An Empirical Examination of the Effects of System Support and Maintenance on Business Process Innovation

Ammar Rashid

A thesis submitted to
Auckland University of Technology
in fulfilment of the requirements for the degree of
Doctor of Philosophy (PhD)

2012

Department of Business Information Systems
AUT Business School

TABLE OF CONTENTS

Attestation of Authorship

I hereby declare that this submission is my own work and that, to the best of my knowledge and belief, it contains no material previously published or written by another person (except where explicitly referenced), nor material which to a substantial extent has been submitted for the award of any other degree or diploma of a university or other institution of higher learning.

The following peer reviewed papers relate to work undertaken for this thesis:

- Rashid, A. & Wang, William Y.C. (2012). "Exploring Links between Post Adoption Operations and Process Innovation". International Journal of Innovation and Learning (IJIL)(in Press)

- Rashid, A., Wang, William Y.C., Tan, F.B. (2011). "Opportunities and Leverage in the Information Technology Post Adoption Stage". Proceedings of Fourth International Conference on Developments in e-Systems Engineering (DESE 2011), Dubai.

- Rashid, A., Wang, William Y.C., Tan, F.B. (2011). "The Role of Systems Support & Maintenance in Business Process Innovation". Proceedings of International Conference on Information Resources Managements (CONF-IRM 2011), Seoul, Korea, Paper 26. http://aisel.aisnet.org/confirm2011/26

- Rashid, A., Wang, William Y.C., Tan, F.B. (2010). "Information Systems Maintenance: A key driver of Business Process Innovation". Proceedings of 16th Americas Conference on Information Systems (AMCIS 2010), Peru, Paper 219. http://aisel.aisnet.org/amcis2010/219

- Rashid, A. & Wang, William Y.C. (2010). "Developing Information Systems Process Innovation Capability in Organizations." Proceedings of 2010 International Conference on Technology Innovation and Industrial Management (TIIM 2010), Thailand, ISSN-1906-7631

- Rashid, A. (2010). "Investigating the relationship between Enterprise Systems Support and Business Innovation" The New Zealand Information Systems Doctoral Conference (NZISDC), New Zealand

- Rashid, A., Wang, William Y.C., Dorner, D. (2009). "Gauging the Differences between Expectation and Systems Support: The Managerial Approach of Adaptive and Perfective Software Maintenance." Proceedings of Fourth International Conference on Cooperation and Promotion of Information Resources in Science and Technology (COINFO 2009), China, pp.45-50

Author's Signature: Rashid

Acknowledgements

I would like to acknowledge and thank the contribution of those whole helped me to complete this thesis.

To **Dr. William Y. C. Wang**, my primary supervisor, thank you for your guidance and encouragement throughout this journey. I am grateful for your patience in working through theoretical and methodological challenges with me, and your commitment to your role as my primary supervisor.

To **Dr. Felix B. Tan**, my co-supervisor, thank you for your helpful research advice and invaluable input at every stage of this research.

To AUT colleague, especially **Dr. Harminder Singh** for providing me insightful feedback to improve this work.

To the **AUT Business School**, for offering me the graduate assistantship scholarship.

To the postgraduate office of AUT Business School, **Dr Andy Godfrey** and **Ms. Eathar Abdul-Ghani,** for all their assistance and support related to PhD funding and doctoral forms.

To **AUT Ethics Committee**, for approving my ethical application (reference no 10/114) on 1 July 2010 for a period of three years.

To AUT Business School **research participants**, Chris Arasanmi, Danny Quik and Kamarul Faizal Hashim, for their feedback.

To my **father** and **mother**, for giving me unconditional love and source of comfort.

To my **brothers** and **sister**, for all the social support throughout this journey.

To my **wife, son** and **daughter**, for their patience, endless love, encouragement and support throughout this journey.

List of Figures

List of Tables

List of Abbreviations

BPI	Business Process Innovation
CO	Collaboration
ES	Enterprise Systems
IS	Information Systems
ICT	Information and Communication Technology
IN	Inter-functional Coordination
IT	Information Technology
PLS	Partial Least Square
SDLC	System Development Life Cycle
SSM	System Support and Maintenance
TP	Technology Planning
OL	Organizational Learning

Abstract

Over the last decade, Information Systems research has been preoccupied with examining the pre-adoption, use and impact of Information Technology. A great majority of the research effort has been directed towards studying the cognitive processes associated with an individual's pre-adoption activities, adoption decisions, and initial user behaviors. In recent years, post-adoptive behavioral studies have started to emerge but generally using the lens of the same set of factors that lead to initial use and acceptance. Little research is found in the Information Systems literature that explores issues related to the post-adoption stage.

This study addressed an important issue related to the post-adoption stage of Enterprise Systems in the Information Systems literature. Its aim was to provide a mechanism for understanding the use of Information Systems competencies at the post-adoption stage as change levers to achieve Business Process Innovation (BPI). More specifically, the purpose of this study was to develop and validate a model to understand the role of Systems Support and Maintenance at the post-adoption stage in influencing Business Process Innovation, in conjunction with the mediating effects of Information Systems competencies. A Competency Based Perspective, an extension of the Resource Based View, was used as a theoretical foundation underlying the research model.

The model hypothesized that Systems Support and Maintenance (SSM), Organizational Learning (OL), Technology Planning (TP), Inter-functional Coordination (IN) and Collaboration (CO) would influence BPI. A two phased approach was used to collect the data for this research. In the first phase, the content and construct validity of the measure was established through card sorting, expert panel review rounds, a survey pre-test as well as a pilot study. The result obtained in this stage helped to refine the measurements. In the second phase, data were collected from Information Technology professionals to quantitatively test the research model. The research model was then evaluated using partial least square (PLS). SmartPLS software was used to evaluate the measurement model as well as the structural model. Altogether 189 useable responses were received.

The results showed that the SSM, TP, CO variables were strong predictors of BPI. Overall, the SSM construct and other identified variables accounted for at least 71% of variance in the dependent variable, BPI. Furthermore, the results also demonstrated that SSM positively influences TP, OL, IN and CO at the post-adoption stage.

This thesis has significant theoretical as well as practical implications. From a theoretical viewpoint, this study contributes and extends post-adoption literature by applying the Competency Based Perspective in explaining the role of SSM and other IS competencies that can influence BPI. Another theoretical contribution lies in the specification, rationalization and empirical justification of a set of interrelationships between SSM and IS Competencies that have a propensity to be associated with BPI at the post adoption stage. From a practical viewpoint, the findings of this study emphasize an important role of SSM and IS competencies that can further enhance a common understanding of the IS competencies required to develop the innovation capabilities in an organization.

Chapter 1: Introduction

1.1 Chapter Overview

This chapter lays the foundation for the research by first explaining the motivation for, and importance of the study. This is followed by a detailed description of the focus of this research. The chapter then presents the goal of the study and its research questions. An outline of the research methodology is provided followed by a discussion of theoretical and practical contributions. The chapter concludes with a description of the thesis structureand an overview of the contents of each chapter.

1.2 Motivation for the Research

In recent years, three developments have increased the importance of System Support andMaintenance in the field of Information Systems (IS) (Nordström & Welander, 2005). First, is the deployment of variouslarge scale IS to support company business processes. These systems require various types of system support. Second, the business processes that are heavily supported by Internet technologies require companies to significantly change their business models. Third, operating a business that spans multiple global boundaries is a complex task that is hard to manage and control.

Today, companies are not constrained by geographical boundaries, and now rely on new forms of distributed technologies such as the Internet; whereas in the past, enterprises conducted their businesses in a particular geographical area. Organizations that do not take advantage of these technologies find it difficult to survive and compete in the current business environment(McElheran, 2011). In this rapidly changing business environment, the IS that is adopted by a company has to continuously evolve, and be supportedand maintained in order to address changing business rules, satisfy existing users, take advantage of the latest technology, or to keep up with other competitors(Khan & Zheng, 2005). In the IS literature, the work of continuously "managing, changing and supporting maintenance objects where IT systems are integral parts, for the purpose of securing the intended business value and accessibility" (Nordström & Welander, 2005, p. 334)is referred to as Systems Support and Maintenance (SSM).

In order to cope with developments in a rapidly evolving world, companies find new ways to incorporate innovation into their products or services in order to grow and remain competitive in the market place. Advances in Internet and computing technologies are unprecedented and so are the changes in business models, strategies and scope. The consequence of this advancement is that senior management teams have been continuously under pressure to improve innovation capabilities. For many years, an ability to develop new ideas and innovations has been one of the top priorities of senior management(Gartner, 2007, 2009). Innovation is a process by which companies create new products, services and processes required for addressing change in the market place (Dougherty & Hardy, 1996).

Previous empirical studies suggest that the system maintenance costs will almost equal the total cost of the system in the near future (Erlikh, 2000). There are many different reasons for the high maintenance costs including, but not limited to, changing requirements, poor planning, insufficient IT skills, or inefficient communication and coordination between staff members in an organization. Although SSM has been reported as the most expensive part of the IS Development lifecycle (Polo, Piattini, & Ruiz, 2003), few studies exist that look at this area from a non-technical perspective. SSM work is often left for interns, entry level workers or inexperienced personnel. The SSM work is not well regarded and a high staff turnover rate among staff responsible for it is common in organizations(Rashid, Wang, & Tan, 2010). The people who carry out this work receive fewer incentives attached to their work(Chapin, Hale, Khan, Ramil, & Tan, 2001).Despite the substantial body of knowledge present in different areas of IS, to date there has been a scarcity of rigorous study investigating the relationship between SSM and process innovation (Khan & Zheng, 2005; McElheran, 2011;Wang, Pauleen, & Ho, 2011). This relationship is an important one because in order to stay competitive in the market, all organizations have to undertake SSM to bring innovation into their business processes (El-Sawy, Malhotra, Park, & Pavlou, 2010). For example, the Internet diffusion creates new opportunities for businesses to transform and automate their business processes within and between firms. In addition to this, through SSM work, companies may find innovative ways of linking information or operational processes to dramatically improve company performance(Alysyouf, 2007).

Despite the prominent role of SSM in building up strategic advantages in the changing business environment, the strategic management literature has extensively focused on the invention and commercialization of new products(McElheran, 2011). Both empirical and theoretical innovation research has exclusively focused on product innovation, with very limited attention given to manufacturing processes. Furthermore, process innovation, in general, has received considerably less attention in the scholarly literature. Consequently, Business Process Innovation (BPI) has received even less attention despiteits growing importance in the modern economy(Lichtenthaler & Ernst, 2008; McElheran, 2011). The goal of BPI is to use change levers to radically improve key business processes (Davenport, 1993).BPI demands different types of organizational skills and knowledgeas compared to product or manufacturing processes. Furthermore, BPI is difficult to replicate because all knowledge exists within the company (McElheran, 2011). This may also offer the company the opportunity to potentially generate a sustainable competitive advantage.

In the context of this research, the term ‘change levers’ refers to the work of SSM where Enterprise Systems are continuously being evolved, supported and maintained to cope with changes in the business environment(Davenport, 1993).Enterprise Systems (ES) are software applications that are implemented in an organization to automate complex transactions and improve overall organizational effectiveness (Davenport, 2000; Markus & Tanis, 2000).The need to change the ES normally emerges from a change in business rules, manifestation of new technology, introduction of new functionality, or need to fix an error in the existing system and so on. Organizations are continuously finding new ways to manage these processes at minimal cost. Several studies including Layzell et al. (1993), Swanson (1994) and Erlikh(2000)report that post-adoption activities such as SSM are costing companies billions of dollars every year. Furthermore, Khan and Zheng(2005) and Polo et al. (2003) confirm SSM costs as perceived by previous research, and predict that these costs will almost equal the total cost of the system in the near future.

1.3 Focus of this Research

In this research, the focus is on examining the role of SSM at the post adoption stage of Enterprise Systems in influencing BPI and also examine how this influence is mediated by IS competencies. It is a timely response to a practitioner’s concerns where in a survey of Chief Information Officers (CIOs), 87% of the respondents stated that innovation is important to the continuous success of their organization but only 26% of the respondents believed that they have the right innovation processes in place(Gartner, 2007). Furthermore, improving business processes has remained the top priority of many CIOsfor four years in a row(Gartner, 2009). In addition,there is limited understanding of innovation and innovation processes in the current literature in the field, and this is largely derived from studies of manufacturingand production (Chesbrough, 2007; Lichtenthaler & Ernst, 2008;Tether, 2005).

Previous studies have used the Resource Based View (RBV) perspective to argue that technology resources may not necessarily lead to a competitive advantage, as these are easily duplicated by other companies (Ravichandran & Lertwongsatien, 2005b). Previous empirical studies suggest that a company's specific, valuable, intangible and hard to imitate resources can only supply a competitive advantage(Bharadwaj, 2000; Sambamurthy & Zmud, 1997). Furthermore, in order to gain a competitive advantage, a company must have specific IS competencies that are unique and distinctive as compared to its competitors. The term 'competencies' signifies aspects that a company excels at in comparison to its competitors, and its capacity to achieve the specified purpose of the company, in a manner superior to others(Prahalad & Hamel, 1990). The IS literature identify two types of competencies, namely operational and transformational, that can influence company performance (Hall, 1992; Tarafdar & Gordon, 2007). The former refers to the degree to which a company is capable of using information technology to transform itself, and the latter refers to the extent to which the business operations of a company are free from outages due to information related errors, bugs or failures (Ravichandran & Lertwongsatien, 2000; Tarafdar & Gordon, 2007).

Both types of competencies are important because they ensure that the company is sufficiently agile to quickly achieve new changes, and flexible enough to use IT to transform itself. In addition to this, companies should have the ability to control the deployed IT to provide disruption-free IT services. The combined effect of these competencies results in enhancing the company's ability to create new business opportunities through IT-enabled innovations. For example, American Airlines developed strategic applications to redesign its inter-organizational processes, achieving significant financial gains and positioning itself better in regards to its competitors(Srivardhana & Pawlowski, 2007). Similarly, IT-enabled innovations allow companies to compete in the market by differentiating themselves through providing unique products or services with reduced production/operational costs and with higher customer value, which in turn results in higher financial benefits and growth in market share.

In the current business environment, organizations are heavily dependent on their ES as well as their IS operational competencies. Those systems have become key differentiation as well as a strategic capability points to separate them from their competitors. A considerable amount of empirical evidence shows us that an outage of important ES could lead to significant financial losses for companies(Radding, 1999) .In recent years, the financial loss from system outages has quadrupled as a majority of ES are now enabled by the Internet, and small outages of these systemsproducea ripple effect. In addition to tangible losses, system failures could have major intangible business losses. These include, but are not limited to, reduced customer trust and loyalty (Michalisin, Smith, & Kline, 1997).

As mentioned earlier, the goal of BPI is to use change levers to radically improve key business processes (Davenport, 1993). At the pre-adoption stage of ES, these change levers include, but are not limited to, IS resources and capabilities that employ new forms of IT to automate business processes, and hence achieve improved company performance. At the post-adoption phase, these change levers include specific types of IS competencies that support and maintain key business processes to achieve a sustainable competitive advantage.

BPI is different in many ways from product innovation. It involves both internal as well as external forces pushing companies along different innovation paths. For example, external factors like competitive pressures(Utterback, 1994) and customer requirements play significant roles in business process innovation. Similarly, internal factors like organizational priorities and routines (Henderson & Clark, 1990)may also push a company into taking different innovation paths.This further clarifies that we cannot simply apply hypothetical theories developed to explain product innovation in the case of business process innovation (McElheran, 2011).

One way to improve business processes is through continuously refining the underlying business process so that it meets growing business needs. The challenge in this case is that new operational knowledge is required in the transformation process where existing routines are replaced with unproven techniques. In the context of this research, a company may develop or design specific technology to support new ways of doing business. Competency in SSM provides companies with resources for managing, changing and supporting the IS to secure the intended business value. A simple change by the change lever, SSM work, would disrupt the existing organizational structure and routines, and may create internal implementation delays and conflicts (Edmondson, Bohmer, & Pisano, 2001).

Despite the growing importance of BPI activity in a modern high tech economy, very limited understanding exists in the IS literature of the overall process required to foster BPI. Much of the empirical and theoretical innovation literature has focused extensively on product innovation, with some attention to process innovation, but it has completely ignoredBPI (McElheran, 2011; Srivardhana & Pawlowski, 2007;Tarafdar & Gordon, 2007). Furthermore, despite huge concern shown in the research and practitioner community to develop theories in BPI, very little is known about the role of SSM in achieving BPI at the post adoption stage of ES.

A great majority of previous research has used the RBV as a theoretical lens to study the impact of IT on company performance(Clemons & Row, 1991; Ross, Beath, & Goodhue, 1996). These studies suggest that IS capabilities and IT managerial resources differentiate companies from each other based on their market performance. This research draws its theoretical basis from an extension of theRBV, namely a Competency Based Perspective of strategy to assess the influence of post adoption IS competencies on BPI. A basic principle of this study was that a company's competitive advantage can be explained by examining the company's competencies in utilizing, supporting, and maintaining the IT to transform its current business processes, and to improve its operational performance.

1.4 Research Question and Research Objectives

The diffusion of the commercial Internet creates huge opportunities for companies to automate and transform their current business processes. So far, business companies have been able to exploit technologies in such a way that they can create new business practices for themselves (Davenport, 1993; Hammer, 2004). For instance, innovative ways are found to link informationand implement operating processes that can radically improve company performance and contribute to an overall competitive advantage. The focus in the majority of studies so far is to specify the ways in which information technology can support business process innovation within the company (Attaran, 2003; Serrano & Hangst, 2005). The focus of these studies has been on the role of individual activities and different technologies, but they do not address the integrated influence of technology, or the IS resources and competencies necessary for successful business process innovation. For example, using a process modelling tool would not be useful in facilitating the business process innovation if there is no managerial mechanism in place to cultivate collaboration between the experts who understand the business workflows, and the professional who understand the process modelling tool.

Little research was found in the management, strategy and IS literature that demonstrates the effect of SSM and post-adoption IS competencies on BPI. Therefore, the purpose of this study was to develop and validate a model to understand the effect of SSM in influencing BPI at the post adoption stage, and also to examine how this influence is mediated by IS competencies. In doing so, it also aimed to understand the relationship between SSM and IS competencies at the post adoption stage.

The research objectiveswere to:

1) Extend the existing understanding of System Support and Maintenance by examining the theoretical underpinning that affects Business Process Innovation. A comprehensive understanding of Systems Support and Maintenance is important to realize the benefits associatedwith it.

2) Extend the understanding of the factors that influence Business Process Innovation at the post-adoption stage. It is important to understand the combinative effect of different factors that are likely to have an effect on Business Process Innovation.

3) Examine the effect of Systems Support and Maintenance on different IS competencies at the post-adoption stage. A comprehensive understanding is important to provide guidance to practitioners on better utilizing the available IS competencies to support successful innovation in the company.

As a result, the main research question that guided this study was:

What factors influence Business Process Innovation at the post-adoption stage?

and the three subsidiary questions were:

- *To what extent does System Support and Maintenance influence Business Process Innovation?*

- *To what extent do Organization Learning, Technology Planning, Inter-functional Coordination, and Collaboration influence Business Process Innovation?*

- *To what extent does System Support and Maintenance influence Organization Learning, Technology Planning, Inter-functional Coordination, and Collaboration?*

To address the questions mentioned above, a research model was developed and empirically tested to evaluate the factors that impact on business process innovation.

1.5 Research Design

The research design of this study consisted of three major phases. The three phases are shown in Figure 1.1. The detail on each section is found in the corresponding chapter as shown in the figure. The phases were developed to accomplish the objectives and to answer the research questions mentioned earlier.

The goal of the first phase was to conduct a comprehensive review of the literature (Chapter 2) to inform the conceptualization of the research model and to identify the research gap. The literature review conducted at this stage covers both the empirical as well as the theoretical context. Based on this, the research model and research hypotheses were developed (Chapter 3).

The primary goal of the second phase was to refine the initial conceptualization of the research model and to design and develop the survey questionnaire instrument. Chapter 5, which covers this phase, provides an in depth explanation regarding the construct domains and initial item generation. This is followed by a description of the survey refinement process including the card sortingand survey questionnaire instrument pretest.

The third phase of this research aimed to quantitatively test the main survey questionnaire instrument and assess the research hypotheses (Chapter 6). In this phase, the theoretical model was tested through a large scale survey of IT professionals working and living in New Zealand. Also, this phase included the assessment of the measurement as well as of the structural model.

1.6 Methodology

The study examined a research model that aimed to evaluate and understand the role of SSM in influencing BPI at the post adoption stage and also to examine how this influence is mediated by IS competencies. A survey research technique was used to empirically test the research model. The survey instrument was administered through an online survey questionnaire. The survey method was conducted to gather the information from IT professionals working and living in New Zealand. The overall structure of the survey was designed in such a way that it allowed survey participants to easily navigate to the next sections. The online survey was made available to collect information from a large sample that included IT professionals from different industry sectors and who belong to different job categories. The survey asked participants to answer the questions related to SSM and IS competencies that influence BPI.

The research model was then assessed using the Partial Least Square (PLS) test. The Partial Least Square test is a component based approach for testing structural equation models (Marcoulides & Chin, 2009; Qureshi & Compeau, 2009;Wetzels & Odekerken-Schroeder, 2009). This approach has been extensively used in the field of IS and includes some advantages in comparison to covariance based approaches. First, the PLS test does not require any assumptions about the distribution of the variables and permits a small sample size (Chin, 1998; Esposito Vinzi & Chin, 2010). In addition to this, the

PLS test can work effectively in situations where theoretical support of the study is at an early stage.

In the IS literature, the PLS test is a widely accepted component-based approach for testing structural equations(Chin, 1998). This study followed the standard criteria for reporting the result of PLS analysis proposed by Chin (Chin, 2010). In this study, SmartPLS software was utilized to assess the proposed hypotheses. The PLS analysis includedareviewof the measurement as well as a structural model assessment. Furthermore, the examination of the measurement model included an assessment of indicator and internal consistency reliability, as well as the convergent and discriminant validity of the instrument items. The structural model examination involved the assessment of the path coefficients and explained variance.

In the context of this study, the PLS test was selected to test the research model for two reasons. Firstly, several scholars including Qureshi&Compeau(2009) and Chin (1998) suggest that the PLS test is an appropriate approach for theory development and exploratory research. Second, the PLS test has the capability to support statistical power for non-normal data and for large effect models (Chin & Gopal, 1997; Fornell & Bookstein, 1982).

The findings of the main survey were analyzed in accordance with the original research questions. The findings were compared with the existing research reported in the academic and practitioner literature. This was then followed by proposing the main academic and practical contributions of this study.

1.7 Contributions

This research should interest both academics and practitioners as it examined an important conceptual issue which also has significant practical value for Information System practitioners. This research is expected to make a number of important contributions to the academic literature andbusiness practices, as well as paving the way for future research. This study contributes to a more comprehensive understanding of how companies can achieve BPI. A main contribution of the research lies in the justification, specification, and empirical validation of the set of interrelationships between important factors that may be predisposed to be associated with BPI.

This research adds theoretical value to the existing literature in the field of information systems by demonstrating the use of a Competency Based Perspective (Ravichandran & Lertwongsatien, 2000; Tarafdar & Gordon, 2007);extending resource based theory; andmodeling and investigating the role of SSM in influencing BPI at the post adoption stage and how this influence is mediated by IS competencies. In addition to this, the study also extendedthe scope of post-adoption literature by introducing the role and impact of SSM in achieving BPI. Existing studies published in IS have tended to investigate the pre adoption use, management, and impact of information systems and have largely ignored post adoption- related issues (Saeed & Abdinnour-Helm, 2008). This research helps to extend the body of knowledge to understand and realize the value of the post-adoption stage.

The Information Systems practitioner will also benefit from this study, as it helps them better understand the value of systems support and maintenance operations, and the innovation they can bring into the organization. This research also offers a roadmap towards using the combined effect SSM and IS competencies on the road to achieving BPI. In addition to this, IT professionals will also benefit from the contributions of this research effort. For example, this study enables practitioners to make a better case for senior management to give serious attention to post-adoption activities.

This study can potentially provide a better understanding of the technical as well as the managerial competencies involved at the post adoption stage that can successfully contribute to successful BPI. In addition to this, the study findings can also provide a reference point for practitioners to use so that they can assesses their organizations to evaluate the readiness and ability of their post adoption IS competencies to facilitate business process innovation, and identify those IS competencies that need improvement or are missing.

Chapter 8 provides a detailed discussion regarding the contribution of this research; however, more specifically, this research makes the following contributions. It:

- Provides a better understanding of the importance of Systems Support & Maintenance activities and the innovation it can bring in the organization.

- Provides a better understanding of the relationship between SSM and Business Process Innovation.

- Provides practitioners and academics with a theoretical model based on a Competency Based Perspective which is relevant to business process innovation.

- Incorporates a Competency Based Perspective, as an extension of the RBV, in the context of information systems and provides a foundation for further research on achieving successful BPI.

- Provides practitioners with clear guidance when developing, implementing and evaluating the organizational readiness to facilitate BPI.

1.8 Thesis Outline

This thesis is organized into eight chapters. Chapter 1 starts with the motivation of the study and presents the importance of the research. The goals and the research questions of this study are also presented in the chapter. This is then followed by a summary of the research methodology. In addition to this, a brief discussion regarding a theoretical and practical contribution of the research is also presented.

In Chapter 2, the theoretical foundation of this study is presented. It also provides a clearer and more comprehensive theoretical basis of the thesis. A literature relating to underlying theory of resource based theory, as well as current research on post adoption and innovation is also provided.

The goal of Chapter 3 is to describe the development of a conceptual model. It includes the development of the conceptual model based on the research questions presented in the preceding chapter. A set of nine hypotheses are developed in relation to the research questions.

The aim of Chapter 4 is to explain the research methodology used in this research. It outlines the theoretical perspective and strategies of inquiry. This is then followed by describing the research method used in this study. In addition to this, a detailed description of the survey procedure, and the use and justification of PLS for testing the structural model is provided.

The goal of Chapter 5 is to provide the description of the design and development of instruments. It includes detailed discussion on item generation and, card sorting rounds followed by an outline of how the data was collected for the pilot study. An initial result of the pilot study is also presented in this chapter.

Chapter 6 reports the main study of this research. It includes detailed discussion of how the main survey is deployed and the description of the data collection process. This is followed by data preparation and coding of the instrument. In the end, the evaluation of the measurement and structural model is presented.

Chapter 7 discusses the findings of the research in relation to the current research. More specifically, this chapter discusses the implications of this research for academic theories and practitioners. Finally, the conclusion is presented in Chapter 8. This chapter also discuss the limitations of the research and notes future research directions. Figure 1.1 shows an outline of the thesis.

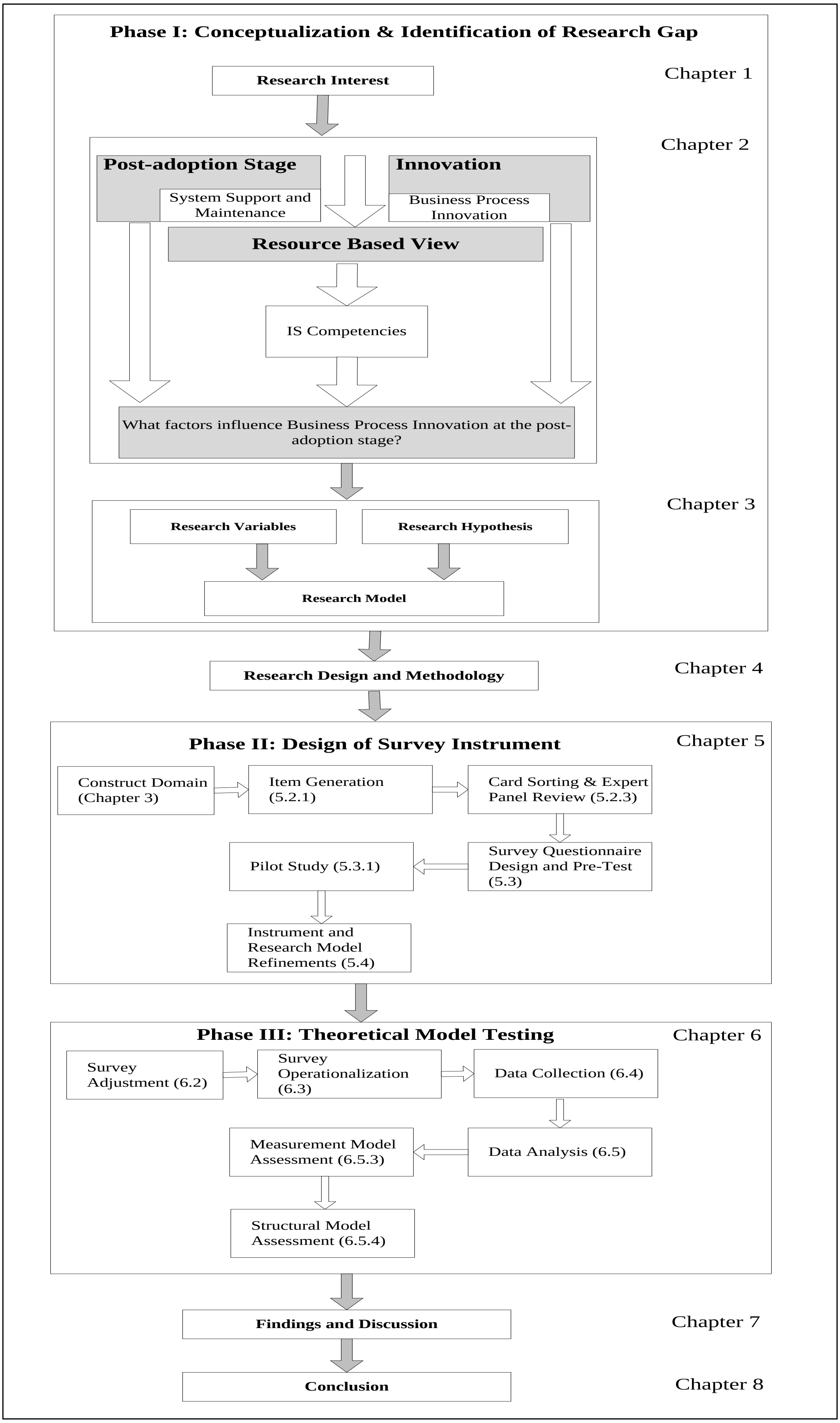

Figure 1.1: Thesis Outline

1.9 Chapter Summary

This chapter presented the background and basic structure of this research and lays the foundation for the study. First, it introduces the motivation for the study and presents the importance of the research. The goal of this study and the research question is then presented followed by a brief description of the research methodology. Next, discussion regarding a theoretical and practical contribution of the research is also presented. In the end, the thesis outline is described. The following chapter reviews the existing literature on post-adoption and innovation, and presents the theoretical foundation of the study. In addition, this chapter will also provide a clearer and more comprehensive theoretical basis for the thesis.

Chapter 2: Literature Review

2.1 Chapter Overview

This chapter provides a comprehensive review for the purpose of establishing the theoretical foundation of the research. Since little is known about the effect of System Support and Maintenance on Business Process Innovation at the post adoption stage, relevant literature is reviewed. This chapter examines the literature from IS, business management, psychology and social sciences. The chapter also provides a clear and more comprehensive theoretical basis of the study. In addition to the above, a literature, relating to underlying theory of Resource Based View is also presented.

Figure 2.1 systematically presents relevant informing disciplines used in the literature. This thesis reviewed the literature from two main bodies of research and its respective correlated sub-disciplines: 1) Post Adoption Stage and 2) Innovation. First informing discipline, presented in Section 2.2 and 2.3 includes a review of relevant literature relating to post-adoption stage in ES, and description on the role of SSM at the post-adoption stage. This is followed by Section 2.4 that provides review of the theoretical underpinning of Resource Based View to explain the rationale behind the research. The second informing discipline, presented in Section 2.5, explainsthe review of the IS literature relating to innovation. The goal of this segment is to explain categories and types of innovation, and review innovation literature that is particularly relevant to BPI. The last section, Section 2.6 reviews the literature particularly about BPI to establish and argue the link between SSM and BPI.

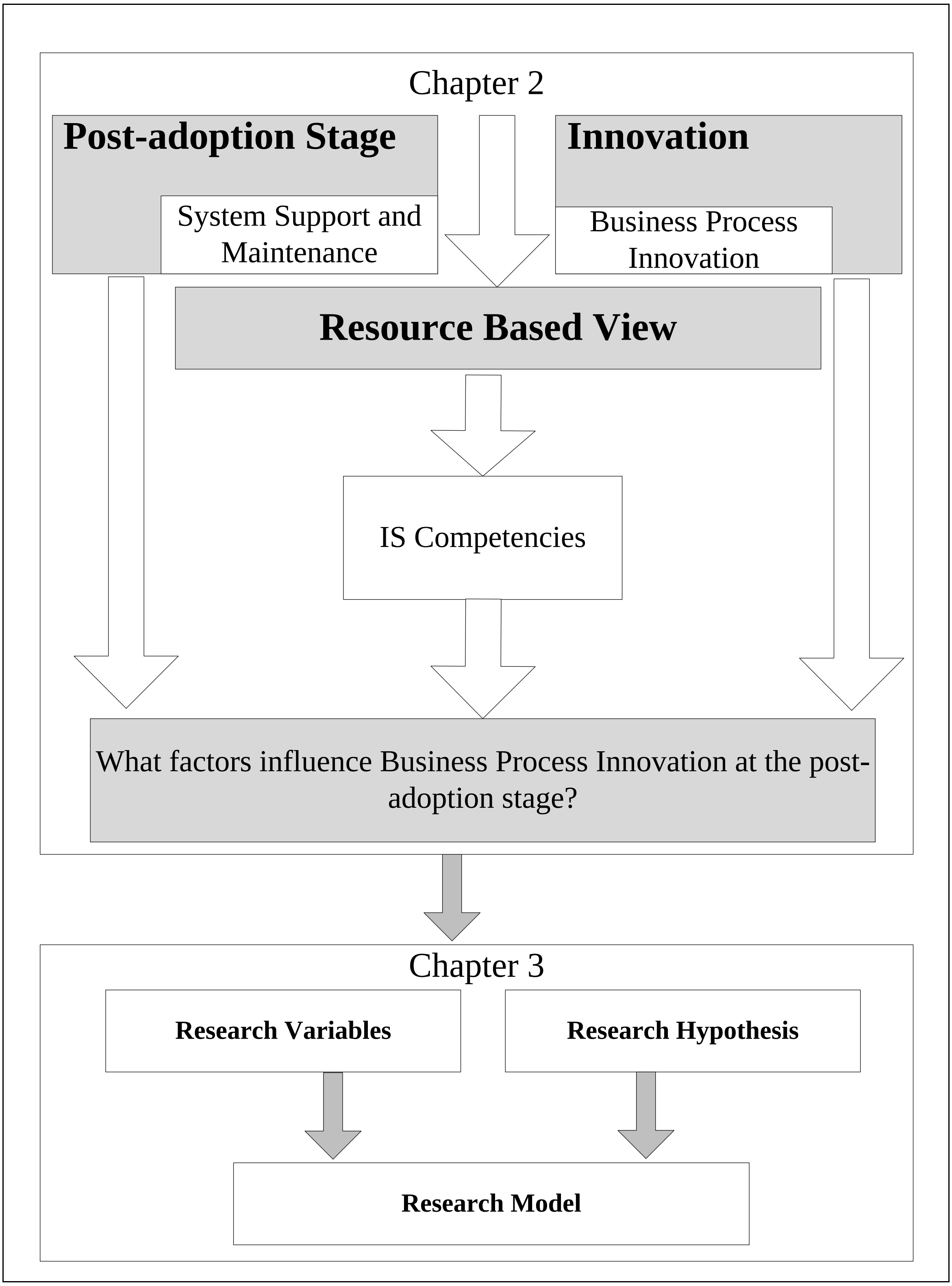

Figure 2.1: Informing Disciplines

2.2 Post-adoption Stage

The research stream examining the adoption, use and impact of IT has evolved in to one of the most mature research streams in the IS field (Hu, Chau, Sheng, & Tam, 1999; Jasperson, Carter, & Zmud, 2005;Venkatesh, Morris, Davis, & Davis, 2003). A great majority of the research efforts has been focused towards studying the cognitive processing associated with an individual's pre adoption activities (Rogers, 1995), adoption decisions (Cooper & Zmud, 1990; Kwon & Zmud, 1987), and initial use behaviors. In recent years, post adoptive behavioral studies have started to emerge in different IS publications but the main focus remains towards studying the same set of factors that lead to initial use and acceptance (Bhattacherjee, 2001; Saeed & Abdinnour-Helm, 2008; Venkatesh, Morris, & Ackerman, 2000; Venkatesh, et al., 2003).

Earlier studies have looked at the post-adoption stage from different perspectives. Some notable examples are from IS implementation literature that include IS implementation process model of incorporation (Kwon & Zmud, 1987) and routinization(Cooper & Zmud, 1990). These studies examine post-adoption behaviors at an individual level and establish its theoretical basis on the innovation diffusion theory. The innovation diffusion theory formulate on the basis that diffusion of innovation can be viewed as an ongoing process where features and output of early stages are different from later stages (Agarwal & Prasad, 1997). Furthermore, Roger (1995) explains that diffusion of innovation is a process whereby innovation is communicated to members of the social community through numerous channels over time. Similarly, IS implementation can be viewed as continuous effort to diffuse an implemented IS to members of the social community over time (Kwon & Zmud, 1987).

The first IS implementation process model consist of six stages: initiation, adoption, adaptation, acceptance, use and incorporation (Kwon & Zmud, 1987) as shown in Table 2.1. These stages are then revised by Cooper and Zmud in 1990. The new model eliminates the use stage and divide incorporation stage in to two stages namely routinization and infusion.

Table 2.1: Two IS implementation Process Models

IS Implementation Process Model (Kwon & Zmud, 1987)					
Initiation	Adoption	Adaptation	Acceptance	Use	Incorporation
IS implementation Process Model (Cooper & Zmud, 1990)					
Initiation	Adoption	Adaptation	Acceptance	Routinization	Infusion

As shown in the Table 2.1, adoption and acceptance are two different stages in the implementation process. Adoption at an individual level implies a potential adopter's decision to whether to use or not to use IS. At an organizational level, this means organization's decision to designate and ensure resources needed for change. Also, at this stage, there is a possibility that a potential adopter may have knowledge of the IS but do not have hands on experience in using any particular IS (Karahanna, Straub, & Chervany, 1999). The adaptation stage includes the process in which an individual or an organization goes through number of cycles to fully accustom with newly adopted IS. At this stage, users go through user training to fully understand the capability of the IS. The acceptance stage occurs after adaptation and entails an organization's devotion of efforts to persuade users to use implemented IS at work. At an individual level, this would mean increased productivity, work performance after adapting and accepting the new IS (Agarwal & Karahanna, 2000).

At the acceptance stage, users commit themselves to use IS and to gain experiences. Some variables like attitude toward use, and intention to use, can be employed to for the measurement of IS acceptance. Even though adoption and acceptance are two different stages in the IS Implementation Process Model, several theories that explain these stages do not provide clear differentiation. Some of the popular theories include theory of the reasoned action (Davis, 1989; Karahanna, et al., 1999), theory of planned behavior (Taylor & Todd, 1995), technology acceptance (Davis, 1989; Kim & Malhotra, 2005)and unified theory of acceptance and use of technology (Venkatesh, et al., 2003) .

Several studies including Bhattacherjee(2001), Bhattacherjee and Premkumar(2004) and Jasperson et al. (2005) suggest that an initial adoption and acceptance stages are very important, but true value and return on the investment can only be measured at the later stages namely routinization and infusion. According to Saga and Zmud(1994), routinization is a permanent change in the organization's governing system to accommodate for the newly installed IS. At the individual level, this routinization implies a standardized usage behavior that is treated as normal. In last stage of infusion, organization integrate IS at its fullest potential into management and operational processes (Jones, Sundaram, & Chin, 2002). This implies applying advanced and more features of IS to further enhance a more comprehensive set of tasks at the workplace (Saga & Zmud, 1994).

In summary, first three stages of IS implementation refers to activities at an organization or departmental level, and last three stages illustrate activities both at micro (e.g., an individual) as well as macro level. In particular, last two stages of the IS implementation can be envisioned as post-acceptance stage (Hsieh & Wang, 2007). Furthermore all the stages identified in Table 2.1 do not necessarily mean that these stages have to come in sequential way. These stages of IS implementation can occur in parallel as well (Saga & Zmud, 1994). Furthermore, different terms like post adoption / acceptance / implementation are used interchangeably in these studies.

Even though last section has explained post-adoption stage using IS implementation process model, it is important to understand this stage in ES. The following section explains the concept of post-adoption in ES followed by discussion on SSM.

2.2.1 Conceptualization of the post-adoption stage in enterprise systems

Enterprise systems (ES), such as Enterprise Resource Planning (ERP), connect and manage information flow within and across organizations. These systems allow managers to make decisions based on most up to date state of the business. ES are integrated software applications that are implemented in an organization to automate complex transactions and improve overall organizational effectiveness (Davenport, 1998; Markus & Tanis, 2000). Historically these systems were installed to support back office tasks like integrating and automating complex transaction processes across company functions like finance and human resources (Davenport, 1998). Today, the functions of ES have been greatly expanded to provide additional functionality such as customer relationship management, supply chain management, planning, performance management and advance analytics.

The concept of post-adoption stage in the Enterprise System was presented by Markus and Tanis (2000) in 2000 . They used a process theory approach to divide the ES pre-adoption and post-adoption experience lifecycle into four phases (Markus & Tanis, 2000). The process theory argues that sequences of events leads to certain output stages, following a set of process. These four phases are shown in the Figure 2.2:

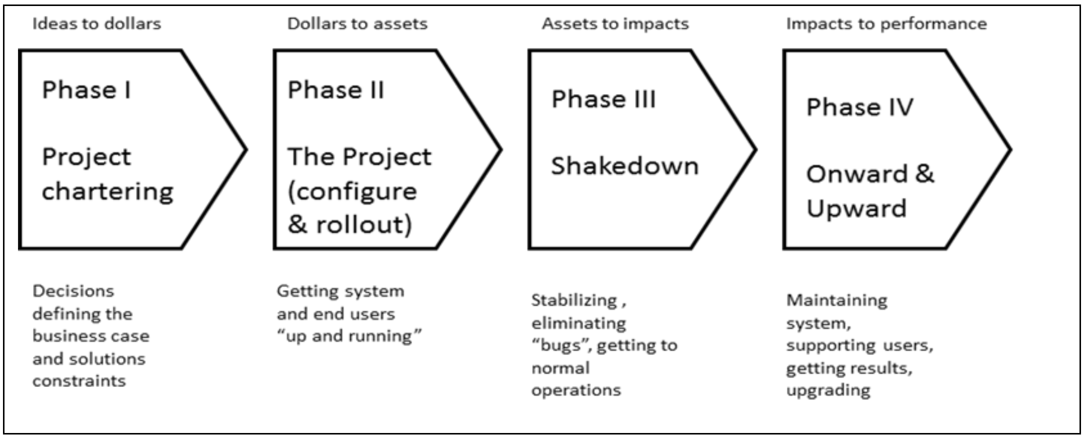

Figure 2.2: Enterprise System Experience Cycle (Markus & Tanis, 2000)

The project chartering phase consists of key decisions leading to funding of ES. Key actors in the phase include company executives, vendors, consultants, and IT specialists. Key activities include initiation of idea to adopt ES, and identification and assignment of tasks to project champions. Additional activities include the identification and selection of software and project scheduling and planning.

In the system configuration and rollout phase of a project, all activities are focused towards getting a system up and running in different organization units. Key actors include project team members from different organization units, functional managers, vendors, IT specialists and consultants. All partners that are selected in the implementation of the project work closely with the project team to ensure that a project achieves the organizational goal of enterprise systems implementation.

The shakedown phase refers to the period of time from when a system goes live until normal operation has been achieved. Key activities include errors or bug fixing, fine tuning the system, retraining additional staff members, and increasing staffing to handle the normal or temporary inefficiencies. In this phase, inefficiencies are realized to improve productivity (Markus & Tanis, 2000). Effective monitoring and timely adjustment is required to ensure normal operations of the system.

The onward and upward phase continues from normal operation until ES is replaced with an improved, upgraded or a completely different new system. This is a stage when an organization discovers the true benefit of its ES investment. Key actors include end users, IT support personnel, and operational managers. Internal and external consultants and vendors may be also involved if upgrades are considered. Key activities include the post implementation audits, benefit assessment, upgrading to new software releases, and additional user skill building. Table 2.2 summarizes key actors and activities involved at the onward and upward phase (Phase IV) as identified by Markus and Tanis (2000).

Table 2.2: Key actors and activities in Phase IV of Enterprise System Experience Cycle (Markus & Tanis, 2000)

Key Actors	Description	Key Activities
Operations manager End users IT support personnel Business Executives Vendors Internal and external consultants	Routine operation of the business until such time as new version of enterprise system is rolled out Pending during which business realizes business benefits from system, if any	Post implementation investment audit, Continuous business improvement, Technology upgradation/migration, System Support and Maintenance, Additional end-user skill building

Furthermore, Deloitte (1999) divides ERP implementation phases into three phases namely stabilise, synthesise and synergise. These three phases are also referred to as "second wave" implementation phase. In the first phase, organizations adopt a system and changes that occur due to this implementation. The second phase includes discovery of business benefits by the implementation of improved business processes and training of people to support new changes. The last phase, referred to as post-adoption stage, is where process optimization is achieved that results in business transformation.

