggest that users (or adopting firms) of an ERP system experience higher levels of benefits from their software when the vendors/consultants possess the appropriate qualities (trust, good communication skills, quality training, etc.). Similarly, the information output quality from the system will be better understood and valued if the vendor/consultant quality is high. That is, the vendor/consultant is prepared to make efforts to ensure that users use or interpret the output from the system

appropriately (Gefen & Ridings, 2002; Westrup & Knight, 2000, Sammon et al, 2003, Gefen, 2004). Indeed, Bajwa et al. (1998) note that past research suggests that when an IS is complex, mediating institutions (vendors and consultants) play crucial roles in the delivery of such technologies. Therefore, we hypothesize:

H1: The higher the *Vendor/Consultant Quality*, the higher the *System Quality* of the acquired ERP system.

H2: The higher the *Vendor/Consultant Quality*, the higher the *Information Quality* of the acquired ERP system.

Ceteris paribus, the impacts accruing to the individuals, workgroups, and the entire organization will be high when a good vendor/consultant is engaged for their ERP initiatives (Thong et al., 1996; Westrup & Knight, 2000; Sedera et al., 2003b; Gefen, 2004; Ko et al., 2005). Gefen and Ridings (2002) found that when users have contact with the ERP technical implementation team, the assessment of the new system tends to be more favorable than for instances where such contact was low. The decision to adopt an ERP is often influenced by the desire to improve functional and organizational goals and objectives in organizations (Davenport, 1998, 2000; Markus & Tanis, 2000). A good source of external expertise (i.e., vendors/consultants) would enable firms to leverage the use of complex IS systems such as ERP in realizing organizational objectives (Davenport, 2000; Sedera et al., 2003b; Ko et al., 2005). It is therefore logical to conjure that the higher the quality of the vendor/consultant engaged, the more likely it is for functional and organizational goals to be met. Thus, we formulate the set of hypotheses as follows:

H3: The higher the *Vendor/Consultant Quality*, the higher the *Individual Impact*.

H4: The higher the *Vendor/Consultant Quality*, the higher the *Workgroup Impact.*

H5: The higher the *Vendor/Consultant Quality*, the higher the *Organizational Impact.*

The study by Seddon and Kiew (1994) and Rai et al. (2002) showed a positive relationship between system quality and "usefulness". Upon examining the measures used to measure this item in both studies, we noticed some salient similarities between their "usefulness" construct and our own dimension of *Individual Impact*. Calisir and Calisir (2004) report significant path coefficients perceived ease of use and perceived usefulness ($\beta = 0.381$) and between system capability and perceived usefulness ($\beta = 0.354$). Therefore, we predict:

H6: Increases in *System Quality* will cause increases in *Individual Impact*.

Also, Seddon and Kiew (1994) found that increases in *Information Quality* led to more "usefulness" of an IS as assessed from the perspective of the individual. Prior literature (e.g., Kraemer et al., 1993) has also shown that increased *Information Quality* will lead to increased usefulness of an IS for the individual. Recently, Kwahk (2006) found strong support for ERP system utilization being positively influenced by perceived usefulness. We therefore hypothesize:

H7: Increases in *Information Quality* will cause increases in *Individual Impact*.

Ceteris paribus, when the effect arising from the use of an IS is high for an individual, it is likely that the impact for the workgroup or sub-unit to which the individual belongs will also be high. Evidence in support for this viewpoint is partially provided by the direction of flow in the DeLone and McLean IS success model as well as in the alternative IS success measurement model that Myers et al. (1996) proposed. The flow also indicates that as the effects of an IS on the individual increase, so will the impact on the workgroups, and ultimately for the organization (Bakos, 1987; DeLone & McLean, 1992; Myers et al., 1996). Based on this brief discussion we formulate the following set of hypotheses:

H8: Increases in *Individual Impact* will cause increases in *Workgroup Impact*.

H9: Increases in *Workgroup Impact* will cause increases in *Organizational Impact.*

H10: Increases in *Individual Impact* will cause increases in *Organizational Impact.*

Answers to research question one, its sub-questions, and the foregoing hypotheses are provided in Articles I, II, and III.

As depicted in the research framework (Figure 2), we aim to examine the impacts of selected contingencies in differing contexts (internal and external) on ERP systems success for adopting organizations. In the preceding section, we provided a rationale for the development of our integrative framework by citing pertinent theoretical models (Saunders & Jones, 1992; Myers et al., 1997; Somers et al., 2000). We also decided to concentrate on the variables highlighted in those frameworks. These prior frameworks, taken together, imply that the success or effectiveness of IT functions and/or systems (including ERPs) might be influenced positively by some of the selected variables in differing environmental contexts (i.e., external and internal), which we clearly delineated in our research framework. As mentioned above, this study is an initial attempt at investigating the hypothesized relationships between the selected contingencies, on the one hand and ERP success, on the other. Thus, we aim to present detailed information as to how the selected contingency factors in this study influence or impact the success assessment of ERP systems in adopting organizations. Thus, the second research question is presented as follows:

Research question two (RQ2): What relationships exist between ERP systems success and some selected contingencies in the contextual environment (i.e., external and internal: organizational and technology [IT] related factors)?

In providing answers to the question above, we develop sub-questions and hypotheses, which we discuss in detail below. We start by highlighting hypotheses related to the other part of the research framework (i.e., external environment) and transit to the hypotheses formulated in relation to the internal level contingencies.

2.5.2 Hypotheses related to the external environment

In the Organizational Science literature, emphasis has been placed on the impact of external environmental factors on the organization (see for example, Duncan 1972), and researchers, including Miller and Friesen (1982), over the last three decades have called for studies not to neglect the relationships between environmental variables and the organization. This is relevant nowadays as business organizations come under increased pressure due to rapidly changing external contextual influences such as global competition and dynamic market environments (Powell, 1996; Watson et al., 1997; Lee, 2001). Thus, it is critical for management to have insights about some (and if possible all) important external contextual factors that may impact upon their adopted information technology (IT) systems, in this instance, ERP systems.

We examine the impact of external contextual factors on the assessment of ERP system success and focus on few variables, i.e., industry type, industry climate (stability and competition), and the national economic climate of the adopting firms. Although external contextual factors might include other components (e.g., government regulations, the influence of suppliers/partners, national culture), we chose our variables for the following two reasons: (1) simplicity/illustration purposes and (2) the availability of ERP implementation studies related to these issues. We indicated earlier that the framework proposed by Somers et al. (2000) with respect to ERP system implementation and outcomes suggest that contextual factors (including industry type, competitiveness, etc.) are important for assessing ERP outcomes in adopting organizations. In addition, extensive review of the literature revealed that other researchers (e.g., Chadhar & Rahmati, 2004) have discussed the impact of other external contextual factors, i.e., national culture on ERP success assessment. Due to the similarities in cultural values between the two countries in this study, we decided against including cross-cultural impacts in this study. Rather, we focus on industry type, climate and national economic climates.

Following the categorization of industries by Wu and Wang (2003), we similarly classified the participating firms in this study into two main categories, namely, manufacturing and services sectors. The term "information intensity" coined by Porter and Millar (1985) was also used to classify firms in

this research sample. Information intensity, according to Glazer (1991) is the extent to which products and operations are based on the information collected and processed as part of exchanges along the value-added chain. Industry climate, in this study, describes the stability and competition in the industry. National economic climate is used to distinguish the level of socio-economic development or status of countries (WEF, 2004). Overall, studies and development reports suggest that all the three variables (i.e., industry type, industry climate, and national economic climate) influence IT systems success assessment (see e.g., Bergeron et al., 1991; Grover & Goslar, 1993; Huang & Palvia, 2001; Wu & Wang, 2003; WEF, 2004; Lee & Kim, 2006). For example, traditional, relatively static industries (e.g., metal and cement manufacturing) with low information intensive products might find ERP useful but not essential (Busch et al., 1991). Wu and Wang (2003) found that the overall ERP satisfaction level in industry with high information intensity is significantly higher than that in traditional industry. Grover and Goslar (1993), citing Pfeffer and Leblebici (1977), suggest that organizations in relatively undifferentiated and stable environments may find IT systems adoption unnecessary. However, firms in unstable environments (characterized by ever-changing industrial landscapes) see IT systems as critical and necessary infrastructure, seamlessly use such systems to gain competitive advantage (Porter & Millar, 1985; Glazer, 1991), and are adept at strategically using them (Busch et al., 1991; Johnston & Carrico, 1988; Davenport, 1998; Lee & Kim, 2006). Differences in the economic status of nations are a major differentiator in the perception of IT benefits (Dewan & Kraemer, 2000; WEF, 2004; Gregorio et al., 2005). Huang and Palvia (2001) suggest that the poor economic capabilities in developing countries present a problem regarding ERP penetration. Davenport (2000) comments, "[ERP] can lead to greater productivity and efficiency in advanced economies" (p.24) to imply that such benefits might be difficult to obtain in developing economies.

In order to investigate the impact of the three external variables in the context of ERP systems, we ask the following sub-questions: (a) Does industry type matter in the assessment of ERP success? (b) Does industry climate influence a firm's assessment of ERP success? (c) Does national economic climate influence a firm's assessment of ERP success?

Specifically, the formulated hypotheses for questions a, b, and c are as follows:

H11a: Firms in different industrial sectors will assess ERP success differently.

H11b: ERP success assessment in firms will differ according to their information intensities.

H12: ERP success assessment will differ according to industry climate.

H13: ERP success assessment will differ according to national economic climate.

Answers to the foregoing sub-questions (and their related hypotheses: H11 – H13) above are provided in Article IV.

With regard to the issues at the internal or organizational level, we approach them from three perspectives. The first part (Article V) deals with the impact of three contingencies (i.e., size, top management support, and organizational goals and mission) on ERP systems success measurement. We decided to simplify this aspect of our work to reflect the methodological patterns commonly seen with comparable studies in the literature as noted by Weill and Olson (1989). We believe that by using such an approach, our readers might be better prepared for the slightly more complex part of the study's analysis that incorporates the interactions (or moderating roles) of some variables across the organizational and technology (IT-related) sub-contexts. Weill and Olson (1989) argue that such a methodological consideration would facilitate deeper insights. The second and the third parts (i.e., Articles VI and VII) are designed to include such interacting effects. Next, we discuss and raise the relevant questions and hypotheses.

2.5.3 Hypothesis related to top management support

Several researchers, including Igbaria (1990), Thong et al. (1996), Dong (2001), Hong and Kim (2002), and Somers and Nelson (2004) have noted the crucial nature of securing top management support and commitment in order to ensure the success of IT projects (and ERP projects) in organizations. In fact, top management support is critical for the success of IT projects in organizations because of its influence and role in providing financial resources and relevant guidelines (Doll, 1985; Dong, 2001; Ifinedo, 2007d). Furthermore, a positive relationship between top management support and IS effectiveness or success has been reported in the literature (e.g., Igbaria, 1990; Thong et al., 1996). Indeed, many studies suggest that during ERP acquisitions top management support is among the critical success factors (CSFs) for ERP implementation projects (e.g., Bingi et al., 1999; Sumner, 1999; Holland & Light, 1999; Hong & Kim, 2002; Somers & Nelson, 2004). Other commentators suggest that top management support must not end at the acquisition phase but should be available throughout the systems' life cycle. For example, Bingi et al. (1999) note "The success of a major project like an ERP implementation completely hinges on the strong, *sustained* commitment of top management." Thus we ask: Does top management support influence ERP system success? Recall that the success being referred in our study differs from success at implementation phases. Given that studies investigating this sort of relationships are scarce, we hope that our effort will increase knowledge with our hypothesis below, which sought to uncover the nature of the influence of top management support on ERP success.

H14: Top management support is positively related to ERP systems success.

2.5.4 Hypothesis related to organizational goals and mission

According to Johnson and Scholes (1999, p.13), "A mission is a general expression of the overall purpose of the organization, which, ideally, is in line with the values and expectations of the major stakeholders … It is sometimes referred to in terms of …: *What business are we in*?" Simply put, a company mission serves to distinguish a firm from other firms by outlining its beliefs and values (Christopher et al., 2000). Goal, on the other hand, is a general aim in line with the company's mission (Johnson & Scholes, 1999). Many organizations purportedly adopt ERP to meet their organizational objectives: goals and mission (Davenport, 1998, 2000; Bingi et al., 1999). The widely publicized reasons for ERP adoption include gaining strategic advantage, enhancing globalization, improving customer service, etc. (Davenport, 1998, 2000; Sumner, 1999; Mabert et al., 2003) which incidentally reflect organizational goals and mission. However, studies have suggested that not all organizations are able to articulate their IT strategy (i.e., ERP adoption) vis-à-vis their overall company objectives (e.g., Keen, 1993; Deloitte Consulting, 2000). Indeed, some organizations are unable to link their strategic intent with IT strategies, including ERP implementations, and have been known to jump on the bandwagon of IT system adoption without a clear and defendable rationale (Keen, 1993; Davenport, 2000). In fact, Deloitte Consulting (2000) attributed the high failure rates of ERP projects to poorly defined goals and mission, and it has been suggested that there is a need to have strategic clarity before embarking on its adoption (e.g., Davenport, 2000). Thus we ask: Does a clear organizational goals and mission influence ERP system success? The hypothesis developed to provide answer to the question is stated as follows:

H15: There would be a positive relationship between organizational goals and mission (vis-à-vis ERP adoption) and ERP systems success.

2.5.5 Hypothesis related to organization's or firm size

An extensive study of the literature by Laukkanen et al. (2005) indicate that many researchers in the IS and related disciplines describe organization or firm size differently; however, they seem to agree that the concept can be assessed using employee workforce, and/or annual turnover/sales (Ein-Dor & Segev, 1978; Laukkanen et al., 2005; Buonanno et al., 2005). Evidence suggests that the success of ERP software may be impacted by organizational size (Bernroider & Koch, 2001; Buonanno et al., 2005; Laukkanen et al., 2005). Further, studies (e.g., Mabert et al., 2003; Sedera et al., 2003a) have shown that larger firms experience more ERP benefits compared to smaller firms perhaps because of the availability of resources (Hunton et al., 2003). Thus we ask: Does organizational size influence ERP system success? The hypothesis developed to provide answer to the question is stated as follows:

H16: ERP systems success would be positively influenced by organizational size.

Answers to the foregoing sub-questions (and their related hypotheses: H14 – H16) above are provided in Article V.

At this juncture, we present the aspect of the study related to the influence of organizational culture, structure, and to some extent, organization or firm size as well as their interacting effects (or moderating roles) with technology (IT) related issues. Clearly, from the research framework (Figure 2), technology (IT) includes issues or factors such as size of the IT department, IS budget size, value of the IT department, satisfaction with existing IT systems, and so forth. The use of factor analysis (see Article VI for full discussion) permitted us to group factors or items that loaded together under new names (indicating higher order factors). For example, "*IT assets*" was used to represent items such as IT skills/expertise of staff and value of the IT department that loaded together. Similarly, "*IT resources*" was used to represent size of the IT department and IS budget size. Next, we briefly discuss each of the main effects' contingency variables and their related hypotheses before presenting the interacting effects.

2.5.6 Hypothesis related to organizational structure

Organizational structure (also called organizational design) can be described in several ways (Mintzberg, 1980; Fry, 1982; Daft, 1998; Donaldson, 2001). According to Daft (1998, p.15), "Structural dimensions provide labels to describe the internal characteristics of an organization. They create a basis for measuring and comparing organizations." Morton and Hu (2004) assert that commonly used structural dimensions include centralization, specialization, standardization, formalization, hierarchy levels, etc. Different researchers tend to use dimensions based on their research purposes; for example, Morton and Hu (2004) note that Fry (1982) used centralization and formalization in assessing technology-structure relationships. In this study, we focus on the following three dimensions: centralization, specialization, and formalization, which we believe are adequate for assessing technology-structure relationships (see Fry, 1982; Donaldson, 2001).

Centralization refers to the decision-making hierarchy in the organization. When decisions are kept at the top, an organization is centralized, whereas in decentralized organizations, decisions are delegated to lower organizational levels (Daft, 1998). Specialization is the extent to which tasks are subdivided into separate jobs in an organization. If specialization is extensive, it is likely that each worker performs a narrow range of work. Formalization is the degree to which rules and procedures are clearly documented and are made known to all employees. It is known that ERP systems require disciplined task behavior among workers in an organization (Strong et al., 2001), and ERP might be more suitable for firms having distinct and specialized functions or tasks. The structure of an organization is considered to be very important for firms adopting ERP (Davenport, 1998; 2000). Organizations with high levels of

centralization may favor ERP, in contrast to decentralized ones. ERP systems may be less useful in organizations where operations and tasks are not explicitly defined (Strong et al., 2001); this is because ERP enforces a disciplined behavior for adopting organizations in such a way that procedures need to be clear. Following this brief discussion, we ask: What is the relationship between organizational structure and the success of ERP systems in adopting firms? The hypothesis developed to provide answer to the sub-question benefits from the foregoing discussion and is stated as follows:

H17: A positive relationship exists between an organizational structure that is conducive to ERP adoption and ERP success.

2.5.7 Hypothesis related to organizational culture

According to Kanungo et al. (2001) organizational culture can be viewed from different perspectives. The work of Schein (1985) and Hofstede (1984) are among the most cited with regard to organizational culture, which is different from national culture (see Hofstede, 1984; 2001). According to Schein (1985), organizational culture is "a pattern of basic assumptions – invented, discovered, or developed by a given group as it learns to cope with its problems of external adaptation and internal integration – that have worked well enough to be considered valid…"(p.9). Likewise, Hofstede (1984) asserts that organizational culture is a way things are done in the business, and shared perceptions, beliefs, symbols, rites and rituals, and myths may be "taken for granted" in an organization. Thus, the existing culture in a company may have a bearing on the way people within it work, deal with others, and adopt and use technology (Krumbholz & Maiden, 2001). Schein (1985) describes how organizations can be differentiated using a variety of dimensions, including shared meaning, and embedded skills, among others. As clarified above, organizational culture has many views. In this study, we concentrate on the aspects relating to shared norms and values, supportive, collaborative, and cooperative behaviors. ERP implementation success has been reported to be related to the cultural attributes that are noted in the foregoing sentence (see Bingi et al., 1999; Krumbholz et al., 2000; Esteves and Pastor, 2001). Many researchers (e.g., Swan et al., 1999; Krumbholz & Maiden, 2001; Soh et al., 2000) have suggested that the core values in the corporate culture of adopting firms can cause mismatch problems during the ERP implementation process and adversely affect benefit realization from such systems (Davenport, 1998; 2000; Kappos, 2000; Jones & Price, 2001).

Essentially, organizational culture is related to how the overall success of an ERP system is perceived in adopting organizations (Swan et al., 1999; Krumbholz et al., 2000; Soh et al., 2000). This is because employees who are used to doing things certain ways due to shared and enforced beliefs may have to accommodate the change that ERP imposes to enhance success with their software (Davenport, 2000; Krumbholz & Maiden, 2001). Further, evidence supports the view that the adoption of an ERP often brings about changes in organizational culture and intra-organizational functioning (Swan et al., 1999;

Davenport, 2000; Krumbholz & Maiden, 2001; Strong et al., 2001; Lee & Lee, 2004). In addition, cultural attributes such as cooperation, collaboration and consensus are critical ingredients required for success in the acquisition of complex IT systems such as ERP system (Willcocks & Sykes, 2000; Davenport, 2000; Markus & Tanis, 2000). For example, Jones and Price (2001) state "organizational members must collaborate and share their knowledge as a team to successfully bring about the changes in the business required to realize long-term ERP benefits" (p.551). To increase our knowledge in this area, we ask: Does organizational culture influence ERP systems success? The hypothesis developed to provide answer to the question is stated as follows:

H18: A positive relationship exists between an organizational culture that is conducive to ERP adoption and ERP success.

In the opening part of this section we mentioned that will not only make use of "deterministic models" (Weill & Olson, 1989), which in our study are dealt with in Articles IV and V. To provide deeper understanding of our theme, we examine the interactions between selected contingencies in the organizational (business related) and technology (IT-related) sub-contexts. The interacting contingencies were selected for illustration purposes. Influential researchers such as Davenport (2000) and Willcocks and Sykes (2000) have asserted that ERP acquisitions are not only a business matter but a technological/technical matter as well, as we have already mentioned elsewhere in this work. Thus, designing our analytic process following suggestions from Venkatraman (1989) to consider interacting effects or moderating roles from the two sub-contexts would offer deeper insights.

2.5.8 Hypotheses related to the interacting effects with IT assets and IT resources

Lee and Lee (2004) used the term "IT assets" in describing the IT infrastructural support consisting of highly competent human IT assets and strong relationships between IT and business (in other words, the value of IT to the business). The IT staff's quality (i.e., knowledge of technological changes and up-to-date skills) is cited among the important factors required for IT systems success in general and for ERP implementation success in particular (Essex et al., 1998; Esteves & Pastor, 2001; Lee & Lee, 2004). Several ERP studies (e.g., Holland & Light, 1999; Markus & Tanis, 2000; Willcocks & Sykes, 2000; Lee & Lee, 2004) have suggested that the knowledge base or expertise of the in-house IT professionals must be adequate to ensure success with ERP implementation. Empirical evidence suggests that IT systems are more likely to succeed in organizations where general IT skills and relevant in-house IT expertise exist (Igbaria, 1990; Lee & Lee, 2004). Particularly, empirical evidence from the works of Willcocks and Sykes (2000) indicate that ERP implementation tends to be more successful when IT departments are rated highly and are consulted during ERP implementation than when they are sidelined. Further, there is

ongoing skepticism regarding the value that IT departments give to their organization (Benjamin et al., 1985; Ward & Peppard, 1999; Willcocks & Sykes, 2000), which can be attributed to two types of reasoning: 1) the inability of the IT department to deliver or appreciate business issues, 2) cultural gaps between IT personnel and other organizational members (Ward & Peppard, 1996, 1999). In fact, during ERP acquisitions, the IT department tends to have roles less important than those of other departments (Willcocks & Sykes, 2000).

With regard to "IT resources" available to a firm, we believe this can be gauged through its IT department's size and the budget allocated to that department. The IT department initially locates itself within other departments, but as the IT unit matures or the organization becomes wealthier, it eventually becomes autonomous (Choe, 1996; Shields, 2001). Larger firms tend to have specialized IT departments, usually with a sizeable number of workers. This may not be the case, however, with small firms due to lacking resources (Cragg & King, 1993; Laukkanen et al., 2005). In fact, Ein-Dor and Segev (1978, p.1070) posit that "budgeting of sufficient resources increases the likelihood of MIS success". Without a doubt, ERP adoption requires huge sums of money, and evidence tends to support the view that larger firms have more resources and are capable of allocating resources to IT issues, including software maintenance and upgrades, compared to smaller firms (Cragg & King, 1993; Bernroider & Koch, 2001; Laukkanen et al., 2005). Hunton et al. (2003) suggest that smaller firms possess fewer resources and are less able than larger firms to attract resources, "thus, large firms can more easily absorb and withstand ERP implementation costs (p.170).

Following the overview of the concepts of IT assets and IT resources, we formulate a set of hypotheses highlighting the interactions or the moderating roles between them and the other contingencies (i.e., organization or firm size, organizational structure and culture) as follows:

Willcocks and Sykes (2000), Davenport (2000), and Markus and Tanis (2000) have all suggest that ERP systems implementations, to some extent, benefit from the support provided by in-house IT professionals and it is likely that bigger firms are able to house larger IT departments (Choe, 1996; Shields, 2001; Hunton et al., 2003). It is worth noting that the sorts of skills required for an ERP implementation are different from other IT systems implementations (Markus & Tanis, 2000); nonetheless, it may be reasonable to suggest that firms with larger IT departments might have increased their prospects of having people with relevant expertise that could benefit their ERP acquisition. As the members of the organization recognize the roles that their IT department plays in ERP initiatives, the value of the IT department increases, and so will the overall success with the system. It is safe to expect larger firms possessing more IT assets to experience higher levels of success with their software than would be the case with small firms. Therefore, we hypothesize:

H19: The relationship between firm size and ERP success will be moderated by IT assets, such that success will be higher in larger firms.

A certain relationship exists between the financial resources available to a firm and how it evaluates its IS success (Ein-Dor &and Segev, 1978; Raymond, 1985). It is generally accepted that small-sized firms possessing fewer resources than larger firms tend to have constraints relating to resource allocation (Hunton et al., 2003; Laukkanen et al., 2005). ERP acquisitions are costly because resources must be continually kept back for maintenance and upgrades (Davenport, 2000). As would be expected, bigger IT budgets are more likely to be available to larger firms (Hunton et al., 2003; Laukkanen et al., 2005). Thus, it may be reasonable to suggest that the bigger the size of the IT budget in an ERP adopting firm the better, since ERP systems success may increase with bigger IT budgets. Therefore we hypothesize:

H20: The relationship between firm size and ERP success will be moderated by IT resources, such that success will be higher in larger firms.

It is safe to suggest that the success of an IT system may depend on how organizational members view it due to cultural orientations in the organization (e.g., Schein, 1992). Thus, in organizations where cultural gaps between the IT department/personnel and others are smaller, the IT department is more likely to be valued, and IT systems in such organizations may be more successful than in firms having a less favorable perception of their IT department (Raymond, 1985; Ward & Peppard, 1999; Willcocks & Sykes, 2000). Likewise, in organizations where the employees (IT staff and others) have the necessary skills and expertise (Igbaria, 1990; Essex et al., 1998; Duplaga & Astani, 2003; Lee & Lee, 2004) it is reasonable to suggest that ERP success will be higher compared to where such expertise is lacking. Thus, we formulate the following hypothesis:

H21: Organizational culture will influence ERP success, such that success will be higher in firms with higher IT assets.