The phases identified in Markus and Tanis's (2000) ES cycle model are aligned with the stages of traditional systems development lifecycle (Nah, Lau, & Kuang, 2001) and IS implementation process models (Cooper & Zmud, 1990; Kwon & Zmud, 1987). This study considers the post-adoption stage to be the same as the onward and upward phase and synergize phase as conceptualize in the case of ES. As SSM is one of a key activity at the post-adoption stage, the following section explains the nature of SSM work and identifies research gaps related to this area.

2.3 Nature of System Support and Maintenance operations

The people that carry out SSM (Grossman, Gu, Sabala, & Zhang) operations are constantly had to face change in their environment (Nelson, Nadkarni, Narayanan, & Ghods, 2000). The cause of this may be due to change in hardware, software, or business environment. In order to address change in the environment, the knowledge and expertise of an IS professional in development, deployment and supporting is significantly important in the overall success of the installed IS (Applegate, 1995). In recent years, significance of this work has considerably become more prominent as 90% of system development cycle effort is being spent on SSM function (Nelson, et al., 2000; Polo, et al., 2003).

Despite of repeated calls of identifying specific job category for SSM, the domain of this work remains relatively unexplored(Batra & Davis, 1992; Scarbrough, 1993). A review of the literature reveals that existing framework provides explanation on the general expertise (Bedard, 1991; Shanteau & Stewart, 1992) as well as IS related expertise (Koubek, Salvendy, Dunsmore, & LeBold, 1989) required to carry of system development and implementation work. These studies have generally focused on explaining either general expertise or differences between expert levels. A study by Nelson et al., (2000) provides an holistic view of IS expertise and domain specific expertise required to carry out SSM.

In IS literature, the topic of SSM is generally discussed after the idea of system development is presented (Dekleva, 1992; Swanson & Beath, 1989). The popularity of SSM in among practitioner further diminishes if the organization core competency is in the development of the system rather than supporting it. Organizations that develop specialized systems in house put much attention on system design activities instead of system support and maintenance. Previous studies have identified this context as an evolving support environments where focus is on the development tasks rather than supporting operations(Krogstie, 1995; Nelson, et al., 2000).

In contrast, there are organizations that do not develop IT-systems but rather buy it, customize and spend time to support customized version. In these types of organizations, majority of efforts are spent in supporting the systems instead of developing it from scratch. Nelson et al. (2000) refer this type of context as mature support environments where majority of efforts are spent on SSM instead of development tasks. Table 2.3 presents the difference between mature and evolving support environment.

Table 2.3: Mature vs Evolving Support Environment (Nelson et al., 2000)

Comparison items	**Mature Support Environment**	**Evolving Support Environment**
System Support duration	Long period	Short period
Task Assignment	Assignment is based on one suite of applications or particular system	Assignment is based on random system issue problems.
Task Categories	Divided into hardware, software, database, network tasks	Simultaneously working on all aspects of system
Work institutionalization	Yes	No

In mature support environment, the nature of SSM can be extremely complex. One of the reasons is that support personnel need to have a high level of competence in specialized software, operating system or legacy system. These personnel perform activities including but not limited to maintaining legacy system, providing support to end user or assist in organization wide technology migration. Generally the support groups that provide these kinds of services act as an internal consultant to their respective organization. On the other hand, the personnel in evolving support environment perform dual role of developer as well as system support maintainer. The support personnel spend majority of their time in development and provide assistance in supporting activities on ad hoc basis. The scope of SSM remains same no matter the type of environment. This is explained in the next section.

2.3.1 Scope of system support and maintenance operations

Previous empirical studies suggest to use maintenance object hierarchy toexplainthe scope of SSM (Nordström & Welander, 2005). In this hierarchy, maintenance operations are used tomaintain the objects instead of system. This establishes a micro view of the organization for each object where systems as well as the processes are portrayed. Three layers are considered while understanding a maintenance object (Nordström & Welander, 2005). First layer includes a channel by which a company provides support to its products or services. Second layer includes office functions that are used to develop product or service. Third layer includes IT systems used by the organization to support its business operations. Within the context of this study, IT systems include all of the software application including ES currently in use by an organization. All three layers are shown in Figure 2.3:

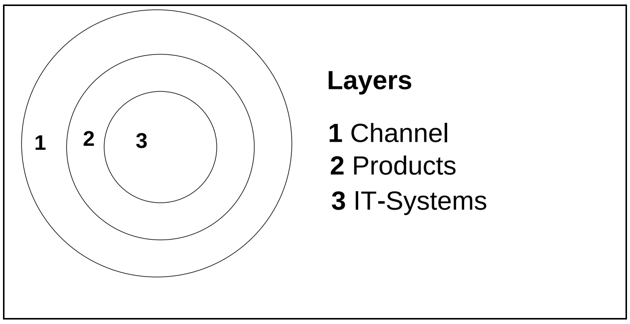

Figure 2.3: Maintenance Object (Nordström&Welander, 2005)

Taking car insurance company as an example, Figure 2.3 shows one of the maintenance objects in the company. In the case of car insurance, first layer consists of different channels used by the company to provide support to their product. This includes customer service support via phone, internet or through online web support. The second layer consists of company functions to develop and maintain auto insurance product. The third layer consists of IT-systems that are required to create auto insurance product for their customers. This includes local intranet, company web sites, or other supporting software or hard systems. In order to solve an issue in an IT-system, a technical solution is required to fix the problem. Terms like software maintenance (Chapin, et al., 2001) are used to capture the scope of this work. Software maintenance is defined as the "the modification of a software product after delivery, to correct faults, to improve performance or other attributes, or to adapt the product to a modified environment" (IEEE, 1998). Some may question that if the software maintenance was discussed decades ago, why does it still warrant our attention today? Extant review of the literature suggests that major academic research attention has been focused on the software development issues instead of software maintenance (Chapin, et al., 2001; Polo, et al., 2003). Maintenance of a system is complicated in the overall software development lifecycle. The complexity of the process further increases with the growth in the size of the software product.

Software maintenance is very broad activity which include all work made on a software system after it has become operational. This covers correcting and fixing errors, modification or deletion of functions, addition of new or upgraded capabilities, improvement in performance or usability, or other quality related attribute. A common misconception about this view is that it assumes that software maintenance is a post-delivery activity. This view can be verified after looking at the definition provided by Institute of Electrical and Electronics Engineers (IEEE) in 1998 (IEEE, 1998) where software maintenance was defined as a post-delivery activity. Early software development models like waterfall model also share this view of software maintenance (April, Hayes, Abran, & Dumke, 2005; Boehm, 2006).

Some researchers including Chapin et al. (2001) and Polo (2003) disagree with this view of software maintenance and state that software maintenance should start well before a system becomes operational. Osborne et al. (1990) further suggest that software engineers should take different approach to manage and change software systems. Furthermore, they suggest adopting an approach that views at all aspects of development process with an eye toward maintenance. Chapin et al. (2001) and Polo (2003) explain that software maintenance include set of different activities that can be carried out at pre-delivery stage as well as the post-delivery stage. Empirical evidence shows us that less attention has been given to maintenance area at the post acceptance stage. One typical example includes the issue of Year 2000 (e.g. Y2k) that draws significant attention towards this area.

There is common misconception that there is no different between software development activities and software maintenance activities. It is true that there are many activities overlap each other but there are some unique activities which are only are performed in software maintenance. Arban el al. (2004) provides a list of unique software maintenance activities. One example includes the development and implementation of service level agreement. This activity is only unique to software maintenance and not present in software development.

There is ongoing debate in explaining categories on maintenance object. For example, Lientz& Swanson (1981) divides maintenance effort into three categories: corrective, adaptive, and perfective maintenance. Three categories can help software engineers to learn and understand significance of maintenance and its implications on quality and cost of the systems currently in use by the organization. Furthermore, they explain that corrective maintenance deals with making changes to remove actual faults present in the original system. Adaptive maintenance deals with making changes to the system to adopt and incorporate changes in the underlying technology (i.e. hardware or network) Finally, Perfective maintenance deals with making changes to a system based on user requests including but not limited to deleting, extending, modifying functions or improving performance or ease of use. Table 2.4 shows software maintenance categories provided by IEEE standard (IEEE, 1998):

Table 2.4: Software maintenance categories (IEEE, 1998)

Type	**Definition**
Preventive	*maintenance performed for the purpose of preventing problems before they occur*
Corrective	*reactive modification of a software product performed after delivery to correct discovered faults*
Perfective	*modification of a software product after delivery to improve performance or maintainability*
Adaptive	*modification of a software product performed after delivery to keep a computer program usable in a changed or changing environment.*

Software maintenance only covers the support & maintenance of the IT-systems and do not consider other maintenance layers as shown in Figure 2.3. Furthermore, even though post-adoption operations like SSM (Grossman, et al.) are reported as the most expensive activities yet very limited research has been focused to examine this area (Polo, et al., 2003).

2.3.2 Expertise required for system support and maintenance

Normally intern students or entry level workers are hired to carry out maintenance and support work (Erlikh, 2000). The people who carry out this work are not treated at the same level of organizational status as compared to other employees. The reason for this is because normally very few incentives are attached with their work. Their work is not well regarded and high staff turnover rate is common in organizations (Chapin, et al., 2001). Previous empirical studies show that there are specific expertise required for SSM (Nelson, et al., 2000).

Empirical evidence shows us that expertise required for SSM include the combination of cognitive skills as well psychological traits(Chapin, et al., 2001). A study reports that expertise required for SSM can be categorize into five constructs namely; personal competence, IS group outcomes, environment, motivation and IS policy (Nelson, et al., 2000). Extant review of IS literature suggest that these constructs are aligned with the constructs previously explored in the context of IS development and maintenance. Generally, these constructs are categorized into two main areas namely, generalized theories of expertise and domain specific expertise. Both of these categories are required while explaining expertise required for SSM.

Table 2.5: Constructs of SSM expertise (Nelson et al., 2000)

Construct	Categories
1. Personal Competencies	Cognitive Abilities General IS Related Abilities Technical Competencies Business Application Competencies Context Specific Competencies Social Competencies Mode of Knowledge Acquisition
2. IS Policy	Personal Policies
3. Environment	General Environmental Factors Context specific environmental factors
4. Motivation	
5. IS Group outcomes	Technical performance of IS Group Organizational Performance of IS Group System Learning

As shown in Table 2.5, Personal competencies are further divided into seven categories; cognitive abilities, general IS related abilities, technical competencies, business application competencies, context specific competencies, social competencies, and, mode of knowledge acquisition. In the IS field, previous studies that have identified and presented general framework of expertise to carry out general IS related work revolve around domain knowledge, cognitive skills and psychological traits(Chapin, et al., 2001; Khan & Zheng, 2005;Shanteau & Stewart, 1992). As like with any other IS development and implementation work, technical competencies are required that comprise of knowledge skills about hardware, software, database or network. Some experts suggest that due to nature of SSM, it requires competencies above and beyond IS development and implementation (Chapin, et al., 2001; Polo, et al., 2003). Furthermore, due to high rate of change occurrences in the SSM work, support personnel needs to have in depth knowledge and understanding of business. The requirement of having this skill may not be that important in the development stage but it is highly desirable for SSM. This is the only way that support personnel can accurately and timely respond to changes in the business environment and help contribute in the overall success of the business.

IS policy is another expertise that is required for SSM. IS policy in this case refers to personnel policies set out by the company that include but not limited to cost allocation policies or goal set for IS function. In other word, companies need to have policies in place to recruit, train and retain people that have skill set needed for SSM. Empirical evidence shows that IS policy that is properly implemented in the company is the key to IS group success (Howard, 1990). Furthermore, an expertise in an environment plays vital role and largely impact overall SSM expertise. Previous empirical studies suggest that people who are trained and experts in one environment may not perform well in other environments (Shanteau & Stewart, 1992). People who perform SSM need to have expertise in the general as well as context specific environment. For example, SSM personnel needs to have a full understanding of business and system environment, and, familiarity and abilities to tackle any domain related environmental as well as system specific complexity.

Motivation is an expertise that is also required in the context of SSM. It involves supporting SSM personnel growth and performance. Here personnel growth refers to as individual satisfaction gained through performing challenging task and the opportunity to work on complex and multiple projects. SSM personnel may feel high level of satisfaction as their work is being recognized as good quality and they gain reputation in the organization. This may pave chances for growth in the company as well as promotion. Experts believe that SSM personnel are more motivated by the outcome of their work instead of the work itself (Nelson, et al., 2000). Even though they perform daily routine taskthat may be repetitive in nature, but intrinsic motivation play a great role. Extrinsic motivation like promotion or pay rise is likely not be main motivation factor. This argument may present partial reasoning of why SSM is under paid and less rewarded (Khan & Zheng, 2005; Polo, et al., 2003).

Finally, an expertise in IS group outcomes is required in the context of SSM. It comprises of technical and organization performance of the SSM group. The technical performance can be viewed in terms of performance in hardware, software, database performance, and organization performance can be viewed as performance indicators including but not limited to contribution, cost reduction and productivity. Furthermore, system learning is an important dimension that comprise of documentation, system knowledge and reverse engineering. Empirical evidence shows that SSM personnel views group and individual performance as component of IS group outcomes. This view is consistent and aligned with previous finding where experts reports that an expertise of domain or specific area may reside in the community of practice or in an individual expert (Duguid P. & Brown, 1991).

Above sections explained the nature, scope and expertise required for SSM, the following section provide explanation on the role of SSM and its links with innovation.

2.3.3 Understanding the role of system support and maintenance at post-adoption stage

There are several activities at the post-adoption stage to ensure that ES continues to meet the business demand. Some suggest that these activities are complex in nature because of their dual nature of doing and managing character(Chapin, et al., 2001). Nordstorm and Welander(2005) suggest two categories of these activities to capture the scope of post-adoption work. First category includes the activities that deal with the planning, managing and execution of change request. For example, a request to change, upgrade or fix a system by the customer. Second category includes all the activities that deal with providing the support. Some examples of these activities include providing support to users in problem situations, and, supporting the technology through which services are accessed.

SSM involves complex activities, both of the “doing” and the “managing” character (Chapin, et al., 2001). Khan &Zheng(2005) suggest that there is a need for “defined formalism describing various tasks, tools and methods are required” (pp. 7). Activities at the post- adoption phase are not only superficial operation work but could potentially link to the business pulses, i.e., the change of business environment or market climate via data maintenance in the decision support systems (Wang, et al., 2011).

Innovation andpost adoption usage behavior

Prior IS literature suggests the degree of innovation depends upon level of IS usage at the post-adoption stage. Several studies including Schwarz (2003)and Sundaram et al. (2007) argue that level of innovation and learning increases with the utilization of information system in the organization. Here utilization refers to an extent at which the users integrate IS to support their work tasks. This study assimilates previous IS literature and identify key literature based on the type of IS usage and level of innovation. Table 2.6 presents empirical studies identified based on previous IS literature.

Table 2.6: Post adoption IS Usage Behavior

IS usage level	**Key Literature**	**Level of Innovativeness & Learning**
Minimum	Routine/Standardize Use (Saga & Zmud, 1994; Schwarz, 2003; Sundaram, et al., 2007)	Low
Moderate	Extended/Deep structure Use (Burton-Jones & Straub, 2006; Schwarz, 2003; Swanson, 1994)	Medium
Maximum	Emergent/exploration Use (Agarwal & Karahanna, 2000; Ahuja & Thatcher, 2005; Jasperson, et al., 2005; Nambisan, Agarwal, & Tanniru, 1999; Nambisan & Baron, 2007; Wang & Hsieh, 2006)	High

In the table 2.6, minimum IS usage refers to the user's utilization of IS in a standardized or routine manner that is compatible with standard work processes. Different terms like standard use (Schwarz, 2003; Sundaram, et al., 2007), routine use or normal use (Saga & Zmud, 1994) emerge in the IS literature for this concept. The key characteristic inherent in this type of IS usage includes common expectations from a user once IS implementation has reached to post adoption stage. This expectations include but not limited to know how predefined set of rules, policy or regulations related to IS use, so that it can facilitate the integration between IS use and work processes (Saga & Zmud, 1994).

Moderate level of IS usage refers to user's utilization of more IS functions or features to support work task performance. Extant literature suggests that similar concepts that explain this level of IS usage include but not limited to deep use (Saga & Zmud, 1994), extant function or feature use (Burton-Jones & Straub, 2006). The key characteristic of this level of IS usage is that it includes utilization of IS features or functionalities to accommodate additional work task. This level comes during the post-adoption stage where user become more familiar with IS functions due to extended use. Empirical evidence suggest that this level further increase the user capability and enable them to perform their tasks in more efficient and effective way (Hsieh & Wang, 2007).

Maximum level of IS usage refers to a stage where level of innovativeness and learning is at highest level through the utilization of IS. Previous studies identify different terms like emergent use (Agarwal & Karahanna, 2000), exploration use (Nambisan, et al., 1999) , or innovation IT use (Ahuja & Thatcher, 2005) to explain this stage. The key characteristic of this stage include the utilization of IS in a fashion that go beyond the way that imparted by original implementer or designer (Jasperson, et al., 2005). Furthermore, this stage includes users utilization at maximum level where intention to explore, or try to innovate with IT is at highest level.

Although previous research has shown link between post-adoption operations and innovation (Agarwal & Karahanna, 2000; Ahuja & Thatcher, 2005; Jasperson, et al., 2005; Nambisan, et al., 1999; Nambisan & Baron, 2007; Wang & Hsieh, 2006), there is little information available on the factors that influence BPI at the post-adoption stage of ES. The following section first reviews previous empirical studies that use RBV theoretical lens to explain the role of IS resources, IS capacities and IS competencies and then explain the links between IS competencies and BPI.

2.4 Resource Based View

Over the past 20 years, a considerable large amount of IS literature has used Resource Based theory (RBT) or Resource based view (RBV). The theory has been substantially used in the strategic management literature and specifically focuses on the concept of sustained competitive advantage to elucidate organizations performance and direct the idea and implementation of strategy (Grant, 1996).

Inside the area of strategic management, one of the goals is signified by the understanding of the antecedents of the competitive advantage for firms (Penrose, 1959). The idea of competitive advantage stems from theories on distribution in economics exchanges and value creation (Penrose, 1959). Researchers argue that firm can have a competitive advantage when the value it possess, by an economic exchange in which firm participates, is greater than the value it had without its collaboration in the exchange (Brandenburger, 1996; Piccoli & Ives, 2005).

The classical viewpoint in strategic management suggests that organizations achieves sustained competitive advantage through the implementation of strategies designed at the exploitation of internal strengths to contest the external opportunities, and at the same time, limit internal weakness and offset the external threats (Ansoff & McDonnell, 1988). Even though this view is simple but previous research has shown very limited applicability because of the two assumptions on which it is based on. First, this view point presumes that all the organizations that belong to homogenous industry have same strategies and similar strategic resources (Porter, 1981; Rumelt, 1984; Scherer, 1980). Second, this view presumes that a case where strategic resource belong to completely different strategic group can be quickly transferred from one company to another company and hence be equally reallocated in the industry or strategic group. This viewpoint is generally referred to as mobility of resources (Barney, 1986). Both of these assumptions refer to the concept of resources which can be explained as the assets and capabilities of a company that can be useful in discovering and responding to the market opportunities and threats (Sanchez & Mahoney, 1996).

The limitations to the applicability of the competitive advantage framework prescribe by the above mentioned assumptions demand the academic scholars to search for alternative theories that can strive with immobility and resource heterogeneity as the potential sources of the competitive advantage (Khan & Zheng, 2005; Penrose, 1959; Wernerfelt, 1984). In 1991, Barney proposed the theory of the RBV of the firm considering the limitations of the previous frameworks (Barney, 1991). According to RBV, organizations that belong to same industry or strategic group may have completely different distribution of resources, and this heterogeneity can exist over the length of time since these resources may not be impeccably mobile across organizations.

The seminal work by Barney (1991), represented in Figure 2.4, shed light on the concept of the temporality of the competitive advantage and the related sustainability of the competitive advantage. This view point further triggers a debate in the academic community and enhances the effort by management researchers to identify the potential sources of sustained competitive advantage. According to Porter (1985), the sustainability may take place when the competitive advantage remains longer than the competing organizations. This persistence is asserted when the firm exhibit key resources that can act as the obstacle to the replication of its strategy to its competitors (Wernerfelt, 1984). Furthermore, a resource must exhibit four characteristics in order to be potential source of competitive advantage (Barney, 1991). First, a resource must be valuable. In other words, the resource must enable the firm to utilize the conception and implementation of value creating strategies by either outperforming its competitors by exploiting external opportunities or reducing its own internal weakness. Second, a resource must be rare by definition. The resource is rare when it is not possessed by any potential or current competitor. Furthermore, if the resource is available rarely, then it would be degenerate the competitive advantage of the first mover. Third, a resource must be imperfectly imitable. A resource is imperfectly imitable when firms that do not possess it, is unable to obtain it. This is generally happens when a valuable resources is controlled by only a single firm and hence become source of competitive advantage. This characteristic depends on the social complexity, history and the casual ambiguity of its competitive advantage. Fourth, a resource must be non-substitutable. In other words, a resource is non-substitutable by other resources when it cannot be substitute by any other resource for the implementation of the identical strategy.

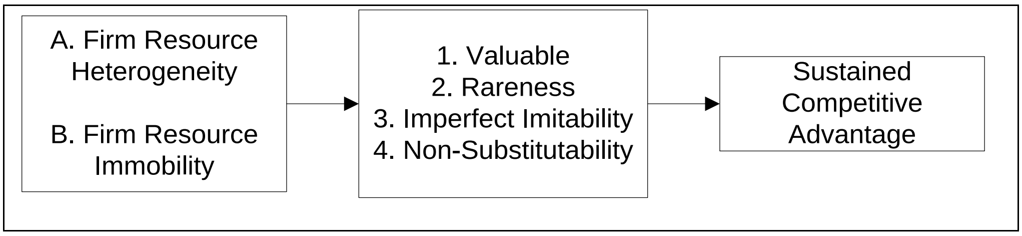

Figure 2.4: The Theory of Resource Based View (Barney, 1991)

The level at which a resource has above mentioned properties would classify the degree to which it can be a potential source of sustained competitive advantage. Although other attributes have been proposed for making a resource as a potential source of sustained competitive advantage, there has been large consensus among academic community on those mentioned above(Amit & Schoemaker, 1993; Collis & Montgomery, 1995; Grant, 1991).

Despite of different attributes identified to explain sustained competitive advantage, RBV theory does not contend that the potential source of sustained competitive advantage automatically arbitrates a sustained competitive advantage. Apart from attributes identified above, others sources of sustained competitive advantage come into existence when managerial initiatives are exploited in the manner where limited capabilities are homogenize and resources are mobilize within competing organizations (Barney, 1991). In addition to this, when such initiatives succeed, long term sustainability would require a preservation of competitive advantage by renewing the barriers to replication of the strategy over time. This type of result is achieved through organizational learning and asset stock accumulation (Piccoli & Ives, 2005).

Organizational learning is defined as the "capacity or processes within an organization to maintain or improve performance based on experience" (Nevis & DiBella, 1995, p. 75). Organizational learning would enable companies to repeat the experiences, allow them to analyze mistakes, build the capacity to do experimentation that would result in organization to learn, improve performance and retain competitive advantage. Asset of stock accumulation is defined as the "process by which a company accrues of build up a resource over time" (Piccoli & Ives, 2005, p. 756). Adoption of this process by any company further strengthens the safeguard to replication, and at the same time requires significant investment.

The rationale provide above further initiated an academic debate that argue the distinction between resources that enable the attainment, defined as “ex-ante limits to competition”, that would include value, and rarity, and those resources that would sustain the advantage, defined as “ex-post limits to completion, that include imitability and substitutability (Piccoli & Ives, 2005; Priem & Butler, 2001; Wade & Hulland, 2004).

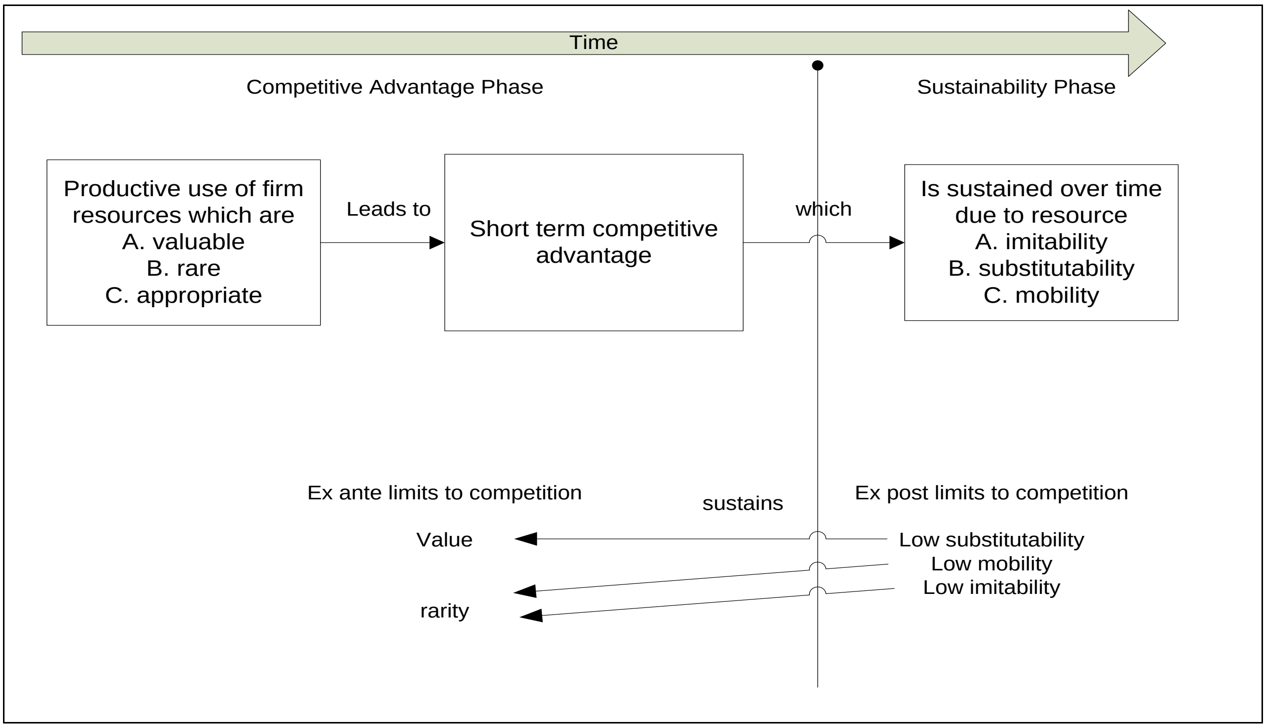

Figure 2.5: The Resource Based View over time (Wade &Hulland, 2004)

RBV has a clear distinction between resources, capabilities, and competencies. Resources are stocks of available assets plus capabilities that are controlled and owned by a firm to detect and respond to market threats and opportunities (Amit & Schoemaker, 1993; Wade & Hulland, 2004) . These resources also include fixed company specific inputs to production process (Grant, 1991). According to Hall (1992), resources can be tangible or intangible. Within IS, tangible resources can be viewed as hardware, network infrastructure or software environment. Intangible resources can be viewed as information based resources like software patents, supplier relationships, consumer trust, management skills, or reputation (Hall, 1992). Capabilities, on the other hand, refer to the company’s capacity to distribute resources systematically using organizational process (Amit & Schoemaker, 1993). These capabilities are generally developed in the functional or sub functional areas by combining human, physical and technological resources. In other words, capabilities are repeatable patterns of actions in the use of assets that would facilitate to create, produce or offer products or services to the market. In addition to this, capabilities can also be viewed as the capacity of a team to perform a task or activity (Grant, 1991). Competencies are higher level capabilities that can be regarded as purposive combination of company specific capabilities and resources that would enable company to achieve a specified organizational goal, preferably in a way better than competitors (McGrath, Venkataraman, & MacMillan, 1995; Ravichandran & Lertwongsatien, 2005a; Teece, Pisano, & Shuen, 1997). Competencies originate from the distinctive combination of resources and capabilities. Competencies are not created over night but rather generated over time where companies garner unique combinations of resources and capabilities that would generate returns on the basis of distinctiveness. These newly realized competencies of a company can then create superior returns and differentiate from other competitors (Petaraf, 1993).

The seminal work of Barney (Barney, 1991) regarding the theory of resource based of the firm has been applied and debated in numerous management disciplines (Fahy, 1999; Foss, 1997; Priem & Butler, 2001), as shown in Figure 2.5. The RBV viewpoint was argued not to be suited to study IS (Wade & Hulland, 2004), but rather to frame the influence of the resources directly on the sustainable competitive advantage. However, IS resources subscribe indirectly to sustained competitive advantage through IT capabilities and assets (Piccoli & Ives, 2005).

In last two decade, RBV has been continuously applied to IS research, more specifically to provide explanation to the productivity paradox (King & McAulay, 1997; Santhanam & Hartono, 2003). A considerable number of articles published in the IS literature suggest that IT resources cannot automatically lead a firm to competitive advantage because of two main reasons. First, IT is not rare. Any organization that plan to improve the productivity can invest in IT to acquire it. Second, IT is not easily imitable by competitors (Bharadwaj, 2000; Santhanam & Hartono, 2003;Tippins & Sohi, 2003). Following this rationale leads to different models in the adoption and use of IT to increase productivity or improve performances of the processes (Tippins & Sohi, 2003).

Previous empirical studies suggest that it is not presence of IT that could generate a strategic advantage for a company, but, rather the way how IT as well as associated IS are utilized and managed (Bharadwaj, 2000; Duhan, 2001;Peppard & Ward, 2004). Furthermore, a company improves business performance and maintains competitive advantage is through integrating and employing in combination and co-specialization with it IS resources, IS capabilities and IS competencies (Bharadwaj, 2000; Santhanam & Hartono, 2003).

This research examines the relationship between SSM and its relationship with BPI using a RBV as theoretical lens. This study uses Competency Based Perspective in strategy to explain how SSM and other IS competencies at the post adoption stage can influence BPI. The following section further elaborates on IS resources, IS capabilities and IS competencies followed by the discussion on the usage of IS competency as change levers to achieve BPI.

2.4.1 IS resources

In IS literature, three broad categories of IS resources have been defined namely, relationship resources, human resources, and technology resources (Ravichandran & Lertwongsatien, 2005a). This study integrated different IS literature and present the key attributes of IS resources that are identified as a critical to achieve increased productivity, effective IS performance (Bharadwaj, 2000; Clemons & Row, 1991;Ross, et al., 1996). These include the quality of the relationship between IS and key internal and external stakeholders, the skills of IS human resource in an organization, and the sophistication of the available IT infrastructure.

The quality of internal partnership relates to the coherence of objectives and goals of IS department with internal business unit (Henderson, 1990; Henderson & Cockburn, 1994). Key characteristics of internal partnership include joint planning, commitment, trust and shared benefit and risk sharing (Anderson & Narus, 1990; Bharadwaj, 2000;Lee & Kim, 1999). An improved level of partnership is required between IS department and business units to share knowledge and understanding because both will be interacting with each other on technology transfer related projects (Nelson & Cooprider, 1996). The quality of external partnership relates to a degree at which participants expectations are met through the interaction between information systems department and the service provider (Lee & Kim, 1999). Extant IS literature indicates that there is a direct link between IT success and vendor partnership. For example, a quality partnership between outsourcing vendor may help companies to minimize unanticipated changes in contracts that may threaten the success of IT projects. In addition to this, several case studies (Lasher, Ives, & Jarvenpaa, 1991) have identified quality of external partnership as one of the most important success criteria in the implementation of large scale projects (Ravichandran & Lertwongsatien, 2005b). Generally these partnerships allow both parties to share the risk, utilize complementary knowledge and resources as a cornerstone for a productive relationship.

IS human resources relates to knowledge and experience of the IS department to effectively accomplish IS functions (Ross, et al., 1996). The skills of IS human resource contemplate company specific personal relationships, experiences and knowledge (Coff, 1997). Empirical evidence indicates that characteristics of particular human resource may result from different factors. For example, it is more likely to foster particular knowledge and expertise about the company when IS human resource work in an interdependent work setting. The longer an employee work in the organization, the higher specific knowledge and expertise will be acquired (Overby, Bharadwaj, & Sambamurthy, 2006). Furthermore, several studies indicates that IS department having competent staff members would perform all assigned activities in an effective and efficient manner and be able to utilize and leverage IS applications to gain competitive advantage (King & McAulay, 1997; King, 1988). Within an IS department, it is critical that a team member have good technical, business and managerial skills. Good technical skills would allow an individual to recognize opportunities to apply new technologies at the workplace, to fix errors in existing systems, to deliver technical solutions, and to automate or improve business processes. Business skills would allow IS staff members to persuade users that IS department understand their user requirements, concerns, goals, and processes and have an ability to fulfill their desired goals. Managerial skills and interpersonal skills include not only how communication with other occur but also an ability to listen, understand, solve problems, and make appropriate decisions. In IS projects, these skills are important for good coordination and effective task execution. In addition to this, these skills are useful in IS projects where high coordination is required between team members.

IT infrastructure complexity refers to a degree to which the infrastructure is able of respond to user demands within an organization (Duncan, 1995). The IT infrastructure complexity is generally replicated by compatibility, speed, suitability, and connectivity of IT infrastructure (Ravichandran & Lertwongsatien, 2005b). In the literature, several studies indicate that complexity of IT infrastructure influences the company ability to exploit IT to improve business processes and improve its performance(Brynjolfsson, McAfee, Sorell, & Zhu, 2008; McElheran, 2011; Srivardhana & Pawlowski, 2007; Tarafdar & Gordon, 2007). For example, Rockart and Hofman(1992) argue that platform readiness, easy access to relevant data, and availability of required networking systems affect the time and development of IS projects. Additionally any company that have the access and availability of right tools and technology for implementing new technology applications would be in better shape to address present and future business demands, and can respond timely to any environment shifts (Sambamurthy & Zmud, 1997).

2.4.2 IS capabilities

In the field of IS, process perspective is most commonly used to define IS capabilities (Ravichandran & Lertwongsatien, 2005b). According to process perspective, a company capability in any functional area is arbitrated by a quality of complexity of its processes. Previous literature identified four IS capabilities namely, IS planning, systems design and development, desktop support, and systems operations (Bhatt, 2000; Eisenhardt & Martin, 2000; Feeny & Willcocks, 1998;Teece, 2007). In depth look of these capabilities reveals that these all relate to core IS activities that include planning, system development, support and system operations (Feeny & Willcocks, 1998). IS planning refers to the degree of assembling between business managers and IS on the preferences for IS activities (Boynton, Zmud, & Jacobs, 1994; Jasperson, et al., 2005). Furthermore, this assembling enables the integration of business knowledge. As a result, it improves the classification and development of strategic IT applications (Reich & Benbasat, 1990). Empirical evidence indicates that IT applications are considered as one of the core elements that increases rate at which company bring innovation in processes or create functionality that makes its products valuable to customers (Quinn, Baruch, & Zien, 1996; Ravichandran & Lertwongsatien, 2005a). To achieve the aforementioned, demand to deliver IT based products within assigned budgets and short development times is accelerated within company (Quinn, et al., 1996). Research indicates that companies with streamline system development process are more likely to meet such demands (Feeny & Willcocks, 1998). At every level in an organization, there needs to better manage the use of technology. IS department having a mature support processes enables a department to educate users with adequate IT information. The success of any IT project partially depends on how well IS department support, maintain, as well as educate its key users. In addition to this, systems operations capability include the performance tuning, emergency planning, use of IT for system control, and maintenance. These entire serve as an important enabler for providing proficient IS services to the company. In sum, all four of the IS capabilities explained above are critical to employ IT to support and assist business transformations and achieve operational excellence.

2.4.3 IS competencies

The concept of IS competencies is defined as characteristics of a company that lead to achieve superior performance and excel in preferably in comparison with its competitors (McGrath, et al., 1995; Spencer & Spencer, 1993). Excellence refers to a capacity to pursue company's purpose (McGrath, et al., 1995) in a manner that is superior to its counterparts (Prahalad & Hamel, 1990). Review of this definition indicates that there is high degree of intersection lies between the goal a company sets, and its ability to accomplish them. Past research have identified IS competencies (Doherty & Terry, 2009; Ravichandran & Lertwongsatien, 2005b) on two broad dimensions namely; operational competencies and transformational competencies. IS operational competencies relates to a company's ability to deal with any type of IS related failure and provide disruption free business environment (Doherty & Terry, 2009). Now days, companies heavily depend on IT support departments to provide and maintain disruption free environment as majority of core business processes are enabled by IT. An efficiency of core business processes depend on IT support department ability to run ESand to take action in a case of unexpected outages.

Transformational competences refer to an ability of a company to use IT to transform itself (Bassellier & Benbasat, 2004; Henderson & Cockburn, 1994). Every company is different to an extent at which it transforms (i.e. sophistication of IT enabled changes a company can accomplish and rate of speed at which it transforms). Even though business transformation is important for a long term sustainability of a company, it is also important that organizations have the ability to control over the use of IT and deployment to guarantee that effective IS resources are available within a company.

IS transformational competencies increase a company's ability to generate new business opportunities through IT innovations (Davenport, 1993). In last decade, this competency have been given importance as it has an ability to develop and use strategic application systems like ES to automate inter or intra organizational processes. An example of this include an IT enabled innovations such as cash management system that transform the nature of financial services and offer significant change in the competitive positioning of a company as compared to its counterparts in the financial services industry. In addition to this, IS transformation competence allow companies to compete in a market by offering unique products and services with reduce operational or production cost but with higher customer value. As a result, these companies enjoy increase financial gains and growth in market share.

The current business environment demands an increasingly high dependence on IS operational competencies to continuously offer unique products and services without any disruptions in an IT enabled business processes. For example, previous studies argue that any small outage in a production system of a company could result in hours of productivity loss and millions of dollars in lost sales (Radding, 1999). As more and more companies have started conducted their business online, it would be devastating if IT support department is unable to offer disruptions free service. Furthermore, financial analysts estimate that any failure of a system can have a major effect not only on sales but also on stock prices (Dalton, 2009; Lasher, et al., 1991). Associated with this are not only tangible losses but also intangible losses that include but not limited to customer trust and customer loyalty towards products or a service (Michalisin, et al., 1997).

In recent years, the role of IS competencies for BPI have increased to create business value (Doherty & Terry, 2009; McElheran, 2011;Tarafdar & Gordon, 2007). The next section explain the role of IS competencies and BPI.

2.4.4 IS competencies and business process innovation

The literature shows that there has been great deal of academic efforts been devoted to better understand how IS resources support improvement to an organization's operational performance (Bharadwaj, 2000; Doherty & Terry, 2009; Ravichandran & Lertwongsatien, 2005a). A considerable large amount of IS studies incorporate the concepts of RBV to suggest that organizations realize the value of using ES by taking into account how different IS competencies create business value. Continuous research follows the same conceptualization and examine the influence of IS competencies and resources on overall firm performance, antecedents of performance including but not limited to supply chain integration, and ability to sustain competitive advantage (Bharadwaj, 2000; Ravichandran & Lertwongsatien, 2005a; Santhanam & Hartono, 2003; Tarafdar & Gordon, 2007; Wade & Hulland, 2004) .

In modern organizations, innovation is largely IT enabled and require an in depth understanding of IS competencies and resources. A large number of studies in IS literature specify different ways in which IT can facilitate and maintain process innovation (Davenport & Short, 1990; Serrano & Hangst, 2005). Even though these studies report important findings but the main focus remain on the role of IT and individual activities (Attaran, 2003; Tarafdar & Gordon, 2007).

Empirical evidence indicates that previous studies have not addressedan integrated and combined effect of technology, IS professionals, managerial arrangements required for successful business process innovation (Doherty & Terry, 2009; Tarafdar & Gordon, 2007). For example, the usage of processing modeling tool without proper managerial collaboration mechanism would not enable process innovation in a company. A successful process innovation occurs when both managerial mechanisms to cultivate the collaboration between experts (people who understand the business and the process) and IS professionals (who understands the use of tool) work side by side.

At the pre-adoption stage, IS competencies play significant role in ensuring that adopted IS function and perform effectively. For example, IS operational competencies increases the company’s ability to deal with IS system failure so that business can function without any disruption (Doherty & Terry, 2009). Similarly, at the post-adoption stage, IS transformational competencies increase a company’s ability to continuously explore new business opportunities through innovation (Davenport, 1993). The literature in strategic management and IS have argued that these competencies positively influence organizational performance and increase rate of innovation in a company(Montealegre, 2002; Peppard & Ward, 2004;Wade & Hulland, 2004).

The role of IS competencies in supporting BPI has been studied in many different filed including but not limited to innovation diffusion (Bofondi & Lotti, 2006; Florkowski & Olivas-Luja´n, 2006), IT strategy (Ross, et al., 1996; Souitaris, 2002), and electronic alliances (Malhotra, Gosain, & El Sawy, 2005; Tikkanen & Renko, 2006; Xie

&Johnston, 2004). However, the impact of IS competencies at the post-adoption stage has not been studied to examine its influence on BPI. The study of this relationship is important to increase the predictive understanding of the phenomenon and realizing the importance of IS competencies at the post-adoption stage. The following section reviews IS literature to explain the categories, type of innovation to describe the innovation literature that is particularly relevant to BPI.

2.5 Innovation

In today's highly competitive business environment, an organization's ability to innovate remains the number one driving force behind long term sustainability. There are many different definitions of innovation in the literature. The most cited definition is provided by Jacob Schmookler in 1966. He defines (Schmookler, 1966) invention as "Every invention is a new combination of pre-existing knowledge which satisfies some want". Peter F. Drucker(1973) explains that "They [organizations] know that innovation is not science or technology, but value. They know that it is not something that takes place within the organization but a change outside. The measure of innovation is the impact on the environment. Innovation in a business enterprise must therefore always be market-focused*"(*pp. 505 – 506).

A quick review of existing definitions (Pinchot, 1985; Roberts, 1987) of invention and innovation reveals that the definitions of invention reflect the same meaning; however, to understand the meaning of innovation requires further understanding of the context in which the term is discussed. There have been many different explanations of innovation in the literature. For example Rothwell(1994) explains the concept of innovation, as a series of five generations of behavior. He explains that the first generation innovation (1G) occurred during the industrial revolution. In this era, innovation came through the huge push of technology to be used for products and means of production. Another name for 1G is the "technology push". The second generation of innovation (2G) occurred when companies shifted their focus to provide for the market/customer. In this era, the market or customer determines the need for products and services and the production systems address their need in different ways. This innovation is also some time referred to as "need pull". The field of marketing also achieved popularity during this era. Third generation innovation (3G) involved uniting push (1G) and (2G) pull models. In this era, the focus was shifted to having a capacity to leverage both 1G and

2G models. In this era, research and development department started working side by side with the marketing department. Fourth generation innovation (4G) demanded that companies develop tight integration between R&D, marketing, suppliers and customers. This generation of innovation allows the companies to respond to market (pull or push) needs and at the same time deliver products and services more efficiently and in less time. The last generation of innovation is referred to as the fifth generation of innovation (5G). This generation of innovation builds on the integrated model. This model is also referred to as system integration and the networking model. This model is a combination of 4G with an addition of having strategic partnership with suppliers, and customers in collaborative marketing and research arrangements. In this generation of innovation, special emphasis is put on the rate at which new products and services are developed with a special focus on quality and other non-price factors.

Literature also categories five different types innovation (Gaynor, 2001) namely; incremental, discontinuous, architectural, system and radical innovation. Incremental innovation relates to minor enhancements or refinements made to the existing tasks, routines, products or services. This is usually being based on the knowledge learned over the time.

Discontinuous innovation relates to introducing a completely new product or service which has never been introduced to market/customer. It is believed by some researchers that incremental innovation leads to discontinuous innovation. Architectural innovation (Henderson & Clark, 1990) is defined as "changing the way in which components of a product are linked together, while leaving the core design concepts and thus the basic knowledge underlying the components". In other words, architectural innovation reconfigures different components into new architecture to achieve better performance. This type of innovation "destroys the usefulness of [the non-innovator's] architectural knowledge, but preserves the usefulness of its knowledge about the product's components". System Innovation takes many years to complete. In this type, input in the form of ideas or resources are required to create new functions by uniting different parts in new ways. The use of automobile engines for two-wheelers is an example of system innovation. Finally, Radical Innovation relates to introduction of new products or services that result in the creation of a major business or unit. Radical innovation is often confused with an incremental innovation. An incremental innovation is introduced based on the existing knowledge and resources within a certain firm. An incremental innovation helps in enhancing the competence of certain firms. On the other hand, a radical innovation requires an introduction of completely new knowledge/resources within a certain firm. Another major difference between incremental and radical innovation involve the level of technology changes and market competiveness. An incremental innovation involves technological changes step by step and hence existing products can remain competitive while a radical innovation involves large technological change and hence existing product may become obsolete and non-competitive. Previous empirical literature suggests that any category of innovation has to relate with type of innovation(Damanpour & Wischnevsky, 2006; Rowley, Baregheh, & Sambrook, 2011). The following section presents different types of innovation followed by a review and identification of gaps in the IS literature regarding process innovation.

2.5.1 Types of Innovation

The concept of type of innovation is central to management and strategy research and practice and hence received considerable amount of attention from many authors (Daft & Becker, 1978; Damanpour, 1987;Damanpour & Wischnevsky, 2006). The result of this is that many different types of models, framework and classification and definitions emerge from these studies. Subsequently, it becomes very difficult to compare, contrast, and integrate different types of definitions used by different authors. This research adapt a recent conceptualization provided by Rowley et al. (2011) in explaining the types of innovation. The development of this list includes the identification, integration, and mapping of the key types innovation using Francis and Bessant's framework (2005). Their model reveals four innovation types namely: product innovation, position innovation, paradigm innovation and process innovation.

Production innovationis mainly concerned with an organization's new service or product offerings (Bessant & Tidd, 2007). According to Rowley et al (2011), this type of innovation include not only product or service but also hybrid innovations. Previous research indicates that hybrid innovation can also be considered as a mix between product and service. Position innovation refers to a generation of value by improving the customer's perception of a service or a product (Bessant & Tidd, 2007). In management and marketing literature, this type of innovation has also been referred to as marketing, commercial or business system innovation (Rowley, et al., 2011). Paradigm innovation refers to changes in the fundamental mental models which frame what an organization accomplish (Bessant & Tidd, 2007). For instance, Starbucks did not invent coffee, but re-position coffee as a premium designer product and hence changed the perception of the product. Process innovation refers to changes in the way in which products or services are generated and delivered (Bessant & Tidd, 2007) . Empirical evidence indicates that innovations in this category can be either of technical nature or administrative nature (Francis & Bessant, 2005). As shown in Table 2.7, previous studies used many different terms for process innovation including but not limited to management, organizational, people, organizational structure, administrative and production. In addition to this, there exists an overlap between management, organizational, administrative and business system innovations, as they all attributes the innovations within the management or administration side or organizational operations. Furthermore, production and technical can overlap because they both relates to the technical side of the operations.

Table 2.7: Innovation type mapping (Rowley et al., 2011)

Francis and Bessant(2005) innovation type model	**Other terms used to describe innovation types**
Product Innovation	Product Hybrid Service Technical
Position Innovation	Business System Commercial Marketing
Paradigm Innovation	
Process Innovation	Business System Management Organizational People Organizational Structure Administrative Production Technical

The following section reviews the type of process innovation identified in IS literature. It includes the review of past development of process innovation in the field of IS.

2.5.2 Information systems and process innovation

The leading work in defining what constitutes Information Systems Innovation is conducted in 1994. In this study, Swanson suggested that the "overall domain of IS innovation may be mapped on two basic dimensions: 1) business impact and 2) technological and organizational feature composition" (Swanson, 1994). His research work extended the dual-core model (technical vs administrative) of organization innovation and present tri-core model of IS innovation. Table 2.8 summarizes the type of IS innovation types identified in his study:

Table 2.8: IS Innovation Types (Swanson, 1994)

Innovation Types	**Description**	**Illustrations**
Type Ia	IS Administrative Process-Innovation	Maintenance Departmentalization
Type Ib	IS Technological Process-Innovation	Systems Programming
Type II	IS Product and Business Administrative Process-Innovation	Accounting Systems
Type IIIa	IS Product and Business Technological Process-Innovation	Airline Reservations Systems
Type IIIb	IS Product and Business Product Innovation	Remote Customer Order Entry
Type IIIc	IS Product and Business Integration Innovation	Electronic Data Interchange

Type I is defined as a process innovation that enhances the efficiency or effectiveness of IS. If the focus is the IS administration, then Type 1a will be used. If the focus is on technical IS tasks, then Type 1b will be highlighted. Some examples include the usage of relational database or object oriented technologies in a company. It is suggested that Type I has a potential to support other business innovations in the company but in a "weak-order effects; they may support but they do don't compel innovation elsewhere" (p.1077). Another example of Type I innovation is software maintenance which is likely to have effects beyond the boundary of the Information Systems unit. Type II innovation contributes in an enhancement of administrative work processes of an organization. Few examples include payroll systems, office productivity software and decision support systems. The main focus of this type of innovation is towards enhancement of administrative tasks and activities. Type III innovation involves integration of IS products and services with an organization core technology. This type of innovation enables firms to gain competitive advantage. An example of Type III innovation includes usage of technology systems like ERP systems in the organization.

In 2004, Erja and Kalle(2004) conducts qualitative research (Mustonen-Ollila & Lyytinen, 2004) in defining the categories of Information Systems Process Innovation (Michalisin, et al.). Their model suggests that ISPI can be divided in to two categories (as shown Figure 2.6)

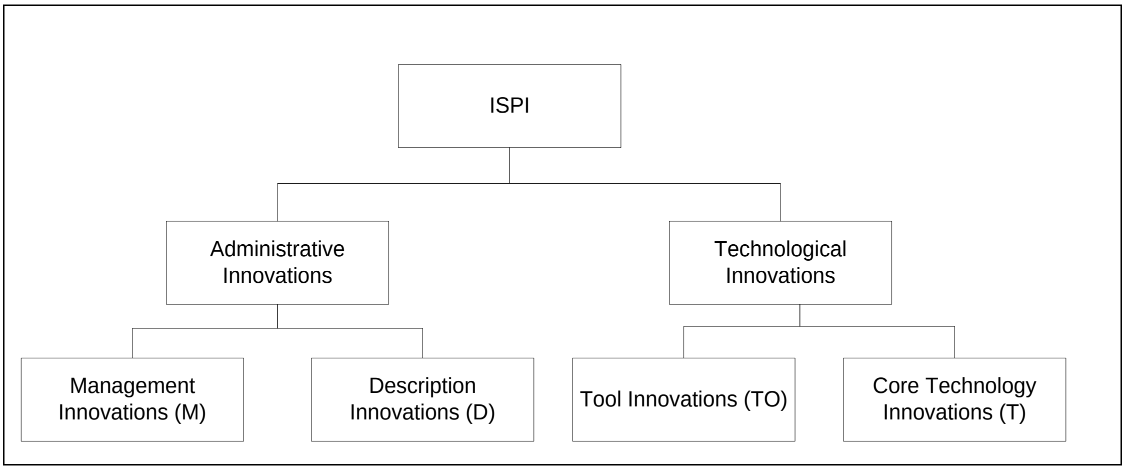

Figure 2.6: Information Systems Process Innovation categories (Mustonen-Ollila&Lyytinen 2004)

They suggest that ISPI cover broad range of innovative activities. Furthermore, they indicate that ISPI can "embrace changes in the technologies that offer new computing functionality or novel non-functional features (like portability, security) for the delivered IS. Typical technological innovations include adoptions of programming languages or operating systems. Likewise, ISPIs can include administrative innovations, such as the deployment of project management methods, the introduction of participative approaches to guide development interactions, or contracting of development work outside" (Mustonen-Ollila & Lyytinen, 2004, p. 37). Their view of Information Systems Process innovation completely aligns with the terminology explained by the previous research (Swanson, 1994). The terminology used by Swanson for these type of innovation were called Type1a(Technological) and Type1b (administrative).

Mustonen-Ollila and Lyytinen(2004) subdivided Type1a and Type 1b into two sub-categories. Administrative innovation is subdivided into Management Innovations (M) and Description Innovations (D) and Technological innovation is subdivided into Tool innovation (TO) and Core Technology Innovations (T). Furthermore, they suggest that this classification is based on the IS development literature that distinguish between organizational innovations (innovate project management principles, new programming techniques) and usage of innovative notational techniques (e.g. Unified Modelling Language) in an organization.

Management innovations (M) deal with bringing changes in the administrative processes that deal with the overall IS development activities. The result of this change can bring improved project management guidelines or new organizational structure. Description innovations (D) deals with bringing changes in the notational systems that can be used for effective communication between different stakeholders of a project. Few examples include the usage of standardize notational techniques like Data flow diagram (DFD) or Unified Modelling Language (UML) in Information Systems development projects. Tool innovations (TO) deal with the adoption of the technology tools to support IS processes. Core Technology (T) innovations deal with bringing improvements in the overall technical infrastructure that is required to deliver IS products. Few examples include the usage of programming language and database management system in an organization. The constant change in technology landscape makes it difficult to sustain this type of innovation for long duration. Although IS literature have explained the IS process innovation (Mustonen-Ollila & Lyytinen, 2004; Swanson, 1994), there is limited information about the BPI in the literature. The following sections reviews the area of BPI in IS and explains how it is confined in organization.

2.6 Business Process Innovation in Information Systems

Business Process Innovation entails different type of knowledge and organizational skills from those demanded by manufacturing or product process. Existing research in management literature focused tremendously on the invention of products and considerably less attention has been focused on process innovation. Business process innovation, has received even less attention in by both IS and management scholars over the past 10 years (McElheran, 2011). Therefore, it is important to be particular about what it entails.

The adoption and diffusion of internet in business has created new opportunities to automate and transform wide variety of business processes both within intra and between firms. In 1990, the movement towards business process reengineering (Hammer, 2004) urge business companies to take advantage of new technologies to explore and create entirely new business practices. Moreover companies take advantage of new technologies and find innovative ways to link information and execute their operating processes in an effort to increase productivity and achieve superior performance. BPI is difficult for competitors to simulate, and has tremendous potential for developing sustainable competitive advantage (Davenport, 2000; Davenport & Short, 1990).

BPI is a type of innovation that "focuses on extracting waste not from offer (product/service) but from the enabling processes that produce it" (Moore, 2008). The goal for this type of innovation is to remove none value-added steps from a business workflow. For instance, Dell's direct-retail and Wal-mart's vendor managed inventory process improve profit margins for their respective companies to maintain competitive advantage. In the context of IS, BPI is defined as "improving the sequencing of work routines and information flow to achieve business improvement" (Srivardhana & Pawlowski, 2007, p. 53) .

One of the challenges in achieving BPI is that it demands novel operational knowledge that can be used to implement the transformation process. Additionally, old routines need to be replaced with unverified techniques. According to Bresnahan and Greenstien(1996), process of invention and co-invention has to work parallel to achieve this kind of innovation. On one hand, companies should expand or obtain particular technology (software/hardware) to support new ways of doing business. On the other hand, companies should also design new business processes and organizational structures to correspond to a newly adopted technology constraints. Consequently, these two interconnected demands can create misalignment between a company existing and new capabilities that are required to implement new technology. Companies are also required to acquire new knowledge and skills to fully exploit the technological opportunities.

Empirical evidence suggest that even a simple automation present significant organizational challenges (Davenport, 1993; Tarafdar & Gordon, 2007) . A paramount advantage of automation is that it guarantees that an implemented process flow will be executed with improved speed and uniformity for every related transaction. Previous studies indicate that innovative ideas can be widely disseminate throughout the organization with high consistency and also create important benefits (Brynjolfsson, et al., 2008). At the same time, as automation requires homogeneous operational practices and related forms of communication, and require careful planning, communication, and negotiation among users. This further creates a pressure to get things right the first time. Previous empirical studies indicate that any simple change by nature is disruptive to existing practices and organizational structures (Nelson & Winter, 1982). The following section further reviews the area of BPI to explain how it is confined in organization and current gaps in the literature following by focusing on the role SSM at the post adoption stage and its influence on BPI.

2.6.1 Institutionalization of business process innovation

According to existing organizational theory literature, companies adopt innovations that are built upon existing knowledge and capabilities (Rowley, et al., 2011). This type of innovation is often described as "incremental" innovations (McElheran, 2011) . Over the past 30 years, this type of innovation has been most widely adopted because it captures a fundamental idea that involves lower organizational and/or economic risk for adopting companies (Gatignon, Tushman, Smith, & Anderson, 2002). Previous studies indicates that companies tend to develop organizational routines and information filters (Nelson & Winter, 1982) based on past experience that manifest organizational condition and knowledge, and develop ways to respond to changes in their business environment. Subsequently, companies gain experience over time, identify and pursue only those innovations that are based on existing knowledge and competencies (Gatignon, et al., 2002). As a result, large companies are more willing and prepared to pursue incremental innovation as compared to small and less established companies.

On the contrary, radical innovation entails new knowledge on the part of adopting company or increase the obsolescence of existing knowledge base (Gatignon, et al., 2002). This type also demands a complete set of new knowledge and core competencies from a company to manage and utilize new technology. Empirical evidence suggest that these type of innovations are more challenging to implement (Henderson & Cockburn, 1994). For example, large companies may have less incentive to invest if the implication of radical innovation has negative effect on existing revenue streams. Other explanations for resistance in adopting radical innovation is lack of organizational capabilities and not having a proper justification on why to acquire a new one when radical innovation has a tendency to superannuate an existing knowledge base. Companies that focus on existing path to increase profits or maintain existing customer base generally fail to identify their misalignment with new technological realities

(Tripsas & Gavetti, 2000). Other reasons include but not limited to not putting efforts to develop new knowledge, resource or routines because perceived notion is that it is too costly and risky to implement.

A multidimensional integrative model of innovation (Cooper, 1998) suggest that any innovation type has some aspect of other types of innovation. For example, process innovation can possess combined attributed of radical or incremental, and administrative and technological. Regardless of the type of innovation, the challenges of BPI further increase when an associated business process are more complex, shares interdependencies with other business functions in the company , and has high effect on a customer. Under this situation, any misalignment between new and old knowledge, skills and capabilities is likely to create a kind of economic or organizational risk that have attributes similar to radical innovation.

To start with, any change to a complex business process requires in-depth, and advanced procedural and organizational knowledge than to perform a simple adjustment. In the same sense, supporting technology for more complex business routines and organizational structure, and optimizing internal business processes prescribes more information input across the company as well as complicated operational know how of overall business process. In other words, BPI demands high level of inter-functional coordination and greater managerial skills. Empirical evidence confirms that total cost of creating alignment between new IT systems and the adopting organization through co-invention tends to be higher when sophisticated processes are involved (Bresnahan & Greenstein, 1996).

Empirically, prior research indicates that huge challenges arise when there are interdependencies between different components of a product, process or service. For example, any simple change in product architecture will have effect on the overall product. Moreover as all the component are linked, any change in the linkage will be mainly destructive for reputable companies (Henderson, 1990). Similarly, in the case of business process, different set of activities that operate are dependent on each other within the company. Any simple change in a business process will have a ripple effect because all processes are tightly coupled with others. This type of disruption in inter process linkages would then affect not only the process performance but also performance of the whole company. Previous studies indicates that any change in a process require a complimentary innovation in other part of the process or other area of the company (Milgrom & Roberts, 1990). It leads to a demand in terms of coordination and amount of knowledge required to implement change. It also raises stake in the likelihood and cost of failure associated with implementing change. In the cases where internet enabled process innovation are considered, upgrading a process to implement changes like reducing the process times, finished inventory , or buffers such as work in progress tends to further tighten the couplings among different operations. The literature indicates that any change in one area is even more risky because of its interdependence nature and may cost significant cost to the company (Brynjolfsson, et al., 2008).

When a business process innovation occur, it is not only the inter linkages that matter but also the external linkages that matter as well. In other words, a change in a business process would have a direct effect on customers. It is comparatively easy to manage a change within organization because all primary stakeholders function within the boundaries of same company. For instance, a proper organizational hierarchy and share culture may be able to facilitate decision making and an implementation of newly adopted interdependent process. These techniques would not work because business processes cross company boundaries. The cost and risk associated with implementing a change in a business process in cross company boundaries increase dramatically because of tight integration of a process with the rest of value chain. Empirically, previous studies show that the greater the strength of inter-company linkages, the greater is the difficulty of managing the business process change (Davenport, 1993).

2.6.2 System support andmaintenance and business process innovation

The goal of BPI is to "use change levers to radically improve key business processes" (Davenport, 1993, p. 142). At the post-adoption stage, these change levers refers to IS competencies (Duhan, 2001; McElheran, 2011; Mustonen-Ollila & Lyytinen, 2004; Saeed & Abdinnour-Helm, 2008; Swanson, 1994; Tarafdar & Gordon, 2007) that have an effects on the antecedents of company performance, such as BPI, supply chain management, and ability to sustain competitive advantage (Bharadwaj, 2000; Pavlou, Liang, & Xue, 2007; Santhanam & Hartono, 2003; Tarafdar & Gordon, 2007; Wade & Hulland, 2004).

In the context of this research, one of the change lever include a competency in SSM that radically improve key business processes (Chapin, et al., 2001; Dekleva, 1992; Khan & Zheng, 2005; Parikh, 1986; Rashid, et al., 2010; Wang, et al., 2011). Previous literature suggest that proper functioning of business operations demand a high degree of IT support department involvement to support and maintain the system, and their ability to respond to quickly in the case of outages (Chapin, et al., 2001; Khan & Zheng, 2005). The competency in SSM is an important one because all organizations have to undertake SSM to bring innovation in their business processes (El-Sawy, et al., 2010). Furthermore, the importance of this competency has increased as internet diffusion creates new opportunities for businesses to transform and automate their business processes within and between firms. It is through SSM that companies may find innovative ways to link information or operational processes to dramatically improve company performance(Chapin, et al., 2001; McElheran, 2011).

As much of the innovation in business relies on IS/IT, other change levers in this case include the IS competencies that can transform a company in such a way that it is then capable of using IT, and at the same time have a control over the deployment and use of IT, so that all the business operations run smoothly and free of disruptions(McElheran, 2011; Piller & Christoph, 2009; Rowley, et al., 2011; Srivardhana & Pawlowski, 2007). This is a basic premise of this research is that a company's competitive advantage can be explained by how competent it is in supporting and maintaining anIS at the post adoption stage and their abilities to adopt BPI. This is possible when organizations act on knowledge learned at the pre-adoption stage and bring innovation in products and processes to remain competitive in the marketplace. (Doherty & Terry, 2009; Srivardhana & Pawlowski, 2007; Teece, 2007)

Empirically, previous studies indicates that pre-adoption IS competencies of IS department in developing, managing and leveraging IT are likely to have a positive effect on overall company performance (Bharadwaj, 2000; Ravichandran & Lertwongsatien, 2000, 2005a; Rockart & Hoffman, 1992). Although previous research has established the links between IS competencies and BPI, however, no study has investigated the influence of SSM on BPI at the post adoption stage of ES. Several studies have called for additional research to examine this area (Damanpour & Gopalakrishnan, 2001; Davenport, 1993; Fichman & Kemerer, 1997; McElheran, 2011;

Mustonen-Ollila & Lyytinen, 2004; Saeed & Abdinnour-Helm, 2008; Srivardhana & Pawlowski, 2007; Tarafdar & Gordon, 2007).

2.7 Chapter Summary

This chapter presented a literature review for the purpose of initiating theoretical foundations for this research. In this chapter, relevant literature is presented to explain the post-adoption stage, role of SSM at the post-adoption stage, and how post-adoption IS competencies contribute in adopting BPI. Subsequently, the theoretical rationale is presented by explaining the role of IS capabilities, IS resources and IS competencies to achieve innovation. In the last section, detailed literature is presented on BPI, how it relates in the context of this study.

This literature review has yielded the theoretical foundation of the research that is to examine and understand post-adoption IS competency of SSM and its role in achieving BPI. The theoretical foundation is presented in order to facilitate the development of the conceptual model.

Chapter 3: Conceptual Model and Research Hypotheses

3.1 Chapter Overview

This chapter discusses the development of a research model and classifies research hypotheses that are used to validate the model. The first section presents the research model and revisits the research questions used in this study. This is followed by the details of the development of the research model based on the extant literature discussed in the previous chapter. The chapter concludes with an in depth discussion of all the constructs as well as an explanation of the development of the research hypothesis.

3.2 Research Model

Much of the IS literature that relies on the RBV typically undertakes to measure the competitive or economic impacts of supplemental resources at the enterprise level (Bharadwaj, 2000; Bhatt & Grover, 2005; Lin, 2007; Ravichandran & Lertwongsatien, 2005b; Rivard, Raymond, & Verreault, 2006; Santhanam & Hartono, 2003; Zhang, Sarker, & Sarker, 2008). Even though these studies highlight new and interesting insights, there are critics who indicate that these studies do not properly adopt the aggregate-level of analysis, which in turn leads to deluded decisions (Barua, Kriebel, & Mukhopadhyay, 1995; Doherty & Terry, 2009; Ray, Barney, & Muhanna, 2004). Some scholars, including Piccoli and Ives (2005), suggest conducting additional studies that investigate the competitive effects of IS resources and competencies that use 'individual strategic initiatives' as the unit of analysis. To date, this has not been addressed in the IS literature. Furthermore, while it has also been identified in the literature that IS resources and competencies at the system adoption stage affect firm performance and increase competitiveness, exploring the IS resources and competencies at the post-adoption stage has been ignored (Saeed & Abdinnour-Helm, 2008; Santhanam & Hartono, 2003; Wade & Hulland, 2004).

As mentioned in Chapter 2, this research draws its theoretical basis from an extension of the RBV of IS, namely a Competency Based Perspective of strategy; to assess how post-adoption IS competencies would contribute to BPI. In the past, the RBV of IS has been applied to identify specific IS competencies that influence product, service or process innovation (Broadbent, Weill, & Clair, 1999; Kogut & Zander, 1992).

In general, competencies are created when a mixture of resources are applied together to develop particular organizational abilities (Teece, et al., 1997). In other words, competencies are a company's ability to organize resources in combination to create the capacity to achieve a desired organizational objective. Competencies are a company's unique abilities created through combining resources in unique ways, and through particular organizational routines (Amit & Schoemaker, 1993; Prahalad & Hamel, 1990). Empirical evidence indicates that competencies help companies to achieve superior performance and are distinctive to a company (Conner, 1991; Prahalad & Hamel, 1990). In addition to this, competencies are difficult to imitate because they are rooted deeply within the company's culture and routines (Day, 1994). Furthermore, competencies are path-dependent in an organization and not always transparent (Barney, 1991; Ray, Barney, & Muhanna, 2005).

Within an IS context, IS competency is developed when business processes and organizational structure are applied in a non-transparent way in combination with IS resources, to create particular types of abilities to accomplish IS-related organizational tasks(Teece, 2007). Similar to other competencies, IS competencies are embedded in organizational processes and business routines. Existing IS research suggests that IS competencies positively influence organizational performance (Montealegre, 2002; Peppard & Ward, 2004; Wade & Hulland, 2004).

IS competencies play a significant role in facilitating Business Process Innovation (Tarafdar & Gordon, 2007). As BPI is an aspect of process innovation and business innovation, it is important to examine the role of IScompetencies not only in BPI, but also in process innovation as well as business innovation in general. Previous empirical studies suggest that when a combination of IS-related resources (technical, human and intangible)are applied together to create IS competency in an organization,it also helps facilitate business innovation, process innovation, and BPI(Malhotra, 2004; Ramiller & Swanson, 2003). Even though many studies in the IS literature do not make reference toa RBV, it is apparent that IS competencies are derived from the IS-related human, technical, or intangible resources of a company. The role of IS competencies in supporting BPI has been studied in many different fields including but not limited to innovation diffusion (Bofondi & Lotti, 2006; Florkowski & Olivas-Luja´n, 2006), IT strategy (Ross, et al., 1996; Souitaris, 2002), and electronic alliances (Malhotra, et al., 2005; Tikkanen & Renko, 2006; Xie & Johnston, 2004).

Based on the above discussion, the Competency Based Perspective in IS was used to examine the influence of post-adoption IS competency of SSM and its relationship with BPI. The research model presented in Figure 3.1 was thus created by applying three steps. Section 3.4 provides a detailed discussion of each of these three steps.

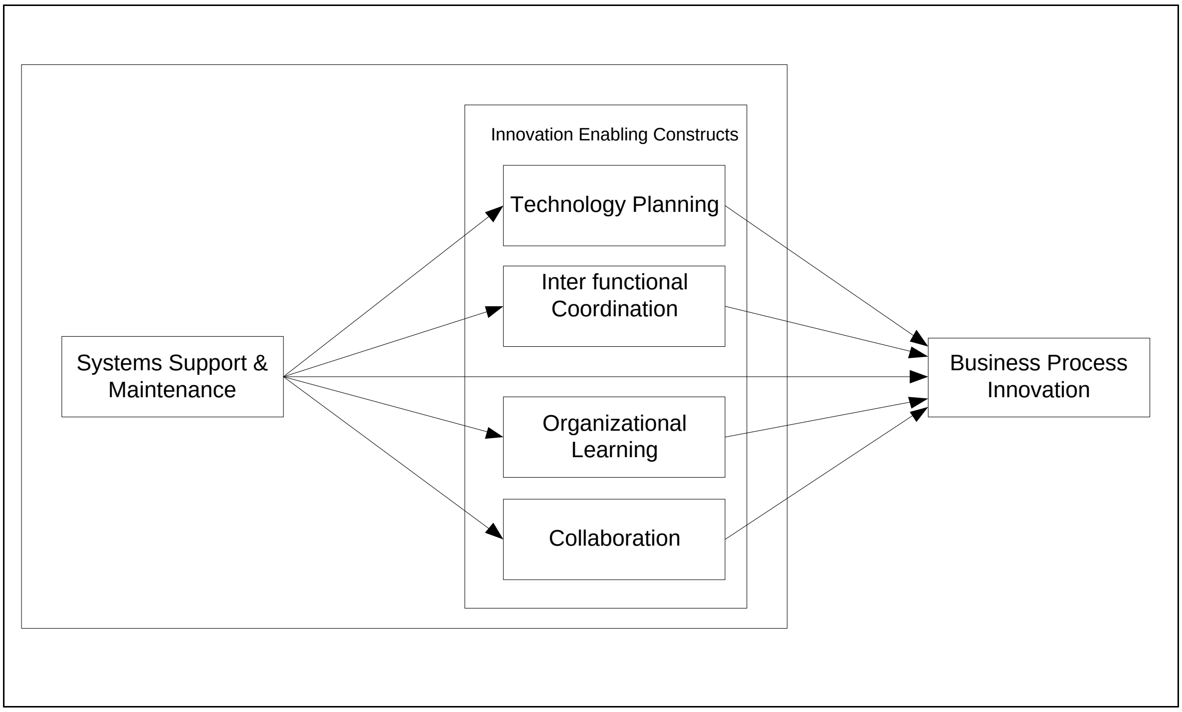

Figure 3.1: Research Model

There are total of 6 variables/constructs in the research model. Table 3.1 shows the independent, mediated and dependent variable in the research model.

Table 3.1: Research Variables

Independent Variable	Mediating Variables	Dependent Variable
Systems Support and Maintenance	• Technology Planning • Inter-functional Coordination • Organizational Learning • Collaboration	Business Process Innovation

The following section presents a brief review of the research question that guided this study, followed by an in-depth discussion ofthe identification of research variables and concludes withan explanation of the development of the research hypothesis.

3.3 Research Questions Revisited

As mentioned in Chapter 1, this study was guided by the main research question "*What factors influence Business Process Innovation at the post-adoption stage?*" This literature review chapter provides the foundation for the development of the research question and the development of the conceptual model. This study drew upon the RBV to identify how SSM and other IS competencies at the post-adoption stage influence BPI. This study makes an important departure from the organizational-level orientation of previous studies, by focusing on the role of post-adoption IS-competencies in achieving BPI through an individual initiatives(Doherty & Terry, 2009; Piccoli & Ives, 2005).

Consequently, in order to answer the above question, the sub research questions that were considered in the empirical phases of the study were as follows:

- To what extent does System Support and Maintenance influence Business Process Innovation?
- To what extent do Organization Learning, Technology Planning, Inter-functional Coordination, and Collaboration influence Business Process Innovation?
- To what extent does System Support and Maintenance influence Organization Learning, Technology Planning, Inter-functional Coordination, and Collaboration?

Besides answering the above questions, this research will contribute to the existing body of knowledge in the identification of competencies to achieve BPI. A detailed discussion of the contribution of this research to the work of academics and practitioners is presented in Chapter 8.

3.4 Research Model Variables

As aforementioned, this study drew upon the RBV to examine the effect of SSM on BPI at the post-adoption stage, and also examined how this influence is mediated by IS competencies.

To do this, three steps were used in the identification of innovation enabling variable/constructs. The first step involved a thorough literature review of IS competencies at the post-adoption stage. The second step involved the identification of innovation-enabling constructs that affect Business Process Innovation. The third step involvedtaking a critical review of available competencies, activities and roles and identifying only those constructs that are likely to affect BPI at the post-adoption stage. Each causal link is explained in detail in Section 3.5.

While selecting the research variables for the research model, the study objective was to draw from the IS literature a widespread set of the IS competencies required at the post-adoption stage, hereafter referred to as 'innovation enabling constructs', which could be analyzed to investigate whether the variables result in process innovation. The review of existing literature revealed that the innovation enabling constructs that appear in the RBV literature are overlapping; and in addition are referred to using inconsistent terminology (Tarafdar & Gordon, 2007). In this case, previous studies suggest first identifying a list of innovation enabling constructs that are relevant to the context under investigation (Ray, et al., 2004). A considerable amount of studies in the IS literature have used this technique in the past (Henderson & Cockburn, 1994; Schroeder, Bates, & Junttila, 2002; Tarafdar & Gordon, 2007).

This study adopted a technique similar to hierarchal clustering to find patterns in the literature to identify post-adoption IS competencies (Bernard & Ryan, 1998) in addition to SSM. It is a positivist approach to analyzing qualitative data which focuses on reducing text to codes (Bernard & Ryan, 1998; Dey, 1993). It has been widely used by IS researchers and many methods have been put forward to analyze textual data (LeCompte & Schensul, 1999; Tarafdar & Gordon, 2007). At a very basic level, it is a content analysis technique to determine the frequency of particular words or phrases in the text. Word counts can be extended to incorporate associated attributes of keywords, such as synonyms, surrounding words or phrases, or location in the text. Previous studies have used this technique to categorize items in order to have distinct groups that represent identical objects (Jain, Chalimeda, Ivaturi, & Reddy, 2001; Lee, Jung, Kim, Jang, & Ham, 2001; Tarafdar & Gordon, 2007).

To start with, the terms that were most closely related to the context of this study were grouped together into one. This was iteratively applied until no further grouping was possible. In many cases, the term did not relate to the context of the study and hence was omitted from the selection. For example, even though Business and IS Linkage (Mark & Monnoyer, 2004) is identified in the literature as one of the competencies that influences process innovation, it was regarded as irrelevant in the context of this study. This construct would be more relevant if the focus of the study was to establish a close connection between businesses and IS professionals in order to bring innovation into products, processes or services. In such cases, it would be appropriate to consider this construct because innovation would not occur without business and IS linkage (Tarafdar & Gordon, 2007). Similarly, Mustonen-Ollila and Lyytinen(2004) explain that innovative activity triggers other types of innovations that can lead to social and technical design. They further explain that while an introduction of the software tools that aid in software engineering may bring changes in the organizational principles of software engineering, those tools are less likely to bring about innovation in business processes (Mustonen-Ollila & Lyytinen, 2004) . Moreover, this research drew on strategic management literature to create a list of innovation-enabling activities, roles and competencies that could affect process innovation, as shown in Table 3.2 and Table 3.3.

Table 3.2: IS Competencies in Enabling Process Innovation

Source	Innovation-enabling Competencies
Tarafdar& Gordon (2007)	Knowledge Management Collaboration Project Management Ambidexterity IT/innovation governance Business IS Linkage Process Modeling
Ray et al. (2005)	Shared knowledge IT infrastructure flexibility
Ravichandran and Lertwongsatien(2005a)	IS planning sophistication System Development Capability IS support maturity IS operations capability
Bhatt and Grover (2005)	IT Infrastructure IT business experience Relationship infrastructure
Wade and Hulland(2004)	External relationships management Market responsiveness

	IS business partnerships IS planning and change management IS infrastructure IS technical skills IS development capability Operational efficiency
Ray et al. (2004)	Managerial IT Knowledge
Peppard and Ward (2004)	Exploitation Deliver solutions Supply
Montealegre(2002)	Strategy formulation IS Strategy IT Strategy
Broadbent et al. (1999)	Infrastructure Management
Kogut and Zander (1992)	Combinative ability

Once the grouping was finished, four steps were taken to select IS competencies variables/constructs. The first step involved a thorough review of the literature addressing competencies, which was analyzed to examine whether the variables had an impact on process innovation. The review of existing literature revealed that IS competencies constructs appear in the RBV literature as overlapping constructs, and are referred to with inconsistent terminology (Tarafdar & Gordon, 2007). In this case, previous studies suggest first identifying a list of constructs that are relevant to the context under investigation (Ray, et al., 2004).

Table 3.3: IS Activities and Roles in Enabling Process Innovation

Source	**Innovation-enabling Activities & Roles**
Shin (2006)	Inter-Organizational systems
Karahanna and Watson (2006)	IS Leadership
Gebauer&Schober(2006)	Flexibility
Marjanovic(2005)	Knowledge Management Coordination
Mustonen-Ollila and Lyytinen(2004)	Knowledge Transfer Mechanisms Slack IS resources
Attaran(2003)	Infrastructure flexibility Communication Coordination Project Management Process Analysis

The second step involved the selection of IS competencies that relate to BPI. Previous empirical studies that different types of factors are likely to influence process innovation (McElheran, 2011). For example, factors such as combinative ability and knowledge management have already been identified in previous studies (Bhatt, 2000; Kogut & Zander, 1992; Savory, 2006) as being likely to influence process innovation. Attaran(2003) and Marjanovic(2005) identify coordination as one of the innovation-enabling constructs. In a similar way, other factors like governance (Kor & Mahoney, 2005; Sawhney & Prandelli, 2000) would also be likely to influence process innovation.

Once the selection of the IS competencies available in the literature was completed, the next step was to separate them based on the IS Implementation Process model (Kwon & Zmud, 1987). This step further separates the pre-adoption process innovation factors and post-adoption process innovation factors. The separation was important within the context of this study as it aimed to explore only those innovation-enabling constructs that influence process innovation at the post-adoption stage. To give an example, project management (Tarafdar & Gordon, 2007) is identified as one of the IS competencies that does not have any effect on process innovation at the post-adoption stage. In addition, project management and business IS linkage competencies may pose problems in the overall innovation process (Tarafdar & Gordon, 2007). Table 3.4 shows the innovation enabling constructs identified in relation to IS implementation process model.

The fourth step involved the selection of available factors based on the empirical evidence. The outcome of this step resulted in the selection of only those constructs/variables that were regarded as being likely to have a positive effect on BPI at the post-adoption stage. This step further reduced the number of constructs to only those which contribute to successful BPI.

Table 3.4: Identification of Innovation Enabling Constructs relating to the IS implementation Process model

Studies that identify innovation enabling factors relating topost-adoption stage		
Stage	**Constructs**	**Source**
Post-adoption	Systems Support & Maintenance, Technology Planning, Inter-functional Coordination, Organizational Learning	(Adamides & Karacapilides, 2006; Al-Mashari & Zairi, 2000; Bassellier & Benbasat, 2004; Bhatt, 2000; Corso & Paolucci, 2001; Den Hengst & de Vreede, 2004; Fairbank, Labianca, Steensma, & Metters, 2006; Malhotra, et al., 2005; Marjanovic, 2005; Mustonen-Ollila & Lyytinen, 2004; Prasad, 2000; Savory, 2006; Shin, 2006; Tarafdar & Gordon, 2007; Zahra & George, 2002)

Four innovation enabling constructs for BPI were thus identified, namely: Technology Planning; Inter-functional Coordination; Organizational Learning; and Collaboration. Using the aforementioned steps, these constructs were identified as bringing about BPI at the post-adoption phase. The research model was designed to explore whether these variables and SSM do in fact have an effect on BPI. The remainder of this chapter describes previously identified IS competencies and provides a detailed explanation about the inclusion of these IS competencies in the model.

3.5 Research Hypotheses

This section first presents the definitions of the research variables used in this study, followed by a description of the development of the research hypotheses. The role of each variable in the research model is explained along with its reference in the literature. Moreover, the anticipated relationships between the different variables are stated in the form of hypotheses, with the support of the relevant literature.

Table 3.5: Definition of Research Variables

Variable	Definition	Reference
System Support and Maintenance (SSM)	SSM is the work of continuously managing, changing and supporting maintenance objects where IT systems are integral parts, for the purpose of securing the intended business value and accessibility	(Iacovou, Benbasat, & Dexter, 1995; Karimi, Somers, & Bhattacherjee, 2009; Overby, et al., 2006).
Technology Planning (TP)	TP is the process of planning the technical evolution of a program or system to achieve its future vision or end-state	(Segars & Grover, 1998)
Inter-functional Coordination (IN)	IN is the managing of dependencies between activities	(Malone & Crowston, 1994)
Organizational Learning (OL)	OL is processes within an organization to maintain or improve performance based on experience	(Nevis & DiBella, 1995)
Collaboration (CO)	CO is a recursive process where two or more people or organizations work together in an intersection of common goals	(Tarafdar & Gordon, 2007)
Business Process Innovation (BPI)	BPI is improving the sequencing of work routines and information flow to achieve improvement in key business processes. The aim of BPI is to use change levers to radically improve key business processes	(Daft, 1982; Grover & Ramanlal, 1999)

3.5.1 System support andmaintenance

SSM is referred to as a type of IS competency at the operational level (Tippins & Sohi, 2003) . This competency relates to company's ability to deal with any type of information systems-related failure and provide a disruption free business environment (Doherty & Terry, 2009)**.** In modern the business environment, companies depend on

IT systems', as well as information systems', operational competencies. It has become one key point of differentiation among their competitors, as well as a strategic capability. Additionally, companies heavily depend on IT support departments to provide a disruption free environment since the majority of core business processes are enabled by IT systems. In the majority of cases, the efficiency of core business processes depend on the IS department's ability to run IT systems and reliably maintain them, and its ability to take action in the case of unexpected outages.

As mentioned in Chapter 2, the aim of BPI is to "use change levers to radically improve key business processes" (Davenport, 1993, p. 142). At the post-adoption stage, these "change levers" refer to the IS competencies which have an effect on overall company performance as well on the antecedents of company performance, such as BPI, effective supply chain management, and the ability to sustain competitive advantage (Bharadwaj, 2000; Pavlou, et al., 2007; Santhanam & Hartono, 2003; Tarafdar & Gordon, 2007; Wade & Hulland, 2004). In the context of this research, change levers are referred to as post-adoption IS competencies of System Support and Maintenance (SSM) along with other innovation enabling constructs identified previously that can be used to radically improve key business processes.

This study was concerned with organizational readiness towards providing effective and efficient SSM. In the IS literature, the term 'readiness' is defined as the availability of needed organizational resources (Barua, Konana, Whinston, & Yin, 2004). Several IT adoption studies (Crook & Kumar, 1998; Grover, 2000; Grover & Ramanlal, 1999; Premkumar & Potter, 1995; Saunders & Clark, 1992) argue that lack of internal organizational readiness limits the IT adoption rate. Similarly, this study presumed that lack of organizational readiness towards providing post-adoption service limits an organization's ability to innovate and gain a competitive advantage. Several studies (Klein & Kozlowski, 2000; Weiner, 2009) argue that readiness has to be considered through organizational and digital aspects. This study followed the same guideline and proposed that SSM includes both 'organizational' and 'digital option' aspects.

The 'organizational aspect' describes the "level of preparedness of an organization" to provide the SSM service. This includes the combination of the IS technical and human resources to support the SSM (Iacovou, et al., 1995). The 'digital option aspect' refers to the reach and richness of organizational knowledge available to an individual

(Overby, et al., 2006). According to Overby et al. (2006), this aspect has to include the "comprehensiveness and accessibility of codified knowledge that is available to an individual" (Overby, et al., 2006, p. 121), and the quality of the information available to the individual to support their work (Karimi, et al., 2009). The term 'option' is used here because the available knowledge can be used or remain unused in the company. An individual will have the option to access the available knowledge or ignore it for use in maintenance operations**.**

Extant empirical research has shown that the importance of IS operational competencies has been increasingly emphasized with the growing maturity of IT systems used in core business processes (McElheran, 2011; Ray, et al., 2005). For example, the proper functioning of business operations demands a high degree of involvement by the IT support department; an ability to support and maintain the system; and to respond to quickly in the case of outages. This was a basic premise of this research that explains the influence of competency in SSM on BPI (Bresnahan & Greenstein, 1996).

Based on the above discussion, the following hypothesis was proposed:
H1: System Support and Maintenance positively influences Business Process Innovation.

At the post-adoption stage, one of the challenges arising is when new operational knowledge demands a transformation process because existing business routines are replaced with unproven techniques (McElheran, 2011). In other words, any change in core business processes requires a company to first develop and acquire the right technology to support new ways of doing business (Bresnahan & Greenstein, 1996; Tarafdar & Gordon, 2007). In turn, when companies develop new organizational structures or business processes, existing IS competencies for supporting and maintaining the system have to be upgraded so that new knowledge and skills can be used to access new technological opportunities (Srivardhana & Pawlowski, 2007).

Markus and Tanis (2000) suggest that the ES's 'onward and upward' stage is one where an organization discovers the true benefit of its system investment. This phase (Markus & Tanis, 2000) is aligned with the stages of the traditional systems development lifecycle (Nah, et al., 2001) and IS implementation process models (Cooper & Zmud, 1990; Kwon & Zmud, 1987). The literature on technology planning and integration

(Hoffman, 1996) suggests that competency in SSM, at the onward and upward phase, plays a key role in assessing the benefits of the system (Chapin, et al., 2001); enhancing user skills and supporting technology plans (Phaal, Farrukh, & Probert, 2004). For example, Paul (1994) mentions that teachers in the education sector play an active role in providing system support in order to recognize and determine organizational opportunities and resource requirements for better technology planning. Moreover, a larger number of masters and doctoral students in education institutions (Garbosky, 1994; Vitchoff, 1989) are called to serve as support personnel to pursue funds for new technology, and identify and assess further technology needs of an individual teacher or department (Russell, Sorge, & Brickner, 1994). Furthermore, at the post-adoption stage, one of the purposes of SSM is to assess the system's capacity (Segars & Grover, 1998). This assessment provides an important indicator of system effectiveness and plays an important role in technology planning for better utilization (Boynton & Zmud, 1987; Boynton, et al., 1994).

Based on the above discussion, the following hypothesis was proposed:
H2: System Support and Maintenance positively influences Technology Planning.

Business processes reside in different sets of activities which are dependent on each other within a company. More specifically, a simple change in a business process will have a ripple effect, as all business processes are tightly coupled with others. As a result, it raises the demand of the Inter-functional Coordination (IN) and knowledge required to implement the change. At the post-adoption stage, a change in a business process triggered by SSM further raises level of IN. One of the reason is that all business processes are operationally interdependent, and any change in one business process, requires a high level of IN to make sure the risks are mitigated (Henderson & Cockburn, 1994; McElheran, 2011).

Grudin(1994) suggest that high level of IN is required in a group's work system to keep it functioning. A change in a process or a system requires a group's members to engage with each other for the purpose of managing or controlling the impact of change. With ES, where multiple groups are involved, any simple change as a result of SSM requires an even higher level of IN (Dourish & Bellotti, 1992). At the post-adoption stage, if disagreements are not resolved or issues are not clarified it can result in conflict (Franco et al., 1995) that may disrupt overall business operations and limit the capacity to innovate (McElheran, 2011).

Based on the above discussion, the following hypothesis was proposed:
H3: System Support and Maintenance positively influences Inter-functional Coordination.

In this study, Organizational Learning (OL) is defined as the "processes within an organization to maintain or improve performance based on experience" (Nevis & DiBella, 1995, p. 75). As a company's experience grows, so does its competency in bringing innovation into its products or processes. For example, when an organization learns through acquisition, communication and exploitation of knowledge, it increases the organizational ability to innovate (Hurley & Hult, 1998). In other words, the better a company's OL processes are, the greater would be its capacity to develop product or process innovation (Damanpour, 1991; Damanpour & Gopalakrishnan, 2001). In addition to this, OL would enable companies to repeat the experiences, allow them to analyze mistakes and build the capacity to do experimentation and innovate that would result in the organization learning, improving its performance and retaining its competitive advantage. According to Kolb's learning cycle (1984), an organization has to go through a cycle of five stages, namely: experiencing; reflecting; planning; deciding; and acting; to learn anything. Similarly, at the post-adoption stage, an organization learns and relearns to apply the gained knowledge acquired through SSM into actions.

Markus and Tanis (2000) explain that in the ES's onward and upward stage, organizations may be able to decide that the investment has been unsuccessful in meeting goals or business needs through SSM. The knowledge and experience generated through SSM enable companies to unlearn (Nystrom & Starbuck, 1984) and re-learn in an informed way.Although maintenance is considered an operational function of an organization's operations, it does have strategic dimension(Tsang, 1998), that is, the ability to re-learn in order to improve performance based on knowledge and experience.

Based on the above discussion, the following hypothesis was proposed:
H4: System Support and Maintenance positively influences the Organization Learning.

At the post-adoption stage, a successful BPI would occur when managerial mechanisms to cultivate the collaboration (CO) between experts (people who understand the business and the process) and IS professionals (who understands the use of the tool) work side by side. According to Bresnahan and Greenstien(1996), the processes of invention and co-invention have to work in parallel to achieve BPI. On the one hand, companies need to increase the CO between experts and IS professionals to expand or obtain particular IT systems to support the new way of doing business. On the other hand, companies need to also design new business processes and organizational structures to correspond with the newly adopted technology constraints. In other words, SSM increases the level of CO that then facilitates bringing about BPI.

Empirical evidence indicates that an increased level of CO is required at the initial stage of system development (Conger, 2011). The outcome of effective CO results in the development of a system within budget and on time. Similarly, at the post-adoption stage, SSM further increases the need for collaboration between different stakeholders. For example, Noel and Robert (2003) suggest that effective CO is a reason that many collaborative information environments, like Wikipedia, maintain a high quality of content even after multiple rounds of content maintenance. Researchers suggest SSM further increases the demand (Dekleva, 1992) for CO so that value can be created to achieve the objectives of an organization (Rosen, 2007; Tapscott & Williams, 2008; Tikkanen & Renko, 2006).