As implied above, ERP systems are more useful, and would be more successful in organizations with the appropriate organizational dimensions than in organizations lacking such. We also argue that ERP systems success would be higher in firms where organizational members value their IT departments (and assuming those IT personnel possess some levels of expertise) as opposed to instances where such support is low or nonexistent (Willcocks & Sykes, 2000). Put differently, the personnel in the IT department, because of their knowledge of technological and IT issues could be the best link or liaison between the adopting firm and the ERP provider. Accordingly, ERP success might be high in firms where the in-house IT professionals are able to assist other organizational members to efficiently and effectively use the acquired system to achieve the firm's objectives (e.g., using IT to support organizational procedures and tasks). Thus, it is reasonable to hypothesize:

H22: Organizational structure will influence ERP success, such that success will be higher in firms with higher IT assets.

Research on how firms allocate resources have suggested that some organizations have cultures that favor the disbursement of sufficient resources to the IT function whereas others may have less favorable views on such issues (see Schein, 1985; Segars & Grover, 1995; Johnston & Carrico, 1988; Ward & Peppard, 1996; Krumbholz & Maiden, 2001). This allows us to predict that the existence of a positive organizational culture and higher levels of IT resources in an organization will augur well for the success of adopted IT systems, including ERP.

H23: Organizational culture will influence ERP success, such that success will be higher in firms with higher IT resources.

Answers to the questions (and their related hypotheses: H17 – H23) above are provided in Article VI.

As we continue our discussion on the influences of the contingency variables on ERP success, it will be useful to investigate the impacts arising from modeling the technology (IT-related) issues as main effects and using some selected organizational contingency variables as the interacting effects or moderators. It is important to note that the selected issues (i.e., the interacting effects) are offered as illustrative, rather than exhaustive examples. The main effects of the technology (IT-related) issues, i.e., IT assets and IT sources and the other related issues or factors highlighted in the research framework (Figure2) that include IT head in the hierarchy, employees' general IT skills, and satisfaction with legacy IT systems that have not yet been mentioned are presented in this section of the thesis. Below, we formulate the respective hypothesis for each.

We have provided in-depth information regarding IT assets and resources above. In brief, Lee and Lee (2004) show a relationship between organizational IT assets (i.e., the IT professionals' skills and the IT department's value) and ERP effectiveness (or success). ERP systems are complex technologies that require specialized skills. In-house IT professionals may play supporting roles during ERP implementation process if they possess some relevant technical skills (Davenport, 2000; Markus & Tanis, 2000). The in-house IT professionals' participation in the acquisition process is valuable to the organization because these professionals could serve as liaisons between the systems' providers and organizational members who are less technically-minded. Accordingly, the IT department's value will be higher, as will the systems success levels, than when such endowments (relevant expertise, support, and appreciation) are not lacking. Willcocks and Sykes (2000) indicate that ERP systems success - at the implementation - tends to be higher where the IT department is valued highly. We therefore hypothesize:

H24: IT assets are positively related to ERP systems success.

In considering the interacting effect between IT assets and firm size, we develop the next hypothesis. It is suggested that, at a general level, larger firms have bigger pools of sophisticated professionals than do smaller firms (Cragg & King, 1993; Laukkanen et al., 2005). Moreover, other researchers (Ein-Dor & Segev, 1978; Hunton et al., 2003) imply that IT projects success increases in larger organizations because of the availability of resources, as opposed to smaller organizations where such resources are limited. Therefore, we further hypothesize:

H25: A relationship exists between IT assets and ERP systems success, such that success will be moderated by the organizational size.

Next, we present the hypothesis related to the interacting effects of top management and IT assets. Essentially, the importance of top management support has been noted as being vitally important for the success of IT projects in organizations (Doll, 1985; Igbaria, 1990; Thong et al., 1996; Dong, 2001, Hong & Kim, 2002). Top management support can be manifest in various ways, for example, it might be related to provision of needed resources or support of skill acquisitions among employees. In this respect, it is likely that ERP success will be higher in firms where top management support is available and the required IT assets are available as well. We hypothesize:

H26: The relationship between IT assets and ERP systems success will be higher when top management support is higher.

The resources available to a firm may have a bearing on the way the success of its adopted IT systems is assessed or evaluated (e.g., Ein-Dor & Segev, 1978). This is because expensive and complex IT systems such as ERP require a flow of resources to maintain them (Davenport, 1998; Hunton et al., 2003). In reality, large firms tend to have more such resources than smaller ones (Cragg & King, 1993; Mabert et al., 2003; Sedera et al., 2003c; Laukkanen et al., 2005). We formulate the set of hypotheses below to investigate the nature of the relationships.

H27: A positive relationship exists between IT resources and ERP systems success.

H28: A relationship exists between IT resources and ERP systems success, such that success will be moderated by the organizational size.

2.5.9 Hypothesis related to employees' general IT skills

In view of the fact that quality end-user training and general IT knowledge are considered critical factors necessary for IS success (Igbaria, 1990; Essex et al., 1998; Lee & Lee, 2004), employees who are equipped with such skills are more likely to understand the need for process changes and to value their ERP

systems than are those with no such skills. Thus, it is logical to expect that ERP success will be higher where such broad IT skills exist. We hypothesize:

H29: A positive relationship exists between employees' general IT skills and ERP systems success.

Further, we argue that larger firms have more employees with general IT skills than smaller firms, perhaps because larger setups have more financial resources to provide facilities (Hunton et al., 2003), and smaller organizations may be constrained by inadequacies of resources, which some IS researcher have labeled "resource poverty problems" (Cragg & King, 1993; Thong et al., 1996, Laukkanen et al., 2005). Thus, when the general IT skills levels available among organization's employees are low - as would be expected for a small-sized firm having fewer resources to provide such facilities - their ability to use complex IT systems such as ERP will be low. Consequently, their evaluation of the success of such systems will be low. Laukkanen et al. (2005) reported differences across firm sizes regarding the availability of skills in their adoption of ERP – larger firms fared better than smaller ones on such fronts. Thus, we hypothesize:

H30: A relationship exists between employees' general IT skills and ERP systems success, such that success will be moderated by the organizational size.

Organizational structure has been noted as an important issue for firms when adopting ERP (Davenport, 1998; 2000; Hong & Kim, 2002), and organizations with high levels of centralization, formalization and specialization may favor ERP, in contrast to decentralized, less formalized and less specialized ones (e.g., Strong et al., 2001; Morton & Hu, 2004). Similarly, employees possessing general IT skills will be able to use their IT systems (ERP in this instance) to accomplish their tasks and functions more effectively when their tasks, processes and duties are explicitly defined than when they are not. Thus, success with the software will be higher where a favorable organizational structure exists and where the employees possess some general IT skills. Therefore we hypothesize:

H31: A relationship exists between employees' general IT skills and ERP systems success, such that success will be moderated by the organizational structure.

2.5.10 Hypothesis related to satisfaction with legacy IT systems

ERP systems are usually adopted by organizations to replace aging legacy IT systems because their legacy IT systems have outlived their usefulness is the conventional wisdom (Davenport, 1998; 2000; Markus & Tanis, 2000; Mabert et al., 2003). Several studies on the reasons why ERP systems are adopted ranked the replacement of old IT systems as the main reason for adoption. Given this

information it is logical to expect an inverse relationship between the level of satisfaction that firms get from their legacy IT systems and the assessment of the effectiveness or success of ERP systems. We hypothesize:

H32: An inverse relationship exists between the satisfaction levels that firms get from legacy IT systems and ERP systems success.

2.5.11 Hypothesis related to IT head (Chief Information Officer) in the hierarchy

The IT head, also commonly referred to as the Chief Information Officer (CIO) is an important functionary in modern organizations and the position of such an executive in the organizational hierarchy has been seen as important for IT projects' success (Raymond, 1985, Raghunathan, 1992; Willcocks & Sykes, 2000). When the CIO is a top manager, he or she is likely to have a good knowledge of organizational goals and be able to marshal organizational IT resources toward achieving the firm's objectives (e.g., using IT to support organizational procedures and tasks). This might not be the case where the CIO is ranked lowly (Benjamin et al., 1985; Raghunathan & Raghunathan, 1989; Raghunathan, 1992; Raymond, 1985). Thus, it is likely that success with IT systems such as ERP will be higher in situations where the CIOs are top management executives and capable of harmonizing organizational functioning vis-à-vis IT systems' capabilities (Benjamin et al., 1985; Ward & Peppard, 1999; 2002; Willcocks & Sykes, 2000). We formulate the following hypothesis:

H33: Firms having their CIOs as top management executives will experience higher levels of ERP systems success than firms not having such functionaries as top executives.

Answers to the issues formulated in hypotheses: H14 – H23 are provided in Article VII.

In this study, ERP systems success is considered from the perspective of respondents that we grouped according to two main categories: organizational hierarchy and occupation. We note that several researchers, including Hamilton and Chervany (1981) and Myers et al. (1997) recommend that for deeper understanding to emerge, researchers should endeavor to present discussions of IT systems success in organizations from several perspectives, including the evaluator's perspective. With regard to occupation, we dealt with business and IT professionals/managers given that ERP acquisitions have both business and technological imperatives (Willcocks & Sykes, 2000), and from the viewpoint of organizational hierarchy, we selected top-level and mid-level (functional) management from the three management level identified by Anthony (1965). We excluded from our study lower-level workers who perform clerical duties and whose view of organizational issues might be useful but limited (Abdinnour-Helm et al., 2003; Amoako-Gyampah, 2004).

Regarding, occupational classification, the IS literature suggests that business managers and IT professionals usually hold differing views of organizational IT issues due to the existence of cultural gaps between them (Schein, 1992; Pfeffer, 1992; Ward & Peppard, 1996; 1999), and due to their different perceptions of value in relation to organizational IT issues (e.g., Saunders & Jones, 1992; Lee & Myers, 2004). Saunders and Jones (1992) sum it up by noting that value is a relative concept that is in the eye of the beholder, and it is likely that IT professionals and business managers may hold dissimilar views on a wide range of issues. In this case, what is important for one group may appear otherwise for the other. In relation to organizational hierarchy, the extant IS literature suggests dissimilar views on organizational IT issues do exist between organizational members due to their roles, influence and positions in the organization (Rousseau, 1978; Cameron, 1986; Pfeffer, 1992, Pijpers et al., 2001). As would be expected, top managers have more influence and may have more to lose than mid-career executives from the acquisition of a system that does not enhance organizational effectiveness or success (e.g., Pfeffer, 1992, Pijpers et al., 2001). The foregoing discussions led us to pose the third research question below, which we hope will permit deeper understanding of ERP systems success measurement or assessment vis-à-vis organizational stakeholder groups.

Research question three (RQ3): Do different organizational stakeholder groups assess ERP systems success differently?

2.5.12 Hypotheses related to organizational stakeholder groups' views on ERP success

In finding answers to the third research question, we draw from the foregoing literature noting differences in perceptions across organizational stakeholder groups when classified by occupation types. Importantly, the results from Sedera et al. (2002; 2004) showed that IT staff evaluated and prioritized *System Quality* more than Users (Strategic and Management) did and the latter evaluated and prioritized measures and the dimensions of *Organizational Impact* more than the IT staff did. Both share similar views regarding the informational quality of ERP systems. The authors did not offer reasons as to why such noticeable differences surfaced in their study. However, as noted above, the literature suggests that differences in perceptions of value and occupational cultures could be some of the main reasons (see, Schein, 1992; Grindley, 1992; Shah et al., 1994; Saunders & Jones, 1992; Ward & Peppard, 1996, 1999). This has informed our approach in that we are not aiming at providing answers as to why this might have been the case. For the sake of simplicity, we formulate the next hypothesis as follows:

H34: As members of different organizational stakeholder groups, business managers and IT professionals/managers hold different views on ERP success.

Gyampah (2004), and Sedera et al. (2004) writing in the context of ERP systems have provided evidence supporting the opinion that top managers have a better assessment of ERP values and benefits than other organizational members. Therefore, we predict that both the top- and mid-level managers will assess ERP success differently.

H35: Top management and mid-level managers will hold different views of ERP success.

Answers to the third research question (its related sub-questions and hypotheses: H34 - H35) are provided in Article VIII and Article IX.

3 RESEARCH METHODOLOGY AND APPROACH

The purpose of this chapter is to provide information regarding the research contexts, philosophical assumptions underpinning the study, and research strategies used. We also briefly discuss the statistical techniques that were used.

3.1 Research contexts

This study was carried out in the neighboring Finland and Estonia (See the map of Finland and Estonia in Figure 7). Both are small countries in the north of Europe with a combined population of approximately seven (7) million people (CIA World Factbook, 2005). Finland is a technologically developed Nordic country, and Estonia is one of three Baltic countries. Estonia is an emerging economy and leads Eastern European countries on the use of information technology (IT) products for socio-economic development (WEF, 2004; Ifinedo & Davidrajuh, 2005). Companies in Finland started adopting ERP systems in the late 1990s, but the software is just beginning to spread to Estonia and other parts of Eastern Europe (Clouther, 2005; Ifinedo, 2005; Ifinedo & Nahar, 2006f). The adoption of ERP in Estonian firms has been ranked among the top ten key information systems (IS) management issues for Estonia for the next three years (Ifinedo, 2006h). As indicated above, Estonia and Finland share similar cultural orientations (Ifinedo & Davidrajuh, 2005).

Hofstede defines culture as "the collective programming of the mind which distinguishes the members of one group from another" (1984, p.21). Culture has been researched by several authors (e.g., Hall, 1976; Hofstede, 1984; Trompenaars, 1994), but the work of Hofstede (1984) has been widely recognized as the most dominant framework for theory development and validation in cross-cultural studies, and several studies in IS and other areas have used it (Myers & Tan, 2002; Ford et al., 2003). However, Hofstede' framework has been criticized for a variety of reasons, including its inability to adequately take into consideration the existence of multiple cultures within a single country (see Myers & Tan, 2002). Regardless, Hofstede's framework is

popular among researchers (Ford et al., 2003). Its four main cultural dimensions are briefly described as follows: 1) Power Distance (PD), which refers to the degree of inequality between members of a society and the extent to which this is accepted. A cross-cultural comparison across cultures is measured by power distance index (PDI). 2) Individualism (IDV), which describes the relationship between the individual and society. 3) Uncertainty Avoidance (UAI), which measures the extent to which uncertainty is tolerated in the society. 4) Masculinity (MAS), which describes the differences between genders. Full discussions on the dimensions of culture are beyond the scope of this thesis.

Source: (Atlapedia, 2006)

FIGURE 7 Map of Finland and Estonia and neighboring countries

Importantly, Hofstede's 1980 classic and the subsequent editions (e.g. Hofstede, 1984) did not cover Estonia; however, Mockaitis (2002) used the same Value Survey Module (VSM) tool that was used by Hofstede to compute the indices for Estonia (see Table 1). Clearly, both countries compare favorably against many other European countries. It is important to point out this fact because Soh et al. (2000) suggest national culture might have a bearing on ERP processes implementation. Thus, although our data comes from two different countries, we can be assured of the homogenous nature of the sample on a major differentiator, namely, cross-national cultural differences. Finally, van

Everdingen et al. (2000) note that the penetration rates of ERP systems among middle-sized companies in the Nordic region were higher in comparison with those of other regions in Europe. They attributed this to the cultural factors of countries in the region and stated, "This cluster [of countries] is recognized as the most innovative cluster with relatively weak resistance to new products and a strong desire for novelty and variety" (p.29). This might suggest that the relevance of our research setting with respect to ERP system acquisitions is recognized in the literature.

TABLE 1 Cross-cultural indices and economic indicators of Estonia and Finland

Country	Cultural dimensions				Economy type	GDP per capita (2005 estimates)	Population
	PDI	IDV	UAI	MAS			
Finland	33	63	59	26	Developed	US$30,900	5.2 million
Estonia	40	60	60	30	Emerging	US$ 16,700	1.3 million
Lowest index score in Hofstede's database	*11*	*6*	*8*	*5*			

3.2 Philosophical assumptions of the research

This study focuses on the testing of relationships, which can be investigated through the use of structured instruments (see Orlikowski & Baroudi, 1991; Creswell, 1998; Järvinen, 2001; Straub et al., 2004; 2005). In his taxonomy of research studies, Järvinen (2001) refers to such an approach as theory-testing studies, which, he comments, concentrate on the testing relationships between phenomena, of which the researcher may have some prior knowledge. The author contrasts the foregoing approach with theory-creating studies, in which the researcher may have no prior knowledge of the nature of reality in a phenomenon. Generally, the philosophical underpinnings of IS research can be classified into three main areas: the positivist, interpretive, and critical traditions (Orlikowski & Baroudi, 1991; Myers & Avison, 2002). Following this classification, the philosophical underpinning of this study is positivist, because our emphasis seems to be placed on the testing of relationships between phenomena which were reduced to empirical data. Basically, the positivist tradition concentrates on theory testing in order to increase the predictive understanding of variables or phenomena. The assumption in positivism is that "the researcher is independent of and neither affects nor is affected by the subject of the research" (Remenyi et al., 1998, p.33). Positivist researchers test hypotheses (formal propositions) by using quantifiable data, which they

generate from a population sample, and they subsequently generate inferences from their results. On the other hand, the interpretive tradition assumes that epistemology (i.e., the nature of knowledge) and ontology (i.e., the categories, relationships, and the concept of reality) is socially constructed. Likewise, the critical research tradition agrees that our knowledge of reality is a result of social conditioning, which cannot be understood independently of the social actors (i.e., reality is produced by people) (Orlikowski & Baroudi, 1991; Dobson, 2002).

Having briefly discussed the philosophical underpinning of this study, let us turn our attention to the quantitative and to the qualitative research paradigms. The former emphasizes the use of quantitative data, and is rooted in the positivist philosophy (Creswell, 1998; Saunders et al., 2000; Straub et al., 2004; 2005) whereas the latter emphasizes process and meanings expressed in words, and is prevalent in the interpretive and the critical research traditions (Creswell, 1998; Sale et al., 2002; Saunders et al., 2000). Essentially, qualitative research methods help researchers to understand people and the contexts within which they live (Saunders et al., 2000; Myers & Avison, 2002). Survey is the main research strategy used in quantitative research while case studies, focus groups, and ethnography are among the common research strategies employed in qualitative research.

Orlikowski and Baroudi (1991) and Straub et al. (2004, 2005) indicate that the qualitative research paradigm can be conducted through any of the three philosophical traditions discussed above. In fact, Straub et al. (2004) assert that "in the case of quantitative research, however, the interpretive and critical positions are not meaningful; only the positivist one is." It is possible that the seemingly positive advantages seen in one research paradigm over the other as suggested above by Straub et al. (2004) might be the root causes of ongoing debates in many fields regarding the relevance, superiority, etc. of one paradigm over the other (e.g., Sale et al. 2002). In this study, rather than accepting the superiority of one paradigm over the other, we subscribe to the viewpoint espoused by researchers (e.g., Lee, 1991, Gable, 1994; Sale et al. 2002) suggesting that both paradigms can be combined in one study to increase knowledge. Thus, in line with the research objectives of this study, the survey is the main research strategy of this study. Additionally, we used case studies following recommendations by Saunders et al. (2000, p.99) that the use of such research approaches might enable the researcher to "get a picture of the important issues we were likely to encounter in the research". Next, we will describe the two research strategies used in this study.

3.3 Research strategies

Saunders et al. (2000, p.92) explain research strategy as being "a general plan of how you will do about answering the research question(s) you have set." The

research strategies in this study were carried out in a three-step fashion. After reviewing the relevant literature on our study's themes to familiarize ourselves with the necessary concepts, we carried out a preliminary survey to examine practitioners' views of our research themes in the research setting. This was followed by interviews with case companies to increase our understanding of the study's themes. Finally, the main survey was conducted, which was hoped would add to the body of knowledge in this area of study. The research phases are illustrated in Figure 8. As can be seen, both the qualitative and quantitative research approaches were used to enhance the validity of our findings.

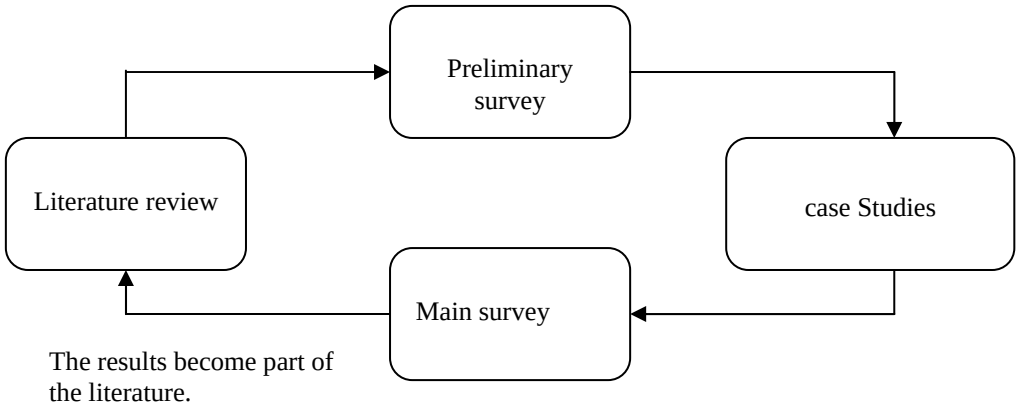


FIGURE 8 The research phases of the study

3.3.1 The preliminary survey

First, an online preliminary survey was designed to elicit the views of participants in the two countries. Researchers (e.g., Laukkanen, et al., 2005) in the region indicate that ERP adoption rates were higher in the retail/wholesale, electronics, and manufacturing sectors. Given this information, we decided to sample views from these industries. We selected firms that could be generated from online directories of companies in both countries e.g., online database of Finnish companies - http://www.yritysopas.com/ (Finnish Companies' Directory, 2006) and Estonian Chamber of Commerce and Industry Directory 2004 (http://mail.koda.ee/ektk/koda_eng). In this phase, we purposively selected 75 firms for Estonia and 150 firms for Finland from the above-named sectors. In particular, a firm was chosen if we could find the email addresses of organizational key personnel including senior and unit managers. Sedera et al. (2004) indicate that these groups of employees are the most knowledgeable about ERP success in organizations. As the unit of analysis of the study is at the firm level, such organizational members would be able to provide the relevant information that we were seeking.

We designed a one-page (A4) questionnaire that was cross-checked by the author's supervisor, another IS faculty member, and one ERP consultant. It was converted to a web page (in local languages) with scripts to prevent multiple submissions. We communicated with each participant using an email

(Appendix 1) that explained the purpose of our study. Using the local languages, we motivated the participants by promising to send them a summary of our findings. The web link of the page was included in the email sent out to voluntary participants. The questionnaire of this first phase is shown in Appendix 2. The participants were asked to list as many attributes as they could of each of the five ERP success dimensions they were provided. Further questions relating to implementation periods of their ERP, ERP types, industry type and job title of respondents were asked. Each participant was sent a reminder about 7 days after the initial email following the Dillman's (2000) suggestions for web-based surveys. This phase of the study was conducted between February and March 2005.

The purpose of the preliminary study was: 1) to ensure that regional contextual influences were accounted for with regard to ERP success evaluations, 2) to enhance the content validity of the main instrument to be developed later, and 3) to test the possibility of using a web-based survey as a research approach for the main study. The hints received from this exercise are as follows:

i) Despite the inherent advantages of Web-based surveys (Roztocki & Lahri, 2003), we noticed that it might not be a good data collection method for us due to the poor response rate that we got; this is the major disadvantage in using Web-based questionnaires (Saunders et al., 2000). In our case, sixteen (16) Estonian and twenty-seven (27) Finnish firms replied to our emails declining participation or indicating that they did not have or use ERP. Four (4) participants from Estonian and seven (7) from Finnish firms responded positively to this preliminary survey. A summary of their demographic profiles, key responses, and companies is provided in Appendix 3 and elaborated in Article I.

ii) We found that the use of local languages for the questionnaire made no difference in increasing the response rates. We also concluded that perhaps finding local contacts might be more important and worthwhile than the emphasis on local languages in the questionnaire.

iii) Above all, there were no specific regional contextual issues that needed extra attention. We noticed that the collected attributes of ERP success compare with the ones used in the literature discussing such issues.

Importantly, the author noticed an upsurge of visitors to his homepage where the web-based questionnaire was hosted, as would be expected. What was (and is still) unclear to us: Given the large number of hits recorded on the author's homepage during the period of the preliminary survey, why was there no appreciable increase in the number of responses for the Web-survey that was hosted on the site. It may be that the very low response rate in the preliminary phase might have been caused by our inability to target firms that actually have

ERP systems – some of the respondents replied saying that they do not have or use such systems.

3.3.2 The case studies

In the second phase, which involves case studies, we enlisted seven firms (3 Estonian and 4 Finnish firms) through contacts. They were interviewed from April to May 2005. We used structured interviews to gain more insights from these case companies. We chose only firms that had more than one ERP module, and had completed their ERP acquisition in the last three years. This was done to reduce response bias due to not distinguishing between ERP implementation success and overall ERP system success. The firms participated voluntarily, though they requested anonymity; therefore, we used pseudonyms only to refer to them. We had sixteen (16) interviewees and we encouraged them to present views representative of their various companies. The profile of the companies and the key responses are provided in Appendix 5. We also elaborate on the findings in this phase in Article I.

Prior to each interview, the protocol questions (Appendix 4) were sent to the interviewees to prepare them for the interview. Clearly, we were interested in finding out about issues relating to the success of their ERP. We also wanted to have an understanding of other contingency factors in the case companies. On average, each interview lasted for an hour and half. In all the cases, we met with at least two interviewees. The use of multiple informants was intended to enhance the reliability and validity of the findings (e.g., Saunders et al., 2000). During the interview sessions notes were taken, which were then transcribed as soon as possible (usually within two or three days). The reports were sent back to the interviewees to peruse and for changes to be made to potentially confusing information. Documents and reports from some organizations were collected and assisted with the research effort. We also used emails to cross-check confusing details. We present a summary of the key results in Appendix 5.