Based on the above discussion, the following hypothesis was proposed:

H5: System Support and Maintenance positively influences Collaboration

3.5.2Technology planning

There has been considerable attention given in the literature to developing methodologies for conducting strategic Technology Planning (TP). These methods are generally designed to support IS planners in aligning their strategies with those of the organization (King, 1988; Segars & Grover, 1998). These methods also aid planners to determine opportunities to use technology for improving processes or gaining competitive advantage (Goodhue, Kirsch, Quillard, & Wybo, 1992; Porter & Linde, 1995). Furthermore, some scholars suggest that TP activities have some similarities with overall organizational strategic planning, and thus should be evaluated and operationalized in a similar fashion (Venkatraman & Ramanujam, 1987).

Generally TP requires a considerable amount of IS technical resources including, but not limited to, time and budget. Accordingly, the TP process should be able to deliver benefits that would contribute to overall organizational effectiveness (King, 1988; Segars & Grover, 1998). These benefits are quantifiable, with tangible benefits like financial measures that include payback or return on investment. Cusumon and Elenkov(1994) suggest that a firm's ability to develop incremental innovation depends on its technical capabilities such as system planning, design development and maintenance. Empirical evidence suggests that these technical capabilities are developed when serious attention is given to the technological planning phase. The technological development and quality management literature further suggests that TP plays an important role in building technological innovation (Garvin, 1988; Panizzolo, 1998; Song & Montoya-Weiss, 1998a).

Based on the above discussion, the following hypothesis was proposed:

H6: Technology planning positively influences Business Process Innovation

3.5.3 Inter- functional coordination

Wheelwright and Clark (1992, p. 2) identifies that interface management is required to achieve successful technology innovation. Interface management "manages the problems that often occur among people, departments, and disciplines rather than within the team" (Wideman, 2002, p. 144). For example, interface management includes the reduction of project conflicts among project participants through close coordination, and the improvement in the quality of physical connections between building components. Furthermore, Thompson (1967, p. 92) defined coordination as an activity "to ensure concerted action in a situation of dependency". Another definition of coordination states that "coordination is the managing of dependencies between activities" (Malone & Crowston, 1994). Several studies suggest that increased inter-functional coordination improves the management process and reduces the information asymmetry (Grinstein, 2008; Jelinek & Schoonhoven, 1990; Moenaert, Souder, Meyer, & Deschoolmeister, 1994). Grinstein (2008) argues that increased Inter-functional Coordination (IN) is one of the critical factors for achieving BPI.

Based on the above discussion, the following hypothesis was proposed:

H7: Inter functional Coordination positively influences Business Process Innovation

3.5.4 Organizational learning

Organization Learning (OL) is a research area that studies the way an organization learns and adapts. Senge(1990) argues that OL need to be considered as a strategic means of achieving long-term organizational success. The literature has suggested different ways to measure learning(Yelle, 1979). For example, Foster (1986) proposed the S-shaped learning curve model to measure learning. However, Garvin (1993) argues that these measuring tools are incomplete. Furthermore, several other researchers including Slater and Naver(1994) and Pilar et al. (2005) argue that OL is a latent multidimensional construct.

Takeuchi and Nonaka(1995) argue that OL development should be based on well-structured knowledge. Garratt (1990) suggests that OL capabilities are required to support and satisfy customer demands. He further adds that good knowledge management processes should be in place to develop OL capabilities. The ability of an organization to develop personal and group learning abilities in its staff depends on good knowledge management (Garratt, 1990; Su, Huang, & Hsieh, 2004). In addition to this, knowledge acquisition and creation, along with knowledge dissemination and integration within the organization, has become the key strategic resource for OL (Pilar, et al., 2005). Furthermore, the literature indicates that knowledge is the antecedent and foundation for OL, and contributes to developing the innovation capabilities of an organization (Crossan, Lane, & White, 1999; Huber, 1992; Ke & Wei, 2006).

Based on the above discussion, the following hypothesis was proposed:

H8: Organizational Learning will positively influence Business Process Innovation.

3.5.5 Collaboration

Collaboration (CO) is defined as "working together to create value while sharing virtual or physical space" (Rosen, 2007, p. 210). In other words, CO is a process of working jointly on an activity or project. The definition indicates that CO happens when two or more people work together to create valuable things. Moreover, effective collaboration does not require any technology. CO can easily occur within an office using a pencil and paper. The whole purpose of CO can be lost if an organization does not foster a culture of sharing within the organization. Technological solutions may provide good alternatives but will not work if the person or group with whom you are working is not ready to share or work together. The role of technological solutions is to provide alternative ways of collaborating that are more effective and efficient. For example, use of instant messaging or online whiteboards for CO is common in organizations nowadays.

The literature suggests that competency in CO does not point to competency in knowledge management. Madanmohan(2005) suggests that the output of collaborative effort does not guarantee the effective retention of knowledge; nor does it guarantee that the two parties involved in the collaborative efforts have access to all the information generated during the process of collaboration. Likewise, competency in KM does not lead to competency in collaboration. For example, two researchers working on similar research projects can have access to the research published by the other researcher, but this does not imply that they are collaborating.

Several studies (Madjar, 2005; Tarafdar & Gordon, 2007) suggest that competency in CO is required to develop an innovative idea in an organization. CO is also required at every stage of innovation in order to successfully convert the idea into an innovative product or service. This idea is typically referred to as ‘the whole is greater than sum of its parts’. Similarly, the creativity of one team is likely to be greater than the sum of its individual team members (Pirola-Merlo & Mann, 2004; Taggar, 2002). Furthermore, the literature suggests that having the ability to produce effective CO is an important factor in the development and implementation of an ‘innovation culture’ (McKnight & Bontis, 2002). It allows team members with the same or different sets of knowledge and skills to assemble, irrespective of their job functions, roles or office location (Zakaria, Amelinckx, & Wilemon, 2004).

Based on the above discussion, the following hypothesis was proposed as:

H9: Collaboration positively influences Business Process Innovation.

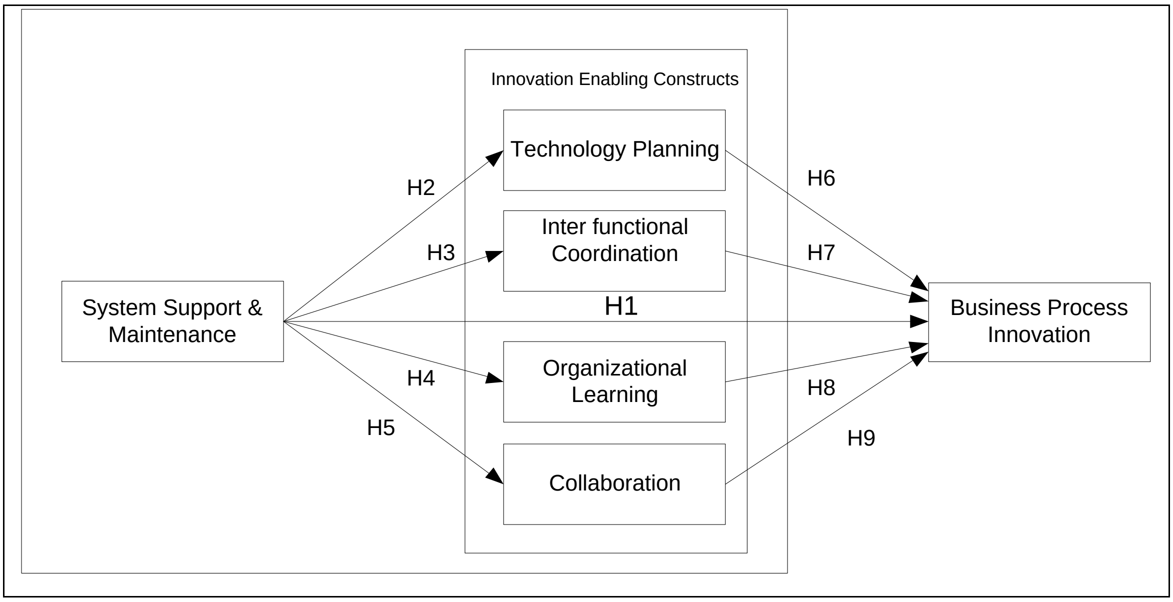

Figure 3.2: Research model including research hypotheses

3.6 Chapter Summary

This chapter presented the development of the research model that directed the investigation of this study. Initially, the research model was introduced and then revisited with the research questions of this research. This was then followed by an in depth discussion of the development of the research model variables as well as the development of the associated research hypotheses. The next chapter outlines the research design and methodology adopted in the study.

Chapter 4: Research Design and Methodology

4.1 Chapter Overview

Previous chapter explained the development of the conceptual research model and the creation of the research hypothesis. This chapter explains and justifies the research design and methodological considerations of the study. In general, the initial research question of a study provides an early direction for the research design, while the research design provides the framework for the overall research effort and the logistical analysis of the research problem. In other words, it reassures the researchers that the data collected will be measuring what it is supposed to measure (De Vaus, 2001; Straub & Gefen, 2005). The first section of this chapter explains the research paradigms and the theoretical perspectives of this study, followed by a discussion of the methodological approach used to address the research questions.

It is important to note that this chapterfocuses on the discussion of the rationale behind the design and methodological considerations of this research. The details of each aspect of instrument design and data collection are further explained in Chapter 5 and Chapter 6.

4.2 Theoretical Perspective

In general, the purpose of a research study is to help understand a phenomenon (Kuhn, 1996; Lakatos, 1978). According to Myers (1997), a research project is founded on several assumptions that are made about what constitutes ‘valid’ research and which type of research methods are most appropriate to understand the phenomenon. In social science research, different theoretical perspectives can be used to explore, describe or explain a phenomenon (Creswell, 2009; Myers, 1997). The theoretical perspective is a “philosophical view informing the methodology and thus providing a context for the process of grounding its logic and criteria” (Crotty, 1998, p. 121). In IS research, the most commonly used perspectives are interpretivism, critical research and positivism (and post positivism)(Chen & Hirschheim, 2004; Myers, 1997).

4.2.1 Interpretivism

Interpretive researchers assume that access to reality is through social construction (Myers, 1997). In general, interpretive studies put an effort into understand a phenomenon through the meaning that humans assign to it, and use interpretive methods when researching IS (Klein & Meyers, 1999; Meyers, 2004; Orlikowski & Baroudi, 1991). The methods are "aimed at producing an understanding of the context of the information system, and the process whereby the information system influences and is influenced by the context" (Walsham, 1993, p. 4).A study that uses interpretivist approach does not include any predefined independent or dependent variables, but rather focuses on the full complexity of human sense making as the situation emerges (Kaplan & Maxwell, 1994).

4.2.2 Critical research

Critical research suggests that reality is historically constructed and that it is produced and reproduced by people (Meyers, 2004). Although people can consciously act to change their social and economic circumstances, critical researchers recognize that people’s ability to do so is constrained by various forms of social, cultural and political domination. The main task of critical research is seen as being one of social critique, whereby the restrictive and alienating conditions of the status quo are brought to light. Critical research focuses on the oppositions, conflicts and contradictions in contemporary society, and seeks to be emancipatory; that is, it should help to eliminate the causes of alienation and domination (Klein & Meyers, 1999).

4.2.3 Positivism

In the IS field, a positivist stance is predominantly used and occupies almost 81 per cent of published empirical research (Chen & Hirschheim, 2004). According to Orlikowski and Baroudi(1991, p. 9), the nature of positivist studies is such that “these studies are premised on the existence of a priori fixed relationships within phenomena which are typically investigated with structured instrumentation. Such studies serve primarily to test theory, in an attempt to increase predictive understanding of phenomena” (p.9). Furthermore, Cortty(1998) argues that the goal of positivist studies is to explain the world accurately and to understand world’s phenomena scientifically.

In recent years, another view termed post-positivism, that is a less strict form of positivism,has been welcomed in the field of IS. According to this stance, knowledge is fallible and there is no absolute proof to explain particular phenomena. One of the notable promoters of this stance is Karl Popper (Popper, 1980, p. 11). He has established the principle of falsification and argues that advances in science are not about scientists making a discovery and then establishing their concept to be right, but rather scientists should make a guess and then try to prove their own guess wrong. According to Karl, "Good tests kill flawed theories; we remain alive to guess again" (Popper, 1980, p. 67). Positivist research (which includes both positivist and post-positivist) is commonly linked to quantitative research methods but qualitative researchers can also take a positivist stance. Some scholars, including Benbasat et al. (1987) and Myers (2003), suggest that the method selected to study phenomena should be independent of the philosophical assumptions of the researcher.

The decision to adopt the positivist epistemology for this research was based on three reasons. Firstly, this research examined the causal relationships existing in the research model. Secondly, this study assumed that reality can be objectively perceived and can be examined using measurable properties that are independent of the observer. Thirdly, this research attempted to test a theory in an effort to increase the predictive understanding of phenomena. According to Creswell (2009), the approach used by a positivist researcher starts with the theory, then collects the data and then tests the hypotheses proposed. This research adopted this approach as it involved a deductive approach (testing the theory) to the relationship between research and theory (Bryman & Bell, 2007). The goal of this research was to find as much proof as possible to support the hypotheses by testing the proposed research model.

4.3. Research Design and Methodology Considerations

The research design facilitates an improvement in the overall viability of a study, as well as helping the researcher to present their ideas in a logical order. Empirical evidence shows that the research design is a strategy formulated to answer the research questions for a particular study and to test hypotheses (Pinsonneault & Kraemer, 1993). The research design and methodological considerations undertaken for this study were broken down into three phases as depicted in the Table 4.1.

The first phase of the research design involved the development of the research questions, model, and hypotheses. This phase has already been discussed in great detail in Chapters 1, 2 and 3. This chapterfocuses on the discussion related to the rationalization behind the design and methodological considerations of this research. Although the research design includes the methods of data collection and analysis, the details about each aspect of these will be further explained when describing the second phase.

The second phase included the design of an instrument that is explained in Chapter 5. The last phase included testing of a theoretical model that is explained in Chapter 6.

.

Table 4.1: Research Design

Phases	**Corresponding Chapter**
Phase I: Conceptualization • Research Questions • Development of Conceptual Model • Research Hypotheses	Chapter 1, 2 & 3
Phase II: Instrument Design • Item Generation • Card Sorting Rounds • Expert Review • Survey Pre-test • Pilot Study	Chapter 5
Phase III: Theoretical Model Testing • Data Collection & Analysis • Validate Instrument • Test Theoretical Model	Chapter 6

4.3.1 Strategies of Inquiry

This study followed the philosophy of positivist epistemology which has been previously explained. A quantitative methodology was selected in order to support the various phases of the research as shown in Table 4.1**.** Previous studies (Benbasat, et al., 1987; Straub, Gefen, & Boudreau, 2004a; Straub, 1989; Straub & Gefen, 2005) suggest that quantitative approaches can provide statistical evidence to support an hypothesis by using a dataset from a large sample,which can demonstrate construct reliability and validity (Pinsonneault & Kraemer, 1993; Straub & Gefen, 2005).

Quantitative methods include laboratory experiments, surveys and numerical or mathematical modeling techniques (Myers, 1997; Straub & Gefen, 2005). Moreover, existing studies using quantitative methods use a positivist stance to answer the research question, using the scientific method. The studies that use quantitative methods using a positivist stance are built on two fundamental premises. The first is the special prominence given to quantitative data, and the second is the emphasis on positivist epistemology (Straub & Gefen, 2005). These types of methods and techniques provide strong support for focusing on the collection of numerical data. Furthermore, the analysis of numerical data provides strong empirical evidence to enable the researcher to understand how a phenomenon works. There are several statistical tools available for researchers that can assist them in the data analysis of numerically based data.

One of the possible benefits of selecting a quantitative approach is that it produces a large amount of data, provides statistical evidence in terms of validity and reliability, and produces findings that can normally be generalized to whole populations(Babbie, 1990; Mingers, 2001; Straub & Gefen, 2005). Quantitative research methods objectively assess and increase the predictive understanding of a phenomenon as well as provide a greater degree of reliability as compared to qualitative research methods (Attewell & Rule, 1991; Babbie, 1990; Mingers, 2001). Furthermore, many researchers argue that a quantitative research approach is expected to produce replicable results, independent of the researcher who is conducting it (Attewell & Rule, 1991; Straub & Gefen, 2005).

In contrast, advocates of a qualitative research approach argue that there are negative sides to quantitative research methods. Firstly, the researcher is absent in the instrument development process and has no chance to clarify unexplainable aspects. Secondly, the researcher can exercise only a limited amount of control as compared to qualitative research methods (Myers, 1997). Thirdly, generally speaking a quantitative research approach produces a low level of response or participation, compared to qualitative approaches. Finally, little insight can be gained about the social context, causes, or processes behind the phenomena that is under investigation (Babbie & Wagenaar, 1992; Mingers, 2001).

4.3.2 Research methods

An important element to consider while creating a research plan is the selection of a particular method of data collection and analysis (Creswell, 2009). Previous empirical studies suggest that a range of possibilities should be taken into account for data collection, and that the methods should be organized based on whether the focus of the research is towards numeric versus non- numeric data analysis. In the literature, quantitative methods are employed when the instrument is based on questions that are closed-ended and statistical analysis is used to interpret the data (Creswell, 2009). In contrast, qualitative methods are employed when the data is collected by observing the behaviour of individuals without preset questions, or through interviews with open ended questions, or through image or text analysis (Creswell, 2009). Mixed methods, on the other hand, include the characteristicsof both qualitative as well as quantitative methods (Creswell, 2009).

Qualitative research methods were not used in this study because the focus of this research involved a deductive approach that also required an examination of the relationship between variables using statistical procedures, in an effort to evaluate the numerical data through unbiased responses. Qualitative research tends to be inductive and do not solve hypotheses questions (Chin, 1998; Creswell, 2009; Myers, 1997). In addition to this, action research and qualitative research methods are not used for quasi-causal and statistic model (Chin, 1998; Creswell, 2009; Straub & Gefen, 2005).

Previous studies have suggested that if the research problem involves different identifiable factors that affect a measurable outcome, then a quantitative approach is more appropriate (Bryman & Bell, 2007; Chin, 1998; Creswell, 2009; Mason, 2002; Myers, 1997). This research was about setting up hypotheses and confirming theoretical relationships between factors in a structural model. Using Statistical Approach was a valid and normal method to serve such purpose and can be found in many PhD theses and publications. Furthermore, many PhD theses/publications stop at the quantitative analysis since the use of Structural Equation Modeling (SEM) is considered to be valid and an adequate method (Rosemann & Vessey, 2008) which allows the researcher to test their structural model as well as assess the overall fit of the model (Chin, 1998; Gefen, Straub, & Boudreau, 2000). For Causal model, it is widely recognized that SEM approach is suitable and adequate without further qualitative study (Gefen, et al., 2000; Cheung & Chan, 2004).

The research methods used in this study were consistent with a quantitative approach, because data was collected using a survey instrument which included pre-set questions, and then analyzed the data using statistical procedures. The use of a survey as a data collection technique has existed for a long time in IS research. This technique is usually used to test or validate the theories under investigation (Pinsonneault & Kraemer, 1993; Straub & Gefen, 2005). According to Lucas (1991), the purpose of survey research in the field of IS is to collect data in an orderly fashion from more than a few entities and to perform statistical analysis on the collected data. In addition to this, surveys provide a systematic way of collecting data about people's actions, characteristics or opinions from a large sized sample. According to Pinsonneault and Kraemer (1993), surveys are appropriate to use when: a) the research goal is identify factors that are predictive of an outcome; b) the objective is not to have any control of the dependent or independent variables; c) the phenomena under study occurs in a natural setting and d) the events under investigation are occurring either currently have occurred in the past (Pinsonneault & Kraemer, 1993).

In the context of this study, the survey technique was selected it enabled the researcher to examine the causal relationships between the different variables identified in the research model and to test the theoretical model through analyzing large amounts of data (Babbie, 1990; Straub & Gefen, 2005). The researcher was well aware of several issues relatingtothe use of surveys as a data collection instrument, including non-response bias as well as frame bias (Pinsonneault & Kraemer, 1993; Straub & Gefen, 2005). These issues were tackled by carefully developing, designing and testing the data collection instrument, and using high quality sampling techniques to ensure an adequate response rate(Evans & Mathur, 2005; Straub, et al., 2004a; Straub & Gefen, 2005). These issues are discussed in detail in Chapter 5 and 6.

Online surveys

The data collection for this research wasconducted using an online survey (web or e-survey)(Babbie & Wagenaar, 1992; Evans & Mathur, 2005; Straub & Gefen, 2005). Online or web based surveys provide the ability to use a self-administered questionnaire without requiring the direct involvement or presence of a researcher. These surveys can generally be accessed through any standard web browser. The responsesto the survey are then transferred to a secure server through an internet. The design of the online survey is such that the questionnaire is based on text with some use of graphics, images or hyperlinks for a better survey experience (Simsek & Veiga, 2000). Traditionally, online surveys are distributed to the respondents by providing them with a web link enclosed in an email message. There are many benefits of using online surveys when compared to traditional paper surveys (Goeritz, 2006; Klassen & Jacobs, 2001). As suggested by Clayton and Werking(1988), one of the greatest advantages of using an online survey is its low cost of administration because of its people less and paperless nature. In other words, there is no cost associated with the administration of online surveys because it involves no paper or printing. In addition to this, no packaging or postage is required to send out the survey. As all the responses are recorded electronically, there is no administrative work required, such as entering the responses ontoa spreadsheet. Furthermore, the cost per response falls which enablesstudies to have large sample sizes,which may help reduce sampling variance (Boyer & ", 2002; Clayton & Werking, 1988). Additional benefits of using online an survey include the shorter survey administration times, improved data collection and management (due to not having to enter or re-enter data manually), and an ability to personalize and customize follow-ups through electronic email (Holland & Smith, 2010; Simsek & Veiga, 2000, 2001). Although there may be a slight cost involved in setting up an initial survey online, there are many online vendors that provide online services that help researchers in the creation and distribution of online surveys.

In this study, the choice of administering the survey online was made in an attempt to obtain a large sample size. According to Pinsonneault and Kraemer (1993), a large sample size allowsan examination of the relationships between variables and provides stronger external validity. For research that is based on quantitative methods, it is important to achieve an adequate sample size. An inadequate sample size can create serious problems at the later stages of data analysis and hypotheses testing. In addition to this, a small sample size can create major issues if regression techniques are utilized (Gefen, Straub, & Boudreau, 2000; Hair & Anderson, 1995; Straub, et al., 2004a).

Survey classification

Previous empirical studies suggest that survey research can be classified depending on the whether the goal of the study isto be explanatory or exploratory (Yin, 1994). The goal of an exploratory survey is to become familiar with the topic,so that information is collected that can later help the researcher to identify different concepts and providesa basis for measurement (Malhotra & Grover, 1998). Moreover, there is no research model adopted in exploratory survey research (Malhotra & Grover, 1998). In contrast, explanatory survey research is employed to explore the causal relationships between variables (Malhotra & Grover, 1998). This type of research includes testing of the hypotheses and interpretation of the results in order to contribute to the theory development (Malhotra & Grover, 1998). This study falls under the category of explanatory research as its main objective was to explain, hypothesize and test how SSM influences BPI at the post-adoption stage and how this influence is mediated by IS competencies.

Surveys can be further categorized as either longitudinal or cross-sectional studies using structured interviews or questionnaires for data collection. This classification is generally done in order to generalize from a sample to a population (Babbie, 1990). In a longitudinal design, information is collected to examine how the study phenomenon changes over time. Data is collected from the same respondents at multiple points in time (Malhotra & Grover, 1998). On the other hand, in a cross-sectional design, information is collected at one point in time from a sample from a selected population. This design is usually carried out with the intention of gathering a quantitative type of data in relation to two or more variables that can be further evaluated to detect causal links or patterns (Bryman & Bell, 2007).

This study was cross-sectional by design. This means that data was only collected at one point in time. Studies show that usually data collected using this design occurs at a certain point in time using different sampling techniques to account for the larger population of interest (Babbie, 1990). There were three occasions where data was collected for this research. In the first instance, data was collected to pretest the survey instrument. The main objective of the pre-test was to evaluate whether the overall administration of the questionnaire wasefficient and viable(Field, 2009; Hinkin, 1998; Moore & Benbasat, 1991). In addition, the purpose of the pre-test the questionnaire was to assess its usability (Pinsonneault & Kraemer, 1993). Each pre-test questionnaire respondent was randomly selected from the target population (Cavana, Delahaye, & Sekaran, 2001; Grover, 2000; Pinsonneault & Kraemer, 1993).

Once the pre-test of the survey was complete, the next stage involvedthe data collection for the pilot study. The main purpose of this stage was to test the reliability of the numerous measurement scales used in the study (Cronbach, 1971; Field, 2009; Hair & Anderson, 1995). Participants were randomly selected to respond to the online pilot survey. All participants in the pilot study came from the target population of this research. The sampling technique used for the main survey questionnaire was purposive sampling. This means it was administered to a sample of respondents who came from the target population (Cavana, et al., 2001; Grover, 2000; Pinsonneault & Kraemer, 1993). Since it was impossible to access the panel different website used to launch the main survey(see section Chapter 6 section 6.4), theoretically motivated purposive sampling methods were employed in selecting participants (Calder, 1977). The participants were selected so as to achieve a wide variety of individual responses from different groups in terms of age, gender, education, and work title, and industry type. Empirical evidence suggests that in any study, the unit of analysis is the major entity that has to be examined (Babbie, 1990). The unit of analysis for this study wasthe individual and in particular, the study focused on IT professionals working and living in New Zealand.

Survey samples

Surveys collect information from a sample of the population for the purpose of being able to generalize findings to the wider population (Malhotra & Grover, 1998). This sample should be selected from a population of individuals who are connected and relevant to the identified construct under investigation (Grover, 2000). The sample for this study consisted of IT professionals working and living in New Zealand. The term 'IT professionals' has been used in the IS literature to describe a group of people that belong to a profession that possess some unique characteristics, expertise and specialized knowledge about planning, developing, maintaining and integrating information systems applications (Agarwal & Ferratt, 2002). These professionals work in areas including but not limited to programming, database, engineering or web development and at are employed at different managerial levels. The prerequisite experience, knowledge and skills requirement of individual IT professionals are different depending upon the job requirements and the level of authority (Lee, Trauth, & Farwell, 1995). For example, many companies have been seeking IT professionals with a good mix of IT and business skills (Lee, et al., 1995).

Previous empirical studies suggest that success in gaining a business advantage through IT largely depends upon effective relationships between IT professionals and business people (Bassellier & Benbasat, 2004). A considerable amount of business innovation has been derived through IT, thus the role of IT professionals has become increasingly important. Moreover, some suggest that IT professionals need to take on active roles that are more entrepreneurial by nature and focus on innovation (Roepke, Agarwal, & Ferratt, 2000). Hence, the profile and work of IT professionals have changed from one in which technical skills are dominant, to one in which the ability to form relationships in an effort to promote business innovations is equally important (Bassellier & Benbasat, 2004).

This research was concerned with improving the understanding of the effects of SSM on BPI at the post-adoption stage and also examining how this influence is mediated by IS competencies. The use of IT professionals as a survey population was appropriate because these individuals are involved at every stage of IS development, and has an understanding of the different roles required for innovation. Furthermore, in recent years, the IT professional’s role has changed towards one of having an active role in business innovation (Bassellier & Benbasat, 2004; Roepke, et al., 2000), thus it was relevant in the context of this study to gather responses from IT professionals to answer the research question.

Ethical considerations

This study followed ethical guidelines set by the Auckland University of Technology Ethics Committee (AUTEC) throughout the data collection process. An ethics application containing the instrument was submitted and approved by the Ethics Committee (AUTEC). The ethics application approval letter and the questionnaire used in the survey are available in Appendices A and C.

Auckland University of Technology requires all research that involves humans to be approved by AUTEC prior to the collection of data. The guidelines of AUTEC require the research to be carried out based around the three principles of Treaty of Waitangi namely, Partnership, Participation and Protection.

Partnership

This research project represented a partnership between the researcher and Information Technology professionals working and living in New Zealand. This study aimed to understand the influenceof SSM on BPI at the post-adoption stage and also examined how this influence is mediated by IS competencies. Participants have the opportunity to get a summary of the research findings, which ensures that they are not only involved in the study outcomes, but also its process.

Participation

Participants were made aware that their participation was voluntary and could be withdrawn at any stage during the data collection process. All the participants were informed of this condition through agreeing to and signing a consent form before survey could start.

Protection

All questions in the questionnaire were generic. No sensitive or personal questions were asked in the questionnaire except for demographics data. Extra precaution was taken to make sure that no participant or their related responses were identified. In addition to this, participantswere anonymous and no questions regarding specific values, practices, or culture were required from participants. The principle of privacy and confidentiality were acknowledged as per the AUTEC guidelines

The privacy issues were also addressed by allowing subjects to read and agree to an information sheet before engaging in the research. After reading and agreeing to the information sheet, participants were then asked to take part in the survey. Participants were allowed to leave or close the survey at any point in time. Participants were duly notified that their participation was voluntary and the collected data would remain anonymous. No information on any specific individual who completed the survey could be identified.

As per AUT standard research practice, the collected data will be retained for a period of six years. The electronic data is stored in the primary supervisor's personal computer. At the end of sixth year, the electronic data will be destroyed by deleting it permanently from the computer.

4.3.3 Data collection and analysis

As previously explained in the first part, this chapter presents the rationale behind the design of this research. Although a research design includes the data collection and analysis, details on each aspect of these will be further explained in Chapters 5 and 6. The following section briefly explains the measurement issues related to validity and reliability of the constructs, justification of using PLS and discussion on reflective and formative constructs.

Validity and Reliability

This study involved the development of reliable and valid measures of all the constructs included in the research model. Assessing both the validity and reliability of the measures of each construct included an examination of how reliable the measures were, as well as their external and internal validity (Chin, 1998, 2010). This study adopted the suggested guidelines proposed by Straub and Gefen et al. (2000) to fully test the research instrument.

Validity in quantitative research focuses primarily on the validity of the instrumentation. In this study, the instrument used was a questionnaire. Previous studies suggest that the validity of an instrument includesthe dimensions of both external validity and internal validity (content validity and construct validity). The purpose of establishing the external validity of a measurement instrument is to establish how generalizable the findings are to the population of interest. For this study, using an electronic medium was considered to be the best way to gather information from a large sample, thus to provide stronger external validity and allow the examination of the relationships hypothesized (Pinsonneault & Kraemer, 1993).

Content validity is the "the degree to which items in an instrument reflect the content universe to which the instrument will be generalized" (Straub & Boudreau, 2004, p. 424). This form of validity is usually evaluated using a literature review and expert panels. For this study, although previously validated items were found in the IS literature, they were again validated using a small expert panel.The content validity of the developed items was assessed through card sorting procedures with subsequent expert panel reviews (Moore & Benbasat, 1991). Five experts were invited to participate in the card sorting round (Moore & Benbasat, 1991). All the experts that wereinvited to participate in the rounds wereselected based on a convenience sample. The criteria used in the selection process were that the person should have an understanding about the scope and nature of SSM. Furthermore, the panel members were selected based on their academic qualifications and experience with questionnaire design and survey development. The expert panel included two senior IS professors, and a senior IT professional. Each panel expert was provided with the construct label, its definition and a list of potential items to be used to measure those constructs. The expert panel wasrequested to analyze the given material and give feedback about the content clarity, grouping of items, and whether the construct was measuring the right content. This is thoroughly explained in Chapter 5 in the‘Card Sorting and Expert Panel Review’ subsection.

Construct validity is concerned with the quality of the measurement between constructs, and whether the measures selected are a true representation of the constructswhich illustrate the phenomenon of interest, or are only artifacts of the methodology (Cronbach, 1971; Gefen, et al., 2000). In cases where the constructs are valid, it is expected that relatively high correlations would exist between measures of the same construct that use different measurement items. Also, low correlations would exist between measures of constructs that are expected to be dissimilar (Campbell & Fiske, 1959; Gefen, et al., 2000; Hair & Anderson, 1995). For this study, both the discriminant and convergent construct validity of the items in the questionnaire (Campbell & Fiske, 1959; Straub, 1989)are discussed in Chapter 6. The degree of discriminant validity between items of measurement is generally established using factor analysis (Adams & Nelson, 1992; Baggozi, 1993). It is actually the degree to which items theorized to reflect the construct vary from those that are not believed to form the construct (Straub, 1989). Convergence validity is the degree to which two or more efforts to measure the same concept are in agreement, and it may also be estimated through confirmatory factor analysis (Baggozi, 1993).

Reliability refers to the stability and consistency of a measurement (Davis, 1989). It is the extent to which the measures used in a study consistently measure what they are intended to measure and provide consistent results whenever they are used again under similar conditions (Straub & Boudreau, 2004). There are number of ways by which reliability can be assessed, however, the most commonly accepted test is that for internal consistency reliability using Cronbach's α (Cronbach, 1971; Hinkin, 1998). This is further explained in detail in Chapter 5 and Chapter 6.

Data analysis

This study applied the decision tree provided by Hair, Anderson et al. (1995) to choose the appropriate method for analyzing the quantitative data. As per Hair , Anderson et al.'s(1995) suggestion, this study analyzed the data set using Structural Equation Modeling (SEM)(Gefen, et al., 2000; Hair & Anderson, 1995; Straub & Gefen, 2005) . The main advantage of using SEM (Rosemann&Vessey, 2008) is that it allows the researcher to test their structural model as well as assess the overall fit of the model. (Chin, 1998; Gefen, et al., 2000). According to Baozzi and Bamugartner(1994), SEM can analyze a complete hypothesized multivariate model. It can also evaluate hypothesized linkages between and among variables and their particular measures. SEM includes a number of multivariate statistical techniques that are used to explore direct and/or indirect relationships between numerous latent variables and one or more dependent latent variables (Gefen, et al., 2000). In addition to this, SEM can be considered to be a versatile modeling tool for conducting multivariate analysis including path analysis, regression analysis, factor analysis, curve modeling and correlation analysis (Cheung & Chan, 2004).

The literature explains (Chin, 1998; Gefen, et al., 2000) that SEM includes two processes: analysis of the measurement model, and analysis of the structural model. The first process stipulates how the hypothetical constructs or the latent variables are measured in terms of their observed variables, and it imparts the measurement properties, such as the reliabilities and validities of the observed variables. The second process includes an analysis of the structural model and stipulates the causal relationships between latent variables and enumerates the causal effects as well as the level of unexplained variance.

The literature argues that using SEM has several advantages in comparison to multiple regression and path analysis (Bagozzi & Baumgartner, 1994; Chin, 1998; Gefen, et al., 2000). On the one hand, SEM evaluates the degree of imperfection in the measurement of the primary constructs. On the other hand, path analysis and regression analysis do not distinguish between the less than perfect measurement of variables and unexplained variance (Chin, 1998). Additionally, path analysis assumes that the primary constructs and the scales used to measure them are identical. This assumption is not the cases with SEM, where reliabilities of each of the latent variables can be assessed are considered in the overall analysis. SEM also permits the modeling of unexplained variance by taking into account the structural equations (Bagozzi & Baumgartner, 1994). Furthermore, SEM puts forth measures of overall fit that can support a summary evaluation of complex models (Cheung & Chan, 2004; Gefen, et al., 2000).

There exist two main approaches within SEM: the covariance-based approach such as theLineal Structural Relations (LISREL) model; and the component-based approach such as the Partial Least Square (PLS)regression method (Marcoulides & Chin, 2009; Qureshi & Compeau, 2009; Wetzels & Odekerken-Schroeder, 2009). Both approaches are used extensively in the IS research. However there are some advantages of using PLS regression in comparison to the LISERL model. First, PLS regression does not require any assumptions to be made about the distribution of the variable, and permits a small sample size (Chin, 1998; Esposito Vinzi & Chin, 2010). In addition to this, PLS regression can work effectively in situations where theoretical support for the study is at an early stage. Thus PLSregression was selected to test the research model because: 1) the literature (Chin, 1998; Qureshi & Compeau, 2009) suggests that PLS regression is an appropriate approach for theory development and exploratory research and 2) PLS regression has the capability to support statistical power for non-normal data and for large effect models (Chin & Gopal, 1997; Fornell & Bookstein, 1982).

One of the significant issues to avoid in instrument development is construct misspecification(Chin, 1998). Within the instrument development processes, researchers need to pay close attention to the causal relationships between all constructs and measures (Straub & Boudreau, 2004). Any latent (or unobservable) constructs used in the model can be measured via‘reflective’ or ‘formative’indicators(as shown in Figure 4.1). Reflective indicators are considered to be effects of latent variables. In other words, reflective indicators are influenced bylatent variables. All the reflective indicators measure the same underlying phenomenon, which is that latent variable (Chin, 1998; Esposito Vinzi & Chin, 2010). The direction of causality between the latent constructsandthe indicators is shown in the Figure 4.1. Moreover, any change in the latent variable should change all reflective indicators, which is referred to as internal consistency (Bollen, 1989). Thus all reflective indicators should correlate positively.

In contrast, formative indicators can form or influence the latent variables by definition (Chin, 1998). They are combined to approximate the underlying construct. Moreover, the observed variables are not considered to be correlated with each other or to have high internal consistency (Chin, 1998); but rather each indicator occurs independently of the other. These types of indicators are viewed as the cause of variables that reflect the conditions under which latent variables are understood. As there is no direct causal relationship between the latent variable and the indicators, formative indicators may even be inversely related to each other (Petter, Detmar, & Rai, 2007).

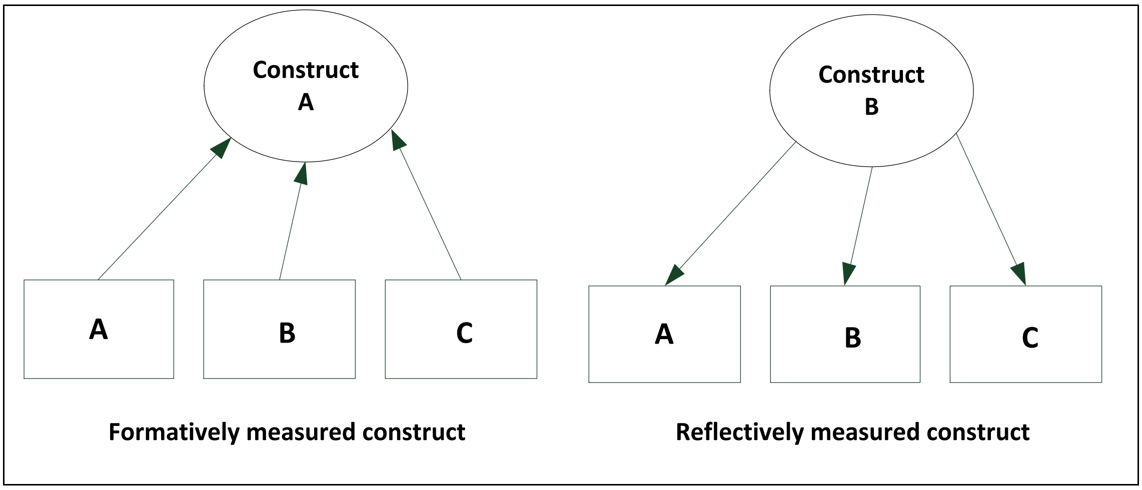

Figure 4.1 Formative Vs Reflective Indicators

Therefore, the main difference between formative and reflective measurement is whether the construct causes variance in the reflective indicators or the formative indicators. Both formatively and reflectively measured constructs are shown in Figure 4.1. Reflective indicators are drawn with the arrows leading away from the construct, while formative indicators are drawn with arrows leading to the construct.

In the IS and strategic management literature, both formative and reflective constructs are used. In this research, six reflective constructs were used. These constructs that used reflective variables were carefully developed so that each variable demonstrated a common latent construct structure with corresponding reflective indicators, and establishing thatchanges in the primary latent construct were reflected in changes in the reflective indicators (Freeze & Raschke, 2007). Further detailsabout the instrument designare presented in Chapter 5.

Measurement and structural model assessment

The research model used in this study was examined using Partial Least Square (PLS) regression. SmartPLS software was used to evaluate the measurement model as well as the structural model. This programmewas useful in evaluating the psychometric properties of the measurement model and assessing the parameters of the structural model. The measurement model was evaluated using the measure of the reliability of the indicators (internal consistency reliability, indicator reliability) and measures of the validity of the factors (convergent, discriminant)(Chin, 1998; Tenenhaus, 2005). The reflective measurement model was generally evaluated with regards to its reliability and validity. The evaluation of the measurement and structural model is presented in Chapter 6.

Mediation analysis was used to examine whether the data set showed a mediational structure in the research model. In many social and psychological studies, the analysis of the role of mediating variables is suggested to examine if a particular data set exhibits mediating influences (MacKinnon, Fairchild, & Fritz, 2007). Despite several methods to evaluate mediation being presented, there is still debate about the use of an integrated model to account for mediation or moderation (Edwards & Lambert, 2007).In SEM, mediating effects are suggested but often not explicitly tested (Ebert, 2009). Most research examines the relationship between two variables, X and Y, and includes different conditions under which X can be considered a possible cause of Y (MacKinnon, et al., 2007). This study followed the guidelines of Baron and Kenny (1986) to establish the mediation effects. Baron and Kenny (1986) indicate that mediating effects can be either ‘partial’ or ‘full’. Partial mediation occurs when the independent variable still has a significant direct effect on the dependent variable, whereas full mediation occurs when the independent variable does not have a significant effect on the dependent variable after the inclusion of the mediator variables. Further detail on the mediation analysis conducted in this study is presented in Chapter 6.

4.4 Chapter Summary

This chapter presented the research design and methodology consideration used to support this study. A detailed explanation was provided for the reasons behind the decisionsfor using the selected methodology. This chapter began with a discussion of the rationale for using a positivist stance for this study, followed by a detailed explanation of the research outline and methodological considerations such as the use of quantitative research methods and online surveys. The next chapter provides a discussion of the methodological issues that were considered in the development of the study's measurement instrument.

Chapter 5: Instrument Design

5.1 Chapter Overview

This chapter describes the survey questionnaire design process. The first part of this chapter explains the survey instrument design process followed by a description of the card sorting and expert review procedure. In the second part of this chapter, a detailed explanation is provided about the survey design and pre-test phase. In the last section, the result of the pilot study is presented.

5.2 Survey Items

In the previous chapter, the methodological consideration of this study was discussed. This chapter presentsa detailed discussion about the research instrument. Several scholars including Churchill (1979), Hinkin(1998), Moore and Benbasat(1991) and Straub (1989) suggest that it is essential to develop a valid and reliable research instrument in order to minimize measurement error.

There are several criteria of precondition evaluation that can be used for instrument development (Gefen, et al., 2000). The list includes construct validity, content validity, convergent validity and reliability. To begin with, construct validity determines whether the measures selected are a true measure of the construct which illustrates the event or whether the selected measures are only artifacts of the methodology inherently (Cronbach, 1971; Gefen, et al., 2000). In cases where constructs are valid, it is expected that relatively high correlations would exist between measures of the same construct that use different measurement items. Also, low correlations would exist between measures of constructs that are expected to be dissimilar (Campbell & Fiske, 1959; Gefen, et al., 2000; Hair & Anderson, 1995). In accordance with the suggested guideline by many IS researchers, this chapter presents both discriminant and convergent construct validity (Campbell & Fiske, 1959; Straub, 1989). Discriminant validity is generally illustrated using confirmatory factor analysis (Adams & Nelson, 1992; Baggozi, 1993). It is actually the degree to which items theorized to reflect the construct vary from those that are not believed to form the construct (Straub, 1989). Convergence validity is the degree to which two or more efforts to measure the same concept are in agreement, and it may also be estimated through confirmatory factor analysis (Baggozi, 1993).

Secondly, content validity is a qualitative estimation of the extent to which the measures of a construct grasp its real nature. In addition to this, the validity of an instrument is normally established through a pre-test that would help to remove any errors caused by inadequately worded or ambiguous questions or instructions. This will ensure that all the questions asked are suitable for their specific purpose and understood (Gefen, et al., 2000).

Thirdly, reliability analysis includes the extent to which the results of measures are reiterated and the reliability of an item that has many measures can be evaluated by composite reliability and Cronbach's alpha (Cronbach's α)(Cronbach, 1971; Field, 2009; Fornell & Bookstein, 1982; Straub & Boudreau, 2004; Straub, 1989) .

This research adoptedthe general guidelines suggested in the literature for the instrument design process (Churchill, 1979; Davis, 1989; Hinkin, 1998; Moore & Benbasat, 1991). Figure 5.1 depicts the instrument design process used in this research, and indicates the relevant chapter and chapter section where the particular step is explained.