3.3.3 The main survey

3.3.3.1 Population and sample

Besides the contacts already made with some firms that have adopted ERP systems in Estonia and Finland, we believe that a larger sample of more than 200 participants would be needed for the main survey given the experience with low response rate in our survey at the preliminary phase. To obtain a larger population of firms, we paid visits to the offices of some professional organizations, associations, and trade unions in both countries with the hope of finding contacts. Such contacts when got would act as *gatekeepers* (Saunders et al., 2000) between their organizations and us. Experience has shown us that the use of contacts in the region of this study to bolster response rates of studies is a common practice. Indeed, seasoned researchers such as Ropponen and Lyytinen (2000) in Finland underscored the importance of having contacts in

their work. Nevertheless, there is very little evidence to suggest that without key contacts, research cannot be conducted in the region.

That said, one of the visits to find contacts or networks took the author to SAK (the central organisation of Finnish trade unions in Finland) where he met with the Director of Research for that organization. In essence, our intention was to focus on sub-unions within the main body to include firms in the retail/wholesale, electronics, and manufacturing sectors. We had noted that a recent study on ERP adoption in Finland by Laukkanen et al. (2005) suggests ERP penetration rates might be higher in the three sectors mentioned above. By the same token, our choice to consider selected industries was informed by an ERP study conducted in Sweden, a neighboring country to Finland, by Olhager and Selldin (2003) where they surveyed ERP issues in manufacturing firms in that country by using subjects from one association: The Swedish Production and Inventory Management Society.

In summary, SAK's Director of Research was briefed on the study's goals, and we told him that we would appreciate contacting the heads of the aforementioned sectors within his body. Our plan was to disseminate the questionnaires attached to the newsletters that they dispatch to their members monthly. Our hope was that when members received the questionnaires this way, the response rates would be higher. That said, while in his office, the Director of Research for SAK made phone calls to the heads of sub-unions which we were interested in contacting. The heads of these sub-unions responded favorably to his request made on our behalf. The respective heads agreed that the author should contact them personally. In short, our effort to get participants for our study from these sources did not produce results. We concluded that our passable knowledge of the Finnish language was unhelpful (please see Swallow, 2001). The next visits by the author took him to the Chambers of Commerce in Helsinki and Tallinn, where each organization provided him with copies of booklets containing the lists of firms in each country (i.e., Estonian Chamber of Commerce and Industry Directory 2004, Helsinki Chamber of Commerce Business Directory 2004). In addition, he was able to obtain web addresses of companies' directories in both countries.

Armed with the information about how to find firms in both countries, we knew that it was going to be a daunting task selecting a sample from these voluminous directories. The firms that had adopted ERP in Finland and Estonia are not indicated in these directories. However, we concentrated on private organizations in the two countries because we believe the adoption of ERP systems might be higher there than in public sector organizations. Through the help of a couple of ERP consultants in both countries, we got other lists: ERP Vendors' lists (e.g., SAP Finnish User Group: http://www.sapfinug.fi/, Scala Customers' List: http://www.scala.net/finland/asiakkaat/customers.asp, Intentia Customers' List: http://www.intentia.com/WCW.nsf/CustomerPortalPage?OpenForm). The good thing about these lists is that they provide concrete information about firms that have adopted ERP systems, unlike the other directories that we had obtained from the Chambers of Commerce. At this point in time, we were not interested in distinguishing

between top brand and mid-market ERP products; we simply were looking for firms that had adopted ERP as systems that have the functionality described in Section 2 of this thesis.

The next thing we did was to carefully study the companies' directories/booklets and select about 500 firms from the list: About 350 for Finland and 150 for Estonia. The relative size of each country informed this sample selection. More importantly, according to Zikmund (2000), a researcher may select his sample size based on his judgment about the sample sized used in comparable studies (see also Saunders et al., 2000). In their study of ERP systems in Sweden, Olhager and Selldin (2003) sent out questionnaires to 511 different firms. Thus, we believed that a population of about 500 firms might suffice for this study. Upon identifying the potential 500 firms to include in our survey, we developed strategies to help increase the survey's response rate. This is important because IS research in the two countries is often characterized by low response rates as indicated by Nissinen (2002). The population of 500 firms that we generated also included a list of firms obtained from contacts in both countries and the ERP Vendors' list. Furthermore, we used another list (i.e., Top 500 Finnish Firms: www.top500.de/g0039407.htm) to target richer and more successful firms that we believed might adopt ERP systems.

Next, the author traveled to Estonia to contact firms on our shortlist of 150 firms for the country for which we had no gatekeepers or contacts. Fortunately, the author has residency permits in the two countries. While in the country, he called (using English) about 40 firms. For each firm, he requested to speak with executives considered most knowledgeable about organizational strategies and information technologies issues in general. He discussed the research objectives with such individuals and sought their participation in the study. He got positive responses in some firms and enlisted willing individuals for possible participation in the study. A good number of the firms contacted do not have ERP systems; others are in the process of implementing ERP systems and were deemed not suitable for this study. A pattern of perceptions about the author by the people he phoned became noticeable: some thought the author was a job-seeker, others were hostile thinking that he was on some industrial espionage mission, and others took him for an ERP salesman. In short, by the 40th call, the author decided against proceeding with this particular exercise, because the number of firms whose possible participation he had enlisted coupled with the ones with contacts in place seemed sufficient for the survey (please see Zikmund, 2000; Saunders et al., 2000).

Moreover, we noticed that the phoning expenses were going above the budget set aside for the activity. More importantly, the trip to Estonia led us to consider revising the total number of firms to be enlisted in Estonia from 150 to 120. The author returned to Finland to repeat the same calling exercise to firms (from our various lists); this time around he did not get beyond 30 calls. We observed that the perceptions about the author by the Finish firms contacted were similar to those previously discussed for Estonia. Rather than generate ill-feelings between ourselves and the firms to contact, we decided to send out the questionnaires to the selected Finnish firms, regardless of whether we got a

promise of participation or not. Among the 30 phoned, we excluded the ones that informed us that they do not have ERP systems or declined to participate. These excluded firms were replaced by an equal number of other firms selected from the companies' directories that were mentioned above. Thus, our final population of firms for both countries is currently 470 of which 350 firms are in Finland and 120 Estonia. Following the discussion above, we are hard-pressed to posit that our population is random; rather, we believe that our sampling technique is akin to judgmental or purposive sampling where the researcher selects his or her respondents based on their suitability for the study's theme (Neuman, 2000) and/or convenience sampling where the researcher selects participants based on his or her own judgments (Saunders et al., 2000). The availability of a sampling frame that clearly indicates a population of ERP adopting in both countries would be required for a genuine random sampling technique to be used (Zikmund, 2000).

3.3.3.2 Survey administration and instrument development

The main survey was carried out from July to September 2005. From the 470 firms selected in both countries, we obtained contact addresses of possible informants from the aforementioned sources: companies' directories and contact persons. The unit of analysis of the study is at the firm level; as such, only key organizational members including senior and unit managers received a packet consisting of a cover letter in local languages (Appendix 6), a questionnaire, and a self-addressed, stamped envelope. We selected respondents by organizational hierarchy, and took into consideration their professional classification as well. The occupations of concern to us were IT professionals/managers and business executives for their knowledge of the research theme, i.e., ERP success in organizations (Gable et al., 2003, Sedera et al., 2004). The profile of the firms and the respondents in the study is shown in Table 2. Painstakingly, we ensured that the questionnaires were sent out to a roughly equal number in the two segmentations, that is, organizational hierarchy and profession.

About sixty percent (60%) of the mailings to the participants included only one questionnaire; the rest (40%) of the mailings had two questionnaires. It was decided that multiple respondents from one organization would enhance the validity of the study as a common source bias would be minimized. Further, once again, low response rates seen with research in the two countries as discussed by Nissinen (2002) prompted the use this approach. In instances where we sent out two questionnaires, the recipients were instructed to give one of the questionnaires to an appropriate person within their organization. We encouraged the subjects to present views representative of their organization. To ensure that organization-wide perspectives are being reflected, we posed the questions in the questionnaire appropriately. The questionnaire is provided in Appendix 7. To ensure data validity and reliability, 4 knowledgeable individuals (i.e., the author's supervisor, 1 IS faculty, 1 ERP consultant and 1 ERP managerial level user) completed the questionnaire before

our mailing it out, and their comments helped us improve its quality. Straub (1989) stresses the need for IS researchers to pre-test their research instruments. We also noticed that for firms with more than one respondent, the responses on key issues were comparable; this enhances the validity of the responses from such firms as well as our data in general.

As the questionnaire used in this study (Appendix 7) has sections designed to address specific issue or aspect of the research, this part of the thesis will not devote much space to discussing each part of the questionnaire as these are available in-depth in each of the articles used to support the thesis. Nonetheless, we note here that attention was paid to development and validation of the measures, which we obtained from validated sources. As can be seen from the questionnaire (Appendix 7), respondents mainly indicate agreement with statements using a 7-point Likert-type scale, where 1 = strongly disagree and 7 = strongly agree. For each article, we assessed the reliability of measures using Cronbach alpha (Straub, 1989), which in all the articles were found to be adequate. Indeed, in all the included articles, values obtained for measures compared favorably with recommended threshold values (above 0.70) in the literature (Nunnally, 1978). Regarding external validity of the study, the pilot test, the preliminary survey, and case studies enhanced the validity of the findings. PLS, a structural equation model technique (Chin, 1998, 2000), permitted us to assess the measurement models (of this more later) of the sub-models or frameworks used for specific sections in this work (i.e., the construct and discriminant validities) and were adequate for this study.

As we conclude this section of the thesis that deals with how the survey was administered, we would like to mention that despite the advantages in using surveys to collect quantitative data and despite their flexibility, as in all surveys, there are disadvantages (see Neuman, 2000; Allreck & Settle, 1995) in our survey, too. The major disadvantages found are:

- Surveys are not useful for obtaining certain detail related to social taboos, tax and income information, and similar sensitive information.

- Surveys can be costly. Envelopes, stamps, and other stationery need to be procured.

- Surveys can generate results that are skewed. It is possible that the collected data favors one section of the population and not the others (i.e., there is a problem with selection bias).

- Due to reliability issues, a single respondent can present a problem for surveys. Also, there is a problem with nonresponse error (i.e. those who fail to respond in the sample).

- It is sometimes difficult to measure causal relations or understand correlations in data obtained from surveys.

3.3.3.3 The results of the main survey

SPSS 13.0 was used to analyze the data. Our respective response rate, excluding the received questionnaires that were unusable, was 29 firms (8.5%) for Finland, 15 firms (12.5%) for Estonia, and 44 (9.5%) combined for the two countries. We received 62 individual responses: 39 from Finland and 23 from Estonia. The profile of the firms is provided in Table 2. The low response in our study can be explained by the following reasons:

- Estonia and Finland were selected for illustration purposes and also due to the fact that the author lives and has contacts in the two countries; thus, it is possible that localized contextual underpinnings might impact the response rates of the study. For example, both countries are very small (with a combined population of about 7 million people, which compares to the populations of large cities in some countries, e.g. Lagos in Nigeria or London in the UK). The low response rate might have been affected by smallness of the selected countries in this study, which when extrapolated in relation to country sizes versus response rates in comparable studies (e.g., Mabert et al., 2003) might not appear to be that unfavorable.

- As follow-on to the preceding item, research studies in both countries tend to be bedeviled by low and poor response rates (Nissinen, 2002; Hietala et al., 2004). In fact, other larger studies in both countries (with ample government support and blessing) do not report higher response rates. For example, Hietala et al. (2004) researching challenges facing Finnish software product companies in a national survey that was sent to 1971 companies got a total 261 responses, representing 13.2% of the potential respondents. Similarly, although Laukkanen et al. (2005) did not reveal the response rate in their study of ERP adoption in Finland, their use of 44 ERP adopting firms might be seen as low for those unfamiliar with the difficulty of enlisting local firms in studies across both countries (and region). Olhager and Selldin (2003) note that "… a response rate of 37.2% [that they received for their ERP study in Sweden] must be considered to be very good …."

- It is also worth mentioning that the data collection efforts reflect the typically low responses that are commonly seen with surveys targeting senior employees in organizations (Kearns & Lederer, 2004).

- This study is constrained by financial resources, which if available in sufficient quantity would have permitted the use of a sample size larger than 470 firms, which might have impacted positively the study's response rates. Additionally, the availability of sufficient resources would have enabled us to send reminders, at intervals, to all the

participants as recommend by Dillman (2000) and Saunders et al. (2000). The few reminders that were actually sent out went to respondents that we had developed closer contacts with, and of whom we knew that they would act seriously upon receiving such reminders.

- ERP systems are expensive to acquire (Davenport, 1998). It is likely that not all the 470 firms selected for our study had ERP systems as the received feedback suggests. In fact, the unusable responses received include those that were returned with notes saying that they do not have ERP systems. Moreover, the adoption of such systems has not been all smooth going for firms (see e.g., Davenport, 1998; Cliffe, 1999; Markus & Tanis, 2000; Abdinnour-Helm et al., 2003). For example, Cliffe (1999) indicates that up to 65% of executives sampled believe that ERP acquisitions could prove harmful. Given that the theme of this study is "ERP success" it is possible that firms not having good experiences with the system might have been uninterested in responding to the survey. We say this because we did not notice outliers (see e.g., Hair et al., 1998) in our data suggesting that some of those who filled out the questionnaires had serious reservations about the success of the system. We are not, in any way or form, suggesting that all the respondents in our study rated "ERP success" as excellent; on the contrary the average rating for the 62 respondents in the study was only 4.99 (standard deviation = 1.136) from a maximum of 7.

- The survey was in *English* because we did not find any reasons from our preliminary survey to suggest that a questionnaire in the local languages might make a difference. However, it is possible that our choice of the English language over the local languages might have impacted the response rate negatively. Management staff in Finland and Estonia, we know, have a good command of the English language (Nissinen, 2002), and we did not believe the choice of English might pose a problem. However, our conjecture may not seem to reflect the reality if one is to accept the viewpoints espoused by Swallow (2001). In our attempt to increase the response rate of our survey, we relied on contacts.

- Finally, the survey period, which was short (about two months), might have been impacted by contextual considerations. Swallow (2001) implies that the summer months, to an average Finn are to be treated with reverence. (Recall that Estonians share similar cultural values.) Thus, the fact the main survey of the study took place between the months of July and September might have affected the study's response rates.

Table 2 shows a summary of the respondents and participating firms (More detailed information is provided in Appendix 8). The data in this study, arranged by hierarchy, comprised of 26 (42%) top-level management and 36

(58%) mid-level managers, and by occupation, 20 (32.3%) IT professionals/managers and 42 (67.7%) business managers. Their job titles included chief executive officer, chief information officer, chief accountant, IT manager, and finance manager. There were 35 (56.5%) men and 27 (43.5%) women in our sample. We received responses from a wide range of industries, including manufacturing, and retail businesses.

TABLE 2 The profile of the industry

No.	Industry type	Number of firms	Percent (%)	Responses from each industry	Percent (%)
1	Telecommunications	3	7%	3	4.8%
2	Cosmetics	1	2%	2	3.2%
3	Pharmaceuticals	2	5%	3	4.8%
4	Logistics / Courier services	3	7%	7	11.3%
5	Automobile / Car dealerships	1	2%	2	3.2%
6	Food processing	3	7%	3	4.8%
7	Wholesale / Retail	12	27%	15	22.6%
8	Electronics	1	5%	1	1.6%
9	Financial / Business investments	2	5%	5	8.1%
10	Facility management	1	2%	1	1.6%
11	Utility and Oil / Gas	2	5%	3	4.8%
12	Manufacturing: cement, aluminum, metal, electrical products, etc.	9	20%	15	24.2%
13	Information technology (IT)	2	5%	2	3.2%
	Total	44	100%	62	100%

Given the low response rate, we accepted 3 responses from 6 of the 7 case companies that we interviewed (please see Appendix 8). On average, they had 9 years of work experience in their respective organizations. Of the respondents, 40% had college degrees, 20% had technical and other vocational education, and 43 (69.3%) were between 31 and 50 years. Regarding the firms, the annual turnover of the firms in the sample ranged from €1 million to a little over €2 billion, with €19 million as the median. The workforce ranged from 10 to 13,000 employees, with a median of 120 employees. Other relevant information can be seen in Table 3.

It is difficult to establish whether the firms in our sample are representative of the population of firms in the two countries that have adopted ERP since no demographic information on ERP adoption is available, as was indicated above. However, our data is consistent with the study by Laukkanen et al. (2005) indicating that ERP adoption in Finland is higher in the retail and manufacturing sectors, and our earlier study (Ifinedo, 2005; Ifinedo & Nahar, 2006f) suggests that SAP is the most common ERP software among large firms

in Finland. Finally, consistent with our informal discussions with ERP consultants in the two countries, our data confirmed that small and medium-sized firms in the region usually adopt mid-market ERP products (i.e., Movex, Scala, etc.). Finally, to assess whether our respondents reflect the quasi-sampling frame of ERP adopting firms in the two countries, we compared early and late respondents in the study (Armstrong & Overton, 1977) on key organizational characteristics such as industry type, year of ERP adoption, and ERP type, among others (i.e., nonresponse bias). The results of the chi-square tests (significant at < 0.05) showed there were no significant differences along these key characteristics.

TABLE 3 Firm characteristics grouped by responses

	Frequency by responses	Percent (%)
Workforce (number of employees)		
< 50	15	24.2
51 - 250	25	40.3
> 250	22	35.5
Turnover (annual)		
< €10 million	21	33.9
€11 million - €50 million	21	33.9
> €50 million	20	32.3
Industry type (information intensity)		
High information intensity	33	53.3
Low information intensity	29	46.8
ERP type		
Top brands (e.g., SAP, Oracle, JD Edwards)	27	43.5
Mid-market product and others (e.g. Movex)	35	56.5
Year after "going live"		
From 1993 to 1999	21	33.87
From 2000 to 2004	41	66.13

3.3.3.4 Statistical techniques used

The main statistical technique used in this study involves the use of structural equation modeling technique. There are two main approaches for structural equation modeling (Gefen et al., 2000). One approach uses covariance-based methods; examples of tools using this approach include AMOS, EQS, and LISREL, among others. The second approach is component-based to estimate structural models, and places minimal demands on sample size and data normality, unlike the other approach. Examples of uses of this approach include PLS (Partial Least Squares), which was popularized by Wold (1981, 1985). PLS is especially suitable for exploratory research focusing on explaining variance (Chin, 1998; Gefen et al., 2000). For this study in particular, we use PLS Graph 3.0 which was developed by Chin (1998). Given the nature of our research

objectives, in particular with respect to *research questions one* and *two,* coupled with the study's small sized sample, the PLS approach seemed the most suitable approach. Essentially, PLS recognizes two components of a casual model, the measurement model and the structural model (Chin, 1998; 2000; Gefen et al., 2000).

The measurement model consists of relationships among the conceptual factors of interest (the observed items or variables) and the measures underlying each construct, and it demonstrates the construct validity of the research instrument (how well the instrument measures what it purports to measure). The main criteria are the item loadings, convergent validity (composite reliability), and the discriminant validity. Discriminant validity is determined by checking the extent to which items measure a construct distinctively. To assess if the measures are distinct and unidimensional the square root of the average variance extracted (AVE) for each construct is checked. When the correlation between the constructs is lower than the squared root of AVE (usually in the leading diagonal), this provides an indication that variance shared between a construct and its indicators is sufficient to distinguish between that construct and the others in the model (Fornell & Larcker, 1981; Chin, 1998). Overall, the convergent and discriminant validities of the data used in our study are psychometrically adequate (Hair et al., 1998; Chin, 1998; 2000).

The second component in a causal model is the structural model. It gives information regarding how well a model predicts the hypothesized paths or relationships. PLS Graph 3.0 provides the squared multiple correlations (R^2) for each endogenous construct in the model and the path coefficients. The R^2 indicates the percentage of a construct's variance in the model, while the path coefficients (ß) indicate the strengths of relationships between constructs (Chin, 1998; 2000). PLS does not generate a single goodness-of-fit metric for the entire model, unlike other structural modeling software (e.g., LISREL), but the path coefficients and the R^2 are sufficient for analysis purposes (Chin, 1998). The author also recommends that path coefficients (ß) should be at least 0.20 and ideally above 0.30 to be considered meaningful. The strength or significance of the paths in causal model can be tested using t-values obtained in the bootstrapping procedure in PLS Graph 3.0 by generating 200 sub-samples with 0 cases (Chin, 1998).

Further, there are aspects of our research for which the use of structural equation modeling would seem inappropriate. For these parts we used other statistical analyses. Once again, the nature of data, in particular its size and its non-normality, informed the choice of selected approaches. In fact, our data do not conform to a normal distribution. This we determined through the normality tests in SPSS, including the Kolmogorov-Smirnov statistic. Moreover, our data were represented using a categorical scale that might be suitable for non-parametric tests (see Hair et al., 1998). These tests were used in some aspects in Articles I, VII, VIII, and IX. The relevant tests used included Mann-Whitney U test, Wilcoxon W test, and Kendall Tau-b coefficient (T^b). In most cases, we performed the equivalent parametric tests (ANOVA test, t-tests, etc.)

and found that data analysis yielded analogous interpretations in both approaches. In each article where we used these tests, we reported the results involving the non-parametric tests for brevity.

4 SUMMARY OF THE ORIGINAL ARTICLES

In this chapter the author presents a brief discussion of each of the articles included in the thesis.

For each article, the research aim or objective is highlighted and discussed.

4.1 "Quality, Impact and Success of ERP Systems: A Study Involving Some Firms in the Nordic-Baltic Region"

Reference: Ifinedo, P. & Nahar, N. 2006f. Quality, Impact and Success of ERP Systems: A Study Involving Some Firms in the Nordic-Baltic Region. Journal of Information Technology Impact (JITI), 6(1), 19-46. (Article I)

ERP acquisitions continue to grow globally, including in Finland and Estonia (van Everdingen et al., 2000; Clouther, 2005; Ifinedo, 2005). Studies in the two countries have focused on the adoption and implementation issues (e.g., Laukkanen, et al., 2005); to our knowledge no prior study exists that discusses the success measurement or assessment of such systems in adopting firms in both countries (and elsewhere in the region: Baltic-Nordic). This paper adds insight to the discourse of ERP adoption in the region by extending discussion to ERP post-implementation issues. At a general level, this paper is designed to focus attention on the perceptions of the derived benefits from such systems to adopting firms as well as to investigate whether contextual considerations matter in such discussions. We are interested in finding out whether there are differences in the evaluation of ERP systems success dimensions and measures in the two chosen countries in the region.

Our main objective, however, is to answer the following questions: What qualities and impacts do adopting firms in the region associate with their ERP software? Using these impacts and qualities to define ERP system success, how do such measures rate in ERP adopting firms? In order to provide answers to the foregoing questions, we summarized how the relevant research strategies,

including web-based survey, case studies and postal surveys were used. The details of these strategies have been discussed in-depth in Chapter 4. That said, we noticed that our respondents enumerated issues or items that compare with those that have been noted elsewhere as regards the success evaluation of ERP systems. This finding gave us the confidence that regional contextual factors or influences may not be critical when assessing the success of such systems, and that we could use or modify research instruments used elsewhere for our main study. In short, we found that the perception of the qualities and impacts listed by respondents were not unique to the region, rather they are comparable with those reported in the literature.

This paper shows that the empirical evidence garnered from the case studies and the rating of the measures in this study by the participants from each of the companies compare with the ratings of other respondents in the main sample (n = 62) that was later used. This information, to some degree, enhances the external validity of the whole study (Straub, 1989). Regarding how those measures were rated, informational quality of ERP is highlighted as the topmost dimension of success (order of importance) for firms in our main survey, while organizational impact rated the lowest in this paper. We also report that the seven case companies in our study indicated that they tend to associate the overall success of their ERP software with the quality of the providers (i.e., vendors and consultants). This revelation led us to redefine the original ERP systems success measurement model that we had been working with to include another dimension of success, i.e., *Vendor/Consultant Quality*.

We indicate that the nature of ERP systems being acquired might be related to how the success of such systems is evaluated, i.e., less complex systems may provide higher success levels. However, further research is required to verify these findings. Overall, our data permitted us to conclude that despite the differences between the two countries in terms of economic resources, the evaluation of ERP success in adopting firms in both compare reasonably well. As noted, this conclusion is supported by empirical evidence from case studies and surveys. The paper highlight salient implications for firms using ERP systems in the region; for example, the information that firms from emerging and developed economies in the region hold comparable view of ERP success may be useful for strategic planning involving the deployment of other complex IT systems across the region in light of the growing cross-border cooperation in the region (Nissinen, 2002; CIA World Factbook, 2005; Ifinedo & Davidrajuh, 2005).

4.2 "Extending the Gable et al. Enterprise Systems Success Measurement Model: A Preliminary Study"

Reference: Ifinedo, P. 2006f. Extending the Gable et al. Enterprise Systems Success Measurement Model: A Preliminary Study. Journal of Information Technology Management, 17(1), 14-33. (Article II)

[A version of the paper was published earlier as: Ifinedo, P. 2006e. Enterprise Resource Planning (ERP) Systems Success Measurement: An Extended Model. In: Manolopoulos, Y., Filipe, J., Constantopoulos, P., and Cordeiro, J. (Eds.) Proceedings of the 8th. International Conference on Enterprise Information Systems (ICEIS 2006), May 23 - 27, 2006, Paphos, Cyprus, INSTICC Press, 71-78]

Measuring the success of Enterprise Resource Planning (ERP) systems for adopting organizations is an emerging area of research, and few studies are available in this area (e.g., Nelson & Somers, 2001; Tan & Pan., 2002; Gable et al., 2003; Sedera et al., 2003a). It has also been reported that some adopting organizations lack knowledge regarding what to evaluate in the context of ERP systems (Seddon et al., 2002; Robbins-Gioia, 2002; Ifinedo, 2005). Given the nature of huge investments expended in acquiring such technologies, it would be beneficial for practitioners, especially for those lacking knowledge on which issues to focus, to be better informed with regard to factors that might affect the evaluation of the success of their ERP system.

This paper complements the growing body of knowledge in this area as we extend the dimensions of success in the measurement model proposed by Gable and colleagues (Gable et al., 2003; Sedera et al., 2003a, Sedera & Gable, 2004). In the paper, we note that other researchers (e.g., Nelson & Somers, 2001; Tan & Pan, 2002) have discussed and proposed ERP success measurement models, but the Gable et al.'s (2003) model has been validated and used in other studies (e.g., Sehgal & Stewart, 2004). In view of the emerging importance of the Gable et al.'s ERP systems success measurement model, we sought answers to the following questions: Are the dimensions of success represented in the ERP systems success measurement model proposed by Gable and colleagues comprehensive? If not, can their model be extended to include any other relevant dimensions? Is "ERP systems success measurement model" a second-order factor as suggested by Sedera and Gable (2004)? Which dimension(s) may serve as the best surrogate of ERP success? In brief, Gable et al., 2003 drew from the influential work of DeLone and McLean (1992) that is widely recognized as the most important IS success evaluation framework in the IS literature. Gable et al. eliminated (through multi-stage data collection and statistical analysis) the *Use* and *User satisfaction* dimensions. Arguments against dropping these dimensions also appear elsewhere in the literature (Seddon & Kiew, 1994; Saarinen, 1996; Seddon, 1997; Ballantine et al., 1997).

The data used for analysis came from the main survey; nonetheless, we underscored the importance of the findings that we got from the case studies in Article I, namely, the dimension of *Vendor/Consultant Quality* that can be added to the Gable et al.'s model. That said, our study of the literature reveals that another dimension, *Workgroup Impact,* would be relevant, and capable of offering useful insights regarding ERP systems success evaluations. At a general level, Barua et al. (1995, p.20) found "that the most important significant contributions of IT investments occur at low organizational levels where they are implemented." We have argued elsewhere in the thesis why we believe the two dimensions would seem appropriate in the context of ERP success measurement and evaluations. Thus, our extended ERP success measurement is as shown in Figure 9.

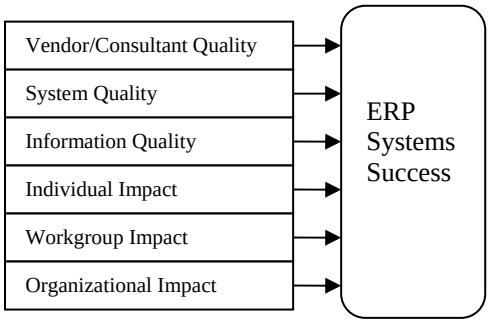


FIGURE 9 The extended ERP systems success measurement model

Following the guidelines used in Gable et al. (2003), we aim to assess the additive nature of the extended ERP systems success measurement with six dimensions of success using criterion validity (Kerlinger, 1986). Indeed, our data analysis indicates that the extended model yields results supporting the additive nature (additivity) and mutual exclusivity of the six dimensions. What these results show in essence, is that the proposed model of ERP systems success measurement with six dimensions yields sufficient information to support the criterion validity of the model. Furthermore, the factor analysis of the measures indicates that a considerable amount of the variance in the model is explained.

Regarding the second-order factor nature of ERP success, our result does not support the results in Sedera and Gable (2004), rather our data seem to be suggesting that ERP success might be a third-order factor. Our data analysis indicates that the dimensions of *System Quality* and *Organizational Impact* may be the two best surrogates of ERP systems success. The extended model and the other findings are important contributions in the IS domain in general and IS success evaluation literature in particular, and future studies could benefit from them. With respect to this dissertation, the ERP success measurement model is at the heart of this thesis; it is the dependant variable in the other articles (see research framework). Therefore, a more comprehensive framework adds depth to our analyses. The extended model also provides practitioners with a wider view of the dimensions of ERP success than the previous model. Finally, the

two best surrogates can be used to assess the success of the acquired enterprise systems in instances where a more comprehensive scale is not readily available.

4.3 "An Empirical Analysis of the Relationships among the Dimensions in an Extended ERP Systems Success Measurement Model"

Reference: Ifinedo, P. 2006c. An Empirical Analysis of the Relationships among the Dimensions in an Extended ERP Systems Success Measurement Model, (submitted to) European Journal of Operational Research (EJOR). (Article III)

As ERP success measurement models begin to appear in the literature, we argue that it is vitally important for information systems (IS) researchers not to downplay the pertinence of establishing interrelationships among the constructs or dimensions in the ERP systems success measurement model that they develop or use. In their influential work, DeLone and McLean (1992, p.88) conclude "By studying the interactions along these components of the model [dimensions of IS success], as well as the components themselves, a clearer picture emerges as to what constitutes information systems success." In fact, researchers investigating ERP implementations have studied the interrelations among critical success factors in the early stages of ERP implementations (see e.g., Akkermans & van Helden, 2002). It is our belief that by examining the interrelationship among the dimensions in the extended ERP success measurement model knowledge can be accumulated in this area of research and will benefit both the practitioner and researcher communities

Towards advancing knowledge in the area, we formulated ten hypotheses, which were developed from the dimensions in the extended ERP systems success measurement model that we developed. The hypothesized paths are shown in Figure 10. The acronyms in Figure 10 are explained as follows: VQ (*Vendor/Consultant Quality*), SQ (*System Quality*), IQ (*Information Quality*), II (*Individual Impact*), WI (*Workgroup Impact*), and OI (*Organizational Impact*).

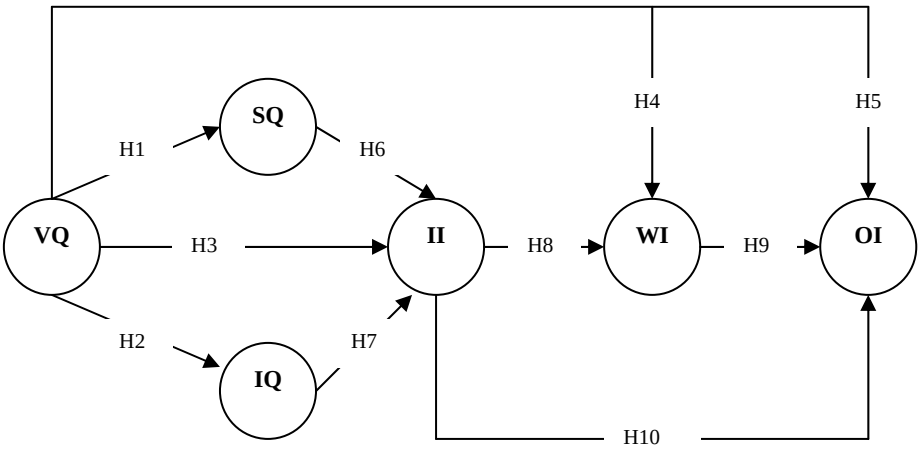


FIGURE 10 The research sub-model used in article III

The data used for analysis came from the main survey. We used structural equation modeling technique (PLS Graph 3.0) for the data analysis. The results confirm the following:

- Increased *Vendor/Consultant Quality* will lead to higher perception of *System Quality*.
- The higher the *Vendor/Consultant Quality*, the higher the *Information Quality* of the acquired system.
- The higher the *Vendor/Consultant Quality*, the higher the *Workgroup Impact*.
- The higher the *Vendor/Consultant Quality*, the higher the *Organizational Impact*.
- Higher *System Quality* will lead to increases in *Individual Impact*.
- Increases in *Individual Impact* will cause corresponding increases in *Workgroup Impact*.
- As *Workgroup Impact* increases, there will be increases in *Organizational Impact*.

Our data did not support the hypothesized paths between *Vendor/Consultant Quality* and *Workgroup Impact* (H4), *Information Quality* and *Individual Impact* (H7), and *Individual Impact* and *Organizational Impact* (H10). Plausible explanations for the lack of support for the three hypotheses (i.e., H4, H7, and H10), we argue, might be related to the following: 1) The nature of our data used in the analysis. We sampled a wide range of firms (small and big) across differing industries where different ERP systems are being adopted; it is possible that the heterogeneous nature of our sample might have impacted the results. It is also likely that some of the dimensions might have been rated differently by respondents from the participating firms. 2) The use of a new scale for the *Workgroup Impact* dimension might be problematic. 3) The inherent limitations in an ERP system with regard to the issues in the unsupported paths.

For example, some of the findings in this paper lend credence to other studies (e.g., Seddon & Kiew, 1994; Rai et al., 2002; Iivari, 2005) investigating the nature of relationships between paths in IS success measurement frameworks. The paper draws the attention of practitioners to important relationships between the dimensions. For example, management should encourage worthwhile interactions between the systems providers and organizational members (i.e., individuals) using the software, because the findings of this study and of others (Gefen & Ridings, 2002, Gefen, 2004; Ko et al., 2005) suggest that such contacts might augur well for individuals using these systems.

4.4 "An Investigation of the Impacts of Some External Contextual Factors on ERP Systems Success Assessment: A Case of Firms in Baltic-Nordic Region"

Reference: Ifinedo, P. 2006d. An Investigation of the Impacts of Some External Contextual Factors on ERP Systems Success Assessment: A Case of Firms in Baltic-Nordic Region. International Journal of Internet and Enterprise Management (IJIEM), 4(4), 355 - 378. (Article IV)

[A version of the paper was published earlier as: Ifinedo, P. 2006b. A Framework for Assessing Enterprise Resources Planning (ERP) Systems Success: An Examination of its Aspect Focusing on External Contextual Influences. In: Papadopoulos, G.A. and Filipe, J. (Eds.) Proceedings of the 4th. ICEIS (International Conference on Enterprise Information Systems) Doctoral Consortium - DCEIS 2006, May 23 - 27, 2006, Paphos, Cyprus, INSTICC Press, 3-15].

As ERP systems success measurement, evaluations or assessment gather momentum, the majority of studies in the area (e.g., Nelson & Somers, 2001; Tan & Pan, 2002; Gable et al., 2003; Sedera & Gable, 2004; Wu & Wang, 2005) tend to focus attention on the internal or organizational factors or issues. However, nowadays, business organizations are coming under increased pressure because of the rapidly changing external contextual factors, including global competition and dynamic market environments (Powell, 1996; Watson et al., 1997). We contend that it is critical for management to have insights about some key contingencies in the external contextual environment that may impact upon their adopted information technology (IT) systems, including ERP. Primarily, this study is motivated by the need to not overlook wider issues that may influence ERP success. Although external contextual factors might include other components (e.g., government regulations, the influence of suppliers/partners, national culture), in the paper, we choose a few variables for two reasons: (1) simplicity/illustration purposes and (2) the availability of ERP implementation studies related to these issues. In the paper, we focus on

three variables highlighted in the research framework (Figure 2), i.e., industry type, industry climate, and national economic climate.

Research shows that firms in different industries evaluate IT issues differently (Bergeron et al., 1991; Wu & Wang, 2003; Kearns & Lederer, 2004; Lee & Kim, 2006). Grover and Goslar (1993) suggest that under relatively undifferentiated and stable environments, organizations can process information without using a complex IT system. They indicate that this is not possible in a rapidly changing environment. Further, firms in unstable environments (characterized by ever-changing landscapes) see IT systems as critical and necessary infrastructure, and seamlessly use such systems to gain competitive advantage (Johnston & Carrico, 1988; Porter & Millar, 1985; Glazer, 1991), and are adept at strategically using them (Busch et al., 1991; Davenport, 1998; Lee & Kim, 2006). Regarding the national economic climate, differences in the economic status of nations are a major differentiator in the perception of IT benefits (Dewan & Kraemer, 2000; WEF, 2004; Gregorio et al., 2005), and in relation to ERP systems, Huang and Palvia (2001) indicate that the poor economic capabilities in developing countries present a problem regarding ERP penetration. Following this brief discussion, this paper aims to provide answers to the following questions: Does industry type matter in the assessment of ERP success? Does industry climate influence a firm's assessment of ERP success? Does national economic climate influence a firm's assessment of ERP success?

The data used for analysis came from the main survey. In the paper, we use structural equation modeling technique and a non-parametric test to hypotheses formulated to answer the questions above. Firstly, the data analysis indicates that there is a positive relationship between industry climate and ERP success, which, from the perspective of operationalized measures, indicates that the more unstable and competitive the business environment (i.e. industry climate), the higher the success with adopted ERP systems thus indirectly adding support to findings in prior studies (e.g., Johnston & Carrico, 1988; Glazer, 1991; Segars & Grover, 1995). Secondly, our analysis for industry type seems to be suggesting that the type of industry in which a firm is situated may not be significant in differentiating between firms on how ERP success is assessed. Thirdly, regarding the national economic climate variable, although the data set of countries in this study is limited, our analysis, nonetheless, shows that the perception of ERP systems success might vary according to national economic climates. It is important to point out that this finding in the paper might, on the surface, appear to contradict the result in Article I, which suggests that both countries hold comparable views on ERP success. (The objective in this paper is to look for variance between the two variables, which was not the aim in Article I.)

Overall, this particular finding lends support to prior studies and observations (e.g., Watson et al., 1997; Dewan & Kraemer, 2000; Huang & Palvia, 2001; WEF, 2004; Gregorio et al., 2005). Our data shows that the more unstable and competitive the business environment, the higher the success with adopted ERP. The information may be relevant to corporate or strategic planning vis-à-vis the acquisition of systems such as ERP. The knowledge that

industry type has no significant bearing on ERP systems success assessment in adopting organizations may be useful for firms that otherwise might believe that ERP would not be relevant to their business operations. The evidence of variance between national economic climate and the perceptions of firms of ERP success may be critical for management in the wealthier countries in the region vis-à-vis the measures that need to be considered as they deploy complex IT systems in the less endowed nations in the region.

4.5 "Impacts of Firm Size, Organizational Goals and Mission, and Top Management Support on ERP Success: An Analysis"

Reference: Ifinedo, P. 2006g. Impacts of Firm Size, Organizational Goals and Mission, and Top Management Support on ERP Success: An Analysis. Business Process Management Journal (BPMJ). Forthcoming. (Article V).

Organizational goals and mission, firm size, and top management support are pertinent factors to ERP systems success. These issues, however, have not received much attention in prior studies dealing ERP success evaluations in organizations. The aforementioned contingencies are among the important variables of interest with respect to the evaluation of IT systems and function at the organizational level (Saunders & Jones, 1992, Somers et al., 2000). To our knowledge, no prior study has empirically examined the relationships between organizational goals and mission (for adopting ERP systems) and top management support, on the one hand, and ERP success, on the other. However, we noticed that Sedera et al. (2003c) had investigated the significance of firm size as antecedent to ERP success and found it to be critical in the assessment of ERP success. This study, in part, complements that effort.

Top management support is vital for the success of IT projects in organizations because of its influence and role in providing financial resources and relevant guidelines (Thong et al., 1996, Doll, 1985; Dong, 2001), and researchers have found a positive relationship between top management support and IS effectiveness or success (Igbaria, 1990; Thong et al., 1996). Many organizations purportedly adopt ERP to meet their organizational objectives: goals and mission (Davenport, 1998, 2000; Bingi et al., 1999). However, Deloitte Consulting (2000) and Davenport (2000) note that the high failure rates of ERP project in organizations can be attributed to poorly defined goals and mission with regard to their ERP acquisitions. Researchers (e.g., Markus & Tanis, 2000; Willcocks & Sykes, 2000; Davenport, 2000) have stressed that an ERP is more than just another IT system for the adopting firm, and there is a need to have strategic clarity before embarking on its adoption. With respect to organizational size, Mabert et al. (2003) note that ERP benefits differ according to firm size. Sedera et al. (2003c), investigating ERP systems success in public

organizations found support for the claims in Mabert et al's study, i.e., larger firms experience more ERP benefits than smaller-sized organizations.

Of note, this article is the first in the series of efforts that we designed to investigate the impact of organizational level variables or factors on ERP success for adopting organizations. Here, we started with a simple framework (Figure 11) highlighting the hypothesized relationship between the three contingencies and ERP success.

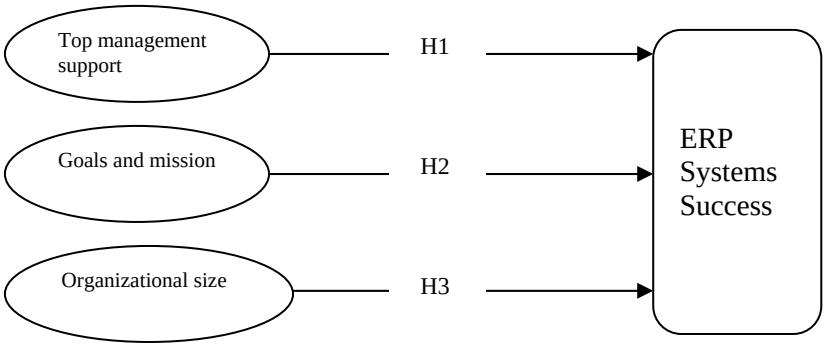


FIGURE 11 The research sub-model used in article V

We used data from the main survey for analysis, and used structural equation modeling technique. The data analysis supports the hypothesis that top management support will be positively related to ERP systems success in adopting firms. This result suggests that success of ERP systems would be enhanced where top management support exists to support espoused viewpoints in the literature (e.g., Doll, 1985, Igbaria, 1990, Thong et al., 1996), and in the context of ERP studies in particular (Davenport, 1998, Hong & Kim, 2002, Dong, 2001). Our prediction that organizational size would positively influence ERP systems success was confirmed; this supports the finding in a comparable study in public sector organizations conducted by Sedera et al. (2003c). We also found that there is a moderate and positive relationship between organizational goals and mission and ERP systems. Unlike the insight obtained from prior discussions on the impact of such issues as top management support upon ERP implementation success that are primarily based upon descriptive write-ups (e.g., Bingi et al., 1999; Holland & Light, 1999) and interviews in case studies usually conducted at the software implementation phases (e.g., Davenport, 1998; 2000), this study provides empiric information to both researchers and practitioners with regard to the impact of the selected factors on ERP success in organizations. Significantly, our study permits readily verifiable empirical data to be compared across different contexts, and may offer a basis for comparative studies in the future. More significantly, practitioners of the future will be better equipped to decide about the issues that should matter most as they assess the success of their ERP systems. For example, would it be more important: a) to elicit top management support during ERP acquisitions, and have such sustained through the life span of the software or b) to ensure better alignments between organizational

objectives (i.e., goals and mission) and ERP acquisitions? In that regard, our data shows that the relationship between top management support and ERP success is stronger than between the other two relationships considered in this article.

4.6 "Interactions between Organizational Size, Culture, and Structure and Some IT Factors in the Context of ERP Success Assessment: An Exploratory Investigation"

Reference: Ifinedo, P. 2007c. Interactions between Organizational Size, Culture, and Structure and Some IT Factors in the Context of ERP Success Assessment: An Exploratory Investigation. Journal of Computer Information Systems. Forthcoming. (Article VI)

[A version of the paper was accepted at The IFIP International Conference on Research and Practical Issues of Enterprise Information Systems (CONFENIS), April 24-26, 2006, Vienna, Austria].

This article continues our discussion on the impact of organizational level contingencies on ERP success. Several researchers (Davenport, 1998; 2000; Markus & Tanis, 2000; Willcocks & Sykes, 2000; Hong & Kim, 2002; Morton & Hu, 2004) have emphasized the relevance of such contingencies for the success of IT systems, including ERP. Few have provided empirical evidence regarding the nature of the impacts of size, culture, and structure of the adopting organization, on the one hand, and ERP system success, on the other. There is also a dearth of research on the effects of organizational IT issues such as IT assets and resources (i.e., the IT department's value, the IT department's size, and the sophistication of the in-house IT professionals, among others) on ERP systems success. We contend that knowledge in this area for both researchers and practitioners will be enriched when this gap in research is bridged.

Rather than consider the impacts of the three main contingency factors, i.e., size, structure, and culture, on the one hand, and ERP success, on the other as was the case with Article V, we decided to address the limitations usually seen in studies using the contingency approach where "deterministic models" are often used. In such models, only the arrows representing a required association are shown and the effects of other factors are ignored (Weill & Olson, 1989). We concur with Weill and Olson, (1989) in that a more elaborate model might improve the causal explanations, and this was affirmed by the findings in this paper. The technology (IT-related) issues or simply "organizational IT issues" used in this paper are shown in the research framework (Figure 2). The use of factor analysis enabled us to group measures that loaded together under new names. For example, both IT department's value and skills/sophistication of in-house IT staff measures loaded together,

and were referred to as "IT assets". We have already provided background information regarding these items in other sections of this work.

We formulated eight hypotheses each representing the impact of the three main contingency factors used in the paper and their interactions with some organizational IT factors. The full development of the relevant hypotheses is excluded here for space considerations, but is available in the attached article. However, the sub-model used in the paper is shown in Figure 12, and the statements of the hypotheses are presented below:

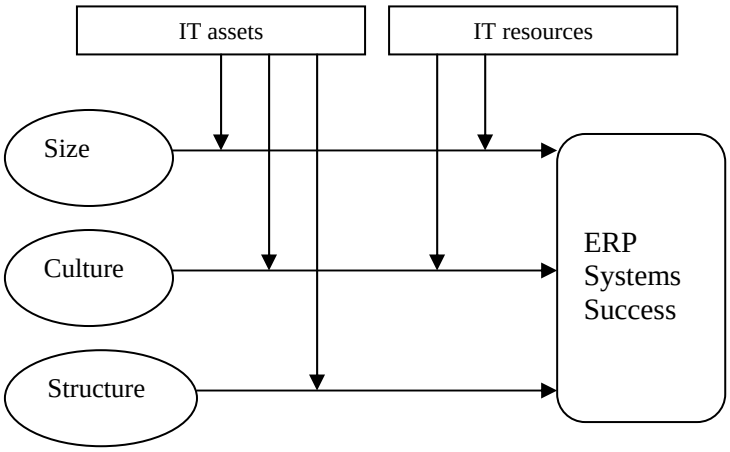


FIGURE 12 The research sub-model used in article VI

- There is a relationship between firm size and ERP success.
- The relationship between firm size and ERP success will be moderated by IT assets, such that success will be higher in larger firms.
- The relationship between firm size and ERP success will be moderated by IT resources, such that success will be higher in larger firms.
- A positive relationship exists between an organizational culture that is conducive to ERP adoption and ERP success.
- Organizational culture will influence ERP success, such that success will be higher in firms with higher IT assets.
- Organizational culture will influence ERP success, such that success will be higher in firms with higher IT resources.
- A positive relationship exists between an organizational structure that is conducive to ERP adoption and ERP success.
- Organizational structure will influence ERP success, such that success will be higher in firms with higher IT assets.

The data used for analysis came from the main survey. In the paper, we use structural equation modeling technique to analyze the collected data. Our data supports six of the eight hypotheses. The summary of the results are presented as follows:

- The results show that organizational size is positively related to ERP success.
- The relationship between firm size and ERP success is found not to be positively moderated by IT assets.
- The relationship between firm size and ERP success is moderated by IT resources, such that success was higher in larger firms than in smaller ones.
- The results support the hypothesis that a positive relationship exists between an organizational culture that is conducive to ERP adoption and ERP success.
- The data analysis indicates that the relationship between organizational culture and ERP success is positively moderated by IT assets.
- Our data analysis indicates that the relationship between organizational culture and ERP success is positively moderated by IT resources.
- The results show that a positive relationship exists between an organizational structure that is conducive to ERP adoption and ERP success.
- The result shows that the relationship between organizational structure and ERP success is not positively moderated by IT assets.

Our effort in this paper represents new insights in the literature from which future inquiry could be built. The paper provides empirical evidence regarding the relevance of organizational size, structure, and culture as important contingencies for ERP success. This information may be useful for ERP adopters and practitioners. Future studies using other research approaches, including case studies, could add to insights as to the pertinence of such contingencies in the evaluation of ERP success. Nonetheless, our approach that explores the interacting effects or the moderating roles of the three main contingency factors and organizational IT issues in a "non-deterministic model" is unique. Other studies using the contingency approach could consider employing our approach.

4.7 "Interactions between Contingency, Organizational IT factors, and ERP Success"

Reference: Ifinedo, P. & Nahar, N. 2006d. Interactions between contingency, organizational IT factors, and ERP success. Industrial Management & Data Systems. Forthcoming. (Article VII)

[A version of the paper was published earlier as: Ifinedo, P. 2005. Do Organisational-Technological Contingency Factors Influence the Perception of ERP Systems Success? An Exploratory Study in the Baltic-Nordic Region of

Europe, 2005, In: Soliman, K. (Ed.) Proceedings of 2005 International Business Information Management Association (IBIMA) Conference, Lisbon, Portugal, pp.427-437]

In this paper, we aim to examine the direct impacts of the organizational IT issues (technology [IT-related] issues) on ERP success to increase our understanding of the influence of such factors in the context of ERP success measurement. Our study of the literature reveals that no prior studies exist in which such issues have been discussed. Specifically, here we examine the impact of some organizational-information technology (IT) factors or issues (i.e., IT assets, employees' IT skills, IT resources, IT head's (CIO) position in the hierarchy, and satisfaction with legacy IT systems) and their interacting effects with selected three contingency factors (i.e., top management support for ERP, size, and structure) in the context of ERP success. It is important to note that the selected issues (i.e., the main and the interacting effects) are offered as illustrative, rather than exhaustive examples (Figure 13).