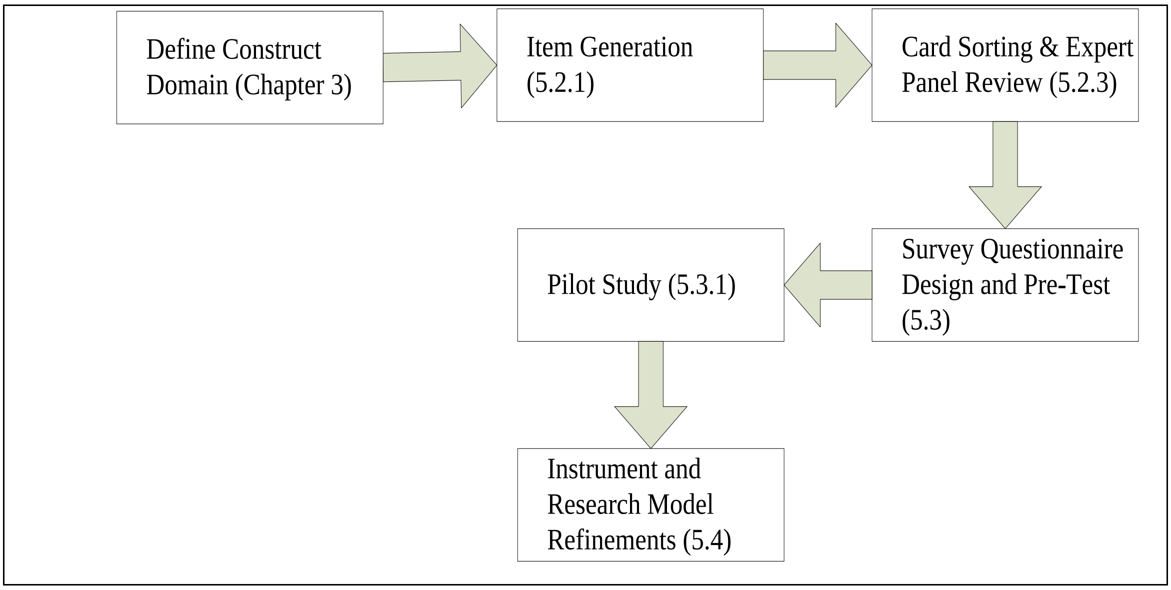

Figure 5.1: Instrument Design Process

The first step in the instrument design process included defining the domains of all the constructs used in the study. It is mandatory for a researcher to explain the definitions of the constructs and denote what is included and what is excluded in the given domain (Churchill, 1979; Hinkin, 1998; Moore & Benbasat, 1991). This was thoroughly discussed and explained in Chapter 3.

The remaining steps in the instrument design process are described in the following section. First section presents the details about the item generation followed by the section on the card sorting and expert review procedures. Next section describes the design of the survey and the pre-test phase, followed by a description of the pilot study and refinement of the scale. Finally, a short summary of this chapter is presented.

5.2.1 Item generation

The goal of an item development procedure is to confirm content validity (Moore & Benbasat, 1991). A well-articulated theoretical foundation that details the content domain for the measure is a prerequisite for successful item generation (Hinkin, 1998). It is imperative to develop items that will result in measures that would then sample the theoretical domain, in order to establish content validity. In addition to this, the statement used in the item should be as short and as simple as possible. Every item needs to address a single issue and the language used during the item generation should be clear and easilyunderstood by the target population (Hinkin, 1998).

The study followed the steps suggested by Moore and Benbasat(1991) for the item generation**.** Table 5.1 shows the steps followed in item creation in this research.

Table 5.1: Item creation

Description
• Review literature for existing scales • Evaluate the reliability of measurements • Evaluate and categorize all items, and confirm applicability to research • Insert items for constructs where all dimensions are not covered • Adjust items by using uniformity and clarity in wording

- Re-examine items, correct wording, and exclude confusing and redundant items.

Researchers may draw items from existing pre-validated scales to achieve low measurement error when generating sample items (Churchill, 1979). It would result in first identifying all relevant items in the literature, and then evaluating and categorizingthe items according to the various constructs, based on the intended purpose. The researcher can then create an early item pool for each construct. Any item that is considered unsuitable for the specific research context can be eliminated (Moore & Benbasat, 1991).

As described in Chapter 4 (section 4.3.3), it is important to avoid construct misspecification (Chin, 1998) in the instrument development. This research included six reflective constructs. The constructs that used reflective variables were carefully developed so that each variable showed a common latent factor structure with reflective indicators, and that changes in the primary latent constructswere reflected by changes in the indicators (Freeze & Raschke, 2007).

Hinkin(1998) suggests that there is no established rule guiding how many items per construct there should be. Additionally, he indicates that about half of the originally created items would be anticipated to be kept for use in the final scale. Hence, if the goal is to keep four to six items per construct, the first pool of items for a new construct should have at least eight to twelve items. Likewise, Moore and Benbasat(1991) suggest that a researcher should start with at least 10 items per construct. A close look at their study indicates that their first pool of items averaged at 13.4 items per construct. Others suggest that it is important to ensure that the domain of each construct is sufficiently sampled regardless of the actual number of items in each construct (Chin & Gopal, 1997; Straub & Boudreau, 2004). Accordingly, to develop and modify items used in this research, a statement was presented to which the respondent recorded their responses. Their responses indicatedthe degree of agreement with the statement using a five point Likert scale ranging from “strongly disagree” to “strongly agree”. This was then followed by the item re-evaluation before moving to next stage (Field, 2009; Hair & Anderson, 1995; Hinkin, 1998; Moore & Benbasat, 1991; Straub & Boudreau, 2004).

5.2.2 Measurement items

It is imperative in the scaling process to have clear definitions of the constructs and content domains (Churchill, 1979). An extensive literature review of existing measures can provide an accurate description of the dimensions, boundaries, and content domain of each constructs. Consequently, this will further enhance the validity of the previously used measures (Netemeyer, Bearden, & Sharma, 2003). Thus, in this study the suggested guidelines for item development were followed and instruments items were generated based on the extensive review of the literature as detailed in Chapter 2.

In this study, the items were drawn from the existing pre-validated scales that are extensively used in studies in the management and information systems research literature that use a Competency Based Perspective, an extension of RBV (Petaraf, 1993; Tarafdar & Gordon, 2007; Tippins & Sohi, 2003). The wording of previously validated items was adapted to fit the context of this research. Past studies have suggested reusing existing validated instruments when using the same survey methods as when they were originally used (Straub, 1989; Straub & Gefen, 2005). In addition to the above, using the pre-validated measures increases the compatibility of the study with other studies (Churchill, 1979). Another advantage of adopting existing measures is that the validity and reliability of these measures have already been tested. This allows the researcher to know more about the measurement qualities of the existing measures (Bryman & Bell, 2007).

A total of six constructs were measured in this research using multiple items as shown in Table 5.2. Each of the constructs had five items. All items were measured using a fully anchored, five point Likert scale. The majority of the constructs used in this study did not require any further development; however, the construct of SSM did require further development. Even though IS operational readiness has been identified in previous research, tailored items were developed for this study to assess the SSM construct. For the purpose of this study, measures for SSM were based on the empirical studies of Iacovou et al. (1995) and Nahet al. (2001)**.** Minor modifications were made to the instrument because this study was concerned with the availability of organizational resources neededto contribute towards providing effective and efficient SSM. This construct was measured based on four aspects, namely: access to technical or human resources; access to codified knowledge; and the quality of the information available in the company (Iacovou, et al., 1995; Karimi, et al., 2009; Overby, et al., 2006).

The measure of Technology Planning (TP) was adapted based the empirical studies of Khan and Manopichetwattana(1989). In this study TP was measured based on four aspects, namely: documenting the technology plan; conducting and sharing the plan with the employees; and the involvement of the employee in the creation of the technology plan. The Inter-functional Coordination (IN) construct was measured using scales adapted from Jaworski and Kohli(1990) andNarver and Slater (1990). Visit frequency, information transparency, integration, and realization aspects were used to measure this construct. Likewise, the adapted measure for Organizational Learning (OL)was measured by three features, namely commitment to learning, shared vision and open mindedness (Baker & Sinkula, 1999; McKnight & Bontis, 2002). Collaboration (CO)was measured by three characteristics, namely: collaboration frequency; use of technology for communication or announcements; and the level of cross-functional collaboration (Tarafdar & Gordon, 2007). Lastly, the BPI construct was measured based on the characteristics which included openness to change, adoption of good ideas, investment in technology to support new initiatives, and organizational-wide acceptance of change (Daft, 1982; Grover & Ramanlal, 1999).

Although the content validity of scales has been scrutinized through previous studies, the modified items developedto measure SSM, TP, OL, IN, and BPI required further re-evaluation of the content validity. These modified developed items were analyzed and discussed with the supervisors of this study. The content validity of developed items was assessed through card sorting procedures along with subsequent expert panel reviews (Moore & Benbasat, 1991).

5.2.3 Card sorting and expert panel review

The card sorting procedure was conducted after the initial pools of thirty items were created. This was followed by an expert panel evaluation. All the six constructs, namely: SSM, TP, IN, OL, CO, BPI were used in the card sorting procedure. The card sorting stage had two objectives as suggested in the literature: firstly, to evaluatethe construct validity of the scales being created, and secondly, to classify specific items which may be confusing (Moore & Benbasat, 1991).

The use of a card sorting procedure is common and extensively practiced in the field of IS (Robertson, 2001). Additionally, a considerably large amount of research published to date has used card sorting procedures to evaluate content validity (Davis, 1989; Moore & Benbasat, 1991). Previous studies show that it is considered a specific approach for initially evaluating the consistency between participant items and the definitions of the constructs they are aiming to measure (Moore & Benbasat, 1991).

The convergence or divergence of items within categories can serve as an indicator of construct validity (Moore & Benbasat, 1991). An item is assumed to present convergent validity with its related construct if it is consistently placed in the same construct category. This item would have discriminant validity in regards to the other items(Moore & Benbasat, 1991).

There are two unequivocal approaches by which card sorting technique can be deployed (Moore & Benbasat, 1991). In the first approach, called as an open (or exploratory) card sorting procedure, participants are asked to sort various items into categories,thento create labels for newly created categories. The open procedure assists researchers to confirm whether the definitions gained are aligned with the purpose of the original scale. In the second approach, called a closed (confirmatory) sorting procedure, participants are asked to sort the items into pre-generated construct categories. This approach helps reduce the researchers' cognitive burden connected with the task of labeling categories and creating groups. Furthermore, if the number of categories established by the expertand the labels and items assigned to those categories are consistent, then any scale that is based on those categories also shows a good degree of discriminant or convergent validity (Moore & Benbasat, 1991).

This study followed Moore and Benbasat's(1991) guideline for conducting the card sorting procedure and adopted the sequential two round procedure. This involved an initial open round followed by a closed round procedure. Five experts were invited to participate in each round. All the experts that were chosen to participate in the rounds wereselected using convenience sampling. The criteria used in the selection process were that the person should be familiar with the nature and scope of SSM.

In the first card sorting round, the first set of judges was included based on their age, gender and academic qualifications. An important criterion to become a judge was that the individual must be an IT professional, or have carried out SSM, or was familiar with post-adoption activities. A total of four judges were involved: two males and two females, each with different academic backgrounds and belonging to different age groups. Each of the 30 items was printed on an index card and presented to the judges. In addition to this, each card was assigned with a random number on the back on the card. This number was later used for inter-rater score analysis. All the judges were provided with instructions about the card sorting process including the labeling of categories and how to point out ambiguous items in the given items. They were also instructed to identify statements that were similar to each other. The main task for them in this round was to sort out the underlying idea that each statement reflected. They were also told that there were no pre-established numbers of categories and they could re-sort cards throughout the process. Each judge was given around 30 to 40 minutes to sort the card into categories, label each category and identify ambiguous or unclear items.

The literature suggests a number of ways to calculate the level of agreement among ratings of multiple judges (Randolph, 2008). In this study, Cohen's kappa coefficient (Cohen, 1960) was used to calculate the level of agreement among judges. Cohen's kappa is defined as the percentage of agreement after chance agreement is eliminated (Cohen, 1960). Cohen's kappa scores were calculated for each pair of judges, and their results were averaged to generate an overall score. Even though there is no set rule of thumb regarding the scores, Moore and Benbasat(1991) suggest that a score of greater than 0.65 is considered an acceptable indicator of inter-rater agreement. Once the first round was over, the results showed a substantial level of agreement, with an average score of greater than 0.90. In most cases, the definitions and the labels provided by the judges matched the actual construct very closely. In addition to establishing the content validity of the new scales, another goal of the card sorting procedure was to reduce the number of items and clarify potential item ambiguity. There were no items identified as ambiguous that required exclusion from the list, however some items were slight edited to make them clearer.

In the second card sorting round, another group of judges was used to accomplish the round. This set also was comprised of judges of different ages, gender and academic qualifications. Like the first round, the important criterion to become a judge was that the individual should belong to the IT profession, or have carried out SSM, or were familiar with post adoption activities. There were a total of four judges were involved in the second round, including three males and one female, each with different academic backgrounds and belonging to different age groups. In this round, judges were asked to complete the card sorting and indicate problematic items. Two set of cards were given to the judges. The first set included white cards that stated each item, and the second group of cards contained the name and definitions of the different categories. Participants were asked to read the statements and sort them into categories. It took approximately 30 minutes to complete each session.

Similar to first round, Cohen's kappa was used to calculate the level of agreement among judges. The result showed higher levels of agreement among each pair of judges with an average Cohen's kappa value of 0.85. Moore and Benbasat(1991) suggest that a score of greater than 0.65 is considered acceptable, so the research then proceeded with the next stage of expert panel review.

The literature suggests that card sorting rounds provide an early indication of the discriminant and convergent validity of the constructs, and also provide a measure of content validity to a certain extent (Cronbach, 1971; Straub & Boudreau, 2004; Straub, 1989). In addition to card sorting rounds, Davis (1989) and Moore and Benbasat(1991) suggest conducting several rounds of instrument pretesting with expert panels to ascertain content validity. In the IS literature, approximately 23 per cent (Straub & Boudreau, 2004) of research articles look at content validity during the instrument validation phase. The main goal for this task is to confirm whether the proposed constructs are likely to be reliable, and the instrument measures the right content.

For this study, the panel members were selected based on their academic qualifications and experience with questionnaire design and survey development. The expert panel included two senior IS professors, and a senior IT professional. Each panel expert was provided with the construct label, its definition and a list of potential items used to measure those constructs. Expert panels were requested to analyze the given material and give feedback about the content clarity, grouping of items, and whether the construct was measuring the right content.

There were no major issues raised by the experts. It was suggested in a few cases to reword the question to make it clearer. Overall, this additional step was useful in the development of the questionnaire. This step helped the researcher to further improve the content validity of the constructs, and to reword some items that required minor changes. Table 5.2 shows each construct and its associated measurement items.

Table 5.2: Measurements of Constructs

Construct	**Items**	**References**	**Scale**
System Support and Maintenance	1. My organization provides adequate resources to carry out systems support & maintenance work 2. I frequently use the knowledge (i.e. database or documents) available in the organization to solve support / maintenance related issues 3. My organization maintains good quality of information across different business functions 4. I am generally able to find the answers in the available information repository present in the organization 5. My organization generally employ experienced employees to carry out system support and maintenance work	(Iacovou, et al., 1995; Nah, et al., 2001)	**5-point scale** Anchors:(1) Strongly disagree, (5) Strongly agree
Technology Planning	1. To what extent did your firm document technology plan 2. How frequently did your firm conduct sessions to analyze the technology plans? 3. To what extent were professionals from different functional areas involved in technology planning 4. To what extent were external sources involved in identifying business opportunities 5. How frequently did your firm share future technology plans with firm's employees?	(Khan & Manopichetwattana, 1989)	**5-point scale** Anchors: (1) Not all, (5) To a great extent
Inter-functional coordination	1. To what extent did your top managers from each function regularly visits customers 2. How frequently the information about customers is freely communicated throughout your organization? 3. To what extent the business functions are integrated to serve the target market needs 4. To what extent do your top managers understand that the employees can contribute to value of customers 5. How frequently do you share resources with other business units?	(Jaworski & Kohli, 1993; Narver & Slater, 1990; Overby, et al., 2006)	**5-point scale** Anchors: (1) Not all, (5) To a great extent

Organizational Learning	1. To what extent does your firm regard learning as its most important basic value 2. How frequently does your manager share future vision with you? 3. How frequently do you look for innovative ways to do your work? 4. To what extent does your firm embrace innovative ideas 5. To what extent do the employees view themselves as partners in charting the direction of the business unit	(Baker & Sinkula, 1999; McKnight & Bontis, 2002)	**5-point scale** Anchors: (1) Not all, (5) To a great extent
Collaboration	1. To what extent do you collaborate with your peers on different projects 2. How frequently do you use online portals to communicate project schedules to the rest of the organization? 3. How frequently do the cross-functional meetings are held in your organization? 4. To what extent do you use online portals to communicate concepts relating to latest technologies or applications 5. How frequently do team members from different functional areas seek suggestions from each other's?	(Tarafdar & Gordon, 2007)	**5-point scale** Anchors: (1) Not all, (5) To a great extent
Business Process Innovation	1. My organization continuously refine project workflows based on the feedback received from designers or users 2. New programming techniques are quickly adopted by the developers to improve project development/maintenance process 3. My organization generally invest heavily in the technical infrastructure that is required to support new business processes 4. A change in business process modelling is generally accepted by different stakeholders of the project 5. My organization frequently reviews administrative processes to accommodate new changes in the project development activities	(Daft, 1978; Grover & Ramanlal, 1999)	**5-point scale** Anchors:(1) Strongly disagree, (5) Strongly agree

5.3 Survey Questionnaire Design and Pre-test

As mentioned in Chapter 4, an online-based survey was used to collect data for this research. When the scales were finalized, the next step in the instrument design process included the development of the online-based questionnaire (Simsek & Veiga, 2001). One of the significant objectives in survey design is to the design survey in a way that it mitigates the non-response rate (Dillman, 2000; Hair & Anderson, 1995). According to Goeritz(2006), there could be several reasons for low or no participation. This includes, but is not limited to, time pressures, complexity of the questions, overall length of the survey, and poor visual appeal.

Previous studies suggest that different methods can be used to increase participation in a survey. First, the survey response process should be created so that is easy and simple to complete. Second, careful attention has to be paid to the details of the survey. For example, attention needs to be paid to survey lay out, wording and flow (Evans & Mathur, 2005; Holland & Smith, 2010). Table 5.3 shows the steps taken in this study to ensure the survey design was easy and simple to use.

Table 5.3: Online Survey Design

A	Pre-Survey 1. Consent 2. Introduction
B	Survey Questionnaire 1. Questions related to Technology Planning 2. Questions related to Inter-functional Coordination 3. Questions related to Organizational Learning 4. Questions related to Collaboration 5. Questions related to System Support and Maintenance 6. Questions related to Business Process Innovation 7. Demographics
C	Post Survey 1. Thank You Note

The pre-survey section provideda detailed description of the purpose of the survey and information about participation consent in accordance with the guidelines of the AUT Ethics Committee. This section also highlighted additional information such asthe focus of the research, participation criteria and anonymity (Simsek & Veiga, 2000, 2001). In addition to this, the participant was also provided with the definition of each term used within the context of this study. This was then followed by the items related to SSM, TP, IN, OL, CO, and BPI. Finally, demographic information like age, gender, occupation, industry was collected. Once the participant had respond to all the questions, a thank you note was displayed.

Following the design of the online survey questionnaire,the next stagewas to pre-test the survey. The main objective of the pre-test was to evaluate whether the overall mechanics for completing the questionnaire were adequate(Field, 2009; Hinkin, 1998; Moore & Benbasat, 1991). In addition to this, the purpose of pre-testing the questionnaire was to assess its usability (Pinsonneault & Kraemer, 1993). Each respondent of the pre-test questionnaire was selected from the target population (Cavana, et al., 2001; Grover, 2000; Pinsonneault & Kraemer, 1993).

Five people from target population participated in the pre-test of the questionnaire. That is, Information Technology (IT) professionals (e.g., Database Administrator, IT Project Manager, CIO, Senior IT Support Officers)who were working and living in New Zealand and who spoke sufficient English. These participants were requested to complete the instrument and then provide their comments on issues like wording, flow, timing and length of the survey (Babbie, 1990; Simsek & Veiga, 2001). It was estimated that each participanttook around 5-10 minutes to complete the survey. The participants' feedback included the correction of spelling; and suggestions to improve the wording, and rearrange the sequence of some questions. Their suggestions wereconsidered and some small changes made to the questionnaire. Overall, no substantial issues were reported by the pre-test participants.

Once all the feedback was incorporated into the questionnaire, the next step was to create the survey instrument using online survey design software. This study used one of the online survey software programmes (www.qualtrics.com) provided for AUT researchers. Some adjustments were made while uploading it onto the internet. For example, notification was added to ensure full responses were recorded before the participant could move to the next section. In addition to this, the layout of the survey was modified in such a way that it helped participants to easily navigate to next section. Furthermore, screen size, color selection, placement of buttons, and navigation issues were modified to ensure maximum participation.

After the survey was uploaded and became functional, a sample of twenty IT professionals was invited to test the system. These participants came from different industries including the education, telecommunication and manufacturing sectors. It was observed during the participation in the pre-test that several different browsers were used to test it. For example, participants used browsers like Firefox, Safari, Internet Explorer and Google Chrome. As a final step, the data extraction routine was also executed using the online software. This was done by exporting the data from the online survey software to Excel and SPSS formats.

Participants were also requested to provide feedback on the clarity of the content or any issue they may have encountered in using the system when answering the survey. Some of them reported back and identified few spelling errors. No major issue was identified with respect to the system. Several reported that they completed the online survey without any issue. Some additions were made to the Job Category items in the demographic section of the questionnaire.

On the whole, the pre-test was conducted using a sample representative of the actual population. This was extremely useful and beneficial because it helped to improve the content validity, test reliability and usability of the instrument, and fine tune the questionnaire structure (Hinkin, 1998).

5.3.1 Pilot study

Once the pre-test of the survey was completed, the next stage in the instrument development involved conducting a pilot study (Hinkin, 1998; Moore & Benbasat, 1991; Pinsonneault & Kraemer, 1993; Straub & Boudreau, 2004). The main purpose of this stage was to test the reliability of the numerous scales used in the study (Cronbach, 1971; Field, 2009; Hair & Anderson, 1995). According to Hinkin(1998), the questionnaire should be presented to the those participants whose background is similar to the target population of the final study. It is important to note here that an application containing instrument was submitted and approved by the AUT Ethics committee before the pilot study commenced (Appendix A).

The pilot study was carried out with IT professionals who were working and living in New Zealand and who spoke sufficient English. It included a range of different participants who were working on a full- orpart time basis. This arrangement wasregarded as appropriate as it allowed testing the pilot study instrument using a range of different IT professionals responsible for a variety of different work tasks (e.g. computer operator, systems analyst).

The survey instrument was deployed using the online survey tool. The pilot study's participants were invited using an email invitation that includeda link to the survey. The survey link was posted on the AUT Blackboard site that is available to students and teaching staff at AUT. Furthermore, email addresses of AUT staff members, including administrative IT staff,were obtained using the AUT online directory and the survey link was sent to them enclosed in email invitation. In order to increase the participation rate, personal networks and professional online networks(Linkedin)were used to send the invitation to IT professionals working and living in New Zealand. All of the survey participants were invited to take part based on the assumption that they had worked as an IT professional in the past or were currently working in the industry as an IT professional. The participants were selected so as to achieve a wide variety of responses from individuals fromdifferent groups in terms of age, gender, education, and work title, and industry type.

The survey was made available online for the total of ten days. The response rate was very slow in the first five days. There were only ten completed survey in the first five days, however a total of 82 responses were recorded by the end of ten days. Also, there were only 73 useful responses because the remaining nine did not complete the survey. This set was excluded and not used in the dataset.

There has been continuous debate over the suitable sample size for the purpose of conducting tests of statistical significance (Hinkin, 1998). According to Field (2009), the probability of statistical significance increases with a large sample size. In addition to this, a large sample size can generate stable estimates of the standard errors to ensure that factor loadings are flawless reflections of the true population values (Hair & Anderson, 1995).

In order to identify the adequacy of a sample size, the particular statistical methods used to evaluate the data must be taken into consideration (Field, 2009). In the field of IS, the literature recommends that item-to-response ratios in any type of factor analysis (confirmatory or exploratory)should range from 1:4 to 1:10 (Hair & Anderson, 1995; Hinkin, 1998). Some scholars including Hoelter(1983) and Guadagnoli and Velicer (1988) suggest that a sample size of 150-200 observations should be ample to gain an accurate result in factor analysis provided that inter-item correlations are strong. For confirmatory factor analysis, a minimum sample size of 180-220 (Hoelter, 1983) or having between 5-10 participants per variable up to a total of 300 (Field, 2005) is recommended.

This study used component-based structural equation modelling. In this technique, the research model has to be validated using Partial Least Squares (PLS), a technique comprised of the measurement and structural models. Chin (1998) suggests that a minimum sample size should be of ten times the number of structural paths leading into a construct. In this study, there were six constructs in the model so a minimum sample size of 60 would make it appropriate to use PLS in this study (Chin, 1998; Field, 2005). PLS is an appropriate technique to analyzea formative construct's data (Chin, 1998). In addition to this, PLS has been successfully used in information systems research (Pavlou, et al., 2007; Venkatesh & Agarwal, 2006), supports a small sample size, and is capable of modelling latent constructs (Chin, 1998).

5.3.2 Pilot results: respondent profile

In the pilot study, the sample was comprised of 57 males (78.1%) and 16 females (21.9%). The highest percentage of people who participated in the survey were aged between 31-40 years old (32%). Only one participant each belonged to the age group of less than 20 or between 51 and 60 years old. In addition to this, a large number of participants helda post graduate degree (37%), while others stated that they had some undergraduate study (4.1%), a Bachelor's degree (31.5%), or a Master's degree (26%), and only one participant had a doctoral degree. The largest number of people who participated in the pilot study came from the information communication and technology sector (41.1%). The second highest number of participants belonged to the utilities sector (Electric, Water, Gas) with 19.2% representation, and third highest to the financial services sector (12.3%). The pilot study participants representeda cross-section of the sample population characteristics in terms of age groups, educational background and industry sector. Table 5.4 shows the profile of respondents in the pilot study.

Table 5.4: Pilot Study Demographics

Variable	Items	Frequency	Percent
Gender	Male	57	78.1 %
	Female	16	21.9%
	Total	73	100%
Age Groups	20 or less	1	1.4%
	21-30	25	34.2%
	31-40	32	43.8%
	41-50	14	19.2%
	51-60	1	1.4%
	Total	73	100%
Education	Some undergraduate School	3	4.1%
	Bachelor Degree	23	31.5%
	Some Postgraduate Study	27	37%
	Master Degree	19	26%
	Doctoral Degree	1	1.4%
	Total	73	100%
Industry Sector	Manufacturing	1	1.4%
	Utilities (Electricity, Gas, Water)	14	19.2%
	Wholesale Trade	2	2.7%
	Retail Trade	7	9.6%
	Information and Communication Technology	30	41.1%
	Communication and Media	4	5.5%
	Financial Services	9	12.3%
	Real Estate	1	1.4%
	Education	5	6.8%
	Total	73	100%

5.4 Validation of Data Characteristics

In the course of data collection for the pilot study, the online survey software notified the participant if any answer was left unanswered before moving to next question. The notification was issued by the online software in the form of a message labeled in red on the screen. A total of 82 people attempted to fill in the online survey. Nine out of the 82 people left the survey without completing it. As a result, 73 responses were completed and no data was missing from this data set. Furthermore, this data set passed through the initial screening and there was no further need to carry out missing data analysis (Carver & Nash, 2005; Field, 2009; Hair & Anderson, 1995).

Normality is a significant issue to be examined during data analysis because some statistical tests assume normal data distributions (Field, 2009). Several scholars including Hair (1995)and Field (Field, 2009) suggest that normality of the data can be confirmed by calculating the skewness and kurtosis rating. Generally kurtosis gauges the degree to which scores cluster in the tails of a distribution while skewness is a measure of the asymmetry of distribution (Hair & Anderson, 1995). In the field of IS, considerable number of scholars assume that a data set is normally distributed if the skewness and kurtiosis ratings are within +2 to -2 range (Field, 2009; Hair & Anderson, 1995). Some others suggests a range of +3 to -3 is also acceptable (Field, 2009; Tabachnick & Fidell, 2007). According to Tabachnick and Fidell(2007), scores that lie outside the acceptable range can have the potential to restrict the data analysis and interpretation of the results. In the pilot study data set, the skewness and kurtosis ratings were normally distributed because both skewness and kurtosis ratings were within the +2 to -2 range (Tabachnick & Fidell, 2007).

An additional issue to consider was non-response bias (Field, 2009). In order to check non-response bias, the researchers created two sub sets of data based on the order of questionnaire completion (Churchill, 1979). The first set included the first 37 people who responded to the survey, while the next set included last 36 people who responded. It is important to note that these sub setswere created after excluding the nine caseswhere survey was not fully completed. Both the early and later data setswere compared using a two tailed t-test at 5% significance level (Field, 2009). There were no major differences regarding the respondents' profiles. In comparing the overall results of two sub datasets, no evidence was found that any substantial differences existed between them that may have raised significant concerns regarding non-response bias in the pilot study (Field, 2009; Hair & Anderson, 1995).

Another important issue to be addressed when using self-reported data is the matter of the potential for common method biases (Brannick & Chan, 2010; Podsakoff, MacKenzie, Lee, & Podsakoff, 2003). This study followed the guideline of Podsakoff et al. (2003) and used the Harman one-factor level test to check for common method bias. The result of the test showed that all factors are there and the most covariance explained by one factor was below 35%. This indicated that common method biases were not a likely contaminant of this study's results (Brannick & Chan, 2010) .

5.4.1 Reliability assessment

Reliability measures the degree of correlation between items within an individual construct (Straub & Boudreau, 2004). Furthermore**,** Straub (1989) mentions that reliability directs the extent to which the respondent can answer the same questions in the same way each time. In other words, it measures the accuracy and consistency of the items designed to measure a construct. There are number of ways by which reliability can be measured, however, the most commonly accepted measure is internal consistency reliability using Cronbach's α (Cronbach, 1971; Hinkin, 1998). A sizeable number of IS researchers prefer internal consistency for reliability testing (Straub & Boudreau, 2004). There is a general consensus among IS researchers about the lower limit of Cronbach's alpha. It is considered acceptable if it is 0.7, however it may lowered to 0.6 in the case of exploratory research (Carver & Nash, 2005; Hair & Anderson, 1995; Straub & Boudreau, 2004). It is important to note that a low Cronbach's α (lower than 0.6) may describe poor construct definition or indicate a multidimensional construct. Alternatively, a very high Cronbach's α (above 0.95) may suggest the existence of common methods bias (Straub & Boudreau, 2004).

This study calculated Cronbach's α using SPSS 16 which is commonly used to measure the reliability for a set of two or more construct indicators (Grover, 2000). In addition to this, a 0.65< α> 0.95 threshold was adopted while calculating Cronbach's α. Table 5.5presents the summary of the initial reliability test. All the Cronbach's α score results were within the expected range (Moore & Benbasat, 1991).A Cornbach's α score within the desired range shows that internal consistency does exist in a set of two or more construct indicators. This study therefore used these constructs and performed a detailed analysis and discussion in the next chapter.

Table 5.5: Pilot Study Reliability Assessment

TP – 5 Items Cronbach's α = .681		
Item	Item-Total Correlation	Cronbach's α if item deleted
TP1	.220	.707
TP2	.354	.669
TP3	.545	.576
TP4	.492	.610
TP5	.587	.560

CO – 5 Items Cronbach's α = .760		
Item	Item-Total Correlation	Cronbach's α if item deleted
CO1	.585	.696
CO2	.586	.698
CO3	.442	.745
CO4	.489	.731
CO5	.556	.708

IN – 5 Items Cronbach's α = .717		
Item	Item-Total Correlation	Cronbach's α if item deleted
IN1	.514	.654
IN2	.394	.702
IN3	.492	.663
IN4	.416	.692
IN5	.567	.633

SSM –5 Items Cronbach's α = .713		
Item	Item-Total Correlation	Cronbach's α if item deleted
SSM1	.363	.715
SSM2	.407	.666
SSM3	.556	.638
SSM4	.608	.605
SSM5	.394	.694

OL – 5 Items Cronbach's α = .677		
Item	Item-Total Correlation	Cronbach's α if item deleted
OL1	.217	.667
OL2	.530	.503
OL3	.353	.601
OL4	.468	.550
OL5	.416	.575

BPI –5 Items Cronbach's α = .780		
Item	Item-Total Correlation	Cronbach's α if item deleted
BPI1	.430	.784
BPI2	.635	.712
BPI3	.525	.749
BPI4	.560	.740
BPI5	.671	.704

5.5 Chapter Summary

This chapter described the steps followed in the development of the research instrument. It presented the development of the questionnaire items followed by a description of the procedures followed to formulate and refine the measurement items including through the use of a card sorting process and expert panel review to establish content and construct reliability. After a pre-test of the instrument, an online pilot study was conducted using the formulated items to assess both the measurement instrument and the online process. Tests to validate the pilot study data indicated that the measures were reliable and no affected by non-response or common method bias. An in-depth and detailed analysis of the full set of survey data is presented in the next chapter.

Chapter 6: Theoretical Model Test

6.1 Chapter Overview

The previous chapter described the development of the research instrument and reported the initial result of pilot study. The purpose of this chapter is to describe the results of the main survey as well as to examine the research model and associated hypotheses. The first part of this chapter provides details about the main survey and the data collection procedure. This is followed by an in-depth data analysis of the main survey results and an assessment of the research model.

6.2 Main Survey Adjustment

Before the launch of the main survey, an ethics application containing the survey instrument was submitted and approved by the Ethics Committee (AUTEC)of the Auckland University of Technology. The ethics application approval letter is attached as Appendix A.

The main survey questionnaire was revised based on the feedback provided during the pilot study phase. Even though no major issues were identified, some adjustmentswere made to the questionnaire wording and layout in an effort to reduce the non-response rate (Hair & Anderson, 1995). Some of the examples of the feedback received included, but were not limited to,the need to improve the wording on the consent page, provide the contact information of the researcher, adddefinitions of major terms, and include the disclaimer on the start of the page. Once all the changes were incorporated, the survey instrument was again pre-tested using participants that represented the population of interest (Field, 2009). Similar to the feedback session in the pilot phase, respondents were asked to provide feedback on the revised instrument. In particular, comments were sought after about the content clarity, wording and the length of each question. Based on the feedback, some minor adjustments were again made such as correcting grammatical and spelling errors.

6.3 Main Survey Operationalization

As with the pilot study, online survey software (Qualtrics)was used to design and collect data for the main phase of the study. The overall structure of the survey was designed in such a way to help participants easily navigate to next sections. In addition to this, the screen size, color selection, placement of buttons and navigation issues were designed to ensure maximum participation. The system was setup in such a way that it provided the researcher with one web address. This web address was then used to collect the data for the main phase.

6.4 Data Collection

As explained in the previous chapters, the population of interest in this research mainly consisted of Information Technology (IT) professionals working and living in New Zealand. The survey instrument was deployed using a web-based survey tool (Dillman, 2000).

The objective at this stage was to collect responses from a relatively large sample of around 200 people that included IT professionals from different industry sectors and belonged to different job categories (e.g., systems analysts, project managers, database administrators etc.)(Goeritz, 2006; Hinkin, 1998; Klassen & Jacobs, 2001; Pinsonneault & Kraemer, 1993; Simsek & Veiga, 2000). The web link of the survey was then posted on the following websites:

- AUT BlackBoard(blackboard.aut.ac.nz)
    - AUT Blackboard is a learning management system for online learning and teaching within AUT. The web link was only posted under the two course sites that the researcher was teaching at the time of data collection.
- GeekZone(geekzone.co.nz)
    - One of the largest New Zealand-based technology websites that publishes news, articles and reviews about technology products/services.
- SmileCity(smilecity.co.nz)
    - An online-based rewards website for New Zealanders where users can earn points while participating in market research. It is important to note that users have an option to enter into the rewards program and earn

points if they choose to do so. Participation is free and researchers bear all the expense of setting up online survey.

The survey was made available online from 1 August, 2011 to 31 August, 2011. It was observed that the response rate was very slow in the first few weeks. This same pattern was observed while conducting the pilot study. To overcome this problem, an online-based rewards programme website was used to attract more participants. This enabled the participants to earn points after completing the survey. Any earned points on the website could then be used to purchase different items on the website.

On 31 August, 2011, the survey was closed to the public. In total, 397 people accessed the questionnaire from all three websites. A questionnaire URL "hit" was used as a criteria to determine whether the survey was accessed or not. The initial analysis of the dataset revealed that 155 (39.04%) abandoned the survey at different stages. It was noted, of the people who accessed the survey, that: 79 stopped at the main page and did not go through to next page; 57 stopped after part one;ten abandoned it after part two; and three abandoned it after part three. In addition to this, 53 (13.36%) abandoned the survey and did not complete demographic information. As a result, 189 responses (47.60%)were identified as useable datasets. The response rate gained through the online survey channel fell within the normal parameters as explained in the existing online based survey (e-survey) literature (Boyer & ", 2002; Dillman, 2000; Holland & Smith, 2010). A summary of the survey response statistics is presented in Table 6.1.

Table 6.1: Online Survey Response Statistics

Type	**Participants**	**Total Percentage**
Abandoned Survey	155 (79 Stopped at main page, 57 after part 1, 10 after part 2, 9 after part 3)	39.04%
Missed Demographic Information	53	13.36%
Useable dataset	***189***	***47.60%***
Total Accessed	397	100%

There has been continuous debate over the suitable sample size for the purpose of conducting tests of statistical significance (Hinkin, 1998) and in the field of IS, the item-to-response ratios to support any type of factor analysis (confirmatory or exploratory)that several scholars recommend ranges from 1:4 to 1:10 (Hair & Anderson, 1995; Hinkin, 1998). In addition to this, some scholars including Hoelter(1983) and Guadagnoli and Velicer(1988) suggest that a sample size of 150-200 observations should be ample to gain an accurate solution in factor analysis provided that inter-item correlations are strong. For confirmatory factor analysis, a sample size of 180-220 (Hoelter, 1983) or having between 5-10 participants per variable up to a total of 300 (Field, 2005) is recommended. If using Partial Least Squares (PLS), a minimum sample size of ten times the number of structural paths can lead into a construct (Chin, 1998).

The total number of usable sample size gained is assumed sufficient because it fulfills the criteria for enacting either confirmatory or exploratory factor analysis (item to response ration)(Chin, 1998; Field, 2009; Hair & Anderson, 1995; Hinkin, 1998). Moreover, the sample size obtained is also suitable for performing analysis using PLS. This sample size also satisfies the suggested minimum sample size of at least ten times the number of structural paths(Chin, 1998).

6.5 Data Analysis

6.5.1 Data preparation

The data preparation process included the data entry, coding, data filtering and finding any missing responses (Fink, 2006). To start with, a visual examination was carried out on the entire unprocessed data file. Second, frequencies were computed for each variable and additional checks were conducted to discover missing data and to recognize outlier responses. Outliers are cases that have data values that are different from the data values from rest of the data set. In addition to this, the researcher also verifiedwhether all the questions were answered appropriately by the participants. For example, to identify if a participant answered all the questions using one response (e.g., “Strongly agree”) for each question.

The data was then analyzed using the statistical software SPSS. SPSS version 17 for Windows was used to calculate frequencies for all variables and also check for any absent data. Moreover, the data file was examined to ascertain whether any coding errorswere caused during the conversion of the file into the SPSS format. There were total of 397 participants who tried to access the survey. Out of those, 189 respondents completed the survey questionnaire. Similar to the pilot study, un-usable responses were deleted from the data set. Several reasons,such as abandoning the survey at different stages of completion of the questionnaire, or not filling in the demographic information, resulted in the exclusion of those responses. Therefore, those samples were discarded.

To further examine the quality of the data, a normal probability plot was used to verify the normality of the data distribution. First, a Q-Q plot was used to examine all variables using SPSS software to verify for normality. The plots showed a very slightlyabnormal distribution, since the responses were skewed more towards 5-7 instead of 1-3 on the scales. Since PLS has a strong ability to model latent constructs under the conditions of non-normality (Chin, 1998, 2010), this small statistical inadequacy was not considered a concern for this study.

Each measurement model scale item was coded in preparation for the data analysis phase. There were a total of thirty scale items administered in the survey. These included items to measure each of the six constructs; with each construct having five scale items. The six constructs used in this research were: System Support and Maintenance; Technology Planning; Inter-functional Coordination; Organizational Learning; Collaboration; and Business Process Innovation. Table 6.2 liststhe scale items and their corresponding code.

Table 6.2: Summary of measurement items

Code	**Scale Items**
	Construct: Technology Planning (TP)
TP1	To what extent did your firm document the technology plan
TP2	How frequently did your firm conduct sessions to analyze the technology plans?
TP3	To what extent were professionals from different functional areas involved in technology planning
TP4	To what extent were external sources involved in identifying business opportunities
TP5	How frequently did your firm share future technology plans with firm's employees?
	Construct: Inter Functional Coordination (IN)
IN1	To what extent did your top managers from each function regularly visits customers
IN2	How frequently the information about customers is freely communicated throughout your organization?
IN3	To what extent the business functions are integrated to serve the target market needs
IN4	To what extent do your top managers understand that the employees can contribute to value of customers
IN5	How frequently do you share resources with other business units?
	Construct: Organizational Learning (OL)
OL1	To what extent does your firm regard learning as its most important basic value
OL2	How frequently does your manager share future vision with you?

OL3	How frequently do you look for innovative ways to do your work?
OL4	To what extent does your firm embrace innovative ideas
OL5	To what extent do the employees view themselves as partners in charting the direction of the business unit
	Construct: Collaboration (CO)
CO1	To what extent do you collaborate with your peers on different projects
CO2	How frequently do you use online portals to communicate project schedules to the rest of the organization?
CO3	How frequently do the cross-functional meetings are held in your organization?
CO4	To what extent do you use online portals to communicate concepts relating to latest technologies or applications
CO5	How frequently do team members from different functional areas seek suggestions from each others?
	Construct: System Support and Maintenance (SSM)
SSM1	My organization provides adequate resources to carry out systems support & maintenance work
SSM2	I frequently use the knowledge (i.e. database or documents) available in the organization to solve support / maintenance related issues
SSM3	My organization maintains good quality of information across different business functions
SSM4	I am generally able to find the answers in the available information repository present in the organization
SSM5	My organization generally employ experienced employees to carry out system support and maintenance work
	Construct: Business Process Innovation (BPI)
BPI1	My organization continuously refine project workflows based on the feedback received from designers or users
BPI2	New programming techniques are quickly adopted by the developers to improve project development/maintenance process
BPI3	My organization generally invest heavily in the technical infrastructure that is required to support new business processes
BPI4	A change in business process modelling is generally accepted by different stakeholders of the project
BPI5	My organization frequently reviews administrative processes to accommodate new changes in the project development activities

6.5.2Demographics

As mentioned earlier, PLS was used to examine the research model. This section describes the PLS analysis and providesdetails of the evaluation of the measurement model and structural model (Chin, 1998) used in this research. Before discussing the PLS analysis in more detail, the following describes the general characteristics of the main study respondents. Table 6.3shows the demographics of the respondents.

Table 6.3: Demographics of Main Survey Respondents

Variable	Items	Frequency	Percent
Gender	Male	155	82%
	Female	34	18%
		189	100%
Age Groups	20 or less	3	1.6%
	21-30	77	40.7%
	31-40	83	43.9%
	41-50	22	11.6%
	51-60	4	2.1%
		189	100%
Education	Some undergraduate School	6	3.2%
	Bachelor Degree	72	38.1%
	Some Postgraduate Study	69	36.5%
	Master Degree	39	20.6%
	Doctoral Degree	3	1.6%
		189	100%
Industry Sector	Manufacturing	15	7.9%
	Utilities (Electricity, Gas, Water)	31	16.4%
	Wholesale Trade	10	5.3%
	Retail Trade	19	10.1%
	Information and Communication Technology	66	34.9%
	Communication and Media	11	5.8%
	Financial Services	14	7.4%
	Real Estate	5	2.6%
	Education	18	9.5%
		189	100%
Job Type	Business Analyst	7	3.7%
	CEO/CTO/CIO	3	1.6%
	Computer Operator	7	3.7%
	Computer Programmer/Software Engineer	30	15.9%
	Database Manager /Administrator	16	8.5%
	Database Developer/modeler/architecture	27	14.3%
	Director IT/IS	9	4.8%
	E-commerce manager/ specialist	13	13%
	Technical support manager/specialist	26	13.8%
	IT/IS Manager	11	5.8%
	Network Engineer/ Administrator	5	2.6%
	Network Engineer/ Architect	3	1.6%
	Project Manager	1	.5%
	Systems Analyst	13	6.9%
	Systems Manager/Administrator	10	5.3%
	Systems Architecture	8	4.2%
		189	100%

The sample was largely comprised of males(82%) and the majority of respondents (43.9%)were aged between 21-30 years old. A wide range of job types as well as industry sectorswere represented in the sample. Most respondents (34.9%) worked in the ICT sector and the remaining were involved in manufacturing (7.9%), utilities (16.4%), the wholesale trade (5.3%), the retail trade (10.1%), communication and media (5.8%), financial services (7.4%), real estate (2.6%), and education (9.5%). Furthermore, the three most commonly represented occupations in the sample were:

computer programmer/software engineer (15.9%); database developer/modeler/architect (14.3%); and technical support manager/specialist (13.8%).

6.5.3 Measurement modelassessment

The research model was examined using Partial Least Square (PLS). SmartPLS software was used to evaluate the measurement model as well as the structural model. This programmewas useful for evaluating the psychometric properties of the measurement model and assessing the parameters of the structural model. The measurement model was evaluated using measures of the reliability of the indicators (internal consistency reliability, indicator reliability) and of the validity of the factors (convergent, discriminant)(Chin, 1998; Tenenhaus, 2005). The reflective measurement model was evaluated with regard to its reliability and validity in general. The following section explains the reliability and validity of measurement model followed by assessment of structural model.

Internal consistency reliability

The reliability of the measurement model refers to the extent to which an instrument generates consistent or error free results (Straub & Boudreau, 2004) . In this study, tests for internal consistency reliability and indicator reliability were used to assess the reliability of the measurement model. The following section explains the processes used to establish both forms of reliability.