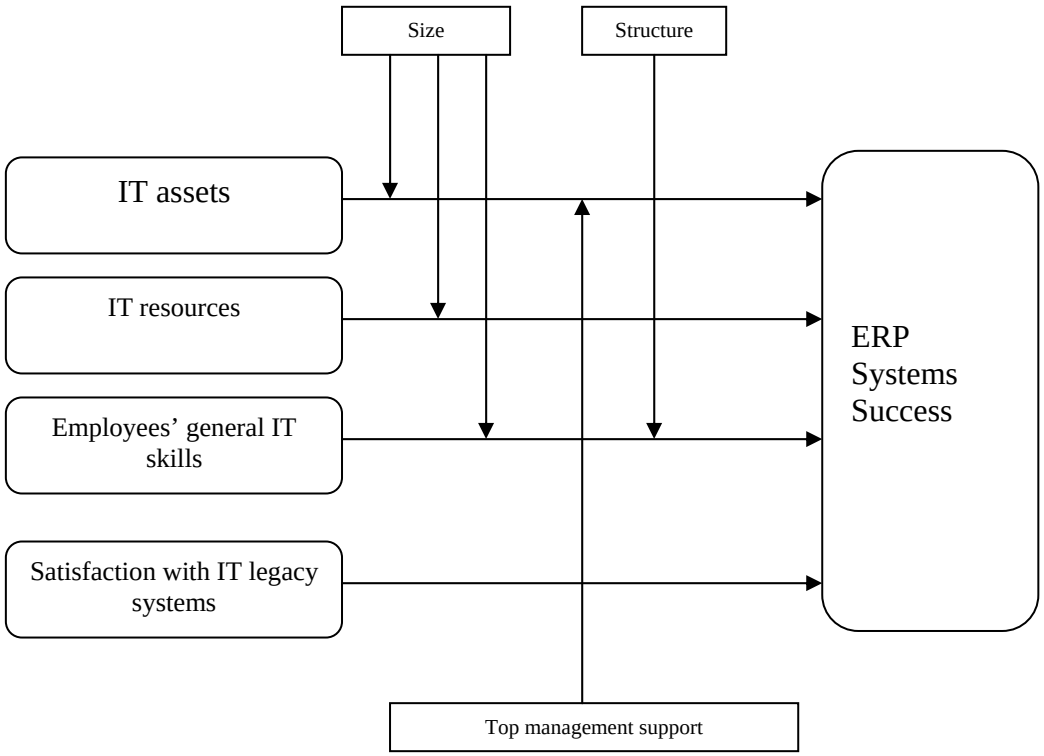


FIGURE 13 The research sub-model used in article VII

That said, the literature also suggests that other researchers (e.g., Sedera et al., 2003a; Morton & Hu, 2004; Lee & Lee, 2004; Laukkanen et al., 2005) have highlighted the pertinence of the selected issues or factors in the context of ERP systems implementation, and to some extent, success evaluations; however, empirical information as to the nature of such relationships is scarce in the literature. This study aims to fill this gap in research. It is hoped that by investigating the selected issues useful knowledge might emerge.

In this paper, we formulated ten hypotheses, nine of which are depicted by the paths in the sub-model (Figure 13). We use structural equation modeling technique to analyze data collected from the main survey. The tenth hypothesis relates to how the position of the CIOs (Chief Information Officer) in the organizational hierarchy influences ERP systems success. For this hypothesis, we use a non-parametric test (i.e., Mann-Whitney U). Basically, we wanted to know if there would be differences in ERP systems success evaluations between firms with CIOs as their top management personnel and firms in which CIOs do not occupy such positions. The ten statements of hypotheses are provided below.

- IT assets are positively related to ERP systems success.
- A relationship exists between IT assets and ERP systems success, such that success will be moderated by the organizational size.
- The relationship between IT assets and ERP systems success will be higher when top management support is higher.

- A positive relationship exists between IT resources and ERP systems success.
- A relationship exists between IT resources and ERP systems success, such that success will be moderated by the organizational size.
- A positive relationship exists between employees' general IT skills and ERP systems success.
- A relationship exists between employees' general IT skills and ERP systems success, such that success will be moderated by the organizational size.
- A relationship exists between employees' general IT skills and ERP systems success, such that success will be moderated by the organizational structure.
- A positive relationship exists between the satisfaction levels that firms get from legacy IT systems and ERP systems success.
- The CIO's position in the hierarchy influences ERP systems success.

Our data supported seven of the ten hypotheses. We provided explanations as to why the three were unsupported; these reasons we offered relate to contextual influences. The summary of the results in the paper is as follows:

1. The results show that IT assets are positively related to ERP systems success.
2. Our data did not support the hypothesis that organizational size moderates the relationship between IT assets and ERP systems success.
3. We found support for the hypothesis: "The relationship between IT assets and ERP systems success will be higher when top management support is higher."
4. A positive relationship, we found, exists between IT resources and ERP success.
5. Organizational size moderates the relationship between IT resources and ERP systems success.
6. Our analysis does not support the hypothesis formulated to highlight the positive relationship between employees' general IT skills and ERP systems success.
7. However, organizational size was found to moderate the relationship between employees' general IT skills and ERP systems success.
8. Organizational structure, we found, moderates the relationship between employees' general IT skills and ERP systems success.
9. Our results show that firms can be satisfied with their legacy IT systems and still positively assess or evaluate their newly acquired ERP success. This result contradicts conventional wisdom.
10. The results indicate that there is no significant difference between firms regarding whether or not they have their IT heads (CIOs) as top management executive on the six dimensions of ERP success.

Overall, the findings in this paper, we believe, represent new source of knowledge for the IS community in relation to ERP success assessment. Similarly, practitioners gain valuable information as to the nature of the relationships between the selected variables and ERP success.

4.8 "ERP Systems Success: An Empirical Analysis of How Two Organizational Stakeholder Groups Prioritize and Evaluate Relevant Measures"

Reference: Ifinedo, P. & Nahar, N. 2006c. ERP Systems Success: An Empirical Analysis of How Two Organizational Stakeholder Groups Prioritize and Evaluate Relevant Measures. Enterprise Information Systems. Forthcoming. (Article VIII)

[A version of the paper was published earlier as: Ifinedo, P. & Nahar, N. 2006a. Do Business Managers and IT Professionals View the Enterprise Resource Planning (ERP) Systems Success Measurement Differently? In: Avery A.E. (Ed.) Proceedings of the 36th. Annual Meeting Southeast Decision Sciences Institute Annual Meeting, February 22-24, 2006, Wilmington, NC, USA, pp.213-228].

In our research framework (Figure 2), we indicated the evaluator's perspective, and we noted that researchers (e.g., Hamilton & Chervany, 1981; Grover et al., 1996; Myers et al. 1997; Shang & Seddon, 2002) have stressed the importance of highlighting the perspective from which the effectiveness or success of acquired IT systems is being presented. Given that the selected research subjects in this study included respondents that can be classified by occupation we decided to examine how our respondents when classified by occupation would perceive ERP systems success in their respective organizations, hoping to shed light on how business executives or managers and IT professionals/managers view such an issue.

Prior studies using the two actors in the context of ERP success evaluation are scarce. To our knowledge the work by Sedera and colleagues (e.g., Sedera et al., 2002; 2004) are among the few that have investigated such issues from the viewpoint of IT staff and business executives. As indicated earlier, their study was carried out using subjects from public sector organizations, thus, it is likely that the findings of their study may not be generalizable to private sector organizations (Mansour & Watson, 1980; Khandelwal, 2001; Ifinedo, 2006h). Our focus on firms complements and adds to the growing body of knowledge in this area of study.

The results from Sedera et al. (2002; 2004) showed that IT staff evaluated and prioritized *System Quality* more than Users (i.e., business managers) did. Furthermore, Users evaluated and prioritized measures and the dimensions of

Organizational Impact more than the IT staff did. The authors also noted that the two organizational stakeholder groups did not show any significant differences in *Information Quality*. They did not offer reasons as to why such noticeable differences surfaced in their study. However, the literature suggests that differences in perceptions of value and occupational cultures could be some of the main reasons (see, Schein, 1992; Grindley, 1992; Shah et al., 1994; Saunders & Jones, 1992; Ward & Peppard, 1996, 1999). van der Heijden (2000, p.154) adds that "This gap is often fostered by 'hard' elements (power and control structures), but also by rituals, routines, stories, myths, and symbols that set the IT department apart from the other departments."

In the context of ERP systems, Singletary et al.'s (2003) study of managers, IT professionals and end-users, regarding the characteristics, benefits and downsides of ERP applications integration, found significant differences among the three stakeholders. In a college environment, the study of Frantz et al. (2002) found that CIOs evaluated certain issues related to ERP implementations (i.e., executive management support and training) differently from how their CFO counterparts did. Sedera et al.'s (2004, p.12) work on ERP success evaluations across different organizational stakeholder groups concludes that "different employment cohorts possess different views on ES success." Following this brief discussion, we hypothesize that, as both the business managers and IT professionals are members of different organizational stakeholder groups, they would hold different views on ERP success assessment in their organizations. Specifically, we predicted that each would prioritize and evaluate measures and dimensions related to ERP success differently.

The data used for analysis came from the main survey and we used non-parametric tests to analyze the collected data. Our results indicate that no significant statistical differences exist between the two groups on how each believes ERP success is assessed in their organizations. In short, the two groups seem to agree on the dimensions of ERP success (i.e., six of them) that we used, but one: the *Vendor/Consultant Quality* dimension. Thus, the findings of this study indicating that both stakeholder groups hold a common view regarding their perceptions of the assessment of ERP success in their organizations would enable both researchers and management to reconsider past information suggesting that both groups have different cultures or will subscribe to different organizational agendas in relation to organizational IT issues, including the success evaluations of complex IT systems like ERP.

4.9 "Do Top and Mid-level Managers View Enterprise Resource Planning (ERP) Systems Success Measures Differently?"

Reference: Ifinedo, P. & Nahar, N. 2006b. Do Top and Mid-level Managers View Enterprise Resource Planning (ERP) Systems Success Measures Differently? International Journal of Management and Enterprise Development. (Article IX)

[A version of the paper was published earlier as: Ifinedo, P. & Nahar, N. 2006e. Prioritization of Enterprise Resource Planning (ERP) Systems Success Measures: Viewpoints of Two Organizational Stakeholder Groups. In: Haddad, H.M., Chbeir, R., Ossowski, S., Wainwright, R.L., Liebrock, L.M., Palakal, M.J., Yetongnon, K., and Nicolle, C. (Eds.) Proceedings of the 21st. Annual ACM Symposium on Applied Computing, April 23 - 27, 2006, Dijon, France, ACM Press, 1554-1560].

Just as in the preceding summary, the aim of this paper was to present the evaluator's perspective (Hamilton & Chervany, 1981; Myers et al. 1997; Shang & Seddon, 2002) of ERP success evaluations by determining whether differences exist between two organizational stakeholder groups, i.e., top- and mid-level managers, which were taken from the three management levels identified by Anthony (1965). We excluded lower-level workers who perform clerical duties from our study. In the course of data collection efforts, we targeted these two groups of organizational actors because both are known to have a better understanding of organizational issues than lower level employees do (Abdinnour-Helm et al., 2003; Sedera et al., 2003a, b; Sedera et al., 2004).

Literature shows that the organizational rank and position of an individual is crucial in the assessment of organizational issues including those related to IT (Rousseau, 1978; Cameron, 1986; Brancheau & Wetherbe, 1987; Pfeffer, 1992; Raghunathan & Raghunathan, 1989). For example, Brancheau and Wetherbe (1987) found that top- and mid-level management have different views on key IS management issues. Mid-level managers reportedly have a better understanding of how IT systems affect the business than do top-level managers (Shang & Seddon, 2002; Moynihan, 1995; Schein, 1992). Wilkes and Dickson (1987) studied the perceptions of three organization stakeholders (top-level management, IS managers, and internal auditors) regarding the assessment of an IS organization. They found the perceptions of the three groups differed markedly. With regard to ERP success evaluations, Sedera et al. (2004) found that top-level managers (Strategic level) placed greater emphasis on *Organizational Impact* than mid-level management cohorts did. In light of these findings we hypothesized that both top- and mid-level managers would hold differing view of ERP success. To enable us to establish whether differences exist between the two groups, we asked the following specific questions: Do top management and mid-level managers *prioritize* the dimensions and measures of ERP systems success differently? Do top

management and mid-level managers *evaluate* the dimensions and measures of ERP systems success differently? *Prioritizing* was used to refer to the ranking orders of the items while *evaluating* was used for individual comparisons of the operationalized measures.

The data used for analysis came from the main survey and we used non-parametric tests to analyze the collected data. As with the preceding article, this paper was grounded in the Stakeholder Theory (Freeman, 1984) as it deals with issues related to the viewpoints of organizational stakeholder groups. The results of our data analysis show that no significant statistical differences exist between the two groups on how they prioritize and evaluate the measures and dimensions of ERP success. The results suggesting converging views across the two groups on how they believe ERP systems success is assessed in their organizations depart from several other studies suggesting that organizational members occupying different organizational positions may hold differing views on organizational issues. Nonetheless, our findings lend support to other studies (e.g., Igbaria, 1990; Senn, 2003) indicating such differences may not exist. In conclusion, the finding in this paper makes a contribution in the literature with regard to the perceptions of the assessment of organizational IT issues from the perspective of differing levels of hierarchy in the organization, and practitioners are alerted to the fact that perhaps with regard to ERP systems success the viewpoints of top- and mid-level cohorts might converge. Information of this nature may be important for achieving organizational harmony (e.g., Pfeffer, 1992).

4.10 Notes on joint authorships and on the included articles

The author consulted the relevant literature for all the papers, including the one jointly authored. He collected the data used in this thesis and wrote all the papers in the thesis, including the four joint articles (Articles I, VII, VIII, and IX). The co-author, Dr. N. Nahar provided valuable comments and suggestions for each of the four papers as well as for the other articles. In all, the guidance and efforts of the co-author in securing funding from the department to present earlier versions of the articles at academic conferences is deeply appreciated. The author did the conference presentations of articles.

At this juncture, it is important to briefly comment on the slight similarities in the included articles. It may become noticeable for anyone reading all the included articles in one session to find similarities in some sections. On the one hand, the minor repetitions, in some respect, underscore the thread connecting the whole study; on the other hand, the seeming repetitions are due to the strong requests by the various reviewers of the journals where the articles have been published (or submitted). For example, the background information on the research setting and ERP systems, the motivation for the study, the development of the ERP success measurement

model, research methodology, data analysis (i.e. structural equation modeling technique), and limitations of the research, among others appear to have some similarities in the included papers. This is because the various articles are, in reality, a part of the same study. Having emphasized this fact, we would like to add that the focus of each article is unique. If this thesis had been written as a monograph rather than as article-based, we are certain that such slight repetitions might have been avoided.

5 CONCLUSION, IMPLICATIONS, AND FUTURE STUDY

This chapter concludes the thesis; here we highlight its contributions and implications for both research and practice, present a summary of the research effort, discuss its limitations, and provide insight for future research in the area.

5.1 Contributions and implications for research

The contributions and implications of the study for research are summarized with respect to each article included (i.e., I - IX), and finally a brief discussion on each of the study's three research questions is presented.

In Article I, we extended the scope of ERP studies in both countries (and the region as a whole). Parts of our findings relate to why firms in Finland and Estonia adopt ERP systems resemble those reported for Finland by Laukkanen et al. (2005). The information that regional contextual factors or influences may not be crucial, when operationalizing measures for the success assessment of complex IT systems such as ERP, may be important for other researchers wishing to study similar areas. Just as this revelation is vital for this study as a whole, it can also provide vital information to researchers studying IT issues across countries in the Baltic-Nordic region (e.g., Ifinedo & Davidrajuh, 2005; Ifinedo, 2006h) or between countries in the region and elsewhere (e.g., Nahar, 2001; Ishman et al., 2001; Mursu et al., 2003; Ifinedo 2005). Our results permit us to say that as the emerging economies in the region transform politically and economically, it is likely that differences on IS evaluation issues will become less pronounced than in the past (see, Dexter et al., 1993, Ifinedo, 2006h) for the two economy types.

We contributed to knowledge through evidence gathered from case studies in the two countries suggesting that acquired ERP systems may not be capable of providing adopting firms with competitive advantages. This finding may stimulate further research. Researchers may benefit from our results

suggesting that informational quality of ERP rated as the topmost dimension of success (in the order of importance) among the six dimensions considered, whereas organizational impact came in last. This paper strengthens information regarding the pattern of ERP adoption among firms: smaller firms tend to procure mid-market ERP products and larger firms, top brand products; this result corroborates the findings in (Mabert et al., 2003). This paper advances knowledge with regard to the use of external sources of technical expertise in relation to IT systems acquisitions; the data indicates that smaller firms might have more need for such technical expertise than larger organizations do, a result that is consistent with the findings in Laukkanen et al. (2005).

In Article II we extended the ERP systems success measurement model proposed by Gable et al. (2003) to include two relevant dimensions: *Workgroup Impact* and *Vendor/Consultant Quality*. We provided support to the work of Gable et al. (2003) through criterion validity that indicates that the dimensions are additive and mutually exclusive. Our results show that ERP systems success may not be a second-order factor as suggested by Gable and colleagues (Gable et al. 2003; Sedera & Gable, 2004). We identified *System Quality* and *Organizational Impact* as the two best surrogates of ERP success. Finally, researchers wishing to evaluate the effectiveness or success of similar enterprise systems can adapt our proposed ERP systems success measurement model to their needs. Perhaps the major contribution of this article is that it provides a base from which future research wishing to develop a scale for evaluating ES success can benefit.

In Article III, we established the nature of relationships between the dimensions in our extended ERP systems success measurement model. Specifically, the paper contributed to knowledge by showing that when the quality of the providers (i.e., vendors and consultants) is high, it is likely that the users of the systems will appreciate and rate highly the system and its output. The findings of this study establishing a positive relationship between the quality of the vendor/consultant and the effect of ERP on the individual is consistent with other studies (Gefen & Ridings, 2002; Gefen, 2004; Ko et al., 2005; Sedera et al., 2003b). *System Quality*, in the context of ERP systems, our analysis shows, is positively related to *Individual Impact*. This finding supports the widely tested paths between these two constructs for other IS (see, Seddon & Kiew, 1994, Rai et al., 2002), and for ERP systems as well (Calisir & Calisir, 2004). This might be suggesting that such a relationship holds for a wide range of IS.

Our analysis does not support the existence of a positive relationship between *Information Quality* and *Individual Impact* as other prior studies do (Kraemer et al., 1993; Seddon & Kiew, 1994, Rai et al., 2002). This perhaps implies that, for ERP systems, such a relationship might not be possible. Sammon et al. (2003) note that ERP systems are not as good in providing information as they are in storing it; thus, an individual using such systems might not be able to get all the benefits potentially available from such systems. Future confirmatory studies may be needed to investigate this result further. We also showed that positive relationships exist between the dimensions of

Individual Impact and *Workgroup Impact* and *Organizational Impact* when assessed in that order. The same cannot be said when *Workgroup Impact* is removed from the path; this finding suggests that the conceptualization of IS success in which *Individual Impact* is directly linked to *Organizational Impact* as shown by the DeLone and McLean (1992) IS success evaluation model may be limited, at least in the context of ERP system (and other ES) that are adopted to connect the operations of the various workgroups, work units, etc. in an organization. Thus, our conceptualization of ERP success that includes the *Workgroup Impact* dimension may provide deeper insights when assessing the success of such systems. By the same token, this finding provides a justification to incorporate the dimension in the work by Gable et al. (2003).

We argue that any ERP success measurement model stands to benefit from a framework that takes into consideration *Workgroup Impact*, because ERP systems are often adopted to overcome the shortcomings of other IT systems that might have isolated the enterprise into islands of information (Davenport, 2000). Our thrust in this direction and subsequent analyses provide context to suggestions by Rousseau (1979), Bakos (1987), and Barua et al. (1995) suggesting more insight would emerge when research efforts assessing the success or impact of IS in organizations do not downplay the importance of analyzing success at all the various levels in the organization. We provide arguments supported by empiric data suggesting that by incorporating a dimension of success related to the quality of the systems' provider (i.e., *Vendor/Consultant Quality*), those wishing to assess the success of such systems might be better served by taking this dimension into account.

Taken together, the three papers (Articles I, II, and III), especially the last two have provided answers to research question one (RQ1). It is hoped that the IS success literature in general and the ERP success literature in particular have been enriched by our contributions.

The implications and contributions of Article IV are briefly discussed as follows: At a general level, this effort shows that ERP systems success could be influenced by external contextual factors, and research efforts investigating the effectiveness or success of ES may yield more insights when factors external to the organizational environment are not overlooked. In particular, this paper contributes to knowledge by showing that there is a positive relationship between a firm's environment and its use or success with complex IT systems (e.g., Johnston & Carrico, 1988; Glazer, 1991). With regard to the classification of firms we provide support to other researchers (e.g., Jarvenpaa & Ives, 1990; Kearns & Lederer, 2004) who found no support for the notion of information intensity as a differentiator between firms. We provide information indicating that while the software has pervaded many industrial sectors (Swan et al., 1999, Klaus et al., 2000; Davenport, 2000) ERP success evaluations may not differ according to industry sector (i.e., manufacturing and services). This knowledge may be useful for researchers wishing to sample viewpoints from industries on related issues. We also found evidence in support of the notion that IT systems evaluation (with the example of ERP systems) might have a relationship with the economic status among nations, which would support findings in other

studies (e.g., Watson et al., 1997; Dewan & Kraemer, 2000; Huang & Palvia, 2001). Accordingly, researchers are alerted to the fact that cross-national variations may exist among countries with regard to how organizational IT issues are evaluated (Watson et al., 1997; Ifinedo, 2006h).

For the fifth paper (Article V), the implication and contribution are as follows: In the paper, we posited and confirmed that organizational contingency factors of top management support, goals and mission, and firm size positively impact ERP systems success. These findings add to the body of knowledge in the literature regarding those contingencies in the context of ERP systems, and support prior studies that have indicated such relationships. For example, Doll (1985), Dong (2001) and Thong et al. (1996) suggest that the support and commitment of top management is needed for the success of IT systems success; firm size may determine the level of IT system success (e.g., Ein-Dor & Segev, 1978; Raymond, 1985; Mabert et al., 2003; Sedera et al., 2003c), and when organizational goals and missions are aligned with ERP adoption, success of such systems will be higher (Deloitte Consulting, 2000; Davenport, 2000). The challenge for other researchers is to determine which of the six ERP success dimensions is most influenced by each of the three aforementioned contingencies. Researchers could investigate further how top management support during ERP acquisitions and the alignments between organizational goals and ERP systems acquisitions influence at later stages in the software's lifecycle. Our study might stimulate future efforts to compare and contrast the impacts of the foregoing contingencies on ERP systems success with the success of non-ERP systems; a comparative study of this nature would be particularly enlightening and would extend the frontiers of knowledge in this area of study.

The implications and contribution of Article VI are briefly presented as follows. The methodological approach of using a "non-deterministic model" in exploring the interacting effects between the selected three contingency factors (organizational size, structure, and culture) and organizational IT factors is commendable. Although researchers (e.g., Jones & Price, 2001; Morton & Hu, 2004) have hypothesized relationships between structure and culture, and ERP success at the implementation phase, to our knowledge no prior empirical research has addressed the themes of ERP success at the post-implementation phase. Our endeavor in this area of study is an initial attempt to empirically test and confirm the relationships between organizational structure and culture, and ERP systems that Jones and Price (2001) and Morton and Hu (2004) envisaged are important at the implementation phase.

In brief, culture, structure, and size are shown as relevant contingency factors for ERP systems success evaluations. Also, this article shows that the interacting effects of the variables can be beneficial for insight. Specifically, this article contributes to literature indicating the relevance of organizational culture in the context of ERP implementation and benefit realization (Davenport, 1998; 2000; Krumbholz et al, 2000; Krumbholz & Maiden, 2001); conducive organizational structure will enhance ERP success (Morton & Hu, 2004), and as already mentioned in the preceding paper that there is a positive relationship between firm size and IT systems success (e.g., Ein-Dor & Segev, 1978; Mabert

et al., 2003; Sedera et al., 2003a). Additionally, this article establishes the pertinence of IT issues such as IS budget size and size of the IT department as a moderator between the selected contingency factors and ERP success.

In the seventh paper (Article VII), the following the implications and contributions are noted: We contributed to knowledge with our results indicating that the amount of IT assets available to a firm may positively impact its IT systems success (e.g., Ein-Dor & Segev, 1978; Lee & Lee, 2004). We confirmed the role of organization size as a critical moderator in the context of IT project success evaluations (Ein-Dor & Segev, 1978; Raymond, 1985). Our findings benefit research with the suggestion that firms with a larger pool of sophisticated IT professionals who are held in esteem by other organizational members will be more likely to experience higher levels of success with complex IT systems such as ERP than firms in which such resources are lacking. The resources available to a firm enhance its success with ERP systems (Hunton et al., 2003; Mabert et al., 2003; Sedera et al., 2003c). Organizational size and structure are important moderating contingencies for the variable of IT resources in the context of ERP success evaluations. This article provides empirical evidence suggesting that the CIO's position in the hierarchy does not significantly impact ERP success to support suggestions in Willcocks and Sykes (2000) and Kumar and van Hillegersberg (2000). We provided information on the perception of firms regarding their view of legacy IT systems vis-à-vis ERP success assessment. Our finding in this regard is inconsistent with conventional wisdom, and we believe more research is needed to increase our understanding in such issues.

Taken together, the four papers (Articles IV - VII) have provided answers to research question two (RQ2). As our study focusing on the selected contingencies is among the few to investigate such issues, we believe that the various contributions of the included papers clearly indicate that contingencies from both the external and internal context are critical and do positively influence ERP success.

In Article VIII the implications and contributions highlighted are as follows: We showed that business managers and their IT professionals hold comparable views (with respect to the prioritization and evaluation of measures) of ERP success. This finding is at variance with viewpoints in the literature comparing both groups, but it does, to some extent, confirm observations in a recent study indicating that views of organizational IT issues between the groups may in fact not be static, (i.e., they may converge or diverge, depending on the issues). In the paper we noted that both groups seem to agree on all the dimensions but one, the *Vendor/Consultant Quality* dimension, perhaps because of the role being accorded to IT professionals in the course of implementing ERP tends to be less prominent than the one accorded to business managers. Additionally, we support the view expressed by other researchers (e.g., Abdinnour-Helm et al., 2003; Sedera et al., 2004) that business managers might have a broader view on ERP success issues than do others. The findings in this paper and those of others (e.g., Senn, 2003) noting the existence of "two worlds" between IT professionals and business managers with regard to the

evaluations of organizational IT issues need to be reconsidered. However, we noted the results in our study might have been influenced by contextual issues such as the research participants sampled.

As for (Article IX) the implications and contributions for research are summarized as follows: The results in the paper suggest converging views between top- and mid-level managers on the assessment of ERP systems success. Our results depart from several other studies (e.g., Brancheau & Wetherbe, 1987; Moynihan, 1995; Schein, 1992), but support others (e.g. Igbaria, 1990) suggesting the views between the two levels may be comparable. The somewhat surprising finding that both of the organizational stakeholders groups in our sample hold comparable views, given that hierarchy had been suggested to be the distinguishing factor in how cohorts view organizational issues, has a plausible explanation. We suggest that the comparable views might have been influenced by contextual factors, i.e., cultural orientations. Northern European countries have a low PDI ranking (Hofstede, 1980; 1984), which might result in superiors and their subordinates having comparable views on issues. Nonetheless, the results in the paper seem to indicate that, on ERP success issues, top management might have a broader view than do mid-level managers, and support findings in the work of Abdinnour-Helm et al. (2003), Amoako-Gyampah (2004), and Sedera et al. (2004). Our finding opens up new opportunities for further investigations on how hierarchy might impact the context of evaluating the effectiveness of organizational IT issues.

The last two papers (Articles VIII and IX) help to answer research question three (RQ3). Both papers are among the initial efforts investigating ERP success assessment by using respondents in private sector organizations categorized into hierarchical and occupational groupings. The knowledge that little difference exists regarding how our 62 respondents (classified by hierarchy and occupation) perceive the evaluation of ERP success measures in their various organizations adds to the growing body of knowledge in the area.

As regards the thesis as a whole, it is our belief that the findings of this study as discussed in each separate article above have permitted useful and empiric information dealing with the nature of a host of elements - at both the internal and external environments of the organization - to emerge. Accordingly, our effort regarding the conceptualization of ERP systems success assessment (Figure 2) has opened up new grounds in ERP studies from which future investigations could benefit. In this thesis, we underscored the following: a) ERP success measurement can be represented by more than four dimensions and a majority of the elements or constructs in the proposed measurement model do have positive inter-relationships, b) several contingencies positively impact ERP success, c) The perception of ERP success among certain organizational stakeholder groups compare reasonably well.

5.2 Contribution and implications for practice

The contributions and implications of the study for practice are summarized with respect to each article (i.e., I - IX) included in the thesis.

In first paper (Article I), we discuss the implications as follows: Because of the relatively mid-ranking positions of the dimensions of ERP success related to *Individual Impact* and *Workgroup Impact* in comparison to the other dimensions, management in the both countries (and elsewhere) could provide relevant training and exposure with respect to acquired ERP systems as well as facilitate inter-departmental and functional cooperation to ensure that company-wide benefits are achieved. Further, in light of the few differences in how firms in both Estonia (emerging economy) and Finland (developed economy) evaluate ERP success, corporate managers from the developed economies in the region can use the information of our study to strategically plan for the deployment of similar systems in the emerging nations of the region where they have interests in knowing that perceptions of such systems may not differ. Knowing that firms in both countries value the attributes of the system itself and the quality of information it produces more than they do the other dimensions of success may be useful for management. ERP providers could pay more attention to these aspects of their products for firms in the region. Our findings indicate that although smaller firms often adopt mid-market products, they also tend to value quality interactions with their ERP vendors and consultants (Laukkanen et al., 2005). Vendors of ERP in the region can also use the information for planning purposes.

In the second paper (Article II) the part of the questionnaire related to ERP success measurement may serve as guidelines for practitioners lacking knowledge about what issues to watch out for when evaluating the success of their ERP software. Management can use the dimensions of *System Quality* and *Organizational Impact* of acquired systems in assessing the effectiveness or success of such technologies in instances where a more comprehensive scale or formal evaluation techniques are not readily available. The extended ERP success measurement model may also be adapted for use with other ES. Another practical way to use our ERP systems success measurement model would be to use the "Quality" constructs and their measures to assess situations with the ERP software during the early periods preceding acquisition and to use the "Impact" items for latter periods when the impact of ERP to the workgroups and the entire organization are to be assessed.

The practical implications in the third paper (Article III) are discussed as follows: First, management of firms wishing to adopt ERP systems must ensure that highly rated providers are engaged. This article shows that when the services of such external entities are engaged, it is likely that the benefits of the software in the adopting firm will be higher. Second, management should encourage worthwhile interactions between the systems providers and organizational members (i.e., individuals) using the software, because the

findings of this study suggest that such contacts might augur well for individuals using the systems. Third, corporate managers where ERP systems are being adopted should ensure that organizational members using the software have access to relevant training in the adopted system. When this is made possible, the effects of the ERP software on the performance and productivity of the individual using it will increase. Fourth, to obtain a clear picture of the impact of ERP in the adopting firm, management must accommodate several levels of analysis, including the sub-units level.

The practical implications of Article IV are discussed as follows: First, the knowledge that there is a strong positive relationship between industry climate, i.e., levels of instability and competition, and ERP system success assessment would enable those responsible for organizational IT issues to make recommendations to superiors who might be seeking a justification for investing in such complex and costly technologies (Ward & Peppard, 1999; Willcocks & Sykes, 2000). This paper suggests that the more unstable and competitive the business environment, the higher the success with adopted ERP systems. This implies that firms in turbulent business environments might be able to benefit from the use such system in meeting organizational goals and mission. Second, the knowledge that industry type has no significant bearing on the way ERP systems success assessment is made in adopting organizations may be useful for firms that otherwise might have believed that ERP would not be relevant to their business operations. Accordingly, vendors of such systems in the two countries in the region (and elsewhere) can use the information to intensify their promotional campaigns. Third, given the variance (through structural equation modeling) noticed in the evaluations of ERP success between firms in Finland and Estonia, it might be safe to suggest that by gradually exposing ERP and training for personnel in less developed countries might be worthwhile as such efforts might go a long way in smoothening out differences in IT benefits evaluations that might arise due to socio-economic and development status (Watson et al., 1997; Dewan & Kraemer, 2000; Huang & Palvia, 2001).

As for the fifth paper (Article V), we summarize its implications as follows: First, top management support for ERP initiatives is critical in enhancing the overall success of the software. Therefore, to increase the prospects of having a successful ERP acquisition in which the expectations of individuals, workgroups or departments, and the entire organization are adequately met, top managers must show commitment and support for their ERP projects both at the implementation and post-implementation phases. Second, management must be explicit about the values they want from ERP vis-à-vis corporate mission and operational goals. The data shows that where such objectives were well-defined, the overall success with the software was higher. Third, with respect to firm size, the data analysis indirectly supports the view that larger firms adopting certain types of ERP software may experience higher levels of success perhaps because of their size advantages (Hunton et al. 2003; Mabert et al., 2003; Sedera et al., 2003c) or perhaps because of the functionality in the systems they adopt. Thus, it may be advisable for firms, especially larger

ones with ample resources to invest in the sorts of ERP that are seen to be commonly adopted in large corporations if their wish is to conform to the pattern reported in this paper.

Regarding Article VI, the practical implications are as follows: On the organizational cultural front, firms planning to adopt and those that have already adopted ERP must ensure that collaborative, cooperative, and, supportive attitudes are promoted in the organization. Our data analysis reveals that ERP success may be enhanced when such cultural attributes are rated highly. We will not repeat the implications in relation to organizational size as this has already been discussed elsewhere in this section. With respect to organizational structure, as operationalized by formalization, centralization, and standardization, firms should be aware of where they stand before embarking on ERP adoption. It is known that the logic in ERP lends itself to certain structural dimension configurations (Davenport, 1998; 2000). Thus, it is likely that ERP will be less successful in firms where tasks are less specialized, where organizational tasks are not properly delineated, and where decentralization of authority is apparent. This is a paramount finding that may benefit management of firms with the intent of procuring ERP systems in both countries (and elsewhere). The findings of this study thus enlighten ERP adoption vis-à-vis organization design. Furthermore, we believe that this foregoing information provides a rationale for adopting ERP in firms to contrast with instances where firms simply join the bandwagon of ERP adopters without any rationale. It is suggested that organizational IT issues, or factors such as IS budget size, and the size of the IT function, among others, are important factors to be considered in the context of ERP success assessment. Thus, management should endeavor to include wide-ranging issues both from the business and technological (IT-related) aspects of the organization when assessing the impact of contingency factors on the success of their ERP. Such an approach could add deeper insights.

The practical implications of the seventh paper (Article VII) are discussed as follows: Our findings suggest that management must ensure that in-house IT professionals update their skill levels; our analysis seems to suggest that success with ERP is higher when they do, and this issue might be particularly pertinent in smaller-sized firms. Managers must encourage their IT departments to participate and to play significant roles during the acquisitions of complex IT systems such as ERP, as this would enhance the IT department's value, which, in turn, might augur well for the organization in the long term. In this paper, we suggest that in the context of ERP systems, the possession of basic IT and computer skills is insufficient, and will not influence success of the software in adopting firms. Consequently, management must ensure that the relevant ERP training and expertise are adequately provided to enhance success with such technologies. Organizational structure with respect to specialization and formalization, in particular, should not be downplayed in firms wishing to adopt ERP. In essence, adopting organizations must not forget that ERP systems tend to be suitable for a command and control structure; i.e., centralized structure. Conversely, highly decentralized firms desiring to adopt

ERP must be prudent in establishing the suitability of ERP systems in their setups.

Our data permits us to cautiously suggest that corporate managers, particularly those in conglomerates with large and small subsidiaries where ERP are being adopted need to pay attention to how resources are being allocated (i.e., how much is allocated to IT and how large the IT department should be). We found evidence in support of the view that the levels of success obtained from an ERP will be significantly influenced by firm size. Put differently, it is possible that smaller units within a conglomerate or smaller organizations in general may require huge amounts of resources for higher levels of ERP success to be obtained. However, there is a need for more studies to be conducted in this area.

Corporate managers adopting ERP systems must devise pragmatic ways to migrate the processes and functions, that their legacy IT systems support, into the new system (ERP) to elicit higher levels of "appreciation" with the new system. Clearly, the firms' aim in adopting the new system is defeated if key organizational members cannot provide a clear distinction between the advantages of their old IT systems and of the new system (ERP).

A brief discussion on the implications in Article VIII is presented as follows: Given that discussions of organizational stakeholders often focus on how to better manage, measure, and evaluate organizational resources (e.g., Fraser & Zarkada-Fraser, 2003), the finding that business managers and their IT counterparts hold comparable views on all but one dimension is vital for practitioners. The common view on how each group believes their acquired ERP software is assessed by organizational members suggests that they both understand and have a common perception of the issue. This finding might augur well for the entire organization in the long term. Another positive fall-out would be that IT professionals that have hitherto been blamed for their parochial view of how IT systems can enhance organizational goals can be accepted as entities who could contribute in such discussions. When such a state of affairs prevails, this could enhance a positive organizational climate in which overall success with the software is achieved, and resistance or sabotage avoided. Ultimately, the organization is better poised to reap the benefits of its investment in such complex and expensive IT systems.

As for the last paper (Article IX), we summarize its implications as follows: Just as in the preceding paper, the commonality in views of the two organizational members suggest that they accept their ERP software as belonging to everyone, and disharmonious situations that might have arisen from the acquisition of an IT software that benefits one party and not the other are avoided. With such knowledge available to practitioners, they may be able to monitor the perspectives of these actors over time on such issues. Knowing that both groups have a similar opinion on ERP success, management of ERP adopting firms could ensure that all parties' (top- and mid-level executives) views are sought during ERP initiatives and this might go a long way in ensuring ownership of the acquired system across the differing segments in the

firm. Under such scenarios, the long term success of the system is assured and resistance avoided.

On the whole, practitioners, including corporate managers and ERP systems providers in the region of this research (and elsewhere) will benefit immensely from our study's results and conclusions. Our study offers knowledgeable insights to ERP practitioners that we noted have been reported to lack knowledge on which issues to pay attention to when assessing the success of such technologies. In particular, our results provide management with such insights. It is our hope that practitioners would use our integrative ERP systems success assessment framework (Figure 2) as a tool or guide when issues related to some of the topics of the investigation of this thesis arise in their organizations.

5.3 Summary of the thesis

This study focused on ERP systems success measurement and the impacts of selected contingency factors on ERP success. In addition, we investigated ERP success from the point of view of different organizational stakeholder groups (i.e., the evaluator's perspective). We chose the ERP software because of its global appeal among firms with a desire to improve their strategic and operational capabilities. We needed to particularize our discourse to one group of IT systems, which we believe is important for the development of deeper understanding. We mentioned that studies discussing ERP issues beyond the implementation phase are not well-represented in the IS domain; thus, with this effort we hope to contribute to the emerging body of knowledge both for researchers and practitioners. Towards achieving our goal, we developed an integrative research framework comprising of issues related to our three aforementioned concerns (e.g., ERP systems success measurement, the impacts of selected contingency factors, and the evaluator's perspective). Importantly, we argued that by framing up those concerns in one single framework, practitioners would gain insights about the need to have a multi-dimensional view of the success assessment of their ERP systems, and future studies will also benefit from the conceptualization.

The integrative ERP success assessment model that we developed benefited from relevant literature highlighting the relevance of the contingencies, contexts, and the success evaluations of IT systems or functions. Thus, our integrative ERP success assessment model depicted in our research framework (Figure 2) is grounded in relevant theories and concepts. That said, the starting point of this study involved reviewing the relevant literature to see what had been done with regard to the subject of interest to us: ERP systems success measurement. The review of the literature led us to the work of Gable et al. (2003) and his colleagues from which we built a base for this study. In general, this part of our work concentrated on the literature dealing with IS

success evaluations. Our main objective was to provide insight to our first research question:

- *Is the Gable et al.'s (2003) ERP success measurement model comprehensive? If not, can the model be extended to incorporate other relevant dimensions of success?*

A review of another stream of the IS literature focusing on the impact of contingencies on IT systems success was conducted. Here, we were interested in examining the nature of the relationships between selected contingencies and ERP success. This we hoped would enable us to provide answers to the following questions:

- *What relationships exist between ERP systems success and some selected contextual factors (i.e., external, organizational, and technological [IT])?*

The third concern to us was to determine whether perspectives on ERP success in adopting organizations would differ. To this end, we posed the third question as follows:

- *Do different organizational stakeholder groups assess ERP systems success similarly or differently?*

In providing answers to the three questions above, we developed sub-questions and hypotheses to help with our inquiry. The findings with respect to those are discussed in-depth elsewhere in the thesis, and a summary of the results is shown in Table 4. With regard to the first research question in the thesis, we provide an extension to the available ERP success measurement model, offer insights as to the nature of the interrelationships between the dimensions of ERP success, and note that *System Quality* and *Organization Impact* are the two best surrogates of ERP success. As for the second question, it can be seen that the majority of the hypotheses were confirmed. Regarding the third question, our data did not support the two formulated hypotheses suggesting that the view of organizational stakeholder groups on ERP success, when classified by hierarchy and occupation types, will differ. In fact, the various parts of the proposed integrative ERP systems success assessment framework (Figure 2) have yielded useful results that would have potential relevance for both practice and research. Specifically, our data supported twenty-four (24) out of the thirty-five (35) hypotheses formulated.

TABLE 4 Summary of the thesis' results

No.	Question and hypothesis	Result	Publication
RQ1	*Is the Gable et al.'s (2003) ERP success measurement model comprehensive?*	An extension was proposed	Articles I, II & III
SRQ1	- Is "ERP systems success measurement model" a second-order factor as suggested by Sedera and Gable (2004)?	Evidence in the study suggests otherwise	Article I & II
SRQ2	- Which dimension(s) might serve as the best surrogate of ERP success?	Best surrogates were System Quality and Organizational Impact	Article II
SRQ3	- What is the nature of the relationships between the dimensions of ERP success?		Article III
	Hypotheses related to interrelationships between the dimensions of ERP success:		
	H1: The higher the *Vendor/Consultant Quality*, the higher the *System Quality* of the acquired ERP system.	Supported	
	H2: The higher the *Vendor/Consultant Quality*, the higher the *Information Quality* of the acquired ERP system.	Supported	
	H3: The higher the *Vendor/Consultant Quality*, the higher the *Individual Impact*.	Supported	
	H4: The higher the *Vendor/Consultant Quality*, the higher the *Workgroup Impact*.	Not Supported	
	H5: The higher the *Vendor/Consultant Quality*, the higher the *Organizational Impact*.	Supported	
	H6: Increases in *System Quality* will cause increases in *Individual Impact*.	Supported	
	H7: Increases in *Information Quality* will cause increases in *Individual Impact*.	Not Supported	
	H8: Increases in *Individual Impact* will cause increases in *Workgroup Impact*.	Supported	
	H9: Increases in *Workgroup Impact* will cause increases in *Organizational Impact*.	Supported	
	H10: Increases in *Individual Impact* will cause increases in *Organizational Impact*.	Not Supported	
RQ2	*What relationships exist between ERP systems success and some selected contingencies in the contextual environment (i.e., external and internal: organizational and technology [IT] related factors)?*		Articles IV, V, VI, & VII
	Hypotheses related to the external environment:		Article IV
	H11a: Firms in different industrial sectors will assess ERP success differently.		
	H11b: ERP success assessment in firms will differ according to their information intensities.	Not Supported	
	H12: ERP success assessment will differ according to industry climate.	Supported	
	H13: ERP success assessment will differ according to national economic climate.	Supported	

(continues)

Legend: RQ=Research question, SRQ=Sub-research question

TABLE 4 (continues)

Hypotheses related to the internal environment (i.e., top management support, organizational goals and mission & firm size):		Article V
H14: Top management support is positively related to ERP systems success.	Supported	
H15: There would be a positive relationship between organizational goals and mission (vis-à-vis ERP adoption) and ERP systems success.	Supported	
H16: ERP systems success would be positively influenced by organizational size.	Supported	
Hypotheses related to the internal environment (i.e., structure, culture, IT assets, & IT resources):		Article VI
H17: A positive relationship exists between an organizational structure that is conducive to ERP adoption and ERP success.	Supported	
H18: A positive relationship exists between an organizational culture that is conducive to ERP adoption and ERP success.	Supported	
H19: The relationship between firm size and ERP success will be moderated by IT assets, such that success will be higher in larger firms.	Not Supported	
H20: The relationship between firm size and ERP success will be moderated by IT resources, such that success will be higher in larger firms.	Supported	
H21: Organizational culture will influence ERP success, such that success will be higher in firms with higher IT assets.	Supported	
H22: Organizational structure will influence ERP success, such that success will be higher in firms with higher IT assets.	Not Supported	
H23: Organizational culture will influence ERP success, such that success will be higher in firms with higher IT resources.	Supported	
Hypotheses related to the interactions between organizational-IT and other contingency factors:		Article VII
H24: IT assets are positively related to ERP systems success.	Supported	
H25: A relationship exists between IT assets and ERP systems success, such that success will be moderated by the organizational size.	Not Supported	
H26: The relationship between IT assets and ERP systems success will be higher when top management support is higher.	Supported	
H27: A positive relationship exists between IT resources and ERP systems success.	Supported	
H28: A relationship exists between IT resources and ERP systems success, such that success will be moderated by the organizational size.	Supported	
H29: A positive relationship exists between employees' general IT skills and ERP systems success.	Not Supported	

Legend: RQ=Research question, SRQ=Sub-research question

(continues)

TABLE 4 (continues)

	H30: A relationship exists between employees' general IT skills and ERP systems success, such that success will be moderated by the organizational size.	Supported	
	H31: A relationship exists between employees' general IT skills and ERP systems success, such that success will be moderated by the organizational structure.	Supported	
	H32: An inverse relationship exists between the satisfaction levels that firms get from legacy IT systems and ERP systems success.	Supported	
	H33: Firms having their CIOs as top management executives will experience higher levels of ERP systems success than firms not having such functionaries as top executives.	Not Supported	
RQ3	*Do different organizational stakeholder groups assess ERP systems success differently?*		Articles VIII & IX
	Hypothesis related to the perception of ERP success grouped by occupations		
	H34: As members of different organizational stakeholder groups, business managers and IT professionals/managers hold different views on ERP success.	Not Supported; though VQ is prioritized differently	Article VIII
	Hypothesis related to the perception of ERP success according to hierarchy.		Article IX
	H35: Top management and mid-level managers will hold different views of ERP success.	Not Supported; though top managers rated the issues better	

Legend: RQ=Research question, SRQ=Sub-research question, VQ=*Vendor/Consultant Quality*

(continues)

It is important to note that some of our results are somewhat surprising to us as they did not conform to what we anticipated. Here, we briefly discuss those results. Given that it has been reported that higher levels of external knowledge expertise increase ERP systems success (Sedera et al., 2003b; Ko et al., 2005) and that ERP systems usually affect several departments within the organization (Davenport, 2000; Yu, 2005), it is surprising that our study indicated no significant relationship between *Vendor/Consultant Quality* and *Workgroup (sub-unit) Impact*. Further, prior studies (e.g., Kraemer et al., 1993; Rai et al., 2002) have suggested that *Information Quality* is positively related to *Individual Impact*, which incidentally our result contradicts. Also, our result showed that industry type may not be an important issue for ERP success evaluations; this result is at variance with findings in the literature (see e.g., Porter & Millar, 1985; Wu & Wang, 2005). Nevertheless, other studies and reports seem to support our results. For example, Klaus et al. (2000) and Mabert et al. (2003) show that ERP adoption is important across a vast number of industries. Thus, the comparable ERP success evaluations across differing industries that we noticed in our study might be a reflection of this reality.

Our data did not support the view that the interactions between firm size and IT assets will lead to higher ERP success in larger organizations. We expected to find support for such relationships in view of observations and suggestions in the literature (please see Cragg & King, 1993; Bernroider & Koch, 2001; Laukkanen et al., 2005). Researchers such as Willcocks and Sykes (2000) have implied that when the IT head (CIO) is highly valued in organizations, it is likely that the success of acquired IT systems will be high. Our result did not support this view. Another surprising result that we got was that IT professionals and their business colleagues did not differ on how each group prioritize and evaluate measures and dimensions related to ERP success; this is at odds with popular beliefs (see e.g., Schein, 1992; Ward & Peppard, 1996) and the views expressed in the ERP success evaluation literature (Sedeera et al., 2002; 2004). Similarly, we did not find differences between our respondents when classified by hierarchy; again this result is inconstant with predictions in prior studies (e.g., Rousseau, 1978; Cameron, 1986; Pfeffer, 1992, Pijpers et al., 2001). At this point in time, we are impelled to assert that the contradictory results that we observed could be attributable to contextual influences. Thus, further investigations on those issues are expected. More importantly, efforts similar to this one, but taking place in other contexts will enable us to better appreciate the findings in this study.

That said, what is the relevance of the findings in this thesis? Many a time, IS research has been criticized for its lack of rigor and relevance (e.g., Senn, 1998; Applegate & King, 1999; Benbasat & Zmud, 1999). With regard to this study, it is hoped that our findings and conclusions would be relevant for both management of ERP adopting firms and IS researchers with interests in complex IT systems such as ERP and their success evaluations. As noted, our search of the literature indicates that the present effort is among the initial studies focusing on ERP success assessment; in that regard, we present sources of new empirical results with respect to our theme. Further, anecdotal evidence

exists indicating that our research instrument, in particular in its aspect that deals with ERP systems success measurement, is already in use for evaluation purposes in research settings similar to ours.

With regard to rigor, we strove to conduct this study in a manner that ensures that such an important issue is not undermined. Our three-phase approach to data collection is a testimony to the foregoing statement. In short, we were not in doubt about this study's objectives vis-à-vis the appropriate methodological approaches and research philosophy to follow. With such clear understanding, we tackled the research questions (including the sub-questions and hypotheses) appropriately. Thus, we can say that this study is methodically defendable. Overall, there are several implications arising from this study; they can be highlighted as follows: 1) Some aspects of this study, as noted above, are among few of their kind offering new insights, 2) This study extends a validated ERP success measurement model, 3) Other aspects of this study lend credence to findings and observations in prior studies, 4) Results from this study open up new areas for future inquiry, 5) The findings provide wide-ranging knowledge for practitioners. We have discussed, separately and in-depth, the contributions of each of the nine articles to research and practice; however, we highlight the major contributions of this thesis as follows:

- In particular, this study contributes to ERP systems success measurement with its addition of two relevant dimensions: *Workgroup Impact* and *Vendor/Consultant Quality*. Furthermore, this is the first effort to develop a scale and also gather empirical data in the context of ERP systems for the dimension of IS success, which Myers et al. (1997) argue is pertinent for IS success evaluations. We lend support to the additive nature of ERP dimensions as suggested by Gable et al. (2003). Overall, our study might engender the development of an appropriate scale to assess ERP systems success for adopting organizations. Further, with regard to ERP success dimensions, this study is the first to provide information related to the inter-relationships between such dimensions.