The study applied the traditional standard of Cronbach's α for assessing internal consistency (Cronbach, 1971). Cronbach's α is basically an estimate of reliability based on the indicator inter-correlations (Henseler, Ringle, & Sinkovics, 2009). In addition to this, Cronbach's α assumes that all indicators are equally reliable, however PLS puts indicators in order of importance according to their reliability, resulting in a reliable composite. Several scholars including Chin (1998) and Werts et al. (1974) suggest reviewing composite reliability as well as Cronbach's α. Irrespective of the type of reliability coefficient used, an internal consistency reliability value above 0.70 is considered satisfactory (Marcoulides & Chin, 2009; Straub & Boudreau, 2004). In this study, loadings of all items were examined using a 0.70 threshold.

The reliability scores for all the constructs are presented in Table 6.4. The output was generated to examine the Cronbach's α value on standardized loadings. The output shown in Table 6.4 was generated using SmartPS software (SmartPLS, 2012).

In the result, Cronbach's α and composite reliability scores were greater than 0.707 and less than 0.968. This result showed that constructs were within satisfactory limits and were reliable (Gefen, et al., 2000).

Table 6.4: Reliability Assessment (standardized loadings)

Construct	**Composite Reliability**	**CronbachsAplha**
BPI	0.8514	0.7814
CO	0.8858	0.8388
IN	0.8746	0.8210
OL	0.8720	0.8169
SSM	0.8466	0.7733
TP	0.8406	0.7668

Indicator reliability

As the reliability of indicators differed, the reliability of each indicator was also examined. The IS literature presumes that latent variables should explain almost 50% of each indicator's variance (Chin, 1998; Henseler, et al., 2009). Some scholars also suggest eliminating reflective indicators from the measurement model if their standardized loadings fall under .40 (Chin, 1998). This study followed the same guideline and examined the indicator reliability using SmartPLS software. The threshold of greater than 0.7 was used for standardized outer loadings. The indicator reliability of each constructs fell under the acceptable range and their squared loadings were approximately 0.5 or greater.

Convergent validity

Two validity subtypes, convergent validity and discriminant validity, were used for the assessment of validity (Chin, 1998; Henseler, et al., 2009). The following section details the procedures for testing the convergent validity and discriminant validity to assess the validity of the measurement model.

Convergent validity means that a set of indicators represents the one-and-the-same underlying construct, which appears asuni-dimensionality. This study followed the well established guidelines (Fornell & Bookstein, 1982)for establishing convergent validity by examining the average variance extracted (AVE), and assumed it satisfactory if the AVE value was at least 0.5 (Fornell & Bookstein, 1982; Fornell & Larcker, 1981).A value of at least 0.5 means that the latent variable used in the model is able to account for more than half of the variance of its indicator on average (Chin, 1998).

The AVE values are shown in Table 6.5. All the constructs used in the model had an AVE value of greater than 0.5. This satisfies the minimum threshold value requirement for convergent validity.

Table 6.5: AVE for latent constructs

Construct	**Average Extracted Variance (AVE)**
BPI	0.5391
CO	0.6093
IN	0.5834
OL	0.5790
SSM	0.5271
TP	0.5181

Discriminant validity

In addition to convergent validity, discriminant validity is a somewhat supplementary concept. Discriminant validity is defined as the extent to which the joint sets of indicators differentiate among constructs and are not seen to be uni-dimensional (Gefen, et al., 2000; Henseler, et al., 2009). Two measures of discriminant validity have been presented: the Fornell-Larcker criterion and the cross loadings (Fornell & Bookstein, 1982; Fornell & Larcker, 1981).

A latent variable should share more variance with its designated indicators than with any other latent variable (Fornell & Larcker, 1981). In other words, discriminant validity will be assumed satisfactory if the square root of the AVE values of a measure exceed the correlations between that measure and all other measures (Gefen, et al., 2000).

In this study, this was demonstrated through preparing a cross correlation matrix as shown in Table 6.6, where items in bold represent the square roots of the AVEs of each element that exceeded the off diagonal elements in its related row and column

Table 6.6: Cross-Correlation Matrix

	BPI	CO	IN	CO	SSM	TP
BPI	**0.7342**					
CO	0.6784	**0.7805**				
IN	0.5530	0.7229	**0.7638**			
OL	0.6076	0.6418	0.6817	**0.7609**		
SSM	0.6354	0.7219	0.5819	0.6493	**0.7260**	
TP	0.5938	0.6840	0.6516	.06345	0.6008	**0.7197**

The second criterion used to assess discriminant validity was cross loadings. Measuring cross loadings offers another wayof examiningwhether the loading of each indicator is higher than all of its cross loadings (Chin, 1998). It is generally anticipated that each group of indicators should load higher than indicators for any of the other constructs. The factor loadings (shown in bold) and cross loadings are presented in Table 6.7. All items presented in Table 6.7 loaded highly on their constructs as compared to other constructs.

The results of the loadings were satisfactory as both criteria(Fornell-Larckerand cross loadings) were used to examine discriminant validity at the indicator as well as the construct level.

Table 6.7: Factor and Cross Loadings

	BPI	CO	IN	OL	SSM	TP
BPI1	**0.5321**	0.3469	0.2444	0.3112	0.3877	0.2096
BPI2	**0.7752**	0.4674	0.4195	0.46	0.6197	0.4991
BPI3	**0.7048**	0.551	0.4441	0.5344	0.6142	0.4887
BPI4	**0.803**	0.5672	0.4497	0.4777	0.6902	0.4655
BPI5	**0.8186**	0.5272	0.4335	0.4276	0.6981	0.4574
CO1	0.4611	**0.6777**	0.4567	0.5818	0.4281	0.3989
CO2	0.5333	**0.7992**	0.5245	0.604	0.5724	0.5157
CO3	0.4461	**0.7557**	0.591	0.7071	0.5024	0.5583
CO4	0.5524	**0.8347**	0.6247	0.7134	0.5987	0.5811
CO5	0.6269	**0.8249**	0.6126	0.6841	0.6758	0.5954
IN1	0.3851	0.4389	**0.7099**	0.5297	0.3378	0.5753
IN2	0.4148	0.5311	**0.7761**	0.583	0.4447	0.6048
IN3	0.4433	0.5991	**0.7617**	0.6094	0.4927	0.7511

IN4	0.3712	0.4878	**0.7185**	0.5804	0.3944	0.5755
IN5	0.4842	0.6683	**0.845**	0.6716	0.5234	0.721
OL1	0.3123	0.4765	0.4729	**0.6115**	0.3228	0.332
OL2	0.5168	0.6914	0.6003	**0.8179**	0.5739	0.5724
OL3	0.4578	0.6857	0.5801	**0.7728**	0.4909	0.5672
OL4	0.449	0.6449	0.6306	**0.7827**	0.4609	0.6208
OL5	0.5334	0.6753	0.6733	**0.8015**	0.569	0.6467
SSM1	0.5203	0.4019	0.2885	0.3451	**0.5964**	0.2663
SSM2	0.6004	0.5609	0.4415	0.5033	**0.7608**	0.4568
SSM3	0.5539	0.5981	0.5117	0.568	**0.7308**	0.4965
SSM4	0.7104	0.5514	0.4836	0.5276	**0.8158**	0.5219
SSM5	0.6448	0.484	0.3477	0.3754	**0.7083**	0.3937
TP1	0.2056	0.3064	0.5097	0.3858	0.2201	**0.5222**
TP2	0.4172	0.5127	0.6174	0.5048	0.4543	**0.7094**
TP3	0.5013	0.5735	0.7009	0.6322	0.5145	**0.8008**
TP4	0.4498	0.5096	0.6323	0.5528	0.464	**0.7562**
TP5	0.4837	0.5071	0.6087	0.5381	0.4362	**0.7757**

6.5.4 Structural modelassessment

Because all the results from different criterion demonstrated satisfactory reliability and validity(as shown in in the previous section), it was decided thatthe reliability and validity of the measurement model evaluations permitted an assessment of the structural model. This section explains the analysis conducted to evaluatethe structural model.

The fundamental criterion used for the evaluation of the structural model and hypothesis included the assessment of the coefficient of determination (R^2 values) of the endogenous latent variables and the estimates ofthe path coefficients (Wixom & Todd, 2005). R^2 values in a structural model signify the amount of variance explained by the independent variables. According to Wynn Chin (1998), an R^2 value of 0.77, 0.33, and 0.19 PLS path models is considered substantial, moderate, and weak, respectively. Others suggest that moderate R^2 values are considered acceptable if the structural path model structure explains an endogenous variable by one or two exogenous latent variables (Henseler, et al., 2009). On the other hand, if endogenous latent variables rely on more than one exogenous latent variable, then the R^2 values may show at a substantial level. In addition to this, a lower R^2 valuemay raise some doubts about the theoretical support for the model and may show that the model is unable to explain the endogenous latent variables.

The next step in the evaluation of the structural model and hypotheses assessment included the evaluation of the path coefficients between latent variables. The path coefficients specify the strengths of the relationships between independent and dependent variables(Chin, 1998; Wixom & Todd, 2005) . The literature suggest that the path coefficient's value in the PLS path model should be evaluated in terms of magnitude, signs and significance (Henseler, et al., 2009). A path coefficient magnitude shows the strength value between two latent variables where a threshold values of at least 0.20 and an acceptable range of above 0.30 can be considered meaningful (Chin, 1998). In cases where the postulated algebraic signs are contrary to the theoretically assumed relationships, then the hypothesis should be rejected (Urbach & Ahlemann, 2010).

This study adopted a method of bootstrapping because the PLS method does not provide results for significance for the path coefficients (Patnayakuni, Ruppel, & Rai, 2006). SmartPLS software was used to run the algorithm for a bootstrapping algorithm. A criteria of cases = 189 and samples = 500 was used to generate the T-statistics for examining the significance levels of a construct's loadings on the latent variables and path coefficients (Chin, 1998). The following section explains the assessment of the structural model. First, a detailed explanation is provided on the mediation analysis of the model, followed by the examination of R^2 values to assess the entire hypothesis. Finally, the research model's goodness of fit is explained.

Mediation analysis

Many social and psychological studies involve the analysis of mediating and/or moderating effects (MacKinnon, et al., 2007). While the methods for evaluating mediation or moderation have been well established, methods for testing integrated model including both mediation and moderation are still under debate (Edwards & Lambert, 2007). It is common in most research to examine the relations between two variables, X and Y including different conditions under which X can be considered a possible cause of Y (MacKinnon, et al., 2007). In SEM, mediating effects are suggested but often not explicitly tested (Ebert, 2009). For example, social presence is known to influence the level of enjoyment and trust in the virtual world; however few studies explore whether social presence mediates the influence (White-Baker & Hubona, 2011).

A mediator is a variable that exists in a causal sequence between two variables, whereas a moderator is a variable that is not part of causal sequence between two variables (MacKinnon, et al., 2007). The single mediator model is shown in Figure 6.1, where mediator variable M is in the causal sequence between independent variable X and dependent variable Y. Path c shows a direct effect of independent variable X on dependent variable Y. The combination of paths a and c together comprise an indirect effect of independent variable X on dependent variable Y. Mediation in its simplest form represents the addition of the third variable M in the X -> Y relationship. Baron and Kenny (1986) indicate that mediation can be either partial or full in nature. Partial mediation occurs when the independent variable still has a significant direct effect on the dependent variable, whereas full mediation occurs when the independent variable does not have a significant effect on the dependent variable after the inclusion of the mediator variables.

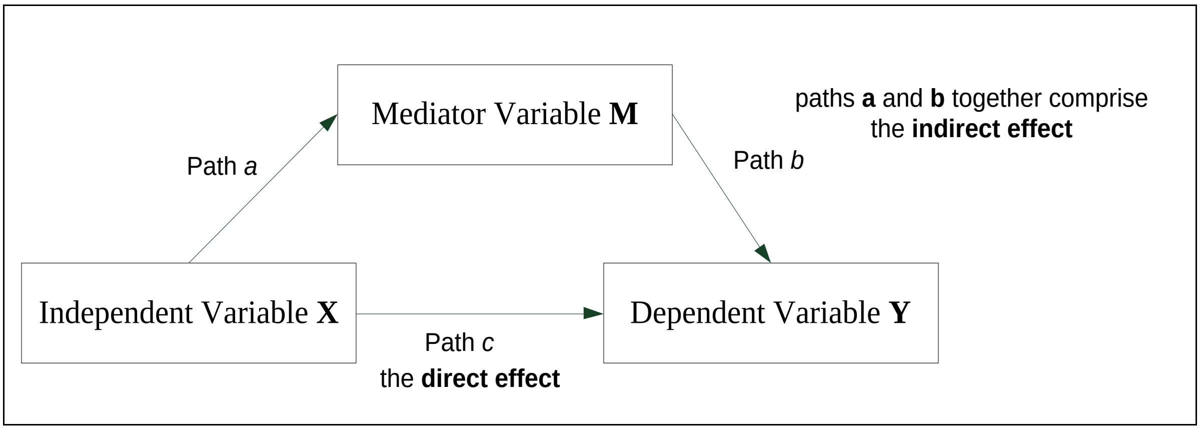

Figure 6.1: Mediation Model

Baron and Kenny (1986) suggest three conditions to establish the mediation effects. The first condition is fulfilled when variations in levels of the independent variable X significantly account for variations in the mediator variable M (path a). The second condition is fulfilled when variations in the mediator variable M significantly account for variations in the dependent variable Y (path b). The last condition is satisfied when paths a and b are controlled, that is, when the previously significant relationship between the independent variable X and dependent variable Y (path c) is no longer significant.

Table 6.8: Independent, Dependent and Mediator Variables

Independent Variable X	Mediating Variables M	Dependent Variable Y
Systems Support and Maintenance	• Technology Planning • Inter-functional Coordination • Organizational Learning • Collaboration	Business Process Innovation

In order to establish the effects of mediation, using the independent variables X, mediator variables M and dependent variables Y as shown in Table 6.8, the study researchers performed the following steps (Baron, 1986; Ebert, 2009; Henseler, et al., 2009):

Step 1: Validate that independent variable X , SSM effects dependent variable Y, BPI (White-Baker & Hubona, 2011). The result of the R^2 values and the path coefficients are obtained after running a PLS and bootstrapping algorithms in SmartPLS software. The result shows the direct effect of SSM on BPI alone produces an R^2 value of .59 and has strong path coefficient with BPI ($\beta = 0.64$).

Step 2: Validate that independent variable, SSM affects mediators variables, TP, OL, IN, and CO (White-Baker & Hubona, 2011) by estimating and test path a. The test result shows the effect of SSM on TP produce R^2 value of .36 and path coefficient of ($\beta = 0.60$), on OL produce R^2 value of .42 and path coefficient of ($\beta = 0.65$), on IN produce R^2 value of .34 and path coefficient of ($\beta = 0.58$), and on CO produce R^2 value of .52 and path coefficient of ($\beta = 0.72$) as shown in Figure 6.2.

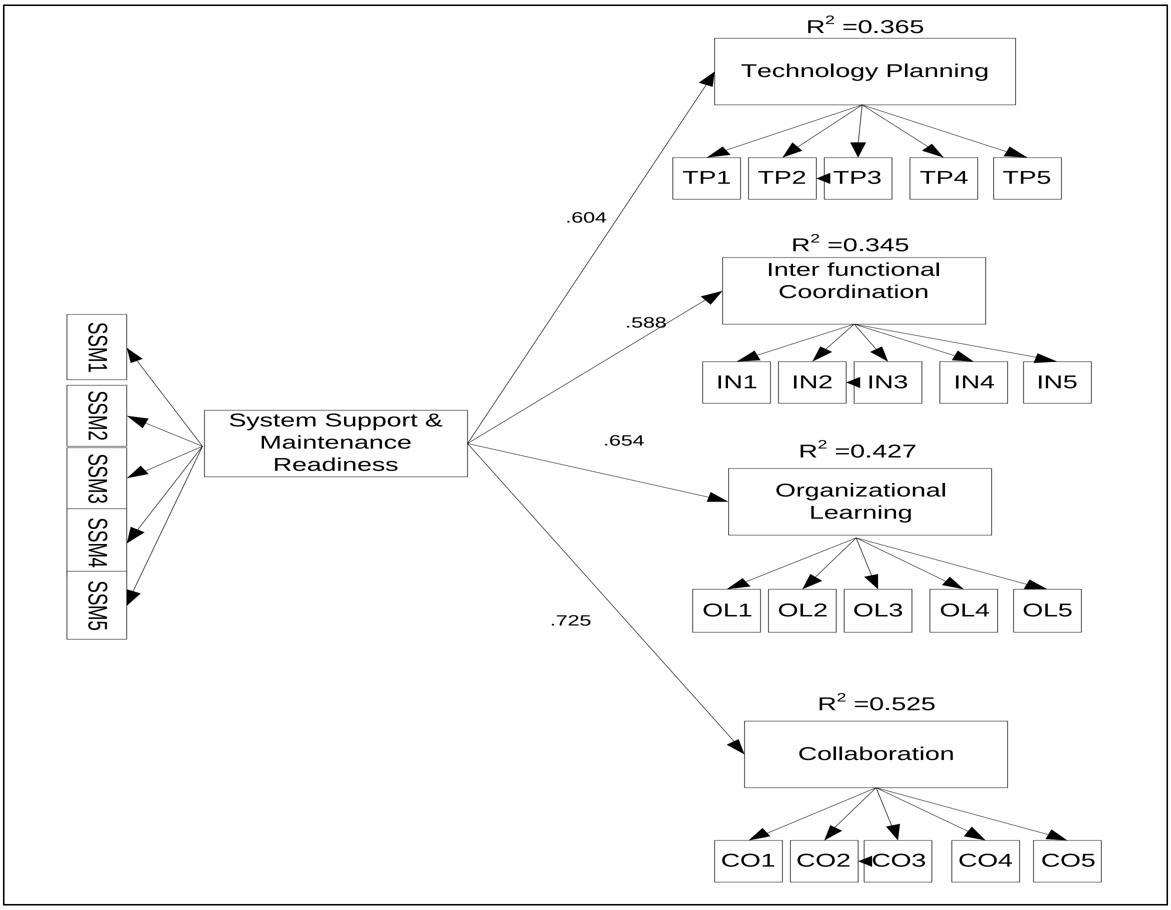

Figure 6.2: Variable X effects on Mediators

Step 3: Validated whether the mediator variables TP, OL, IN, and CO affected the dependent variable, BPI (White-Baker & Hubona, 2011) by estimating and testing path b. The test result showed that TP, CO, OL, and IN produced an R^2 value of 0.499 in the dependent variable BPI. TP and CO had a strong path coefficient of $\beta = 0.31$ and 0.52, while OL and IN showed a non-significant path coefficient of $\beta = 0.02$ and -1.0. The next section explains the examination of R^2 values to assess the entire hypothesis.

Hypotheses testing

The result of the R^2 values and the path coefficients for the entire hypothesis were obtained after running PLS and bootstrapping algorithms in SmartPLS software. Table 6.9 shows the result of the hypothesized structural model. It contains the values of the path coefficient, T-statistics and the hypothesis result. All of the proposed hypotheses were supported except Hypotheses 7 and 8. To confirm the proposed hypotheses and research model, the estimated values for the path coefficients between each constructs needed to be significant. It was observed that the beta path coefficients of SSM, TP and CO were positive and statistically significant at $P < 0.001$.

It is important to report the R^2 values in PLS studies for all the dependent variables included in the model (Henseler, et al., 2009; Hulland, 1999). The research model (as shown in Figure 6.3)demonstrated a significant amount of variance in the dependent variables (TP, IN, OL, CO & BPI). For instance, SSM had a strong path coefficient with BPI ($\beta = 0.69$, $t = 9.7176$, $p < 0.001$). Therefore, Hypothesis H1, that SSM has a positive influence on BPI,was supported. Similarly, SSM hada strong path coefficient with TP ($\beta = 0.60$, $t = 10.3953$, $p < 0.001$), thus H2 was also supported. In the same way, Hypotheses 4, 5, 6, and 9 were supported. Moreover, IN did not positively influence BPI and had a weak path coefficient of ($\beta = -0.06$, $t = 0.6861$), and OL did not positively influence BPI with a weak path coefficient of ($\beta = -0.019$, $t = 0.2335$). Thus, Hypotheses 7 and 8 were not supported.

It is also important to note that the structural model (as shown in Figure 6.1) contains both direct and indirect effects. This model explained 71.6% of the variance with an R^2 value of 0.716. The direct effect of SSM on BPI alone produced an R^2 value of 0.59 and was only able to explain 59% of the variance, implying that the model shown in Figure 6.3 provides a richer picture of the relationships.

Mediation analysis based on 500 bootstrapped samples using bias-corrected and accelerated 95% confidence intervals (Preacher & Hayes, 2004)demonstrated that controlling for the effect of covariate TP and CO, the independent variable SSM had a significant total effect (TE) on the dependent variable BPI (TE=.71, $p < 0.001$) ,a significant residual direct effect (DE= .59, $p < 0.001$),and a significant indirect effect (IE=.499, $p < 0.001$).

Table 6.9: Structural Model Results

)	Hypothesized paths	Path Coefficient	T-statistics	Supported
H1	SSM ---> BPI	0.6975	9.7176	Yes
H2	SSM ---> TP	0.6008	10.3953	Yes
H3	SSM--->IN	0.5819	10.9176	Yes
H4	SSM--->OL	0.6493	14.5266	Yes
H5	SSM --->CO	0.7219	16.0614	Yes
H6	TP ---> BPI	0.3518	9.7602	Yes
H7	IN ---> BPI	-0.0631	0.6861	No
H8	OL ---> BPI	-0.0193	0.2335	No
H9	CO --->BPI	0.5329	10.6793	Yes

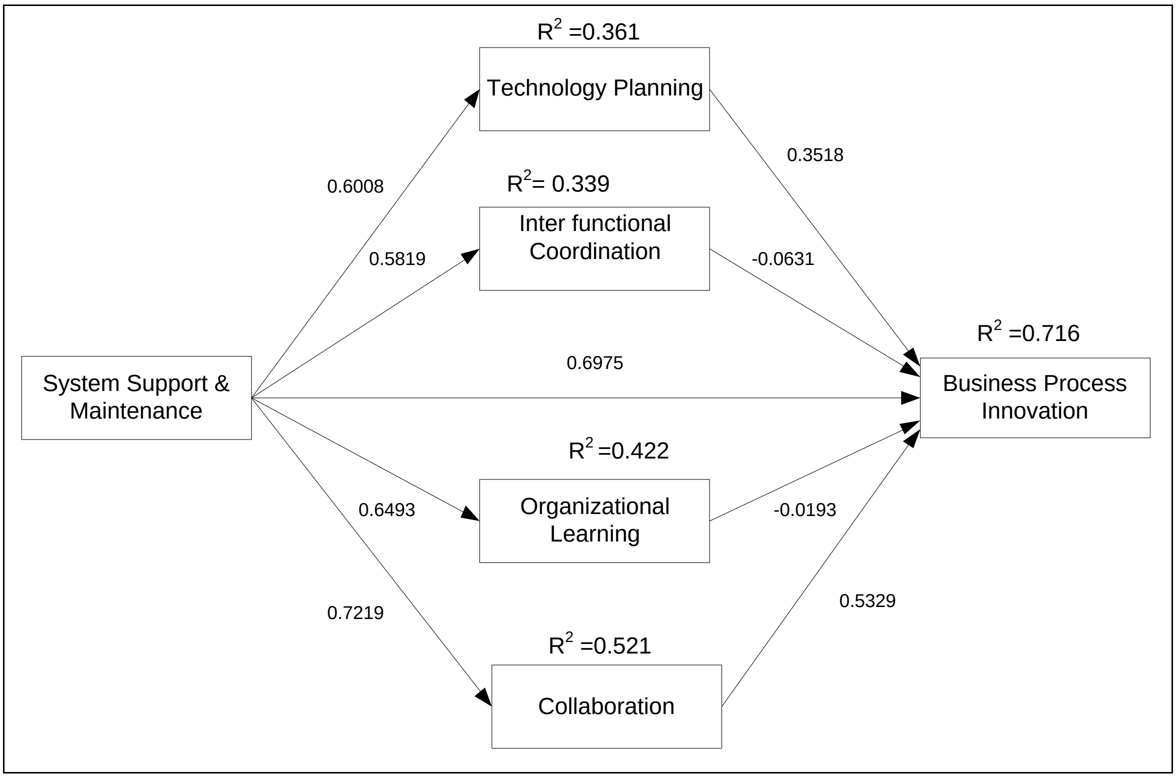

Figure 6.3: Model Results

Goodness of fit measures

PLS path modeling does not provide any global goodness of fit benchmark (Chin, 1998). As a consequence, Chin (1998) has proposed a number of criteria that include the assessment of the outer model (measurement model) and inner model (structural model) to evaluate partial model structure. Previous studies have identified that structural equation modeling (Rosemann & Vessey) techniques that use a co-variance based approach (e.g. AMOS, LISREL) offer more established goodness of fit metrics that can be used to review the quality of the structural model (Henseler, et al., 2009; Urbach & Ahlemann, 2010). However, SEM techniques that use component-based analysis (e.g. PLS-GRAPH)do not provide such kinds of measures (Pavlou, et al., 2007). As a component-based analysis was used in this study, there was no well-established method by which a goodness of fit index could be calculated.

According to Bailey (Bailey, 1978), the goodness of fit index is calculated using the average of the R^2 values and the geometric mean of the average communality index. The original purpose of this index is to evaluate the model performance at both the structural model and the measurement model level, with a focus on assessing the overall performance of the model (Chin, 2010). Many scholars argue that these types of index have not been analyzed in simulation studies and warrant further improvements (Henseler, et al., 2009; Pavlou, et al., 2007).

Furthermore, several researchers report that studies that use component-based analysis use R^2 as a measurement of their research model goodness of fit (Chin, 1998; Pavlou, et al., 2007). In this study, a higher number of R^2 values were obtained. For example, the model demonstratedthat 71% of variance in BPI was explained by SSM and IS competencies. In conclusion, the research model used in this study demonstrated a satisfactory goodness of fit.

6.6 Chapter Summary

This chapter presented the results of the main survey, and the tests the research model and related hypothesis. The first part of the chapter explained the data collection and analysis procedure and presented the demographic profile of the respondents. This was followed by adetailed description of the procedures followed for the evaluation of the measurement and structural models, and the finding of those assessments. This chapter concluded with the explanation on goodness of fit measure. Overall, the findings were that The next chapter presents the discussion on the main findings followed by discussion of the theoretical constructs used in the research in relation with the results obtained.

Chapter 7: Findings and Discussion

7.1 Chapter Overview

The purpose of this chapter is to discuss the main findings obtained in this research. In order to achieve this, the development of each construct and the relationship between them are reviewed. This chapter also highlights new findings, and describes the consistency or inconsistency of the results of this study with those from previous studies.

7.2 The Main Findings

The previous chapter discussed the result of the main survey and assessed the conceptual research model that includedthe evaluation of the measurement as well as the structural model. Based on the empirical results obtained in the previous chapter, this section provides a summary of the main findings, followed by a discussion of the research hypothesis.

The Competency Based Perspective, an extension ofthe RBV, was applied in this study to examine the influence of SSM on BPI at the post-adoption stage, and also examine how this influence is mediated by IS competencies. In doing so, the aim was also to understand the relationship between SSM and IS competencies at the post-adoption stage. Five constructs,(namely: SSM, TP, IN, OL, and CO)were identified to examine the relationship with BPI. The result showed a significant amount of variation in the dependent variable, BPI. In addition to this, SSM significantly influenced TP, IN, OL, CO and BPI.

Table 7.1 details all the research hypotheses examined and the survey test results are provided under the heading of each sub-research question. Seven research hypotheses were supported (i.e., H1, H2, H3, H4, H5, H6 and H9) based on the empirical testing, while two research hypotheses were not supported (i.e., H7 and H8).

Table 7.1: Summary of Research Questions & Hypotheses

Hypothesis	Research Question A To what extent does System Support and Maintenance influence Business Process Innovation?	Supported
H1	System Support and Maintenance positively influences Business Process Innovation	**Yes**
	Research Question B To what extent do Organization Learning, Technology Planning, Inter-functional Coordination, and Collaboration influence Business Process Innovation?	
H6	Technology Planning positively influences Business Process Innovation	**Yes**
H7	Inter-functional Coordination positively influences Business Process Innovation	**No**
H8	Organizational Learning positively influences Business Process Innovation	**No**
H9	Collaboration positively influences Business Process Innovation	**Yes**
	Research Question C To what extent does System Support and Maintenance influence Organization Learning, Technology Planning, Inter-functional Coordination, and Collaboration?	
H2	System Support and Maintenance positively influences Technology Planning	**Yes**
H3	System Support and Maintenance positively influences Inter- functional Coordination	**Yes**
H4	System Support and Maintenance positively influences Organizational Learning	**Yes**
H5	System Support and Maintenance positively influences Collaboration	**Yes**

7.3 Discussion of the Findings

This section discusses findings of the measured outcomes in relation to the underlying research questions. In addition to this, the results are discussed followed by comparing the findings with the previous literature

7.3.1 Research Question A: To what extent does System Support and Maintenance influence Business Process Innovation?

As mentioned in Chapter 1, the purpose of this study was to develop and validate a model to examine the influence of SSM on BPI at the post adoption stage and also examine how this influence is mediated by IS competencies. In doing so, it also aimed to understand the relationship between SSM and IS competencies at the post-adoption stage. The Competency Based Perspective, an extension to the RBV, was therefore used as the theoretical lens to examine the effect of SSM and IS competencies on BPI.

The literature suggests that many BPI initiatives are largely IT driven and specify different ways in which IT can facilitate and maintain process innovation (Davenport & Short, 1990; Serrano & Hangst, 2005). The focus of the extant literature is mainly on the role of different technologies to automate, improve or reengineer existing business processes, and provide facilitation of activities like project management (Attaran, 2003). Similarly, the previous literature also suggests that the combined effects of technology, IS professionals and managerial arrangements affect an organization's ability to envisage, develop and implement BPI (Doherty & Terry, 2009; Tarafdar & Gordon, 2007). For instance, the usage of a processing modeling tool without a proper managerial collaboration mechanism would not enable BPI in a company (Tarafdar & Gordon, 2007).

The literature further suggests that IS competencies have an impact on overall company performance as well on the antecedents of company performance, such as BPI, supply chain management, and ability to sustain competitive advantage (Bharadwaj, 2000; Pavlou, et al., 2007; Santhanam & Hartono, 2003; Tarafdar & Gordon, 2007; Wade & Hulland, 2004). At the pre-adoption stage, the IS competencies of the IT support department in developing, managing and leveraging IT are likely to have a positive effect on overall company performance (Bharadwaj, 2000; Ravichandran & Lertwongsatien, 2000, 2005a; Rockart & Hoffman, 1992). Alternatively, at the post-adoption stage, IS competencies refer to change levers like SSM along with other innovation-enabling factors that can be used to radically improve key business processes (Ravichandran & Lertwongsatien, 2005b; Wade & Hulland, 2004). As much of the innovation in business relies on information system and information technology, a change lever in this case includes the IS competencies that can transform the company in such a way that it is then capable of using IT, and at the same time have a control over the deployment and use of IT, so that all the business operations run smoothly and are free of disruptions (McElheran, 2011).

The findings of this study show that SSM along with other mediated IS competencies together explain a significant portion of variation in BPI (R^2 =.716). This is in accordance with the literature. For example, Tarafdar and Gordon (2007) have examined different IS competencies as antecedents of process innovation and found that different IS competencies have an ability to affect the formation, development and implementation of process innovation. Additionally, the literature also suggests that IS competencies help companies to achieve greater performance from an organizational aspect (Eisenhardt & Martin, 2000) because they are specific and unique to a company (Conner, 1991; Teece, 2007). Recent IS literature tends to conclude that IS competencies in general are likely to influence different antecedents of organizational performance including, but not limited to, success in electronic commerce (Montealegre, 2002), customer service excellence (Ray, et al., 2004) and process innovation (Tarafdar & Gordon, 2007). Furthermore, similar findings show that IS competencies have an effect on BPI in different contexts (Attaran, 2003; Mustonen-Ollila & Lyytinen, 2004).

Hypothesis H1 was supported by the measured results and had a direct and significant effect on BPI. The results showed that SSM ($\beta = 0.69$, $t = 9.7176$, $p < 0.001$) is a strong predictor of BPI and positively influenced BPI at the post-adoption stage. This is consistent with the previous literature that involves an argument about the increasing importance of SSM (McElheran, 2011). At the post adoption stage, a smooth functioning of business operations requires a high level of IT support department involvement and SSM competency to support and provide maintenance to the information systems. A company's competitive advantage can be explained by how competent it is in supporting and maintaining the IS at the post- adoption stage and the its ability to cultivate BPI to achieve a higher level of performance (Ray, et al., 2005).

7.3.2 Research Question B: To what extent do Organizational Learning, Technology Planning, Inter-functional Coordination, and Collaboration influence Business Process Innovation?

The results show that Technology Planning (TP) plays important role in fostering BPI. Previous empirical studies present similar findings and argue that a company's ability to develop process or product innovation depends on its technical capabilities (Cusumano & Elenkov, 1994). These capabilities are developed when attention is given to the technological planning phase. Moreover, the technological development and quality literature suggests that a competency in TP plays an important and positive role in building innovation in the company (Panizzolo, 1998; Song & Montoya-Weiss, 1998b). Additionally, other studies (Phaal, et al., 2004) suggest that TP deals with all aspect of integrating technological issues into business decision making at the pre- and post-adoption stage. TP is directly relevant to a number of business processes, including BPI, strategy development, and operations management. The finding reconfirms that TP plays a positive role in achieving BPI.

In turn, the results show that Collaboration (CO) plays a positive role in BPI. This is consistent with previous research that argues that a competency in CO is required to develop innovative ideas in the organization (Pirola-Merlo & Mann, 2004; Taggar, 2002). Extant IS studies show that CO is required at every stage of innovation to successfully convert the idea into an innovative product or service. This is generally referred to as the 'whole is greater than sum of its parts' (Zakaria, et al., 2004). In other words, the synthesized outcome produced by one team is likely to be greater than the sum of the products generated by individual team members. A competency in CO is an important and positive factor in the development and implementation of an innovation culture (McKnight & Bontis, 2002). competency in CO stimulates team members' efforts through the sharing of knowledge that can trigger new ideas and solutions, and positively impact on BPI (Madjar, 2005). The findings of this study reconfirm that CO plays positive role in achieving BPI (Den Hengst & de Vreede, 2004).

Hypotheses H6 and H9 were supported by the measured results and had a direct and significant effect on BPI. The results showed that TP ($\beta = 0.35$, $t = 9.7602$, $p < 0.001$), and CO ($\beta = 0.53$, $t = 10.6793$, $p < 0.001$) were strong predictors of BPI. The results showed that TP and CO positively influenced BPI at the post-adoption stage. However Hypotheses H7 and H8 were not supported by the results. The results showed that IN ($\beta = -0.06$, $t = 0.6861$), OL ($\beta = -0.01$, $t = 0.2335$). The results of this study showed that IN and OL negatively influence BPI at the post adoption stage. A possible explanation lies in the way how these constructs were measured in the context of this study. In this study, the IN construct was measured using a scale adapted from Jaworski and Kohli(1993) and Narver and Slater (1990). Visit frequency, information transparency, integration, and realization aspects were used to measure this construct. The adapted measure for OL was based on empirical studies by Baker and Sknkula(1999) and McKnight and Bontis(2002) . The construct was measured on three aspects, namely: commitment to learning, shared vision and open mindedness

Previous empirical literature has suggested that increased Inter-functional Coordination (IN) improves the management process and reduces the information asymmetry (Jelinek & Schoonhoven, 1990; Moenaert, et al., 1994). A competency in IN is important to enhance the ability of a company to collect and use market information effectively to achieve successful innovation outcomes (Grinstein, 2008; Marjanovic, 2005). Some other studies suggest that IN has a positive effect on innovation consequences because it aids in disseminating novel information and can increase problem solving (Im & Workman, 2004). However, this was not the case in the measured results of this study. One possible explanation is that too much collaboration and coordination for the purpose of information sharing between the team members can often have negative effect (Henard & Szymanski, 2001). The results of this study showed that at the post-adoption stage, IN did not produce significant effects on BPI.

The findings of this study show that Organization Learning (OL) does not have significant effect on BPI. These findings are similar to previous studies that present mixed empirical evidence regarding the link between OL and innovation (Therin, 2003). To start with, OL refers to "processes within an organization to maintain or improve performance based on experience" (Nevis & DiBella, 1995, p. 75). Learning is embedded in an organization and is not affected by a change in individuals. When an organization learns through acquisition, communication and exploitation of knowledge, it increases the organizational ability to bring incremental innovation (Hurley & Hult, 1998). In other words, the better the OL process is, the greater is the capacity to develop incremental product or process innovation (Damanpour, 1991; Damanpour

&Gopalakrishnan, 2001). Incremental innovation refers to a low degree of acquisition of new knowledge for the purpose of a low degree of organizational transformation (Dewar & Dutton, 1986). On the other side of the spectrum, radical innovation refers to the acquisition of a high degree of new knowledge for the purpose of a high degree of organizational transformation (Dewar & Dutton, 1986; Therin, 2003).

Over the last few decades, much of the literature on the study of organizations has suggested that OL strongly supports incremental innovation because such innovation entails lower economic and organizational risks for adoption companies (McKnight & Bontis, 2002; Nelson & Winter, 1982). This conceptualization is relevant because companies are likely to develop routines and information filters based on previous experiences that represent organizational knowledge and conditions in order to react to changes in the environment (McElheran, 2011). In other words, if a company is good at articulating existing knowledge in different ways, then the company should be good at producing innovative outcomes.

At the post-adoption stage, the goal of BPI is to use change levers to radically improve key business processes (Davenport, 1993). In other words, radical innovations that are based on new knowledge (Gatignon, et al., 2002) are required to bring improvements in business processes. At this stage, OL is not necessarily related to innovation success (Hurley & Hult, 1998) because if the innovation is not aligned with the company strategy and the environment of the company, then the innovation will fail and OL will not be related to BPI (McElheran, 2011; Therin, 2003). The explanation is relevant for this study because BPI requires a high level of alignment between the technology requirements for it to occur and the organization’s ability to meet those requirements.

Extant literature on innovation that focuses on radical innovation highlights that these innovations are generally difficult to achieve for large organizations. For example, larger companies may have lower incentives associated with an innovation because it may replace existing revenue streams (Tripsas & Gavetti, 2000). From another aspect, an organization that integrates knowledge exploration and exploitation without taking into regards organizational boundaries is likely to create a risky knowledge strategy for the company (Zack, 1999). Much of the strategic management literature explains the resistance towards radical innovation, and provides an explanation as to why companies still acquire new ones when existing innovations provide the economic advantage. In summary, this study showed that competency in OL may become an inhibitor (Leonard-Barton, 1992) during a radical change in a business process at the post-adoption stage.

7.3.3 Research Question C: To what extent does System Support and Maintenance influence Organization Learning, Technology Planning, Inter-functional Coordination, and Collaboration?

The literature suggests that at the post adoption stage of Enterprise Systems (ES), the process of invention and re-invention has to work in parallel to achieve BPI (Bresnahan & Greenstein, 1996). On the one hand, companies need to have specific IS competencies to expand or obtain particular IT systems to support the new way of doing their business (Davenport, 2000). On the other hand, companies need to also design new business processes and the organizational structures to correspond to the newly adopted technology constraints (McElheran, 2011). As a result, SSM is not only required for successful BPI but also required to facilitate the overall process of innovation.

The findings of this study showed that SSM explained a significant portion of variation in TP (R^2 =.316), IN (R^2 =.339), OL (R^2 =.422), and CO (R^2 =.521). This is in accordance with the findings reported in previous literature. For example, previous empirical studies suggest that at the post-adoption stage of ES, one of the challenges arising is when new operational knowledge requires a transformation because existing business routines are replaced with unproven techniques (McElheran, 2011). In other words, any changes in the core business process require that the company first develops and acquires the right technology to support the new way of doing business (Bresnahan & Greenstein, 1996; Tarafdar & Gordon, 2007). In turn, when companies develop new organizational structures or business processes, the existing IS competencies for supporting and maintaining the system have to be upgraded so that new knowledge and skills can be used to access new technological opportunities (Srivardhana & Pawlowski, 2007). Accordingly, the results of this study showed that SSM played a positive role in TP.

The findings of this study demonstrated that SSM does have a significant effect on inter-functional coordination (IN). This is consistent with previous empirical findings that explain that business processes reside in different sets of activities which are dependent on each other (Malone & Crowston, 1994; Marjanovic, 2005). For example, a change in a business process will have a ripple effect, as all business processes are tightly coupled with others. It further raises the demand for the IN and knowledge required to implement change. At the post-adoption stage, SSM influences IN as any change in business activities that are operationally interdependent within in a company require a high level of IN to make sure risks are mitigated (Henderson & Cockburn, 1994).

The results demonstrated that SSM does have significant effect on OL. This is also consistent with previous empirical findings. The literature suggests that a company's competency to implement product or process innovation increases as its experience grows (Damanpour, 1987; Damanpour & Wischnevsky, 2006; Nevis & DiBella, 1995). At the pre-adoption stage, an organization learns through acquisition, communication and exploitation of knowledge to increase its ability to innovate. (Hurley & Hult, 1998). Similar findings from some other studies also indicate that the better the OL process is, the greater an organization's capacity would be to develop product or process innovation (Damanpour, 1991; Damanpour & Gopalakrishnan, 2001). However, at the post-adoption stage, the competency of SSM enables companies to repeat experiences, analyze mistakes, and build the capacity to experiment and innovate that would result in the organization learning and improving its performance. This is also consistent with Kolb's learning cycle (1984), that explains that organizations go through multiple stages in order to learn and relearn; and require new forms of knowledge in order to convert ideas into actions.

The findings also showed that SSM did have a significant effect on CO. This finding is also consistent with previous literature. For example, several studies suggest that competency in CO is required to develop new ideas in the organization (Madjar, 2005; Tarafdar & Gordon, 2007). At the pre-adoption stage, the competency in CO is an important factor in the development and implementation of an innovation culture (McKnight & Bontis, 2002). Similarly, at the post-adoption stage, the knowledge and skills acquired through SSM further impacts on the competency of CO to further bring together the different sets of knowledge and skills of people, irrespective of their job functions, roles or office location (Zakaria, et al., 2004).

Hypotheses H2, H3, and H4, and H5 were all supported by the results of this study. The results showed that SSM, with hypothesized path H2 ($\beta = 0.60$, $t = 10.3953$, $p < 0.001$), H3 ($\beta = 0.58$, $t = 10.9176$, $p < 0.001$), H4 ($\beta = 0.64$, $t = 14.5266$, $p < 0.001$), and H5 ($\beta = 0.72$, $t = 16.0614$, $p < 0.001$), was a strong predictor of TP, IN, OL, and CO respectively.

The results demonstrated that SSM was significantly related to TP, IN, OL and CO. The findings are consistent with previous research. This finding suggests that companies develop superior SSM competency in order to expand or obtain particular technology (software/hardware) to support the new way of doing business at the post-adoption stage (Davenport, 1993; Mustonen-Ollila & Lyytinen, 2004; Srivardhana & Pawlowski, 2007). In other words, SSM increases the level of IS competencies that would then facilitate bringing BPI.

7.4 Research Question and Objectives Revisited

The objective of this study was to develop and validate a model to examine the influence SSM on BPI at the post-adoption stage, and also examine how this influence is mediated by IS competencies. In doing so, it also aimed to understand the relationship between SSM and IS competencies, and its effect on BPI. The main research question that guided this study was:

What factors influence Business Process Innovation at the post-adoption stage?

In order achieve the objective of this study, and answer the above research question, three sub questions were set:

RQ1: To what extent does System Support and Maintenance influence Business Process Innovation?

RQ2: To what extent do Organization Learning, Technology Planning, Inter-functional Coordination, and Collaboration influence Business Process Innovation?

RQ3: To what extent does System Support and Maintenance influence Organization Learning, Technology Planning, Inter-functional Coordination, and Collaboration?

This study was able to effectively answer the main research question, along with each sub-research question. In regards to first sub question, it was found that SSM directly influenced BPI. In regards to second sub question, TP and CO directly influenced BPI while IN and OL did not influence BPI. In regards to sub question 3, the results showed that SSM significantly influenced TP, IN, OL, and CO. This research satisfied the objective and the associated research questions set out initially. Figure 7.1 shows the final version of the developed and validated research model.