- We noted that this effort has resulted in the development of an integrative framework or model that encompasses issues related to ERP success measurement, the impact or influence of contingency factors, and the evaluator's perspective under one framework. The ensuing framework could serve as a guide to practitioners when considering issues to focus on with regard to success evaluation of their ERP systems and comparable technologies. Similarly, researchers wishing to study ERP success and the impacts arising from the influence of contingencies from various contexts (i.e., external and internal) could benefit from the framework. Just as Myers et al. (1997) suggest that their own framework provide the "start of the development of a contingency theory for IS assessment" (p.105), we believe that our integrative ERP success assessment model could provide an initial insight toward the emergence of "*a contingency theory for ERP*

success assessment" (Ifinedo, 2006a) This should not be controversial, if we subscribe to the same understanding of the word "theory". According to the Oxford Advanced Learner's Dictionary, "theory" can be described as "a formal set of ideas that is intended to explain why something happens…" (Hornby, 2000, p.1400). Thus, we believe that the various findings of this study when substantiated and improved upon by future efforts will permit the emergence of such a "theory" in the context of ERP success. For example, accumulated, validated information on the nature of relationships between contingencies and ERP success would pave the way for the emergence of a set of ideas to explain or predict ERP success. This study provides a foundation for such theories.

- As noted, studies using the contingency approach tend to over-simply their models, which may limit the amount of knowledge generated from such efforts. Methodologically, this work offers insights for researchers on how the interacting effects or moderating roles of variables can provide additional understanding. Additionally, in many occasions, the findings of this study lend credence to findings and observations in prior studies. We also reported results that contradict established thinking. For example, we reported that firms can evaluate the success of their ERP system highly while at the same time showing a high level of satisfaction with their legacy IT systems, which is contrary to conventional wisdom. We also reported that organizational stakeholder groups, regardless of occupation and hierarchy, may have the same view of ERP success contrary to findings and observations in the literature.

- With respect to relevance of the study to practice, firms using ERP in the region (and elsewhere) can benefit from the knowledge that we provide. Our study provides various useful insights about the influence of the various contingencies, on which we will elaborate below. To cite a few examples here: We found that firms having conducive organizational culture and structure will experience higher level of success from their ERP than those with less conducive organizational culture and structure. In general, our study offers rich and relevant insights to firms lacking knowledge about what issues to look out for when assessing the success of their acquired system. We have already mentioned that our research questions related to ERP success dimensions have been used for evaluative purposes in some local firms. Vendors of ERP in the two countries (and in comparable countries) can also benefit from the findings in this study. Overall, the information to be gleaned from our work might serve as input for planning for ERP adopting firms across the region (and elsewhere).

5.4 Limitations of the study

Seasoned researchers would tell one: "Every research is flawed." Accordingly, we admit that this study has its limitations; we highlight the major ones as follows:

- Our sample is not random, nor can we rule out personal bias in instances where a single informant presented an average view for his or her respective organization. Similarly, it is possible that the sample of this study might have suffered from selection bias as well.

- For firms that we sampled where we had no close contacts, it is difficult to ascertain whether the person to whom we addressed the questionnaire is the one that actually filled out the questionnaire; surveys addressed to certain entities in an organization may in fact be filled out by others (Saunders et al., 2000). For example, senior executives may ask their subordinates to fill out such survey on their behalf.

- For some of our variables we used a single indicator, and this might be limiting; we believe the use of additional indicators or multiple measures for some constructs (e.g., IT assets, satisfaction with legacy IT system) used in this study will permit the emergence of more insights.

- Although our sample size of 62 is statistically sufficient for analysis, a larger sample size might produce better insights. We explained the difficulty that researchers in the region face with the enlistment of participants for their study; we inferred that such difficulties might be amplified for the author as non-local. Nevertheless, our sample size compares favorably with other ERP studies originating from the region (e.g., Laukkanen et al., 2005) and our response rate compares to the ones obtained for larger studies in the region (e.g., Hietala et al., 2004).

- We used subjective and perceptual measures in this study; it is likely that objective measures of ERP success (e.g., profit and productivity measures) might yield a result different from what is discussed herein.

- It was noted at the outset that this study uses ERP systems defined by their functionality; it is possible that the heterogeneous sample comprising of mixed ERP software, including top-brand names (e.g., SAP and Oracle) and mid-market products (e.g., Hansa, Scala, and Nova) might be limiting, and might have negatively affected the percentage of variance explained in some of the papers.

- The views expressed in this study relate only to private sector organizations, opinions in the public sector may differ. Further, as the viewpoints come from firms from a region of Europe we are hard pressed to say whether our findings can be generalized to other regions of the world, such as Asia or America, and to public sector organizations. However, firms in the region sharing similar characterization as the firms sampled in this study may reflect this finding; thus this research may be replicable and applicable to firms in small countries of the region, including Latvia, Lithuania, Iceland and Norway.

- At best, the theories (CT and ST) used in this study provide descriptive insights. Nonetheless, this might be sufficient and in line with the study's objectives and research philosophy.

5.5 Future study

In the course of discussing the issues in this work, we have already noted areas that future study should address. Here, we reiterate some of those areas as well as a few others for future research. Overall, the replication of the various aspects of this study in other contexts is necessary as it is difficult to ascertain the validity of findings on the basis of a single study in one region of the world. Further, the limitations of this work, which are highlighted above provide a basis for guiding such future efforts. Importantly, the viewpoints of junior organizational employees should be sought to increase organization-wide perspective on the issue of ERP success. Future investigations could use case studies and objective data of ERP success to enhance understanding. With regard to the three research questions posed in this work, we specifically suggest the following directions for future research:

Firstly, future research could use confirmatory factor analysis to validate the extended ERP systems success measurement model that was proposed. By building upon our effort in this way, deeper understanding of the nature of the dimensions of ERP systems success can be systematically increased. Furthermore, more research is needed to establish the distinction between ex *post* (experienced-based) and *ex ante* (expectation-based) dimensions of ERP success measures in any future measurement framework. Other researchers in IS success evaluation literature (e.g., Seddon, 1997; Iivari, 2005) have shed light on such issues. Even though our conceptualization of ERP systems success with its inclusion of *Vendor/Consultant Quality* is supported by other studies (e.g., Wu & Wang, 2005), we believe that the extended model could benefit from further refinements. For example, we did not separate *Vendor/Consultant Quality*, which could be viewed as an ex *post* dimension, from the remaining five that could be labeled *ex ante* dimensions. Further research in this area is expected.

Secondly, with respect to the external environment factors, in addition to replicating our study, future studies should consider investigating the impacts of other contingencies in the external environment not included in this study (e.g., supplier/partner influence, government influence, etc.). With respect to the variables operationalized in our study, the results obtained in our data analysis indicate that were industry climate separated into two major parts, i.e., stability and competition, additional, relevant information might become available. Thus, we recommend that future studies could consider separately the impact of industry stability and competition on ERP success in adopting organizations, and each could be represented by appropriate indicators.

Regarding the selected contingencies at the organizational level, the impact of other relevant organizational issues such as management style/philosophy on ERP success can be investigated. To shed more light on the variables that were used for this study, we highlight potentially fruitful avenues for future investigation as follows:

- Given that our study showed that organizational structure is positively related to ERP systems success, we suggest that future studies could categorize firms using the organizational structure typologies proposed by Mintzberg (1980) to include the simple form, and divisionalized form, among others, wherever possible. Such refinements might enhance knowledge about which organizational structure or form might be the most suitable for ERP acquisitions (and support higher levels of success with such systems). Research in this area is virtually nonexistent.

- Our analysis that used specific attributes of culture related to collaboration, cooperation, etc. suggests that when such attributes are available in the adopting organization ERP success tends to be high. This information permits us to suggest that more research in this area might be beneficial for both research in general and ERP practice in particular. Thus, for our knowledge in this area to be expanded, we suggest future efforts could consider using some of the popular instruments designed to study organizational culture, including Organization Culture Scale (Glaser & Zamanou, 1987), O'Reilly III et al. (1991), and so forth (please see the work of Kanungo et al. (2001) for a comprehensive list of such tools). When this is made possible our understanding of how an ERP system (and its success evaluations) compare and contrast across different organizational culture setups might be enhanced. In other words, future studies may need to expand the scope of organizational culture to include more cultural attributes than was used in this study.

- To deepen our understanding about organizational intent or strategic intent (i.e., goals and mission) vis-à-vis ERP acquisitions in firms, researchers could consider a broader array of approaches, including conducting a content analysis of companies' mission statements and other

relevant companies' documentation with the view to better understand how the adoption of complex IT systems such as ERP feature in relation to companies' goals and objectives. Such documentations could also be used to gauge the commitment and support of top managers in relation to ERP acquisitions.

- For the technology (IT) related variables or factors, we believe additional factors can be identified and used in future studies. The framework proposed by Myers et al. (1997) provides a list of related issues of interest that could also be considered. The inclusion of additional issues or factors will improve the variance explained in casual models involving such factors. When operationalizing the technology (IT-related) issues in future studies, it is also important to use multiple indicators that are validated in the literature. For example our "employee IT skills" and "satisfaction with legacy IT systems" could have benefited from such. As noted above, more studies are needed to determine the nature of relationship between "satisfaction with legacy IT systems" and ERP success. Our finding suggests that ERP success did not have adverse effect on the satisfaction with legacy IT systems for firms.

- Additionally, researchers, including Strong et al. (2001) have discussed issues related to task-technology in the context of ERP acquisitions; following such efforts we recommend that future ERP success assessment studies could investigate the impact of task-technology (this is often described with the following: Task structure, task complexity, task independence, and so forth.) on ERP success. Consistent with the organizational effectiveness literature, it might be enlightening if "time" were to be incorporated into our research framework (2).

Thirdly, considering that the respondents in this study classified by hierarchy hold comparable views on the issues of ERP success measurement, future studies might be commissioned to inquire why this should be so. Answers to this might help to determine if executives in ERP adopting firms indeed hold comparable views on the theme or if regional imperatives have been the cause of the converging views observed. It is also likely that our subjects that were grouped as top-and mid-level management might have obfuscated organizational hierarchy. "Number of ranks below CEO" as used by Raghunathan and Raghunathan (1989) might yield better insights, and future studies could consider using it. On the occupational classification front, future inquiry is necessary. In particular, the only dimension of ERP success for which business managers and IT professionals indicted a diverging views, namely, the *Vendor/Consultant Quality* deserve to be further researched. Finally, the perspective of the evaluator from the angle differing workgroups, units/departments, years of working experience, education, and so forth could be investigated to increase our knowledge.

5.6 Whither ERP systems success assessment?

As ERP systems continue to diffuse globally partly due to the need for firms to adapt to the changing business environments and other reasons to adopt such systems (e.g., Davenport, 1998; 2000; Mabert et al., 2003), it is logical to expect that firms will begin to pay attention to issues related to how to assess the success of their ERP systems. Our conjecture is that ERP adopting organizations would seek knowledge about which dimension of success and contingencies to watch out for in such assessments, and they would also want to know how different organizational stakeholder groups view the success of such expensive technologies. Similarly, interests in this area of research will increase. We would like to belief that researchers will begin to shift emphasis away from the *first wave* ERP issues to the *second wave* topical issues such as benefit realization, success measurement or assessment, among others (see Ifinedo, 2006g; 2007a, b).

As we conclude this treatise, we would like to point out that what has been presented in this work may go a long way in meeting the requirements of obtaining a Ph.D.; nonetheless, it does not represent the last word on ERP systems success assessment; rather, it is our belief that the effort only serves to enrich insights. The findings, analysis, and conclusions that we present in this work and the integrative ERP systems success assessment framework (Figure 2) that we proposed only serves the purpose of enriching our understanding of the issue of ERP success in adopting organizations. The words of Van Maanen (1988, p.120) stating that "… we know our analysis is not finished, only over …" in many respects, capture where we stand vis-à-vis ERP systems success assessment. We admit that this work is the starting point of our quest for insights about ERP systems success assessment, which we hope will be benefiting ongoing and future research on the subject as well as practitioners who use such systems.

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APPENDIX 1 The email sent to participants in the preliminary study

Dear Participant:

We obtained your contact details from a list of companies in Finland probably having or using ERP systems. Examples of ERP include SAP, Oracle, Navision, Movex, Scala, Baan, etc. Please, ignore this communication if your firm does not have any ERP systems. An email from you informing the researcher of the unavailability of ERP in your firm will be appreciated as will any other relevant communication. This would enable us to promptly remove your email from our shortlist of companies with ERP before a reminder is sent out in the future.

This research is a part of a study at the University of Jyväskylä, Finland. It concerns assessing the effectiveness or success of ERP systems in organizations. We define "success" as the degree to which the system has enabled your organization to meet its goals, objectives, etc. Recently, many organizations across the globe have spent huge sums of money in acquiring such systems, and it is generally assumed that ERP offers benefits to and enhances success of the acquiring firms; yet reports from some parts of the world suggest that the benefits or success resulting from the use of such systems may be questionable. One plausible reason for the conflicting information might be related to how such success evaluations with the systems are made.

This study aims to add to the debate on ERP success evaluations by sourcing empirical data from firms in this region. At this initial phase of our study, we are interested in finding out what views are held by firms regarding the impacts of ERP in their set-ups. Whatever information we obtain in this phase will serve as initial steps toward proposing an ERP success measurement model that could benefit both practitioners and researchers.

Thus, we are randomly selecting ERP adopting firms in two countries; i.e. Finland and Estonia. It is in this regard that your assistance is sought in gathering the relevant information that we require. You may forward this web-survey to persons in your firm whom you know could assist us. As a token of gratitude for your time, we would like to share the findings of our research - this particular one and others relating to the issue - with you even if you are unable to participate. Please just email us with request for the findings.

Most importantly, your response is handled with strict confidence. Please, note that no individual response is identified. Only summary data is used. Thus, by agreeing to participate in the study, you are indicating that your response is confidential.

Filling in the questionnaire will take about 10-15 minutes of your time. The completed responses from participants are being received until 28/3/2005. Please kindly complete the questionnaire at this web page:

Princely Ifinedo, a Ph.D. candidate in the Computer Science and Information Systems Department at University of Jyväskylä is one of the two researchers in the study; the other is Dr. N. Nahar of the same University who is supervising the research. If you have any additional comments, do not hesitate to contact the corresponding researcher (the contact email address is provided below).

Sincerely
Princely Ifinedo
Email:premifin@cc.jyu.fi

APPENDIX 2 The questionnaire used in the preliminary study

Preliminary Survey on ERP Success/Effectiveness in Finnish and Estonian Firms

1. What type of ERP systems do you have in your organization? Examples of ERP include Oracle, SAP, Baan, Scala, Navision, etc.
2. When did the implementation start?
3. When did the implementation end?
4. Do YOU use the ERP software in your own tasks?
5. What QUALITIES do you associate with your ERP since its implementation in your organization? Please list as many as you can recall.
   - For example, is ERP is easy to use, is the output accurate or not, is the data reliable or not, and so on.
   - Definition: Quality: *A feature of something that especially makes it different from another thing* – it may be positive or negative.
6. What do you consider to be the IMPACTS of ERP since its implementation in your organization? Please list as many as you can recall.
   - Definition: Impact: *The powerful effect that something gives; or an outcome* - it may be positive or negative*).*
7. Can you recall any past initiatives that your organization has used to assess the quality and impacts of the ERP software on the 1) the individual, 2) the departments, 3) groups, 4) organization?
8. Do you know of any current or pending initiatives that your organization is considering using for increasing the positive impacts of ERP?
9. Do you have any other comments regarding the effectiveness/success of ERP that you want to share with us?

Demographics

10. Field of operation/Type of business (Name of organization is optional):
11. Work sector: () public () private () joint ownership (public & private)
12. Location /City:
13. Your Department:
14. Position/Job title:
15. Which of the following below best describe your position in the organization?
    - () Top management () Mid-level professional () Junior employee
16. Your Gender: ( ) Male ( ) Female
17. Your Age range: ( )<20 ( )21-30 ( )31-40 ( )41-50 ( )51-60 ( )> 60
18. Sex: () Male () Female
19. Educational level: ( ) University graduate ( )Vocational/Others ( ) Secondary education
20. Number of years with this company:

APPENDIX 3 Key responses (ERP success dimensions) and profiles of firms in the preliminary survey

Key Responses (ERP Success Dimensions) and Profiles of Estonian Firms Preliminary Survey

Company	EST-Coy1	EST-Coy2	EST-Coy3	EST-Coy4
Industry	Retail	Manufacturing	Retail/Wholesale	Telecommunications
Location	Tallinn	Tallinn	Tallinn	Tallinn
Participant	Purchasing Manager	Finance Officer	Sales Manager	Unit Manager
ERP software	Hansa Financials	Navision	Scala	SAP
What qualities do ERP adopting firms associate with such systems	It is easy to use, and accurate.	These fields already have "good manners" and how things should be done - it is recommended to follow the standards.	It is not easy to use. It is accurate and reliable. It is expensive.	It is complicated but at the same time very functional.
What impacts are derived from their ERP?	It is very good software for planning and management after small development.	-Customer service management. - The system helps the company to operate more effectively.	- Good review about warehouse, good review about buying and selling transactions, lots of possibilities in the ledger module.	-It saves time. - Operations become clearer and more efficient.

Key Responses (ERP Success Dimensions) and Profiles of Finnish Firms Preliminary Survey

Company	FIN-Coy1	FIN-Coy2	FIN-Coy3	FIN-Coy4
Industry	Technical wholesale marketing	Manufacturing services	Manufacturing (metal)	Retail
Location	Helsinki	Helsinki	Vaasa	Espoo
Participant	Business Manager	Accounts Manager	Quality Manager	Sales Manager
ERP software	IBS	SAP	Nova	SAP R/3
What qualities do ERP adopting firms associate with such systems	It is slow, adds mistakes, and does not support creativity	Versatile and comprehensive, not flexible for changes, slightly weak user interface.	It is flexible. Efficient at data collection and storage	It is complicated. It is a comprehensive package.
What impacts are derived from their ERP?	It increases effectiveness, which improves cost saving in our company.	Invoicing is easier and faster. Reporting is faster and has improved.	-Operations are clearer and smoother. -Automation - centralization of data	It enables us to connect to main customers databases.

Company	FIN-Coy5	FIN-Coy6	FIN-Coy7
Industry	Wholesale	Manufacturing	Retail
Location	Helsinki	Espoo	Tampere
Participant	Marketing Manager	SAP Manager	IT Manager
ERP software	Hansa Financials	SAP	Movex
What qualities do ERP adopting firms associate with such systems	It is ease to use. It is reliable.	With more training the difficulty in using the software can be overcome.	- Data reliability for users -Data accuracy and control mechanisms
What impacts are derived from their ERP?	Cost reductions	-Data visibility - e-Purchasing	The software facilitates smoother and faster operations

Notes: Due to confidentiality agreements, we use pseudonyms to represent each firm.

APPENDIX 4 The interview protocol used for the case studies

ERP Success in Organizations: Interview protocol

1. Introduction of self, affiliation and the purpose of the study
- *Princely Ifinedo*, Dept of IS, University of Jyväskylä, Finland

Purpose: To investigate ERP success assessment in organizations by using information gathered from companies in Finland and Estonia. *Highlight the benefits for the participating organizations*. Note: Your response is handled with strict confidence.

2. General company background information:
Name (Or, waived for confidentiality reasons):
Year of establishment:
Size of work force:
Industry: Is the industry very competitive, or stable?
Position of the company in the industry – Local leader, medium-player, small-player; or World player

3. **Information about the informant**
Date/time of interview:
Respondent's position:
Title/department:
Years with the company:
Do you use ERP in your own tasks?

4: **Information about the implemented ERP systems**
What type do you have? Examples include: Oracle, SAP, Baan, Navision, i2; etc. … What version do you have?
When did the implementation start? When did it go live?

5. **Why was the ERP system adopted?**

6. **Who initiated the ERP adoption process? Which department, in particular?**

7. **What was your role during the ERP acquisition process, (if any)?**

8. **What do you consider to be the impacts of ERP in your organization since its implementation?**

Dimensions – System quality, Information quality, Individual, Group and Organizational Impacts

9. **How does your organization assess (measure or report) these impacts?**

10. **If yes, (question 10), can you recall any past initiatives that your organization has used to assess these ERP effectiveness and impacts on the following:**

i) the individual,
ii) the departments, groups,
iii) the entire organization?

- We defined Impact as "the powerful effect that something has on something/somebody." For this study, it has the same meaning as "benefits".
- Do you know of any current or pending initiatives that your organization is considering using for increasing the positive impacts of ERP?

Organizational Factors

11. **How would you describe the *culture* within your organization?**
- Are the different departments of equal importance? Does management freely share information with employees? What would you pin-point as the *culture* of your organization?

12. **How would you describe the *structure* of your organization?**
- How formalized are rules and procedures in your organization? Is it highly centralized or decentralized? What is the degree of interdependence between the various departments or divisions? Do you have any other comments on this issue?

Technological Factors

13. **How skilful, sophisticated or matured is the Information Technology (IT) Department of the organization?**
- Does it have people with expertise in ERP or other complex software applications? - Generally speaking, is the knowledge possessed by IT staff up-to-date?

14. **What is the location or IT department in the organization?** Is it standing by itself or housed within another department? Is its role valued in the running of the overall organization? Specifically, is IS/IT vital for the existence of your organization? Is the HEAD of the IT highly a top management executive in the organization? What about the size of the IT department? Is the IT department well funded? What percent (%) of the annual budget is apportioned the IT?

15. **In your own assessment, are the employees in the organization skilful with computer and/or competent with various computer applications?** In general, what is their attitude towards 1) computers, 2) the ERP system? What are their perceptions of the ERP system? Do you have an idea regarding their expectations from the ERP system?

16. **To recap, what factors do you consider to be most important when it comes to assessing the success or effectiveness of your adopted ERP?**

17. **Do you have any other comments regarding ERP effectiveness or success in your organization that you want to share with this research? Or, any other comment?**

THANK YOU.

APPENDIX 5 The responses and profiles of firms in the case studies

Key Responses (ERP Success Dimensions) and Profiles of Case Companies for Estonia

Company	Co-A	Co-B	Co-C
Type of company	Independent	Subsidiary	Parent
Industry	Electrical goods manufacturing	Courier services	Financial services
Location	Tallinn	Tallinn	Tallinn
Size (employees)	200	75	2200
Interviewee	CEO, Chief Accountant, Finance Director/Head of IT	Finance Manager, IT Manager	ERP Manager, Business Officer
Turnover (euro)	8.6 million	7.2 million	110.0 million
ERP software	Hansa Financials	Scala	Oracle e-Business Suite
Time after implementation	3 years	7 years	7 years
What qualities do ERP adopting firms associate with such systems	- Ease of use - Timeliness - Good features - Conciseness - Accuracy	- Ease of use - Not flexible - Reliability - Not User-friendly - Data resource integration - Poor format	- Not user-friendly - Integrates with other systems - Reliability - Availability - Accuracy - Good format - Timeliness
What impacts are derived from their ERP?	- Productivity is enhanced - Better decision-making - Organizational data resource use	- Productivity is enhanced - Better data flow - Better cooperation in the department - Automation	- Operational efficiency - Productivity is enhanced - Good data warehousing part of the business - e-business enabler
How are the qualities and impacts assessed?	None	Internal audit and controls	Scorecards Internal Audit Cost/Benefit

Key Responses (ERP Success Dimensions) and Profiles of Case Companies for Finland

Company	Co-D	Co-E	Co-F	Co-G
Type of company	Subsidiary	Subsidiary	Parent	Subsidiary
Industry	Logistics	Electrical goods manufacturing	Automobile dealerships	Food (retail)
Location	Helsinki	Espoo	Vantaa	Helsinki
Size (employees)	170	800	1200	25
Interviewee	Logistics Manager, IT Manager	General Sales Manager, Segment Manager, SAP Analyst	Director of IT, Sales Manager	Marketing Manager, Brand Manager
Turnover (euro)	10.0 million	40.0 million	350.0 million	6.5 million
ERP software	SAP R/3	SAP R/3	SAP R/3	Movex (Intentia)
Time after implementation	4 years	6 years	9 years	3 years
What qualities do	- Automatic	- Good database	- Reliability	- Easy of use

ERP adopting firms associate with such systems	report generation - Reliability - Not user-friendly - Poor format - Good features	contents - Accuracy - Reliability - Availability - Timeliness - Data resource integration	- Data resource integration - Good features - Availability - Customization	- Availability - Reliability - Poor format - Good, but sometimes difficult to understand
What impacts are derived from their ERP?	- Productivity is enhanced - Departmental co-ordination - Reduces organizational costs - Efficient for operations - enables business	- A feeling of responsibility becomes visible - Productivity is enhanced - Departmental co-ordination - Efficient for operations - e-business enabler	- Productivity is enhanced - Efficient for operations	- Departmental co-ordination - Efficient for coordinating with partners and suppliers - e-business enabler
How are the qualities and impacts assessed?	None	None	Cost/Benefit Customer feedback	Don't know

Notes: Due to confidentiality agreements, we use pseudonyms to represent each firm.

APPENDIX 6 The cover letter sent to participants in the main survey

2nd. July, 2005

Dear Participant:

We obtained your contact details from a list of companies in Finland probably having or using ERP systems. Examples of ERP include SAP, Oracle, JD Edwards, Navision, Scala, Baan, Nova, Movex, i2, etc.