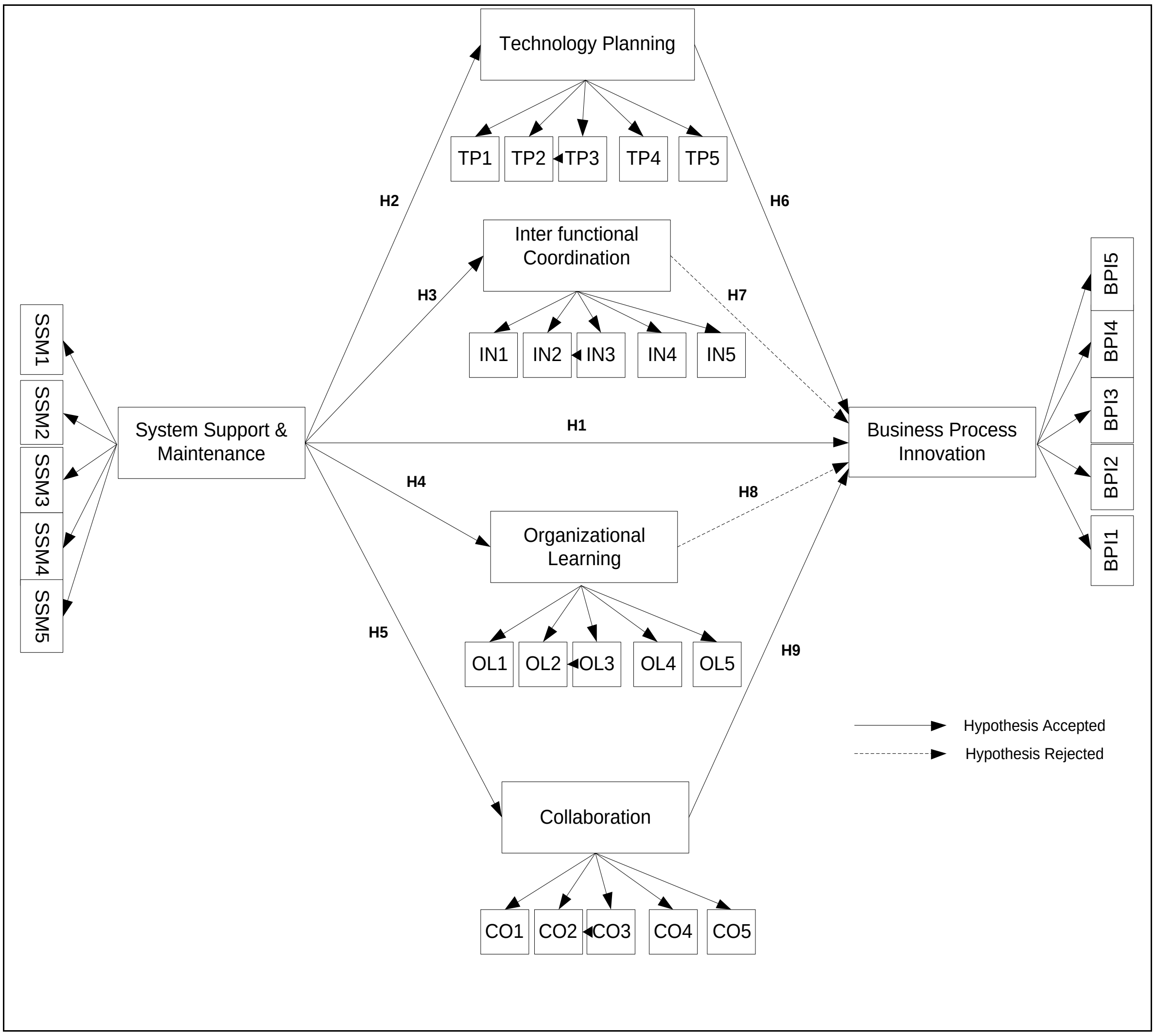

Figure 7.1 Final Research Model

7.5 Chapter Summary

This chapter discussed the findings presented in Chapter 6. The research objective and the associated research questions were answered, and the nine hypotheses werereviewed taking into consideration the findings of previous research. Hypotheses H1, H6, H9 were supported by the results of the study since SSM, TP and CO significantly influenced BPI. However, the relationship between IN and OL was not found to be significant, and Hypotheses H7 and H8 were rejected. Moreover, the relationship between SSM and TP, IN, OL, and CO were significant, and Hypotheses H2, H3, H4, and H5 were therefore accepted. The next chapter provides an overall summary of the research and presents some concluding remarks, including suggestions and recommendations for further research.

Chapter 8: Conclusion

8.1 Chapter Overview

Chapter 8 provides a summary of the previous seven chapters and states the findings of this study. The chapter presents the main contributions of this study to the academic literature, and also identifies and discusses the contributions to practice. The chapter concludes thisthesis with an emphasis on the limitations of this study, followed by suggestions and guidelines for future research.

8.2 Summary of the Research

The purpose of this study was to provide a mechanism to understand the role of SSM as a change lever at the post-adoption stage of ES to achieve BPI. In this study, a survey research technique was used to empirically test the research model. The survey instrument was implemented through an online survey questionnaire. This method was used to gather information from IT professionals who were working and living in New Zealand and spoke sufficient English. The second motivation for conducting this study was the lack of empirical research that focuses on IS post-adoption stage, and the influence of SSM on BPI (Gartner, 2007, 2009; Saeed & Abdinnour-Helm, 2008). Therefore, the aim of this research was to examine the influence of SSM on BPI, and how this influence is mediated by IS competencies. This study has therefore addressed the aim by exploring: 1) the effects of System Support & Maintenance on Business Process Innovation 2) the extent to which Organization Learning, Technology Planning, Inter-functional Coordination and Collaboration influence Business Process Innovation 3) the relationship between SSM and identified IS competencies.

The main research question was:
What factors influence Business Process Innovation at the post-adoption stage?

The sub-research questions were:

- To what extent does System Support and Maintenance influence Business Process Innovation?
- To what extent do Organization Learning, Technology Planning, Inter-functional Coordination, and Collaboration influence Business Process Innovation?

- To what extent does System Support and Maintenance influence Organization Learning, Technology Planning, Inter-functional Coordination, and Collaboration?

The findings showed that the structural model explained 71% of the variance in SSM and mediating effects of IS competencies on Business Process Innovation (R^2 = .71). The findings were consistent with previous studies and showed an influence of SSM and mediated IS competencies on the dependent variable. Hence, hypotheses H1, H6, H9 were supported by the result obtained. Contrary to expectations, hypotheses H7 and H8 were not supported by the results of the study. This study further confirms that innovation-enabling factors identified by previous research are applicable at the post-adoption stage (Petaraf, 1993; Ravichandran & Lertwongsatien, 2005b; Tarafdar & Gordon, 2007; Wade & Hulland, 2004).

The findings also showed that SSM explains a significant amount of variance in Technology Planning (R^2=0.36), Inter-functional Coordination (R^2=0.33), Organizational Learning (R^2=0.42), and Collaboration (R^2=0.52) at the post-adoption stage. Hypotheses H2, H3, H4 and H5 were supported based on the empirical evidence obtained in the study.

8.3 Academic Contributions

This study has made important contributions to the body of research examining the effect of SSM on BPI at the post-adoption stage, in conjunction with examining the mediating effects of IS competencies. The following section highlights the six key academic contributions of this study

Academic Contribution 1

A main contribution of this study lies in the specification, rationalization and empirical justification of a set of interrelationships between important factors that have a propensity to be associated with facilitating BPI at the post-adoption stage. A Competency Based Perspective (Broadbent, et al., 1999; Kogut & Zander, 1992), an extension of the RBV, has provided a theoretical foundation for all the constructs used in the model. Thus, this study serves as an important addition to the literature by applying the Competency Based Perspective in explaining effects of SSM and other IS competencies on BPI.

Academic Contribution 2

This study found that SSM, along with mediating IS competencies at the post-adoption stage, influenced BPI. An early identification of the antecedents of BPI can be helpful to explain how Business Process Innovation can be brought about in a company. This study fills the existing gap in knowledge in the context of the post-adoption stage, since no other study has explored the role of SSM as an enabler of BPI at the post-adoption stage. This study found that SSM and other mediating IS competencies have a direct and significant effect on creating a positive BPI outcome (Edmondson, et al., 2001). Thus, this study provided a mechanism for developing a better understanding of the types of IS competencies at the post-adoption stage that can create positive BPI outcomes.

Academic Contribution 3

This study reviewed the current Competency Based Perspective literature and identified the SSM (Tarafdar & Gordon, 2007) and specific IS competencies that can become essential to BPI. A technique similar to hierarchal clustering was used to find patterns in the literature. This research contributes to the discovery of different methods for the identification of factors that can influence BPI. Many scholars have expressed the need for the development of alternative methods to use, to further explain the predictive understanding of the phenomenon (Bharadwaj, 2000; Peppard & Ward, 2004; Sambamurthy & Zmud, 1997; Tarafdar & Gordon, 2007; Wade & Hulland, 2004) .

Academic Contribution 4

One of the important contributions of this research lies in providing a better understanding of benefits associated with the ES implementation and its impacts on organizational processes and functions. At the pre-adoption stage, these benefits include but not limited to automating business processes to achieve desired organizational result. While at the post-adoption stage of ES implementation, these benefits refer to transforming ES data and knowledge into measurable outcome (Davenport, 2000). Davenport’s framework (Figure 8.1) composes of three main stages. The first stage, namely context, includes factors that are preexisting to transform ES data into knowledge. The second stage, namely transformation, involves the transformation of ES data into knowledge through the analysis and utilization of decision making. The last stage is the realization of outcomes that represent change result from implementation of decisions. This research extends Davenport's (2000) framework (Figure 8.1) of benefit realization by introducing and explaining the contribution of SSM that can facilitate to achieve the outcome of BPI to further realize the benefits associated with ES implementation.

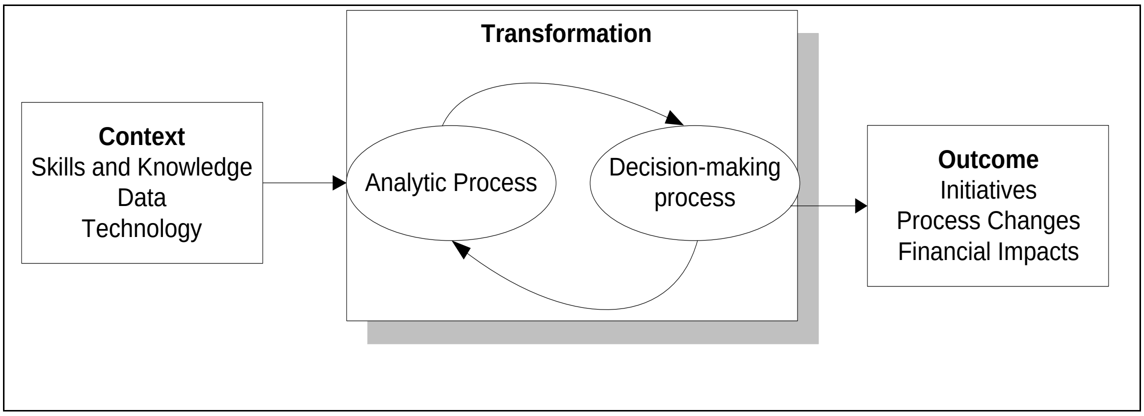

Figure 8.1: Enterprise Systems Benefit Realization

Source: (Davenport, 2000, p. 222)

Academic Contribution 5

This research contributes to and extends the post-adoption literature (McElheran, 2011; Ravichandran & Lertwongsatien, 2000, 2005b; Saeed & Abdinnour-Helm, 2008; Tarafdar & Gordon, 2007) by examining the inter-relationship between SSM and different IS competencies; namely: TP, OL, CO and IN. It also contributes to construct specification and measurement of Business Process Innovation. Another important contribution of this study is that it sheds some light onto the innovation-enabling constructs required to achieve BPI at the post-adoption stage. This addresses one the most important gaps in the strategic management literature (McElheran, 2011).

Academic Contribution 6

Most existing IS research on process innovation is largely concentrated around using information technology (Chapin, et al., 2001; Conger, 2011; Davenport, 1993) to enable the automation of, and improvement in, existing processes. Much of the literature focuses on technical aspects and ignores the role of competencies to enable on-going process innovation, especially at the post-adoption stage. In addition, no other study has looked at the role of SSM in bringing about process innovation. Given its importance in gaining strategic advantage from IT investments (Doherty & Terry, 2009; Piccoli

&Ives, 2005; Srivardhana & Pawlowski, 2007), this study contributes to the literature in IS.

8.4 Implications for Practice

In addition to academic contributions, this study has provided an understanding of the role of SSM in conjunction with the mediating effects of Information Systems competencies on BPI. ICT service providers will be interested in the implications of this research in order to advance their understanding of the role of SSM and IS competencies in achieving BPI. This study highlights the importance of SSM and IS competencies that can further enhance the understanding of ICT service providers, so they can identify and develop innovation capabilities for the continued success of their respective organizations (Gartner, 2009). In other words, it is important for ICT providers to know how they can enhance the contribution of their IS and their innovation-related efforts by developing and strengthening relevant IS competencies. The following section identifies five contributions to IS/IT practitioner made by this study.

Practice Contribution 1

This study reinforces the current ICT practitioner concerns expressed in the literature (Gartner, 2007, 2009; Koch, 2006), to suggest that the emerging role of an organization is to increase the participation in, and provide leadership for, BPI. The findings of this study provide information to assist practitioners to assess the readiness and ability of their IS competencies to support BPI. In addition, the findings can help to identify those IS competencies that are missing or require further improvement. The research model developed could serve as a basis for IS performance evaluation models. As BPI is antecedent of firm performance, the model presented in this study can help develop a more comprehensive understanding of the IS performance framework (Bharadwaj, 2000; McElheran, 2011; Pavlou, et al., 2007; Santhanam & Hartono, 2003; Tarafdar & Gordon, 2007) .

Practice Contribution 2

The IS literature reports consistently that SSM is the most expensive part of the IS development lifecycle and there have been numerous repeated requests to give importance to this area and explore it from a non-technical aspect (Chapin, et al., 2001;

Polo, et al., 2003; Saeed & Abdinnour-Helm, 2008).. Following this track, this study examined the area from a non-technical side and provides an understanding of creating business value by empirically assessing the SSM and IS competencies that may contribute to the continuous improvement in new product or process development (Lee, 2007), influence organizational performance (Daghfous, 2007) and increase its market competiveness (Porter, 1990; Rhee, Park, & Lee, 2010)

Practice Contribution 3

Previous empirical studies indicate that SSM is often left to students, entry level workers or inexperienced personnel (Khan & Zheng, 2005; Polo, et al., 2003). SSM is not well regarded and a high staff turnover rate is common in IT support departments (Chapin, et al., 2001). The people who carry out this work may have few or no performance incentives attached to their work. The findings of this study showed that SSM and IS competencies at the post-adoption stage need to be considered important since these have the ability to provide a disruption-free environment and the potential to support BPI. The reported findings would further justify executive management giving special attention to SSM and reconsidering the practices and policies associated with the roles of the IT support staff.

Practice Contribution 4

The findings of this study have provided a better understanding of SSM and its relationship with BPI. From the practical perspective, managers need information about how innovation capabilities are developed so that they can offer new products or services to gain a competitive advantage. The findings thus provide the potential to create guidance to managers on better utilizing the available IS competencies to support successful innovation in the company (Damanpour & Gopalakrishnan, 2001).

Practice Contribution 5

Finally, a valuable contribution for practitioners from this research is the evidence that a company's IS competencies and SSM strongly influence the success of BPI. The empirical evidence can help managers to justify putting additional resources towards building these competencies, as any variation in these competencies will have a lasting effect on company profitability and growth (Hall, 1992; Ravichandran & Lertwongsatien, 2005b; Tarafdar & Gordon, 2007)

8.5Study Limitations and Directions for Future Research

There were several potential limitations in this study. Below are some theoretical and empirical limitations and suggestions for future research.

The data collected and used in this research to test the hypotheses were cross-sectional (Babbie, 1990). It means that the data collected by observing subjects represented only a slice of a time without considering the differences in time. In other words, this study did not show how the data collected from IT professionals regarding BPI may change over time. Thus, causality can be only inferred because of this study's cross-sectional nature. Further studies should be conducted in a longitudinal manner to explore whether the variables and their associated relationships are consistent over time. By doing this, it will make it possible to make stronger causal conclusions.

According to Straub (1989), there are potential sources of error when conducting survey research. These errors include sampling error, internal validity, measurement error and statistical conclusion error. The researcher is aware of all these errors and made an attempt to moderate them by using highly accepted methods such as card sorting rounds, a pilot study, and performing pretests to develop the survey instrument. In addition, statistical techniques, including structural equation modeling, evaluated the validity of the survey instrument.

Even though extensive efforts were made to review most of the literature related to this study, it is important to acknowledge that some articles may still have been overlooked in the literature review process. For instance, the IS competencies examined in this study may not be the only ones that can influence BPI at the post-adoption stage. Further studies can utilize the knowledge developed in the research and may examine other innovation-enabling constructs that can influence BPI.

A potential limitation of this research concern the survey participant recruitment method and the sample incorporated in the study. It is difficult to guarantee that all respondents met the set criteria, or answered questions clearly; although efforts were made to collect a large sample from IT professionals. In addition, the respondents were limited to New Zealand IT professionals. While results presented in this study can be generalized to some extent when they are applied to similar contexts and circumstances, extra precautions would be necessary when generalizing any further. It is therefore important that these results should not be examined or used out of context.

While the use of PLS modeling is widely used and accepted among IS researchers (Qureshi & Compeau, 2009), recent studies have questioned the usefulness of statistically significant tests in PLS for evaluating structural path models (Rönkkö & Ylitalo, 2010). Thus, it is recommended that future studies should be aware of the recent debate regarding the computing techniques underlying PLS.

Future research should extend the model presented in this study, in order to re-examine or further validate the constructs and the scale developed. The model can also be evaluated to examine its applicability in different contexts. Furthermore, qualitative research can be carried out to examine whether SSM or any other particular IS competencies are more important than others, or what the mandatory conditions are for SSM and IS competencies to support BPI. Despite confirming the positive relationship between SSM and BPI, the quantitative nature of this study imposed a limitation on determining how organizations can reinforce the relationship.

Finally, this study provides an understanding or link between SSM and BPI with the mediating effects of IS competencies. Further studies can use these findings or conduct multiple case studies in different organizational settings and industry sectors to expand on what is reported in this study.

8.6 Concluding Remarks

The chapter presented the main academic contributions of this study and discussed contributions to practice. Furthermore, the limitations of this research followed by suggestions and guidelines for future research are presented. In summary, this study identified and evaluated the influence of SSM on BPI at the post-adoption stage and also examined how this influence was mediated by IS competencies. To achieve this objective, an online survey was implemented to gather information from IT professionals working and living in New Zealand and who spoke sufficient English. The study conducted an extensive literature review and systematic examination of the research context and integrated the theoretical perspectives in the literature from strategic management, IS and management.

The research model used in this study used a Competency Based Perspective, an extension to RBV, as its theoretical foundation. The model was found to be significant and explained 71% of variance in BPI through SSM and IS competencies at the post-adoption stage. Two out of nine proposed study hypotheses were not supported, while the other remaining seven hypothesized relationships were supported. Hypotheses H7 and H8 were not supported, and Hypotheses H1, H2, H3, H4, H5, H6, and H9 were supported in this study. This indicates that SSM and IS competencies at the post-adoption stage have a positive effect on BPI.

The model presented in this study therefore has a reasonably high explanatory power based on the findings; and this research has important practical and theoretical implications. The findings have the potential to enhance the competitiveness of business organizations by providing some ideas as how to best achieve BPI. From a theoretical stand point, this study provides a theoretical framework to explain how BPI can be achieved using SSM and IS competencies at the post-adoption stage. The theoretical contribution of this study lies in the specification, rationalization and empirical justification of a set of interrelationships between important factors. A further contribution is that the study also demonstrated the usefulness of the Competency Based Perspective, as an extension of the RBV, to model and provides reasons about the influence of SSM on BPI at the post-adoption stage, and also examined how this influence is mediated by IS competencies.

References

Adamides, E. D., & Karacapilides, N. (2006). A knowledge centered framework for collaborative business process modeling. *Business Process Management Journal*, *12*(5), 557–575.

Adams, D. A., & Nelson, R. R. (1992). Perceived Usefulness, Ease of Use, and Usage of Information Technology. A Replication. *MIS Quarterly*, *16*(2), 227-248.

Agarwal, R., & Ferratt, T. W. (2002). Enduring Practices for managing IT Professionals. *Communications of the ACM*, *45*(9).

Agarwal, R., & Karahanna, E. (2000). Time Flies When You're Having Fun: Cognitive Absorption and Beliefs about Information Technology Usage. *MIS Quarterly, 24*(4), 665-694.

Agarwal, R., & Prasad, J. (1997). The Role of Innovation Characteristics and Perceived Voluntariness in the. Acceptance of Information Technologies. *Decision Science*, *28*(3), 557-582.

Ahuja, M. K., & Thatcher, J. B. (2005). Moving Byound Intentions and Toward the Theory of Trying: Effects of Work Environment and Gender on Post Adoption Information Technology Use. *MIS Quarterly*, *29*(3), 427-459.

Al-Mashari, M., & Zairi, M. (2000). Creating a fit between BPR and IT infrastructure: a proposed framework for effective implementation. *International Journal of Flexible Manufacturing Systems*, *12*(4), 253–274.

Alysyouf, I. (2007). The role of maintenance in improving companies' productivity and profitability. *International Journal of Production Economics, 105*(1), 70-78.

Amit, R., & Schoemaker, P. (1993). Strategic assets and organizational rent. *Strategic Management Journal, 14*(1), 33-46.

Anderson, J. C., & Narus, J. A. (1990). A Model of Distributor Firm and manufacturer Firm Working Partnerships. *Journal of Marketing 54*, 42-58.

Ansoff, H. I., & McDonnell, E. J. (1988). *The new corporate strategy* (Vol. 1): Wiley.

Applegate, L. M. (1995). Designing and Managing the Information Age of IT Architecture. Boston, MA.

April, A., Hayes, J. H., Abran, A., & Dumke, R. (2005). Software Maintenance Maturity Model (SMmm): the software maintenance process model. *Journal of Software Maintenance and Evolution, 17*(3), 197–223.

Arban, A., Moore, J. W., & Bourque. (2004). Guide to the Software Engineering Body of Knowledge (SWEBOK). Los Alamitos CA,: IEEE Computer Society Press.

Attaran, M. (2003). Information technology and business-process redesign. *Business Process Management Journal, 9*(4), 440-458.

Attewell, P., & Rule, J. B. (1991). *Survey and other methodologies applied to IT impact research: experiences from a comparative study of business computing*. Boston, Massachusetts: Harvard Business School Press.

Babbie, E. R. (1990). *Survey Research Methods*. Belmont, CA: Wadsworth.

Babbie, E. R., & Wagenaar, T. C. (1992). *Practicing Social Research*. Wadsworth, CA.

Baggozi, R. P. (1993). Assessing Construct Validity in Personality Research: Applications to Meausres of Self-Esteem. *Journal of Research in Personality, 27*(1), 49-87.

Bagozzi, R. P., & Baumgartner, H. (1994). *The Evaluation of Structural Equation Model and Hypothesis Testing*. Cambridge, MA: Blackwell.

Bailey, K. D. (1978). *Methods of social science research*. New York: The Free Press.

Baker, W. E., & Sinkula, J. M. (1999). The synergistic effort of market orientation and learning orientation on organizational performance. *Academy of Marketing Science*, *27*(4), 411-427.

Barney, J. (1991). Firm resources and sustained competitive advantage. *Journal of Management 17*(1), 99-120.

Barney, J. B. (1986). Strategic factor markets: expectations, luck and business strategy. *Organization Science, 21*, 1231-1241.

Baron, R. B. a. K., D.A.,. (1986). The Moderator-mediator Variable Distinction in Social Psychological Research. *Journal of Personality and Social Psychology, 51*(6), 1173-1182.

Barua, A., Konana, P., Whinston, A. B., & Yin, F. (2004). An Empirical Investigation of Net-Enabled Business Value. *MIS Quarterly*, *28*(4), 585-620.

Barua, A., Kriebel, C. H., & Mukhopadhyay, T. (1995). IT and business value: an analytic and empirical investigation. *Information Systems Research, 6*(1), 3–23.

Bassellier, G., & Benbasat, I. (2004). Business competence of information technology professionals: conceptual development and influence on IT-business partnerships. *MIS Quarterly, 28*(4), 394–473.

Batra, D., & Davis, J. G. (1992). Conceptual Data Modeling in Database Design: Similarities and Differences Between Expert and Novice Designers. *International Journal Man-Machine Studies, 37*, 83-101.

Bedard, J. (1991). Expertise and its Relation to Audit Decision Quality. *Contemporary Accounting Research 8*(1), 198-222.

Benbasat, I., Goldstein, D. K., &Mead, M. (1987). The case Research Strategy in Studies of Information Systems. *MIS Quarterly*, *11*(3), 369 - 386.

Bernard, H. R., & Ryan, G. (1998). Text analysis: Qualitative and quantitative methods. In H. R. Bernard (Ed.), *Handbook of methods in cultural anthropology* (pp. 595–645). Walnut Creek, CA: Altamira.

Bessant, J., & Tidd, J. (2007). *Innovation and Entrepreneurship*: John Wiley & Sons.

Bharadwaj, A. S. (2000). A resource-based perspective on information technology capability and firm performance: An empirical investigation. *MIS Quarterly, 24*(1), 169–196.

Bhatt, G. D. (2000). A resource-based perspective of developing organizational capabilities for business transformation. *Knowledge and Process Management, 7*(2), 119–129.

Bhatt, G. D., & Grover, V. (2005). Types of information technology capabilities and their role in competitive advantage: an empirical study. *Journal of Management Information Systems, 22*(2), 253-277.

Bhattacherjee, A. (2001). Understanding Information Systems Continuance: An Expectation-Confirmation Model. *MIS Quarterly, 25*(3), 351-370.

Bhattacherjee, A., & Premkumar, G. (2004). Understanding Changes in Belief and Attitude toward Information Technology Usage: A theoretical Model and Longitudinal Test. *MIS Quarterly, 28*(2), 229-254.

Boehm, B. (2006). *A View of 20th and 21st Century Software Engineering*. Paper presented at the International Conferences on Software Engineering, Shanghai, China.

Bofondi, M., & Lotti, F. (2006). Innovation in the retail banking industry: the diffusion of credit scoring. *Review of Industrial Organization, 28*(4), 343-358.

Bollen, K. A. (1989). *Structural Equations with Latent Variables*. New York: Wiley.

Boyer, K., Olson, J.,, & ". (2002). Print versus electronic surveys: A comparison of two data collection methodologies. *Journal of Operations Management, 20*(4), 357-373.

Boynton, A. C., & Zmud, R. (1987). Information Technology Planning in the 1990's: Directions for Practice and Research. *MIS Quarterly, 11*(1), 59-71.
Boynton, A. C., Zmud, R. W., & Jacobs, G. C. (1994). The Influence of IT Management Practice on IT Use in Large Organizations. *MIS Quarterly, 18*(3), 299-318.
Brandenburger, A. (1996). Value-based Business Strategy. *Journal of Economics & Management Strategy, 5*(1), 5-24.
Brannick, M. T., & Chan, D. (2010). What is Common Method Variance and How Can We Cope With Iu? A panel discussion. *Organizational Research Methods, 13*(3), 407-420.
Bresnahan, T. F., & Greenstein, S. (1996). Technical Progress and Co-Invention in Computing and in the Uses of Computers. *Brookings Papers on Economic Activity. Microeconomics*, 1-83.
Broadbent, M., Weill, P., & Clair, D. (1999). The implications of information technology infrastructure for business process redesign. *MIS Quarterly, 23*(159–182).
Bryman, A., & Bell, E. (2007). *Business research methods* (2nd ed.). Oxford: Oxford University Press.
Brynjolfsson, E., McAfee, A., Sorell, M., & Zhu, F. (2008). Scale without Mass: Business Process Replication and Industry Dynamics. *Harvard Business School Technology & Operations Mgt. Unit Research Paper No. 07-016*.
Burton-Jones, A., & Straub, D. W. (2006). Reconceptualizing System Usage: An approach and Empirical Test. *Information Systems Journal*, *17*(3), 228-246.
Calder, B. J. (1977). Focus Groups and the Nature of Qualitative Marketing Research. *Journal of Marketing Research 14*(3), 353-165.
Campbell, D. T., & Fiske, D. W. (1959). Convergent and Discriminant Validation by the MutliTrain - MutliMethod Matrix. *Psychological Bulletin, 56*(2), 81-105.
Carver, R. H. N., & Nash, J. G. (2005). *Doing data analysis with SPSS version 12*. Victoria, Australia: Thomson Learning.
Cavana, R. Y., Delahaye, B. L., & Sekaran, U. (2001). *Applied Business Research: Qualitative and Quantitative Methods*: John Wiley & Sons.
Chapin, N., Hale, J. E., Khan, K. M., Ramil, J. F., & Tan, W. G. (2001). Types of software evolution and maintenance. *Journal of Software Maintenance and Evolution, 13*(1), 3-30.
Chen, W., & Hirschheim, R. (2004). A paradigmatic and methodological examination of information systems research from 1991 to 2001. *Information Systems Journal, 14*(3), 197-235.
Chesbrough, H. W. (2007). The market for innovation: implications for corporate strategy. *California Management Review, 49*(3), 45–66.
Cheung, M. W. L., & Chan, W. (2004). Testing Dependent Correlation Coefficients via Structural Equation Modeling. *Organizational Research Methods, 7*(2), 206-223.
Chin, W. W. (1998). *The partial least squares approach for structural equation modeling*. New Jersey: : Mahwah.
Chin, W. W. (2010). How to write up and report PLS analyses. In V. E. Vinzi, W. W. Chin, J. Henseler & H. Wang (Eds.), *Handbook of Partial Least Squares: Concepts, Methods and Applications* (pp. 655-690). London, New York: Springer.
Chin, W. W., & Gopal, A. (1997). Advancing the Theory of Adaptive Structuration: The Development of a Scale to Measure Faithfulness of Appropriation. *Information Systems Reseaerch, 8*(4), 342-367.
Churchill, G. A. (1979). A paradigm for developing better measures of marketing constructs. *Journal of Marketing, 16*(1), 64-73.

Clayton, R., & Werking, G. (1988). Business surveys of the future: The World Wide Web as a data collection methdology. In M. Couper, R. Baker & Bethlehemet. (Eds.), *Computer-assisted survey information collection* (pp. 543-561). New York: John Wiley.

Clemons, E. K., & Row, M. (1991). Sustaining IT Advantage: The Role of Structural Differences. *MIS Quarterly, 15*(3), 275-292.

Coff, R. W. (1997). Human Assets and Management Dilemmas: Coping with Hazards on the Road to Resource-Based Theory. *Academy of Management Review, 22*(2), 374-402.

Cohen, J. A. (1960). A Coefficient of Agreement for Nominal Scales. *Educational and Psychological Measurement, 20*, 37-46.

Collis, D., & Montgomery, C. A. (1995). Competing on resources : strategy in the 1990s. *Harvard Business Review, 73*(118-128).

Conger, S. (2011). Software Development Life Cycles and Methodologies: Fixing the Old and Adopting the New. *International Journal of Information Technologies and Systems Approach, 4*(1), 1-22.

Conner, K. R. (1991). A historical comparison of resource-based theory and five schools of thought within industrial organization economics: do we have a new theory of the firm? *Journal of Management 17*(1), 121-154.

Cooper, J. R. (1998). A multidimensional approach to the adoption of innovation. *Management Decision, 36*(8), 493-502.

Cooper, R. B., & Zmud, R. W. (1990). Information Technology Implementation Research: A Technological Diffusion Approach. *Management Science, 36*(2), 123-139.

Corso, M., & Paolucci, E. (2001). Fostering innovation and knowledge transfer in product development through information technology. *International Journal of Technology Management, 22*(1), 126–148.

Creswell, J. W. (2009). *Research Design: Qualitative, Quantitative, and Mixed Methods Approaches* (Vol. 3rd Edition). Thousand Oaks, CA: Lincoln-University of Nebraska.

Cronbach, L. J. (1971). *Test Validation*. Washington, DC: American Council on Education.

Crook, C. W., & Kumar, R. L. (1998). Electronic Data Interchange: A Multi-Industry Investigation Using Grounded Theory. *Information & Management, 34*(2), 75-89.

Crossan, H. W., Lane, & White, R. E. (1999). An organizational learning framework: From intuition to institution. *Academic Management Review, 24*(3), 522-537.

Crotty, M. J. (1998). *The Foundations of Social Research: Meaning and Perspective in the Research Process*: SAGE Publications.

Cusumano, M., & Elenkov, D. (1994). Linking international technology transfer with strategy and management: A literature commentary. *Research Policy, 23*(2), 195-215.

Daft, R. L. (1978). A Dual-Core Model of Organizational Innovation. *Academy of Management J., 21*(2), 193-210.

Daft, R. L. (1982). Bureaucratic versus Nonbureaucratic Structure and the Process of Innovation and Change. *Research in the Sociology of Organisation, 1*, 129-166.

Daft, R. L., & Becker, S. W. E. (1978). *Innovation in Organization*. New York.

Daghfous, A. (2007). Absorptive capacity and innovative enterprise systems: a two-level framework. *International Journal of Innovation and Learning 4*(1), 60 - 73

Dalton, G. (2009). Schwab Stays Focused

Damanpour, F. (1987). The adoption of technological, administrative and ancillary innovations - impact of organizational factors. *Journal of Management Studies, 13*(4), 675-688.

Damanpour, F. (1991). Organizational innovation:Ameta-analysis of effects of determinants and moderators. *Academy of Management Journal, 34*, 555-590.

Damanpour, F., & Gopalakrishnan, S. (2001). The dynamics of the adoption of product and process innovations in organizations. *Journal of Management Studies, 38*(1), 45-65.

Damanpour, F., & Wischnevsky, J. (2006). Research on innovation in organizations: Distinguishing innovation-generating from innovation-adopting organizations. *Journal of Engineering and Technology Management, 23*(4), 269–291.

Davenport, T. H. (1993). *Process Innovation Reengineering work through Information Technology*: Harvard Business School Press

Davenport, T. H. (1998). Putting the enterprise into the enterprise system. *Harvard Business Review, 76*(4), 121-131.

Davenport, T. H. (2000). Transforming the Practice of Management with Enterprise Systems *Mission Critical*. Boston: Harvard Business Press.

Davenport, T. H., & Short, J. (1990). The new industrial engineering: information technology and business process redesign. *Sloan Management Review, Summer*, 11-27.

Davis, F. D. (1989). Perceived Usefulness, Perceived Ease of Use, and User Acceptance of Information Technology. *MIS Quarterly, 13*(3), 319-339.

Day, D. L. (1994). Raising radicals: different processes for championing innovative corporate ventures. *Organization Science, 5*(2), 148–172.

De Vaus, D. A. (2001). *Research design in social research*. London: Sage.

Dekleva, S. (1992). The influence of the information systems development approach on maintenance. *MIS Quarterly, 16*(3).

Deloitte. (1999). ERPs Second Wave: Deloitte Consulting.

Den Hengst, M., & de Vreede, G. (2004). Collaborative business engineering: a decade of lessons from the field. *Journal of Management Information Systems, 20*(4), 85–113.

Dewar, R., & Dutton, J. (1986). The adoption of radical and incremental innovations:An empirical analysis. *Management Science, 32*(11), 1422-1433.

Dey, I. (1993). *Qualitative data analysis: A user-friendly guide for social scientists*. New York: Routledge.

Dillman, D. A. (2000). *Mail and Internet Surveys- the tailored design method*. New York: Wiley & Sons.

Doherty, N. F., & Terry, M. (2009). The role of IS capabilities in delivering sustainable improvements to competitive positioning. *The Journal of Strategic Information Systems, 18*(2).

Dougherty, D., & Hardy, C. (1996). Sustained production innovation in large, mature organisations: Overcoming innovation-to-organisation problems. *Academy of Management Journal, 39*(5), 1120–1153.

Dourish, P., & Bellotti, V. (1992). *Awareness and coordination in shared workspaces.* Paper presented at the ACM Conference on Computer Supported Cooperative Work.

Drucker, P. F. (1973). *Management, Tasks, Responsibilites, Practice*. New York: Harper & Row.

Duguid P., & Brown, J. S. (1991). Organizational Learning and Communities of Practice: Toward a Unified View of Working, Learning and Innovation. *Organizational Science, 2*(1), 40-57.

Duhan, S. L. (2001). Information systems strategies in knowledge-based SMEs: the role of core competencies. *European Journal of Information Systems, 10*(1), 25-40.
Duncan, N. B. (1995). Capturing Flexibility of Information Technology Infrastructure: A Study of Resource Characteristics and their Measure. *Journal of Management Information Technology, 12*(2), 37-57.
Ebert, T. (2009). *Trust as the Key to Loyalty in Business-to-Consumer Exchanges* (Vol. 1): Springer.
Edmondson, A. C., Bohmer, R. M., & Pisano, G. (2001). Disrupted Routines: Effects of Team Learning on New Technology Adaptation. *Administrative Science Quarterly, 46*, 685-716.
Edwards, J. R., & Lambert, L. S. (2007). Methods for integrating moderation and mediation: A general analytical framework using moderated path analysis. *Psychological Methods, 12*, 1-22.
Eisenhardt, K., & Martin, J. (2000). Dynamic capabilities: what are they? *Strategic Management Journal, 21*, 1105–1121.
El-Sawy, O. A., Malhotra, A., Park, Y., & Pavlou, P. A. (2010). Research Commentary—Seeking the Configurations of Digital Ecodynamics: It Takes Three to Tango. *Information Systems Research 21*(4), 835-848.
Erlikh, L. (2000). Leveraging legacy system dollars for E-business. *IEEE IT Pro, 2*(3), 3.
Esposito Vinzi, V., & Chin, W. W. (2010). *Handbook of Parital Least Square Concepts, Methods and Applications*. Berlin Heidelberg: Springer.
Evans, J. R., & Mathur, A. (2005). The value of online surveys. *Internet Research, 15*(2), 192-219.
Fahy, J. (1999). Strategic Marketing and the Resource-Based View of the Firm. *Academy of Marketing Science Review, 99*(10).
Fairbank, J. F., Labianca, G., Steensma, H. K., & Metters, R. (2006). Information processing design choices, strategy, and risk management performance. *Journal of Management Information Systems, 23*(1), 293–319.
Feeny, D. F., & Willcocks, L. P. (1998). Core IS capabilities for exploiting information technology. *Sloan Management Review, 39*(3), 9–21.
Fichman, R., & Kemerer, C. (1997). Assimilation of software process innovations: an organizational learning perspective. *Management Science, 43*(10), 1345–1363.
Field, A. (2005). *Discovering statistics using SPSS*: Sage Publications.
Field, A. P. (2009). *Discovering statistics using SPSS :(and sex and drugs and rock 'n' roll)*. London: Sage.
Fink, A. (2006). *How to conduct surveys: A step by step guide*. USA.
Florkowski, G. W., & Olivas-Luja´n, M. R. (2006). The diffusion of human-resource information-technology innovations in US and non-US firms. *Personnel Review, 35*(6), 684–710.
Fornell, C., & Bookstein, F. L. (1982). Two Structural Equation Models: LISREL and PLS Applied to Consumer Exit-Voice Theory. *Journal of Marketing Research, 19*(4), 440-452.
Fornell, C. R., & Larcker, D. F. (1981). Evaluating strcutural equation models with onbservable variables and measurement error. *Journal of Marketing Research, 18*(1), 39-50.
Foss, N. J. (1997). *Resources, Firms, and Strategies: A Reader in the Resource-Based Perspective*. Oxford: Oxford University Press.
Foster, R. N. (1986). *Technology in the Modern Corporation: A Strategic Perspective*: Pergamon Press.
Francis, D., & Bessant, J. (2005). Targeting innovation and implications for capability development. *Technovation, 25*(3), 171-183.

Franco, V., Piirto, R., Hu, H. Y., Lewenstein, B. V., Underwood, R., & Vidal, N. K. (1995). Anatomy of a flame: conflict and community building on the Internet. *Technology and Society Magazine*, *14*, 12-21.

Freeze, R. D., & Raschke, R. L. (2007). *An assessment of Formative and Relfective Constructs in IS Research.* Paper presented at the European Conference on Information Systems, University of St. Gallen, St. Gallen.

Garbosky, J. (1994). Revisiting the experiences of educational technologists in public education. *Educational Technology*.

Garratt, B. (1990). *Creating a learning organization: A guide to leadership, learning and development*. New York: Simon & Schuster Press.

Gartner. (2007). Creating Enterprise Leverage: The 2007 CIO Agenda, from http://www.gartner.com/resources/146200/146279/executive_summary_creating_e_146279.pdf

Gartner. (2009). Meeting the Challenge: The 2009 CIO Agenda, from http://www.gartner.com/resources/165000/165048/executive_summary_meeting_th_165048.pdf

Garvin, D. (1988). *Managing Quality: The Strategic and Competitive Edge*. New York: The Free Press.

Garvin, D. A. (1993). Building a learning organization. *Harvard Business Review*, 78-91.

Gatignon, H., Tushman, M. L., Smith, W., & Anderson, P. (2002). A Structural Approach to Assessing Innovation: Construct Development of Innovation Locus, Type, and Characteristics. *Management Science*, *48*(9), 1103-1122.

Gaynor, G. H. (2001). Innovator: what does it take to be one? *IEEE Antennas and Propagation Magazine*, *43*, 126 - 130.

Gebauer, J., & Schober, F. (2006). Information system flexibility and the cost efficiency of business processes. *Journal of the Association for Information Systems*, *7*(3), 122-146.

Gefen, D., Straub, D. W., & Boudreau, M. C. (2000). Structural Equation Modeling and Regression: guidelines for research practice. *Communications of the Association for Information Systems*, *4*(7), 1-80.

Goeritz, A. S. (2006). Incentives in web studies: Methodological issues and a review. *International Journal of Internet Science*, *1*(1), 58-70.

Goodhue, D. L., Kirsch, L. J., Quillard, J. A., & Wybo, M. D. (1992). Strategic Data Planning: Lessons From the Field. *MIS Quarterly*, *16*(1), 11-34.

Grant, R. M. (1991). The resource-based theory of competitive advantage: implications for strategy formulation. *California Management Review*, *33*(3), 114-135.

Grant, R. M. (1996). Toward a knowledge-based theory of the firm. *Strategic Management Journal*, *17*.

Grinstein, A. (2008). The effect of market orientation and its components on innovation consequences: a meta-analysis *Journal of the Academy of Marketing Science*, *36*(2), 166-173.

Grossman, R. L., Gu, Y. H., Sabala, M., & Zhang, W. Z. (2009). Compute and storage clouds using wide area high performance networks. *Future Generation Computer Systems*, *25*, 179-183.

Grover, V. (2000). A Tutorial on Survey Research: From Constructs to Theory Retrieved Jan 12, 2011, from http://people.clemson.edu/~vgrover/survey/MIS-SUVY.html

Grover, V., & Ramanlal, P. (1999). Six Myths of Information and Markets: Information Technology Networks, Electronic Commerce, and the Battle for Consumer Surplus. *MIS Quarterly*, *23*(4), 465-495.

Grudin, J. S. (1994). Groupware and social dynamics: Eight challenges for developer. *Communications of the ACM, 37*, 92-105.

Guadagnoli, E., & Velicer, W. F. (1988). Relation of sample size to the stability of component patterns. *Psychological Bulletin, 103,* 265-275.

Hair, J. F., & Anderson, R. E. (1995). *Multivariate Data Analysis with Readings*. Englewood Cliffs, NJ: Prrentice Hall.

Hall, R. (1992). The Strategic Analysis of Intangible Resources. *Strategic Management Journal, 13,* 135-144.

Hammer, M. (2004). Deep Change: How Operational Innovation Can Transform Your Company. *Harvard Business Review, 82*(4), 1-10.

Henard, D., & Szymanski, D. (2001). Why some new products are more successful than others. *Journal of Marketing Research, 38*, 362–375.

Henderson, J. C. (1990). Plugging into Strategic Partnerships: The Critical IS Connection. *Sloan Management Review*, 7-18.

Henderson, R., & Cockburn, I. (1994). Measuring competence? Exploring firm effects in pharmaceutical research. *Strategic Management Journal, 15*, 63–84.

Henderson, R. M., & Clark, K. B. (1990). Generational Innovation: The Reconfiguration of Existing Systems and the Failure of Established Firms. *Administrative Sciences Quarterly, 35*(1), 9-30.

Henseler, J., Ringle, C. M., & Sinkovics, R. R. (2009). The use of Parital Least Squares Path Modeling in International Marketing. *Advances in International Marketing, 22*, 277-319.

Hinkin, T. R. (1998). A Brief Tutorial on the Development of Measures for use in Survey Questionnaires. *Organizational Research Methods, 1*(11), 104-121.

Hoelter, J. W. (1983). The analysis of covariance structures:Goodness-of-fit indices. *Sociaological Methods and Research, 11*, 325-344.

Hoffman, B. (1996). What Drives Successful Technology Planning? *Journal of Information Technology for Teacher Education, 5*(1).

Holland, R., & Smith, A. (2010). Survey Responses: Mail Versus Email Solicitations. *Journal of Business and Economics, 8*(4), 95-98.

Howard, T. (1990). Information Technology and Strategy. In H. Thomas & A. Huff (Eds.), *Managing Information for Competitive Advantage*. Oxford, UK: Basil Blackwell.

Hsieh, J., & Wang, W. (2007). Explaining Employees Extended Use of Complex Information Systems. *European Journal of Information Systems, 16*(3), 216-227.

Hu, P. J., Chau, P. Y. K., Sheng, O. R. L., & Tam, K. Y. (1999). Examining the Technology Acceptance Model Using Physician Acceptance of Telemedicine Technology. *Journal of Management Information Systems, 16*(2), 91-112.

Huber, G. P. (1992). Organizational learning: The contributing processes and the literatures. *Organizational Science, 2*(1), 88-115.

Hulland, J. (1999). Use of partial least squares (PLS) in strategic management research: A review of four recent studies. *Strategic Management Journal, 20*(2), 195-204.

Hurley, R. F., & Hult, G. T. (1998). Innovation, Market Orientation, and Organizational Learning: an integration and empirical examination. *Journal of Marketing, 92*, 42-54.