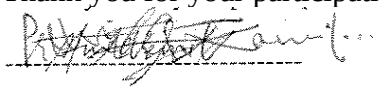
This study is part of a larger research at the University of Jyväskylä, Finland. It is aimed at assessing the success of ERP systems in organizations. Recently, many organizations across the globe, including those in this country, have spent huge sums of money in acquiring such systems. It is generally assumed that firms benefit from their ERP systems; yet, little empirical evidence exists on many aspects of such views. For example, what influence do contextual influence exert on the success of such systems? Contexts may relate to size and culture of the organization, IT skills available within the organization, organizational structure, etc.

Thus, we are randomly selecting ERP-adopting firms in two countries; i.e. Finland and Estonia for the purpose of generality. It is in this regard that your assistance is sought in gathering the relevant information. You may forward this survey to persons in your firm whom you know could assist us. We would prefer that knowledgeable personnel from different departments, including IT and other departments in the organizations would fill in the enclosed questionnaires. As a token of gratitude for your time, we would like to share the findings of our research with you. Please just email us with request for the findings.
Most importantly, your response is handled with strict confidence. Please, note that no individual response is identified. Only summary data is used. Thus, by agreeing to participate in the study, you are indicating that your response is confidential.

Filling in the questionnaire will take about 20 – 25 minutes of your time. When you have completed filling in the questionnaire, please send it by post to the address on the provided return-stamped envelope. The completed responses from participants are being received until 15/9/2005.

Princely Ifinedo, a Ph.D. candidate in the Computer Science and Information Systems Department at University of Jyväskylä is one of the two researchers in the study; the other is Dr. N. Nahar of the same University who is supervising the research. If you have any additional comments, do not hesitate to contact the corresponding researcher (his email is provided below).

Thank you for your participation.



Sincerely,

Princely Ifinedo
Email: premifin@cc.jyu.fi

APPENDIX 7 The questionnaire used for the main survey

ERP Success Assessment in Finnish/Estonian Firms

Instructions: Fill-in the space provided. Please tick (_/) or mark (x) on every question; do not omit any.

Your organization's field of operation / Type of business: _____

How many people does your company currently employ? _____

What is your annual turnover? _____

How competitive is your field of business?
( ) Not at all, competitive
( ) Moderately competitive
( ) Competitive
( ) Very competitive

How stable is your industry? (in terms of changes, innovations, etc.)
( ) Extremely stable
( ) Stable
( ) Moderately stable
( ) Not at all, stable

Your organization has a Headquarters (HQ) somewhere else that coordinates your activities: ( ) Yes ( ) No

Which **ERP** (enterprise resource planning) system do you have?:_____
examples: SAP, Oracle, JD Edwards, Navision, Scala, Baan, Nova, Movex, i2, Proteus, etc.

When (year) did your organization COMPLETE the implementation of the ERP system:_____

What is your job title? _____

What is your position in the organization?
( ) Top management personnel (e.g. CEO, VP)
( ) Mid-career personnel (e.g., IT Manager, Finance Manager)
( ) Junior employee (e.g., Supervisor, Clerk)

Your department in the organization: _____

How long have you been working in the organization: _____

Your Gender: ( ) Male ( ) Female

Your Age range: ( ) <20 ( ) 21 – 30 ( ) 31 – 40 ( ) 41 – 50 ( ) 51 – 60 ( ) > 60

Your Educational level: ( ) University graduate ( ) Vocational/Technical/ Others ( ) Secondary school education

To what extent do you agree or disagree with the statements provided below. (A= Strongly disagree, B= Disagree, C= Somewhat disagree, D=Neutral, E=Somewhat agree, F=Agree, G=Strongly agree)

	A	B	C	D	E	F	G
In our organization, decision making is kept ONLY at the top	1	2	3	4	5	6	7
In our organization, rules and procedure are clearly documented and are known to all employees	1	2	3	4	5	6	7
In our organization, organizational tasks are divided into separate jobs.	1	2	3	4	5	6	7

How valuable is the information technology (IT) department in your organization?:

( ) Not valued, at all
( ) Moderately valued
( ) Valued
( ) Highly valued

Is the "Head of IT" top management personnel in your organization? ( ) Yes ( ) No

How big is your firm's IT department?	**Very Small**			**Medium-Sized**			**Very Big**
	1	2	3	4	5	6	7
What percent of budget is allocated to IT?	≤ 2%	3– 6 %	7 -10 %	11 -20%	21-40 %	> 40 %	

To what extent do you agree or disagree with the statements provided below. (A= Strongly disagree, B= Disagree, C= Somewhat disagree, D=Neutral, E=Somewhat agree, F=Agree, G=Strongly agree)

	A	**B**	**C**	**D**	**E**	**F**	**G**
Our ERP system supports our business goals	1	2	3	4	5	6	7
Our ERP system supports our business mission	1	2	3	4	5	6	7
The management of our firm freely share information	1	2	3	4	5	6	7
The different departments are of equal importance to top management	1	2	3	4	5	6	7
Top management supports the adoption and use of our ERP system	1	2	3	4	5	6	7
Employees are happy with the changes that management decides on ERP issues	1	2	3	4	5	6	7
Employees work in collaboration with others	1	2	3	4	5	6	7
Our firm has clear norms and values	1	2	3	4	5	6	7
To what extent is your organization satisfied with its legacy (old) computer systems	**Very Dissatisfied**			**Neutral**			**Very Satisfied**
	1	2	3	4	5	6	7
How sophisticated or skilled are the IT staff / personnel in your firm?	**Not skilled, at all**			**Averagely skilled**			**Very Skilled**
	1	2	3	4	5	6	7
How skilled are the employees of your organisation on computer and IT issues?	1	2	3	4	5	6	7

To what extent do you agree or disagree with the statements provided below. (A= Strongly disagree, B= Disagree, C= Somewhat disagree, D=Neutral, E=Somewhat agree, F=Agree, G=Strongly agree). Choose the option that best represents an average view in your firm.

	A	**B**	**C**	**D**	**E**	**F**	**G**
Our ERP has accurate data	1	2	3	4	5	6	7
Our ERP is flexible	1	2	3	4	5	6	7
Our ERP is easy to use	1	2	3	4	5	6	7
Our ERP is easy to learn	1	2	3	4	5	6	7
Our ERP is reliable	1	2	3	4	5	6	7
Our ERP allows data integration	1	2	3	4	5	6	7
Our ERP is efficient	1	2	3	4	5	6	7
Our ERP allows for customization	1	2	3	4	5	6	7
Our ERP has good features	1	2	3	4	5	6	7
Our ERP allows for integration with other IT systems	1	2	3	4	5	6	7
Our ERP meets users' requirements	1	2	3	4	5	6	7

Our ERP database contents is up-to-date	1	2	3	4	5	6	7
Our ERP has timely information	1	2	3	4	5	6	7
The information on our ERP is understandable	1	2	3	4	5	6	7
The information on our ERP is important	1	2	3	4	5	6	7
The information on our ERP is brief	1	2	3	4	5	6	7
The information on our ERP is relevant	1	2	3	4	5	6	7
The information on our ERP is usable	1	2	3	4	5	6	7
The information on our ERP is available	1	2	3	4	5	6	7
Our ERP vendor / consultant provides adequate technical support	1	2	3	4	5	6	7
Our ERP vendor / consultant is credible and trustworthy	1	2	3	4	5	6	7
Our ERP vendor / consultant has good relationships with my organization	1	2	3	4	5	6	7
Our ERP vendor / consultant is experienced and provides quality training and services	1	2	3	4	5	6	7
Our ERP vendor / consultant communicates well with my organization	1	2	3	4	5	6	7
Our ERP enhances individual creativity	1	2	3	4	5	6	7
Our ERP enhances organizational learning and recall for individual worker	1	2	3	4	5	6	7
Our ERP improves individual productivity	1	2	3	4	5	6	7
Our ERP is beneficial for individual's tasks	1	2	3	4	5	6	7
Our ERP enhances higher-quality of decision making	1	2	3	4	5	6	7
Our ERP saves time for individual tasks/duties	1	2	3	4	5	6	7
Our ERP helps to improve workers' participation in the organization	1	2	3	4	5	6	7
Our ERP improves organizational-wide communication	1	2	3	4	5	6	7
Our ERP improves inter-departmental coordination	1	2	3	4	5	6	7
Our ERP create a sense of responsibility	1	2	3	4	5	6	7
Our ERP improves the efficiency of sub-units in the organization	1	2	3	4	5	6	7
Our ERP improves work-groups productivity	1	2	3	4	5	6	7
Our ERP enhances solution effectiveness	1	2	3	4	5	6	7
Our ERP reduces organizational costs	1	2	3	4	5	6	7
Our ERP improves overall productivity	1	2	3	4	5	6	7
Our ERP enables e-business / e-commerce	1	2	3	4	5	6	7
Our ERP provides us with competitive advantage	1	2	3	4	5	6	7
Our ERP increases customer service / satisfaction	1	2	3	4	5	6	7
Our ERP facilitates business process change	1	2	3	4	5	6	7
Our ERP supports decision making	1	2	3	4	5	6	7
Our ERP allows for better use of organizational data resource	1	2	3	4	5	6	7
Overall, the impact of our ERP on **me** has been positive	1	2	3	4	5	6	7
Overall, the impact of our ERP on **my workgroup (department)** has been positive	1	2	3	4	5	6	7
Overall, the impact of our ERP on **my organization** has been positive	1	2	3	4	5	6	7

Comments about ERP in your organization: _____

_____

Feedback:_____

THANK YOU VERY MUCH !

For a copy of the results of this study, AND a copy of the thesis (Ph.D.) resulting from this research, please send your request to Princely Ifinedo at premifin@cc.jyu.fi.

APPENDIX 8 Details of the participating firms and respondents in the main survey

	Profile of firms						Profile of the respondents from each firm					
No.	*Industry*	*WKF*	*Annual turnover*	*ERP type*	*ERP adopted (Year)*	*COT*	*Age range*	*GDN*	*EDN*	*Job title*	*Dept.*	*Hierarchy in the firm*
1	Telecommunications	6600	€ 2 billion	SAP	2003	FIN	41-50	M	Voc	Development Director	Mgt	Top-level mgt.
2	Cosmetics	200	€ 75 million	SAP	1997	FIN	31-40	F	Voc	IT Support Executive	IT	Mid-level
							31-40	F	Grad	Analyst	Mgt.	Mid-level
3	Food processing	26	€ 50 million	Movex	1998	FIN	41-50	M	Grad	Finance Director	Mgt.	Top-level mgt.
4	Electronics	10	€ 1 million	Own ERP	2000	FIN	51-60	M	Sec	CEO	Mgt.	Top-level mgt.
5	Logistics	200	€ 13 million	SAP	2001	FIN	41-50	M	Voc	Logistics Manager	Mgt.	Mid-level
							51-60	M	Grad	IT Manager	IT	Mid-level
							41-50	M	Voc	Sales Manager	Mgt.	Mid-level
6	Retail	550	€ 220 million	SAP	2004	FIN	51-60	M	Grad	IT Director	IT	Top-level mgt.
7	Car dealerships	1500	€ 1.9 billion	SAP	2001	FIN	51-60	F	Grad	IT Director	IT	Top-level mgt.
							31-40	M	Grad	Accounts Executive	Mgt.	Mid-level
8	Utility	35	€ 9 million	SAP	2001	FIN	31-40	M	Grad	Financial Director	Mgt.	Top-level mgt.
9	Manufacturing	20	€ 2.7 million	Movex	2001	FIN	41-50	F	Voc	Export Manager	Mgt.	Mid-level
10	Retail	50	€ 25 million	Movex	2001	FIN	31-40	F	Voc	Logistics Manager	Mgt.	Mid-level
11	Manufacturing	800	€ 40 million	SAP	1999	FIN	51-60	M	Voc	Segment Manager	Mgt.	Mid-level
							31-40	M	Grad	IT Support Manager	IT	Mid-level
							51-60	M	Grad	Head of Sales	Mgt.	Top-level mgt.
12	Food processing	120	€ 55 million	Own ERP	1998	FIN	41-50	M	Grad	Director (Finance and Admin.)	Mgt	Top-level mgt.
13	Retail	300	€ 20 million	Scala	2001	FIN	31-40	F	Grad	IT Director	IT	Top-level mgt.
14	Oil services	21	€ 8 million	Liinos	2002	FIN	41-50	M	Grad	Admin. Director	Mgt.	Top-level mgt.
15	IT	15	€ 2.5 million	SAP	2001	FIN	51-60	F	Grad	CEO	Mgt.	Top-level mgt.
16	Business investments	1300	€ 200 million	Movex	2002	FIN	51-60	M	Grad	VP	Mgt.	Top-level mgt.
							21-30	M	Grad	IT Manager	IT	Top-level mgt.
17	Manufacturing	90	€ 90 million	SAP	2003	FIN	31-40	F	Grad	Business Controller	Mgt.	Top-level mgt.
18	Retail	1000	€ 1 billion	ASW	2004	FIN	51-60	M	Grad	CIO	IT	Top-level mgt.
							41-50	M	Voc	Finance Manager	Mgt.	Top-level mgt.
19	Manufacturing	110	€ 86 million	SAP	1998	FIN	41-50	F	Voc	Key Account Manager	Mgt.	Mid-level
20	Facility Management	13000	€ 330 million	SAP	1999	FIN	41-50	F	Grad	Project Manager	Mgt.	Mid-level
21	Food processing	1600	€ 200 million	Movex	2002	FIN	51-60	F	Grad	Admin. Manager	Mgt.	Mid-level
22	Gas and oil	550	€ 386 million	SAP	2002	FIN	51-60	M	Grad	IT Director	IT	Top-level mgt.
23	Pharmaceutical	200	€ 120 million	SAP	2003	FIN	31-40	F	Grad	IT Manager	IT	Mid-level
24	Retail	13	€ 13 million	Movex	2004	FIN	31-40	M	Grad	CEO	Mgt.	Top-level mgt.
							40-51	F	Voc	Sales Manager	Mgt.	Mid-level
							31-50	F	Grad	Marketing Manager	Mgt.	Mid-level
25	Retail	40	€ 4.5 million	Hansa	2003	FIN	31-40	F	Voc	Finance Manager	Mgt.	Mid-level
26	Manufacturing	350	€ 25	JDE	2002	FIN	31-40	M	Grad	Product Manager	Mgt.	Mid-level

			million									
27	IT	1200	€ 130 million	SAP	2001	FIN	41-50	F	Grad	IT Director	IT	Top-level mgt.
28	Manufacturing	50	€ 10 million	Nova	2002	FIN	21-30	M	Voc	Quality Manager	Mgt.	Mid-level
29	Retail	60	€ 45 million	ASW	1996	FIN	41-50	F	Voc	Sales Manager	Mgt.	Mid-level
30	Pharmaceutical	61	€ 7.7 million	SUN	2004	EST	31-40	F	Grad	Director (Business)	Mgt.	Top-level
							21-30	F	Voc	IT Manager	IT	Mid-level
31	Financial services	2220	€ 110 million	Oracle (e-business)	1998	EST	31-40	M	Grad	Director (IT)	IT	Top-level
							31-40	F	Grad	ERP Manager	IT	Mid-level
							31-40	F	Voc	Business Officer	Mgt.	Mid-level
32	Logistics	185	€ 33 million	JDE	1996	EST	21-30	M	Grad	Admin Controller	Mgt.	Mid-level
33	Retail	35	€ 17 million	Scala & JDE	1995	EST	21-30	M	Grad	IT Manager	IT	Mid-level
34	Retail	66	€ 15 million	Concorde	1998	EST	31-40	M	Grad	Director	RD & IT	Top-level
35	Courier and Logistics	75	€ 7.2 million	Scala	1998	EST	31-40	F	Grad	Admin Director	Mgt.	Top-level
							31-40	M	Voc	IT Manager	IT	Mid-level
							21-30	F	Voc	Finance Manager	Mgt.	Mid-level
36	Manufacturing	200	€ 8.6 million	Hansa	2002	EST	41-50	M	Grad	Finance Director & Head of IT	IT/Mgt.	Top-level
							31-40	F	Grad	Chief Accountant	Mgt.	Mid-level
							31-40	M	Grad	Director (Quality)	Mgt.	Top-level
37	Telecommunications	1500	€ 150 million	AXS-ONE	2004	EST	31-40	F	Grad	Finance Director	Mgt.	Top-level
38	Manufacturing	75	€ 15 million	Scala	2000	EST	31-40	M	Voc	IT Manager	IT	Mid-level
							41-50	M	Grad	CEO	Mgt.	Top-level
39	Wholesale	300	€ 12 million	Navision	1998	EST	51-60	F	Grad	Director	Mgt.	Top-level
40	Retail	40	€ 2 million	Scala	1993	EST	41-50	F	Sec	Finance Manager	Mgt.	Mid-level
41	Manufacturing	25	€ 5.5 million	Navision	200	EST	31-40	F	Grad	Accountant	Mgt.	Mid-level
42	Retail	62	€ 4.2 million	Hansa	2001	EST	41-50	F	Voc	Sales Executive	Mgt.	Mid-level
43	Manufacturing	200	€ 9 million	Navision		EST	31-40	M	Grad	IT Manager	IT	Mid-level
44	Telecommunications	70	€ 16 million	SAP	2004	EST	21-30	M	Grad	Operations Manager	Mgt.	Mid-level

Legend: EDN =Education, Grad. = Graduate, Voc. =Vocational/technical education, Sec = Secondary school education, GDN =Gender, M = Male, F = Female, WKF = Workforce (employee size), Mgt. = Management/Administration/Business Department, IT = IT Department, COT = Country, FIN = Finland, EST = Estonia

YHTEENVETO (FINNISH SUMMARY)

Toiminnanohjausjärjestelmät ovat maailmanlaajuisesti eräitä yleisimmin organisaatioissa käyttöönotettuja tietoteknisiä ohjelmistoja; nämä järjestelmät tarjoavat yrityksille strategisia ja operatiivisia parannuksia. Järjestelmien lisääntyvä suosio organisaatioissa on johtanut useisiin tutkimuksiin, jotka tutkivat niiden käyttöönottoa ja toteutusta; vain harvat ovat tarkastelleet toiminnanohjausjärjestelmiä toteutusvaihetta pidemmälle. Huomasimme myös, että tällaisia järjestelmiä käyttäviltä ammatinharjoittajilta puuttuu usein tietoa siitä, mihin kysymyksiin tulisi kiinnittää huomiota tällaisten teknologioiden onnistumisen arvioinnissa. Kaiken kaikkiaan tämän väitöskirjan ensisijaisena motivaationa on toiminnanohjausjärjestelmien toteutuksen jälkeistä organisatorista käyttöönottoa koskevan tutkimuksen puute. Väitöskirjan tarkoituksena on tuottaa lisää toiminnanohjausjärjestelmiin liittyvää tutkimustietoa sekä tällaisten järjestelmien onnistumisen arvioinnista kiinnostuneille tutkijoille että järjestelmiä käyttäville ammatinharjoittajille. Tätä tarkoitusta varten väitöskirjalla on neljää päätavoitetta:

1. Ehdottaa integroitua toiminnanohjausjärjestelmien onnistumisen arvioinnin viitekehystä;

2. Laajentaa viime aikoina ehdotettua toiminnanohjausjärjestelmien onnistumista mittaavaa mallia;

3. Tutkia toiminnanohjausjärjestelmien ja eräiden valikoitujen kontingenssien välisiä suhteita kontekstuaalisissa ympäristöissä (s.o. ulkoinen ja sisäinen; organisatoriset ja tietotekniset tekijät).

4. Tutkia toiminnanohjauksen onnistumista koskevia käsityksiä erilaisten organisatoristen asianosaisryhmien näkökulmasta.

Edellä mainitut tavoitteet vaikuttivat tutkimukseen valittuun lähestymistapaan kolmesta näkökulmasta. Toivoimme voivamme laajentaa kirjallisuudessa saatavilla olevia toiminnanohjauksen onnistumisen mittaamismalleja, tuottaa kokemusperäistä todistusaineistoa sekä organisaation ulkoisista että sisäisistä ympäristöistä valittujen kontingenssien välisistä suhteista, ja esitellä valittujen organisatoristen asianosaisryhmien näkökulmat toiminnanohjauksen onnistumiseen (s.o. eri arvioijien näkökulmista). Edellä mainittujen kysymysten käsittelyä varten kehitettiin tutkimusviitekehys, joka nimettiin ”integroivaksi viitekehykseksi toiminnanohjauksen onnistumisen arviointiin”. Viitekehyksen kehittämisessä on hyödynnetty aiempaa kirjallisuutta ja mikä tärkeintä se palvelee aiheen käsittelyn ohjaajana. Ensinnäkin asiaan liittyvän kirjallisuuden kartoittaminen johti Gablen ym. (2003) työn pariin. Nämä ehdottivat toiminnanohjauksen onnistumisen mittaamisen mallia, joka on saamassa hyväksyntää ja suosiota tietojärjestelmien alueella. Halusimme tietää, onko heidän mallinsa kat-

tava ottaen huomioon että tämä toiminnanohjauksen onnistumisen mittaaminen on tutkimuksemme keskiössä. Siten asetimme ensimmäisen tutkimuskysymyksemme seuraavasti:

TK1: *Onko Gablen ym. (2003) toiminnanohjauksen onnistumisen miittaamismalli kattava? Jos ei ole, voiko mallia laajentaa sisältämään muita asiaan liittyviä onnistumisen ulottuvuuksia?*

Kirjallisuudessa myös esitetään, että kontingessitekijät, kuten rakenne, kulttuuri, organisatoris-tietotekniset kysymykset, teollisuusilmasto, teollisuuden tyyppi muiden muassa, eri tasoilla (organisaation sisäisiä sekä ulkoisia) vaikuttavat tietoteknisten järjestelmien onnistumisen arviointiin, mukaan lukien toiminnanohjaus. Lisäksi emme tarkastelleet tällaisia kysymyksiä eristyksissä vaan suunnittelimme epädeterministisiä malleja (s.o. vain vaadittavaa assosiaatiota kuvaavat nuolet on näytetty ja muiden tekijöiden vaikutukset on jätetty huomiotta) lisätäksemme ymmärtämystämme alueesta. Muotoilimme toisen tutkimuskysymyksemme seuraavasti:

TK2: *Mitä suhteita esiintyy toiminnanohjausjärjestlemien onnistumisen ja eräiden valikoitujen kontingenssien välillä kontekstuaalisessa ympäristössä (s.o. ulkoinen ja sisäinen; organisatoriset ja tietotekniset tekijät)?*

Kolmannen kysymyksen osalta teimme kirjallisuudesta johtopäätöksen, että parempi näkemys syntyy huomioimalla eri organisatoristen toimijoiden näkökulmat tietotekniikan onnistumisen arviointiin. Tätä tarkoitusta varten luokittelimme tutkimuksemme osallistujat organisatorisen hierarkian ja ammatin mukaan ryhtyessämme määrittämään nouseeko erilaisia näkökulmia esiin siinä miten aliryhmät käsittävät toiminnanohjauksen onnistumisen heidän organisaatioissaan. Aiemmat tutkimukset osoittavat tähän suuntaan. Kolmantena kysymyksenä meillä on erityisesti:

TK3: *Arvioivatko erilaiset organisatoriset asianosaisryhmät toiminnanohjausjärjestelmiä eri lailla?*

Tutkimustavoitteittemme luonne merkitsee, että positivistista tutkimusperinnettä (määrällinen tutkimusmetodi) soveltuisi kyselyyn ja että tätä etupäässä käytettiin; lisäksi kuitenkin käytimme muita lähestymistapoja mukaan lukien haastatteluja kohdeyrityksissä oivallusten helpottamiseksi. Pääasiallinen tutkimuksemme suoritettiin käyttämällä kyselyjä Suomessa ja Virossa, kahdessa maassa joissa on tehty paljon toiminnanohjausjärjestelmien toteutuksia. Pääkyselyssämme saimme vastauksia 62 keskeiseltä henkilöltä 44 erilaisesta yrityksestä. Muotoilimme peräti 35 hypoteesia, joista suurimmalle osalle tuli tukea. Ne, joista saatiin päinvastaisia tuloksia, lisäsivät muulla tavoin tietämystä tutkimusalueesta.

Väitöskirjassa asetettujen kolmen tutkimuskysymyksen osalta saavutimme käyttökelpoisia tuloksia. Ensinnäkin onnistuimme laajentamaan saatavilla olevaa toiminnanohjausjärjestelmien onnistumisen mittaamistapaa sisällyttämällä kaksi uutta, merkityksellistä ulottuvuutta (s.o. *Myyjän/konsultin laatu* ja *Työryhmän vaikutus*), joita ei ole otettu huomioon aiemmissa malleissa. Toiseksi totesimme, että useat hypoteeseiksi muotoilluista valikoiduista kontingensseista vaikuttavat positiivisesti toiminnanohjausjärjestelmien onnistumiseen. Kolmanneksi emme havainneet toiminnanohjauksen onnistumisen arvioijien näkökulman suhteen tärkeäksi katsottavia merkittäviä tilastollisia eroja tuloksissamme; liitimme tämän kontekstuaalisiin vaikutuksiin. Kaiken kaikkiaan tämän tutkimuksen tulokset lisäävät tietämystä tietojärjestelmien onnistumisen arvioinnista yleisesti ja toiminnanohjauksen onnistumisen arvioinnista erityisesti. Näemme, että tämä tutkimus voi palvella pohjana tulevalle tutkimukselle tällä tutkimusalueella. Myös ammatinharjoittajat hyötyvät tarjotuista näkemyksistä.