Iacovou, C. L., Benbasat, I., & Dexter, A. S. (1995). Electronic data interchange and small organizations: Adoption and impact of technology. *MIS Quarterly, 19*(4), 465-485.

IEEE. (1998). Standard for Software Maintenance *1219*.

Im, S., & Workman, J. (2004). Market orientation, creativity, and new product performance in high-technology firms. *Journal of Marketing, 68*, 114-132.

Jain, H., Chalimeda, N., Ivaturi, N., & Reddy, B. (2001). *Business component identification - A formal approach*. Paper presented at the Proceedings of the 5th IEEE International Enterprise Distributed Object Computing Conference, Seattle.

Jasperson, J., Carter, P., & Zmud, R. (2005). A Comprehensive Conceptualization of Post Adoptive Behaviors associated with Information Technology Enabled Work Systems *MIS Quarterly*(29), 3.

Jaworski, B., & Kohli, A. (1993). Market orientation: Antecedents and consequences. *Journal of Marketing, 57*(3), 53.

Jelinek, M., & Schoonhoven, C. (1990). *Innovation Marathon: Lessons from High Technology Firms*. Cambridge: Basil Blackwell.

Jones, E., Sundaram, S., & Chin, W. (2002). Factors leading to Sales force automatic use: A longtitudinal Analysis. *Journal of Personal Selling and Sales Management, 3*(1), 145-156.

Kaplan, B., & Maxwell, J. A. (1994). Qualitative Research Methods for Evaluating Computer Information Systems. In J. G. Anderson, C. E. Aydin & S. J. Jay (Eds.), *Evaluating Health Care Information Systems: Methods and Applications* (pp. 45-68). Thousand Oaks, CA: Sage.

Karahanna, E., Straub, D. W., & Chervany, N. L. (1999). Information Technology Adoption Across Time: A Cross-Sectional Comparison of Pre-Adoption and Post-Adoption Beliefs. *MIS Quarterly, 23*(2), 183-213.

Karahanna, E., & Watson, R. T. (2006). Information systems leadership. *IEEE Transactions on Engineering Management Decision, 53*(2), 171-176.

Karimi, J., Somers, T., & Bhattacherjee, A. (2009). The Role of ERP Implementation in Enabling Digital Options: A Theoretical and Empirical Analysis. *International Journal of Electronic Commerce, 13*(3), 7-42.

Ke, W. L., & Wei, K. K. (2006). Organizational learning process: Its antecedents and consequences in enterprise system implementation. *Journal of Global Information Management, 14*(1), 1-22.

Khan, A. M., & Manopichetwattana, V. (1989). Innovative and non-innovative small firms- types and characteristics. *Management Science, 35*, 597-606.

Khan, K., & Zheng, Y. (2005). *Managing Corporate Information Systems Evolution and Maintenance*. Hershey, PA: Idea Group Publishing.

Kim, S. S., & Malhotra, N. K. (2005). Predicting System Usage from Intention and Past Use: Scale Issues in the Predictors. *Decision Science, 36*(1), 187-196.

King, M., & McAulay, L. M. (1997). Information technology investment evaluation: Evidence and interpretations. *Journal of Information Technology, 12*(2), 131-143.

King, W. R. (1988). How Effective Is Your Information Systems Planning? *Long Range Planning, 21*(2), 103-112.

Klassen, R. D., & Jacobs, J. (2001). Experimental comparison of Web, electronic and mail survey technologies in operations management. *Journal of Operations Management 19*(6), 713-728.

Klein, H. K., & Meyers, M. D. (1999). A Set of principles for conducting and evaluating interpretive field studies in Information Systems. *MIS Quarterly, 23*(1), 67-94.

Klein, K. J., & Kozlowski, S. W. (2000). From Micro to Meso: Critical Steps in Conceptualizing and Conducting Multilevel Research. *Organizational Research Methods, 3*, 211-236.

Koch, C. (2006). The postmodern manifesto. *CIO Magazine, 1*, 50–58.

Kogut, B., & Zander, U. (1992). Knowledge of the firm, combinative capabilities, and the replication of technology. *Organization Science, 3*(3), 383–397.

Kohli, A., & Jaworski, B. (1990). Market orientation: The construct, research propositions, and managerial implications. *Journal of Marketing, 54*, 1-8.

Kolb, D. (1984). *Experimental Learning*. Englewood Cliffs, NJ: Prentice-Hall.

Kor, Y. Y., & Mahoney, J. T. (2005). How dynamics, management, and governance of resource deployments influence firm-level performance. *Strategic Management Journal, 26*(5), 489–496.

Koubek, R. J., Salvendy, G., Dunsmore, H. E., & LeBold, W. K. (1989). Cognitive Issues in the Process of Software Development: Review and Reappraisal. *International Journal of Man-Machine Studies, 30*, 171-191.

Krogstie, J. (1995). On the Disctinction between functional development and functional maintenance. *Journal of Software Maintenance Research and Practice, 7*(6), 383-403.

Kuhn, T. (1996). *The Structure of Scientific Revolutions*. Chicago: University of Chicago Press.

Kwon, T. H., & Zmud, R. W. (1987). Unifying the Fragmented Models of Information Systems Implementation. In R. J. Boland & R. A. Hirschheim (Eds.), *Critical Issues in Information Systems Research* (pp. 227-251). New York: John Wiley & Sons.

Lakatos, I. (1978). *The Methodology of Scientific Research Programmes*. Cambridge: Cambridge University Press.

Lasher, D. R., Ives, B., & Jarvenpaa, S. L. (1991). USAA-IBM Partnerships in Information Technology: Managing the Image Project. *MIS Quarterly, 15*(4), 551-565.

Layzell, P., Champion, R., & Freeman, M. (1993). *DOCT: Program comprehension-in-the-large.* Paper presented at the Proceedings of the 2nd IEEE Workshop of Program Comprehension, Los Alamitos CA.

LeCompte, M. D., & Schensul, J. J. (1999). *Analyzing and interpreting ethnographic data*. Walnut Creek, CA: Altamira.

Lee, C. W. (2007). The innovation and success of consumer electronics using new product development process. *International Journal of Innovation and Learning 4*(6), 587 - 611

Lee, D. M. S., Trauth, E. M., & Farwell, D. (1995). Critical skills and knowledge requirements of IS professionals: A joint academic/industry investigation. *MIS Quarterly, 19*(3), 313–340.

Lee, J., Jung, S., Kim, S., Jang, W., & Ham, D. (2001). *Component identification method with coupling and cohesion.* Paper presented at the 8th Asia-Pacific Software Engineering Conference, Macau.

Lee, J. N., & Kim, Y. G. (1999). Effect of partnership quality on IS outsourcing success: Conceptual framework and empirical validation. *Journal of Management Information Systems, 15*(4), 29-61.

Leonard-Barton, D. (1992). Core capabilities and core rigidities: A paradox in managing new product development. *Strategic Management Journal, 13*, 111-125.

Lichtenthaler, U., & Ernst, H. (2008). Opening up the innovation process: the role of technology aggressiveness. *R&D Management, 39*(1), 38–54.

Lientz, B., & Swanson, E. (1981). Problems in Application Software Maintenance. *Communications of the ACM, 24*(11), 763-769.

Lin, B. W. (2007). Information technology capability and value creation: evidence from the US banking industry. *Technology in Society 29*(1), 93–106.

Lucas, H. C. (1991). Methodological Issues in Information Systems Survey Research. In K. L. Kraemer (Ed.), *The Information Systems Research Challenge: Survey Research Methods* (Vol. 3, pp. 273-285). Boston, MA: Harvard Business School Press.

MacKinnon, D. P., Fairchild, A. J., & Fritz, M. S. (2007). Mediation Analysis. *Annual Review of Psychology, 58*, 593–614.

Madanmohan, T. (2005). Incremental Technical Innovations and their Determinants. *International Journal of Innovation Management, 9*(4), 481–510.

Madjar, N. (2005). The contributions of different groups of individuals to employees' creativity. *Advances in Developing Human Resources, 7*(2), 182-206.

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

Malhotra, M. K., & Grover, V. (1998). An assessment of survey research in POM: from constructs to theory. *Journal of Operations Management, 16*(4), 403-423.

Malhotra, N. K. (2004). *Marketing Research - An Applied Orientation* (Fourth Edition ed.). Upper Saddle River: Pearson Prentice Hall.

Mason, J. (2002). Qualitative Researching (2nd edition): Sage Publications.

Malone, T. W., & Crowston, K. (1994). The interdisciplinary study of coordination. *ACM Computing Surveys, 26*(1), 87-119.

Marcoulides, G. A., & Chin, W. W. (2009). A Critical Look ar Partial Least Squares Modeling. *MIS Quarterly 33*(1), 171-175.

Marjanovic, O. (2005). Towards IS supported coordination in emergent business processes. *Business Process Management Journal, 11*(5), 476-487.

Mark, D., & Monnoyer, E. (2004). Next-generation CIO's. *The McKinsey Quarterly, Web Exclusive*(July).

Markus, M., & Tanis, C. (2000). The Enterprise Systems Experience - From Adoption to Success. In R. W. Zmud (Ed.), *Framing the Domains of IT Research Glimpsing the Future Through the Past* (pp. 173-207). Cincinnati: Pinnaflex Educational Resources.

McElheran, K. S. (2011). Do Market Leaders Lead in Business Process Innovation: The Case(s) of E-business Adoption. *Harvard Business Review*.

McGrath, R. G., Venkataraman, S., & MacMillan, I. C. (1995). The Advantage Chain: Antecedents to Rents From Internal Corporate Venture. *Journal of Business Venturing, 9*(5), 351-370.

McKnight, B., & Bontis, N. (2002). E-improvisation: collaborative groupware technology expands the reach and effectiveness of organizational improvisation. *Knowledge and Process Management 9*(4), 219-227.

Meyers, M. D. (2004). Qualitative Research in Information Systems, from http://www.qual.auckland.ac.nz/

Michalisin, M. D., Smith, R. D., & Kline, D. M. (1997). Search of Strategic Assets. *The International Journal of Organizational Analysis, 5*(4), 360-387.

Milgrom, P., & Roberts, J. (1990). The Economics of Modern Manufacturing: Technology, Strategy, and Organization. *American Economic Review, 80*(3), 511-528.

Mingers, J., (2001). "." (2001). Combining IS Research Methods: Towards a Pluralist Methodology. *Information Systems Research, 12*(3), 240-259.

Moenaert, R., Souder, W., Meyer, D., & Deschoolmeister, D. (1994). R&D-Marketing integration mechanisms, communication flows, and innovation success. *Journal of Product Innovation Management, 11*, 31-45.

Montealegre, R. (2002). A process model of capability development: lessons from the electronic commerce strategy at Bolsa de Valores de Guayaquil. *Organization Science, 13*(5), 514–531.

Moore, G., & Benbasat, I. (1991). Development of an Instrument to Measure the Perceptions of Adopting and Information Technology Innovation. *Information Systems Reseaerch, 2*(3), 192-222.

Moore, G. A. (2008). *Dealing with Darwin : How Great Companies Innovate at Every Phase of Their Evolution*. New York, NY Portfolio Trade.

Mustonen-Ollila, E., & Lyytinen, K. (2004). How organizations adopt information system process innovations: a longitudinal analysis. *European Journal of Information Systems, 13*(1), 35-51.

Myers, M. D. (1997). Qualitative Research in Information Systems. *MIS Quarterly, 21*(2), 241-242.

Myers, M. D., & Tan, F. B. (2003). Beyond models of national culture in information systems research. *Advanced topics in global information management Decision 10*(2), 1-19.

Nah, F. F., Lau, J. L., & Kuang, J. (2001). Critical factors for successful implementation of enterprise systems. *Business Process Management Journal, 7*(3), 285 - 296.

Nambisan, S., Agarwal, R., & Tanniru, M. (1999). Organizational Mechanisms for Enhancing User Innovation in Information Technology. *MIS Quarterly, 23*(3), 365-395.

Nambisan, S., & Baron, R. A. (2007). Interactions in virtual customer environments: Implications for product support and customer relationship management. *Journal of Interactive Marketing, 21*(2), 42-62.

Narver, J. C., & Slater, S. R. (1990). The effect of amarket orientation on business profitability. *Journal of Marketing, 54*, 20-35.

Nelson, K., Nadkarni, S., Narayanan, V. K., & Ghods, M. (2000). Understanding Software Operations support expertise: A revealed casual mapping approach. *MIS Quarterly, 24*(3), 475-507.

Nelson, K. M., & Cooprider, J. G. (1996). The Contribution of Shared Knowledge to IS Group Performance. *MIS Quarterly, 20*(4), 409-432.

Nelson, R. R., & Winter, G. (1982). *An Evolutionary Theory of Economic Change*. Cambridge, MA: Harvard University Press.

Netemeyer, R., Bearden, W. O., & Sharma, S. (2003). *Scaling procedures: Issues and Applications*. Thousand Oaks, CA: Sage.

Nevis, E. C., & DiBella, A. (1995). Understanding Organizations as Learning Systems. *Sloan Management Review, 36*(2), 73-85.

Noel, S., & Robert, J. M. (2003). How the Web is used to support collaborative writing. *Behaviour & Information Technology, 22*, 245-262.

Nordström, M., & Welander, T. (2005). Business oriented maintenance management - A reference model for (system) maintenance. In K. M. Khan & Y. Zhang (Eds.), *Managing Corporate Information Systems Evolution and Maintenance* (Vol. 1, pp. 334). Stockholm, Swedish: Idea Group Publishing.

Nystrom, P. C., & Starbuck, W. H. (1984). To avoid organizational crises, unlearn. *Organizational Dynamics, 12*(4), 53-65.

Orlikowski, W., & Baroudi, J. J. (1991). Studying Information Technology in Organizations: Research Approaches and Assumptions. *Information Systems Research, 2*(1).

Osborne, W. M., & Chikofsky, E. J. (1990). Fitting Pieces to the Maintenance Puzzle. *IEEE Software, 7*(1), 11-12.

Overby, E., Bharadwaj, A., & Sambamurthy, V. (2006). Enterprise agility and the enabling role of information technology. *European Journal of Information Systems, 15*(2), 120-131.

Panizzolo, R. (1998). Managing innovations in SMEs: A multiple case analysis of the adoption and implementation of product and process design technologies. *Small Business Economics, 11*(1), 25-42.

Parikh, G. (1986). *Exploring the world of software maintenance III: research and development -- future directions in software maintenance*. Paper presented at the ACM SIGSOFT Software Engineering Notes, New York.

Patnayakuni, R., Ruppel, C., & Rai, A. (2006). Managing the complementarity of knowledge integration and process formalization for systems development performance. *Journal of Association for Information Systems, 7*(8), 545-567.

Paul, D. (1994). An integration/inservice model that works, . *Technological Horizons in Education, 21*(9), 60-62.

Pavlou, P. A., Liang, H., & Xue, Y. (2007). Understanding and mitigating uncertainty in online exchange relationships: a principal-agent perspective. *MIS Quarterly, 31*(1), 105-136.

Penrose, E. (1959). *The Theory of the Growth of the Firm*. London: Basil Blackwell.

Peppard, J., & Ward, J. (2004). Beyond strategic information systems: toward an IS capability. *Strategic Information Systems, 13*, 167-194.

Petaraf, M. A. (1993). The Cornerstones of Competitive Advantage: A Resource-Based View. *Strategic Management Journal, 14*, 179-192.

Petter, S., Detmar, S., & Rai, A. (2007). Specifying formative constructs in information systems research. *MIS Quarterly, 31*(4), 623-656.

Phaal, R., Farrukh, C. J., & Probert, D. R. (2004). Technology roadmapping—A planning framework for evolution and revolution. *71*(1), 5-26.

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

Pilar, J., Jose, C., & Ramon, V. (2005). Organizational learning capability: A proposal of measurement. *Journal of Business Research 58*(6), 715-725.

Piller, F., & Christoph, L. (2009). *Open Innovation with Customers – Foundations, Competences and International Trends.* RWTH Aachen University, Aachen.

Pinchot, G. (1985). *Intrapreneuring*. New York, NY: Harper & Row.

Pinsonneault, A., & Kraemer, K. (1993). Survey Research Methodology in Management Information Systems: An Assessment. *Journal of Management Information Systems, 10*, 75-105.

Pirola-Merlo, A., & Mann, L. (2004). The relationship between individual creativity and team creativity: aggregating across people and time. *Journal of Organizational Behavior, 25*(2), 235-257.

Podsakoff, P. M., MacKenzie, S. B., Lee, J. Y., & Podsakoff, N. P. (2003). Common method biases in behavioral research: a critical review of the literature and recommended remedies. *Journal of Applied Psychology, 88*(5), 879-903.

Polo, M., Piattini, M., & Ruiz, F. (2003). *Advances in Software Maintenance Management: Technologies and Solutions*. Hershey PA: Idea Group Publishing.

Popper, K. (1980). *The Logic of Scientific Discovery*. Unwin Hyman, London.

Porter, M. (1981). The contributions of industrial organization to strategic management. *Academy of Management Review, 6*(4), 609-620.

Porter, M. E. (1985). *Competitive Advantage: Creating and Sustaining superior Performance*. New York: Free Press.

Porter, M. E. (1990). The competitive advantage of nations. *Harvard Business Review, 68*(4), 73-93.

Porter, M. E., & Linde, C. v. d. (1995). Toward a New Conception of the Environment-Competitiveness Relationship. *The Journal of Economic Perspectives, 9*(4), 97-118.

Prahalad, C. K., & Hamel, G. (1990). The Core Competence of the Corporation. *Harvard Business Review 68*(3), 79-91.

Prasad, B. (2000). Converting computer-integrated manufacturing into an intelligent information system by combining CIM with concurrent engineering and knowledge management. *Industrial Management & Data Systems, 100*(7), 301-316.

Preacher, K. J., & Hayes, A. F. (2004). SPSS and SAS procedures for estimating indirect effects in simple mediation models. *Behavior Research Methods, Instruments, & Computers, 36,* 717-731.

Premkumar, G., & Potter, M. (1995). Adoption of computer aided software engineering (CASE) technology: an innovation adoption perspective. *Data Base Advances, 26*(2, 3), 105-124.

Priem, R., & Butler, J. (2001). Is the resource based "view" a useful perspective for strategic management research? *Academy of Management Review, 26*(1), 22-40.

Quinn, J. B., Baruch, J., & Zien, K. A. (1996). Software-Based Innovation. *Sloan Management Review*, 11-24.

Qureshi, I., & Compeau, D. (2009). Assessing Between Group Differences in Information Systems Research: a comparision of covariance- and component-based SEM. *MIS Quarterly 33*, 197-214.

Radding, A. (1999). Disaster!

Ramiller, N. C., & Swanson, E. B. (2003). Organizing visions for information technology and the information systems executive response. *Journal of Management Information Systems, 20*(1), 13–50.

Randolph, J. J. (2008). Online Kappa Calculator, Jan 30, 2012, from http://justus.randolph.name/kappa

Rashid, A., Wang, W. Y. C., & Tan, F. B. (2010). *Information Systems Maintenance: A key driver of Business Process Innovation.* Paper presented at the AMCIS 2010 Proceedings.

Ravichandran, T., & Lertwongsatien, C. (2000). *Strategic implications of information systems resources and capabilities: A competence-based model*. Paper presented at the Americas Conference on Information Systems. :, Atlanta.

Ravichandran, T., & Lertwongsatien, C. (2005a). Effect of information system resources and capabilities on firm performance: a resource-based perspective. *Journal of Management Information Systems*, *21*(4), 237-276.

Ravichandran, T., & Lertwongsatien, C. (2005b). Effect of information systems resources and capabilities on firm performance. A resource-based perspective. *Journal of Management Information Systems*, *21*(4), 237–276.

Ray, G., Barney, J. B., & Muhanna, W. A. (2004). Capabilities, business processes, and competitive advantage: choosing the dependent variable in empirical tests of the resource-based view. *Strategic Management Journal, 25*, 23-37.

Ray, G., Barney, J. B., & Muhanna, W. A. (2005). Information technology and the performance of the customer service process: a resource-based analysis. *MIS Quarterly*, *29*(4), 625-652.

Reich, B. H., & Benbasat, I. (1990). An Empirical Investigation of Factors Influencing the Success of Customer-Oriented Strategic Systems. *Information Systems Research, 1*(3), 325-347.

Rhee, J., Park, T., & Lee, D. H. (2010). Drivers of innovativeness and performance for innovative SMEs in South Korea: Mediation of learning orientation. *Technovation, 30*(1), 65-75.

Rivard, S., Raymond, L., & Verreault, D. (2006). Resource-based view and competitive strategy: an integrated model of the contribution of information technology to firm performance. *Journal of Strategic Information Systems, 15*(1), 29–50.

Roberts, E. B. (1987). *Generating technological innovation*. New York: Oxford University Press.

Robertson, J. (2001). Information design using card sorting, from http://www.steptwo.com.au/papers/cardsorting/index.html
Rockart, J. F., & Hoffman, J. D. (1992). Systems Delivery: Evolving New Strategies. *Sloan Management Review, 33*(4), 57-64.
Roepke, R. P., Agarwal, R., & Ferratt, T. W. (2000). Aligning the IT human Resouce with Business Vision: The leadership Initiative at 3M. *MIS Quarterly, 24*(2), 327-353.
Rogers, E. M. (1995). *Diffusion of Innovations* (4th ed.). New York: The Free Press.
Rönkkö, M., & Ylitalo, K. (2010). *Construct validity in Partial Least Squares Path Modeling*. Paper presented at the International Conference on Information Systems ICIS.
Rosemann, M., & Vessey, I. (2008). Toward improving the relevance of Information Systems Research to practice: the role of applicability checks. *MIS Quarterly, 32*(1), 1-22.
Rosen, E. (2007). *The Culture of Collaboration* (Vol. 9). San Francisco, CA: Red Ape Publishing.
Ross, J. W., Beath, C. M., & Goodhue, D. L. (1996). Develop Long-Term Competitiveness through IT Assets. *Sloan Management Review*, 31-42.
Rothwell, W. J. (1994). *Effective succession planning: Ensuring leadership continuity and building talent from within*. New York: AMACOM.
Rowley, J., Baregheh, A., & Sambrook, S. (2011). Towards an innovation type mapping tool. *Management Decision, 49*(1), 73-86.
Rumelt, R. (1984). *Toward a strategic theory of the firm. Competitive Strategic ManagemenT*. Englewood Cliffs, NJ: Prentice-Hall.
Russell, J. D., Sorge, D., & Brickner, D. (1994). Improving technology implementation in grades 5-12 with the ASSURE model. *Technological Horizons in Education, 21*(9), 66-70.
Saeed, K. A., & Abdinnour-Helm, S. (2008). Examining the effects of information system characteristics and perceived usefulness on post adoption usage of information systems. *Information & Management, 45*(6), 376-386.
Saga, V. L., & Zmud, R. W. (1994). The Nature and Determinants of IT Acceptance, Routinization, and Infusion. In L. Levine (Ed.), *Diffusion, transfer and implementation of information technology* (pp. 67-86). North-Holland, Amsterdam.
Sambamurthy, V., & Zmud, R. W. (1997). At the Heart of Success: Organizationalwide Management Competencies. In C. Sauer & P. W. Yetton (Eds.), *Steps to the Future: Fresh Thinking on the Management of IT-Based Organizational Transformation* (pp. 143-163). San Francisco, CA: Jossey-Bass Publishers.
Sanchez, R., & Mahoney, J. T. (1996). Modularity, flexibility, and knowledge management in product and organization design. *Strategic Management Journal 17*, 63-65.
Santhanam, R., & Hartono, E. (2003). Issues in linking information technology capability to firm performance. *MIS Quarterly 27*(1), 125–153.
Saunders, C., & Clark, S. (1992). EDI Adoption and Implementation: A Focus on Interorganizational Linkages. *Information Resources Management Journal, 5*(1), 9-19.
Savory, C. (2006). Translating knowledge to build technological competence. *Management Decision, 44*(8), 1052-1075.
Sawhney, M., & Prandelli, E. (2000). Communities of creation: managing distributed innovation in turbulent markets. *California Management Review, 42*(4), 24–54.
Scarbrough, H. (1993). Problem-Solutions in the Management of Information Systems Expertise. *Journal of Management Studies, 30*(6), 939-955.

Scherer, E. M. (1980). Industrial market structure and economic performance
Schmookler, J. (1966). *Invention and Economic Growth*. Cambridge, Massachusetts: Harvard University Press.
Schroeder, R. G., Bates, K. A., & Junttila, M. A. (2002). A resource-based view of manufacturing strategy and the relationship to manufacturing performance. *Strategic Management Journal*, *23*, 105–117.
Schwarz, A. (2003). *Defining Information Technology Acceptance: A Human Centered Management Oriented Perspective*. Houston, TX: University of Houston Press.
Segars, A. H., & Grover, V. (1998). Strategic Information Systems Planning Success: An Investigation of the Construct and Its Measurement. *MIS Quarterly*, *22*(2), 139-163.
Senge, P. (1990). *The fifth discipline: The art and practice of the learning organization*. New York: Doubleday Press.
Serrano, A., & Hangst, M. (2005). Modelling the integration of BP and IT using business process simulation. *Journal of Enterprise Information Management, 18*(5), 740–759.
Shanteau, J., & Stewart, T. R. (1992). Why Study Expert Decision Making? Some Historical Perspectives and Comments. *Organizational Behavior and Human Decision Processes*, *53*(2), 95-106.
Shin, D. H. (2006). Distributed inter-organizational systems and innovation processes. *Internet Research*, *16*(5), 553-572.
Simsek, Z., & Veiga, J. F. (2000). The electronic survey technique: An integration and assessment. *Organizationaal Research Methods, 3*, 92-114.
Simsek, Z., & Veiga, J. F. (2001). A Primer on Internet Organizational Surveys. *Organizational Research Methods*, *3*, 218-235.
Slater, S. F., & Narver, J. (1994). Market oriented isn't enough: Build a learning organization *Marketing science institute report,* (pp. 94-103). Cambridge.
SmartPLS. (2012). SmartPLS Website Retrieved July 2011, 2012, from http://www.smartpls.de/forum/
Song, X., & Montoya-Weiss, M. (1998a). Critical development activities for really new versus incremental products. *The Journal of Product Innovation Management, 15*(2), 124-135.
Song, X. M., & Montoya-Weiss, M. M. (1998b). Critical development activities for really new versus incremental products. *The Journal of Product Innovation Management,, 15*(2), 124-135.
Souitaris, V. (2002). Technological trajectories as moderators of firm-level determinants of innovation. *Research Policy, 31*(6), 877–898.
Spencer, L. M., & Spencer, S. M. (1993). *Competence at Work: Models for Superior Performance*. New York, NY: John Wiley & Sons, Inc.
Srivardhana, T., & Pawlowski, S. D. (2007). ERP systems as an enabler of sustained business process innovation: A knowledge-based view. *The Journal of Strategic Information Systems, 16*(1), 53.
Straub, D., & Boudreau, M. C. (2004). Validation Guidelines for IS Positivist Research. *Communications of the AIS*, *13*, 380-427.
Straub, D., Gefen, D., & Boudreau, M. C. (2004a). The ISWorld Quantitative, Positivist Research Methods
Straub, D. W. (1989). Validating Instruments in MIS Research. *MIS Quarterly*, *13*(2), 147-169.
Straub, D. W., & Gefen, D. (2005). Quantitative Research. In D. Avison & J. Pries-Heje (Eds.), *Research in Information Systems: A Handbook for Research Supervisors and Their Students* (Vol. 1). Amsterdam: Elsevier.

Su, K. J., Huang, L. C., & Hsieh, H. L. (2004). The development of a knowledge flow paradigm in engineering education: Empirical research in Taiwanese universities. *World Transactions on Engineering and Technology Education, 3*(1), 125-128.

Sundaram, S., Schwarz, A., Jones, E., & Chin, W. W. (2007). Technology Use on the Front line: How information technology enhances individual performance. *Journal of Academy of Marketing Science, 35*(1), 101-112.

Swanson, E., & Beath, C. (1989). *Maintaining Information Systems in Organizations*. New York: Wiley.

Swanson, E. B. (1994). Information Systems Innovation among Organizations. *Management Science, 40*(9), 1069-1092.

Tabachnick, B. G., & Fidell, L. S. (2007). *Using multivariate statistics*. Boston: Pearson.

Taggar, S. (2002). Individual creativity and group ability to utilize individual creative resources: a multilevel model. *Academy of Management Journal, 45*(2), 315-330.

Takeuchi, H., & Nonaka, I. (1995). *The knowledge-creating company*. New York, NY: Oxford University Press.

Tapscott, D., & Williams, D. A. (2008). Wikinomics: How mass collaboration changes everything. *Journal of Communication, 58*(1), 402-403.

Tarafdar, M., & Gordon, S. R. (2007). Understanding the influence of information systems competencies on process innovation: A resource-based view. *The Journal of Strategic Information Systems, 16*(4), 353-392.

Taylor, S., & Todd, P. A. (1995). Understandig Information Technology Usage: A Test of Competing Models. *Information Systems Reseaerch*, *6*(2), 144-176.

Teece, D. J. (2007). Explicating Dynamic Capabilities: The Nature and Microfoundations of (Sustainable) Enterprise Performance. *Strategic Management Journal, 28*(13), 1319-1350.

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

Tenenhaus, M. (2005). PLS path modeling. *Computational Statistics & Data Analysis, 48*(1), 159-205.

Tether, B. S. (2005). Do Services Innovate (Differently)? Insights from the European Innobarometer Survey. *Industry & Innovation, 12*(2), 153-184.

Therin, F. (2003). *Organizational Learning and Innovation in High-Tech Small Firms*. Paper presented at the 36th Annual Hawaii International Conference on System Sciences (HICSS'03), Big Island, Hawaii.

Thompson, J. (1967). *Organizations in Action: Social Science Bases of Administrative Theory*. New York: McGraw-Hill.

Tikkanen, J., & Renko, M. (2006). Developing innovation networks-the art of inter-organizational collaboration in high-technology innovation. *International Journal of Entrepreneurship and Innovation Management, 6*(6), 573–590.

Tippins, M., & Sohi, R. S. (2003). IT competency and firm performance: is organizational learning a missing link? *Strategic Management Journal 24*(8), 745-761.

Tripsas, M., & Gavetti, G. (2000). Capabilities, Cognition, and Inertia: Evidence from Digital Imaging. *Strategic Management Journal*, *10*(11), 1147-1161.

Tsang, A. H. C. (1998). A strategic approach to managing maintenance performance. *Journal of Quality in Maintenance Engineering, 4*(2), 87 - 94.

Urbach, N., & Ahlemann, F. (2010). Structural equation modeling in information systems research using partial least squares. *Journal of Information Technology Theory and Application, 11*(2), 5-40.

Utterback, J. M. (1994). *Mastering the Dynamics of Innovation: How Companies Can Seize Opportunities in the Face of Technological Change*. Boston, MA: Harvard Business School Press.

Venkatesh, V., & Agarwal, R. (2006). Turning visitors into customers: a usability-centric perspective on purchase behavior in electronic cahnnels. *Management Science*, *52*(3), 367-382.

Venkatesh, V., Morris, M. G., & Ackerman, P. L. (2000). A Longitudinal Field Investigation of Gender Differences in Individual Technology Adoption Decision-Making Processes. *Organizational Behavior and Human Decision Processes, 83*(1), 33-60.

Venkatesh, V., Morris, M. G., Davis, G. B., & Davis, F. D. (2003). User Acceptance of Information Technology: Toward a Unified View. *MIS Quarterly, 27*(3), 425-478.

Venkatraman, N., & Ramanujam, V. (1987). Planning System Success: A Conceptualization and Operational Mode. *Management Science, 33*(6), 687-705.

Vitchoff, L. (1989). *Issues around integrating technology into the educational environment*. Washington.

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

Walsham, G. (1993). *Interpreting Information Systems in Organizations*. Chichester: Wiley, Chichester.

Wang, W., & Hsieh, J. P. (2006). *Symbolic Adoption, Extended Use, and Emergent Use of Complex Information Systems in the Mandatory Organizational Context.* Paper presented at the 27th International Conference on Information Systems (ICIS), Milwaukee.

Wang, W. Y. C., Pauleen, D., & Ho, M. S. C. (2011). *IT Governance for Systems Support and Maintenance - Views from CIO's in Multinational Enterprises*. Paper presented at the The 11th International Conference on Electronic Business (ICEB 2011), Bangkok.

Weiner, B., J. (2009). A Theory of organizational readiness for change. *Implementation Science*, *4*(67), 1-9.

Wernerfelt, B. (1984). A Resource-Based View of the Firm. *Strategic Management Journal, 5*(2), 171-180.

Werts, C. E., Linn, R. L., & Joreskog, K. G. (1974). Intraclass reliability estimates :Testing structural assumptions. *Educational and Psychological Measurement, 34*(1), 25-33.

Wetzels, M., & Odekerken-Schroeder, G. (2009). Using PLS Path Modeling for Assessing Hierarchical Construct Models: guidelines and empirical illustration. *MIS Quarterly, 33*, 177-195.

Wheelwright, S., & Clark, K. (1992). Competing through development capability in a manufacturing based organization. *Business Horizon, 35*(4), 29-43.

White-Baker, E., & Hubona, G. S. (2011). *Does 'Being There' Make a Difference?: Shoppers' Perceptions in Virtual Worlds and on The Internet*. Paper. Graduate School of Computer and Information Science. NOVA South Eastern University.

Wideman, R. (2002). Wideman Comparative glossary of Project Managment Term Ver3.1 Retrieved Jan 21, 2011, from http://www.maxwideman.com/pmglossary/PMG_I03.htm

Wixom, B. H., & Todd, P. A. (2005). A theoretical integration of user satisfaction and technology acceptance. *Information Systems Research, 16*(1), 85-102.

Xie, F. T., & Johnston, W. J. (2004). Strategic alliances: incorporating the impact of e-business technological innovations. *The Journal of Business & Industrial Marketing*, *19*(3), 208–222.
Yelle, L. E. (1979). The learning curve: Historical review and comprehensive survey. *Decision Science*, *10*(2), 302-328.
Yin, R. K. (1994). *Case study research: Design and methods* (2nd ed. Vol. 5). Thousand Oaks, CA: Sage Publications.
Zack, M. (1999). Developing a Knowledge Strategy. *California Management Review*, *41*, 125-145.
Zahra, S. A., & George, G. (2002). The net-enabled business innovation cycle and the evolution of dynamic capabilities. *Information Systems Research*, *13*(2), 147–150.
Zakaria, N., Amelinckx, A., & Wilemon, D. (2004). Working together apart? Building a knowledge-sharing culture for global virtual teams. *Creativity and Innovation Management*, *13*(1), 15-29.
Zhang, M., Sarker, S., & Sarker, S. (2008). Unpacking the effect of IT capability on the performance of export-focused SMEs: a report from China. *Information Systems Journal*, *18*(4), 357–380.

Appendices

Appendix A: AUT Ethics Application Approval

M E M O R A N D U M
Auckland University of Technology Ethics Committee (AUTEC)

To:	WilliamWang
From:	**Charles Grinter**Ethics Coordinator, AUTEC
Date:	1 July 2010
Subject:	Ethics Application Number 10/114**Investigating the relationship between Enterprise System Support and Business Process Innovation.**

Dear William

Thank you for providing written evidence as requested. I am pleased to advise that it satisfies the points raised by a subcommittee of the Auckland University of Technology Ethics Committee (AUTEC) at their meeting on 3 June 2010 and that I have approved your ethics application. This delegated approval is made in accordance with section 5.3.2.3 of AUTEC's *Applying for Ethics Approval: Guidelines and Procedures* and is subject to endorsement at AUTEC's meeting on 9 August 2010.

Your ethics application is approved for a period of three years until 1 July 2013.

I advise that as part of the ethics approval process, you are required to submit the following to AUTEC:

- A brief annual progress report using form EA2, which is available online through *http://www.aut.ac.nz/research/research-ethics*. When necessary this form may also be used to request an extension of the approval at least one month prior to its expiry on 1 July 2013;
- A brief report on the status of the project using form EA3, which is available online through *http://www.aut.ac.nz/research/research-ethics*. This report is to

be submitted either when the approval expires on 1 July 2013 or on completion of the project, whichever comes sooner;

It is a condition of approval that AUTEC is notified of any adverse events or if the research does not commence. AUTEC approval needs to be sought for any alteration to the research, including any alteration of or addition to any documents that are provided to participants. You are reminded that, as applicant, you are responsible for ensuring that research undertaken under this approval occurs within the parameters outlined in the approved application.

Please note that AUTEC grants ethical approval only. If you require management approval from an institution or organisation for your research, then you will need to make the arrangements necessary to obtain this.

When communicating with us about this application, we ask that you use the application number and study title to enable us to provide you with prompt service. Should you have any further enquiries regarding this matter, you are welcome to contact Charles Grinter, Ethics Coordinator, by email at ethics@aut.ac.nz or by telephone on 921 9999 at extension 8860.

On behalf of the AUTEC and myself, I wish you success with your research and look forward to reading about it in your reports.

Yours sincerely

On behalf of Madeline Banda Executive Secretary

Auckland University of Technology Ethics Committee

Cc: Ammar Rashidammar.rashid@aut.ac.nz, AUTEC Faculty Representative, Business and Law

Appendix B: Participant Information Sheet

AUT UNIVERSITY
TE WĀNANGA ARONUI O TAMAKI MAKAU RAU

Participant Information Sheet

Date Information Sheet Produced:

19 July 2010

Project Title

Investigating the relationship between Enterprise Systems Support and Business Process Innovation

An Invitation

My name is Ammar Rashid. I am a PhD candidate in the Department of Business Information Systems at the Auckland University of Technology. This research is part of the requirement of the award of my PhD (Doctor of Philosophy). I invite you to participate in this research on the influence of system support and maintenance on business process innovation. Your participation is entirely voluntary.

What is the purpose of this research?

The purpose of this research is to understand the influence of systems support and maintenance operations on business process innovation. This research is required for the PhD that the researcher is undertaking. The research findings will be published in the form of a doctoral thesis.

How was I chosen for this invitation?

You are chosen because you have been identified as an IT professional , age 20 years or older, and have a sufficient level of English to understand the Questionnaire.

What will happen in this research?

You are invited to complete anonymous web survey through this email. This email contains the Information Sheet (what you are reading right now) and the URL of the anonymous web survey. It will approximately take you 15 to 25 minutes to complete the survey. All of your responses will be uploaded into the server. You have at least 3 months to fill up the web survey.

What are the discomforts and risks?

Minimal discomfort or risk is anticipated for any participant.

How will these discomforts and risks be alleviated?

All information collected will remain anonymous.

What are the benefits?

This research will provide valuable information on the value of systems support and its relationship with the business process innovation. This research would enable Information Technology (IT) professionals to understand the value in the post adoption operations. It would also enable them to make better decisions regarding the overall administration of system support and maintenance work in the organization.

How will my privacy be protected?

Your name will **not** be recorded on the survey form.

What are the costs of participating in this research?

The only cost of participating in this research is the time you give to completing the survey.

What opportunity do I have to consider this invitation?

You are under no obligation to complete the survey form.

How do I agree to participate in this research?

By completing this questionnaire, you are indicating your consent to participate in the research.

Will I receive feedback on the results of this research?

You are welcome to email Ammar Rashid, if you wish to receive a copy of the results of the research.

What do I do if I have concerns about this research?

Any concerns regarding the nature of this project should be notified in the first instance to the Project Supervisor, Dr. William Y. C. Wang, william.*wang@aut.ac.nz*

Concerns regarding the conduct of the research should be notified to the Executive Secretary, AUTEC, Madeline Banda, *madeline.banda@aut.ac.nz* , 921 9999 ext 8044.

Whom do I contact for further information about this research?

Researcher Contact Details:

Ammar Rashid, ammar.*rashid@aut.ac.nz*

Project Supervsior Contact Details:

Dr. William Y. C. Wang william.*wang@aut.ac.nz*

Appendix C: Questionnaire

Questionnarie

Purpose of this questionnaire

The purpose of this research is to investigate the relationship between Enterprise Systems Support and Business Process Innovation. Participation will only take 15-20 minutes and your response to this questionnaire will provide information for my study. All responses from the survey are anonymous. Completion of the questionnaire is deemed to be consent to participation in the research.

Please indicate the extent to which you rate the following set of questions by selecting the appropriate number:

Rating Scale

		1	2	3	4	5
1	To what extent did your firm document the technology plan					
2	How frequently did your firm conduct sessions to analyze the technology plan?					
3	To what extent were professionals from different functional areas involved in technology planning					
4	To what extent were external sources involved in identifying business opportunities					
5	How frequently did your firm share future technology plans with firm's employees?					
6	To what extent did your top managers from each function regularly visits customers					
7	How frequently the information about customers is freely communicated throughout your organization?					
8	To what extent the business functions are integrated to serve the target market needs					
9	To what extent do your top managers understand that the					

	employees can contribute to value of customers					
10	How frequently do you share resources with other business units?					
11	To what extent does your firm regard learning as its most important basic value					
12	How frequently does your manager share future vision with you?					
13	How frequently do you look for innovative ways to do your work?					
14	To what extent does your firm embrace innovative ideas					
15	To what extent do the employees view themselves as partners in charting the direction of the business unit					
16	To what extent do you collaborate with your peers on different projects					
17	How frequently do you use online portals to communicate project schedules to the rest of the organization?					
18	How frequently do the cross-functional meetings are held in your organization?					
19	To what extent do you use online portals to communicate concepts relating to latest technologies or applications					
20	How frequently do team members from different functional areas seek suggestions from each others?					

Please indicate the extent to which you agree with the following statements:

Rating Scale

		1	**2**	**3**	**4**	**5**
21	My organization provides adequate resources to carry out systems support work					
22	I frequently use the knowledge (i.e. database or documents) available in the organization to solve maintenance related issues					
23	My organization maintains good quality of information across different business functions					
24	I am generally able to find the answers in the available information repository present in the organization					

25	My organization generally employ experienced employees to carry out system support work					
26	My organization continuously refine project workflows based on the feedback received from designers or users					
27	New programming techniques are quickly adopted by the developers to improve project development/maintenance process					
28	My organization generally invest heavily in the technical infrastructure that is required to support new business processes					
29	A change in business process modelling is generally accepted by different stakeholders of the project					
30	My organization frequently reviews administrative processes to accommodate new changes in the project development activities					

Please provide information about your background for our study by answering the following questions;

31. Gender

a) Male b) Female

32. Age (years)

a) 20 or less b) 21-30 c) 31-40 d) 41-50 e) 51- 60 f) 61 or above

33. Highest education

a) Primary school b) Secondary school c) Undergraduate degree d) Postgraduate degree

34. Industry Sector (Please Tick only one)

A) Agriculture, Forestry and Fishing

B) Mining

C) Manufacturing

D) Electricity, Gas, Water and Waste Services

E) Construction

F) Wholesale Trade

G) Retail Trade

H) Accommodation and Food Services

I) Transport, Postal and Warehousing

J) Information Media and Telecommunications

K) Financial and Insurance Services

L) Rental, Hiring and Real Estate Services

M) Professional, Scientific and Technical Services

N) Administrative and Support Services

O) Public Administration and Safety

P) Education and Training

Q) Health Care and Social Assistance

R) Arts and Recreation Services

S) Other Services

35. Employee size group

a) 0 b) 1-4 c) 5-10 d) 11-25 e)26-50 f) 51-100 g) 101-200 h) 201-500 i) 500+

36. Years in Business

a) Less than 1 b) 1- 3 c) 3-5 d) 5-7 e) 7-9

37. Annual Revenue

a) Less than (100,000 b) (100,000 – (499,999 c) (500, 000 — 749,999 d) 750,000 – 1000,000 e) > 1 million

38. Job Title

a) Business Analyst

b) CIO/CTO/CSO

c) Communications manager

d) Computer Operator

e) Computer programmer / Software Engineer

f) Database manager / administrator

g) Database developer / modeller / architecture

h) Director of IT/IS

i) E-commerce manager / specialist

j) Help desk / technical support manager

k) Help desk / technical support specialist

l) IT / IS manager

m) Information Security manager / specialist

n) Network manager / administrator

0) Network engineer / architect

p) Project Manager

q) Systems Analyst

r) Systems manager / administrator

s) Systems architect   t) Other ____________

Thank you for completing this survey.

Appendix D: Glossary

Term	Definition	Reference
Business Process Innovation (BPI)	BPI is improving the sequencing of work routines and information flow to achieve improvement in key business processes. The aim of BPI is to use change levers to radically improve key business processes	(Daft, 1982; Grover & Ramanlal, 1999)
Collaboration (CO)	CO is a recursive process where two or more people or organizations work together in an intersection of common goals	(Tarafdar & Gordon, 2007)
Enterprise Systems (ES)	Enterprise Systems (ES) are software applications that are implemented in an organization to automate complex transactions and improve overall organizational effectiveness	(Davenport, 2000; Markus & Tanis, 2000
Inter-functional Coordination (IN)	IN is the managing of dependencies between activities	(Malone & Crowston, 1994)
Organizational Learning (OL)	OL is processes within an organization to maintain or improve performance based on experience	(Nevis & DiBella, 1995)
System Support and Maintenance (SSM)	SSM is the work of continuously managing, changing and supporting maintenance objects where IT systems are integral parts, for the purpose of securing the intended business value and accessibility	(Iacovou, et al., 1995; Karimi, et al., 2009; Overby, et al., 2006).
Technology Planning (TP)	TP is the process of planning the technical evolution of a program or system to achieve its future vision or end-state	(Segars & Grover, 1998)