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ADOPTION PROCESS OF INFORMATION TECHNOLOGY (IT) INNOVATIONS IN ORGANIZATIONS

**A Thesis submitted for the degree of Doctor of Philosophy
by**

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Abstract

Several models have been developed for understanding and predicting innovation adoption in organizations and literature has identified several factors that impact the adoption and implementation of Information Technology (IT). This research examines the process of adoption of IT innovations in organizations. The study explores the processes involved in the adoption of IT and verifies the key factors that influence IT innovation adoption in organizations.

Using a systematic literature review, the study developed a conceptual model of IT innovation adoption in organizations. The model is a theoretical combination of Diffusion of Innovation (DOI) theory, Theory of Reasoned Action (TRA), Technology Acceptance Model (TAM), Theory of Planned Behaviour (TPB) and a framework which contains characteristics of innovation, organization, environment, chief executive officer (CEO) and user acceptance. The model represents IT innovation adoption as a stage-based process, progressing from initiation to adoption-decision to implementation.

The study aggregated findings of past research on IT adoption to identify key factors that influences IT adoption in organizations. The study performed a meta-analysis of innovation, organization, environment, CEOs and user acceptance determinants to assess the magnitude and the strength of these factors on IT innovation adoption. Results confirmed that relative advantage, compatibility, cost, observability and trialability are strong determinants of IT innovation adoption. In terms of organizational context, IS department size, top management support, organizational size, IT expertise, product champion, IS infrastructure, information intensity, resources and specialization was found influential in the adoption of IT. As for environmental characteristics, the meta-analysis verified the significance of external pressure, government support and competitive pressure. Meta-analysis results verified that CEO’s innovativeness, attitude and IT knowledge as key determinants. The findings confirmed the importance of perceived usefulness, perceived ease of use, subjective norm and facilitating conditions for the user acceptance of IT in organizations.

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Chapter 1

Introduction

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1.1 Introduction

Understanding how and why organizations adopt and implement Information Technology (IT) innovations and the knowledge of underlying factors that manipulate the organizational adoption and user acceptance of IT helps businesses to more effectively evaluate their IT implementation. Organizations have invested considerable amounts of revenue on IT to improve their performance and investment in IT represents a substantial risk in terms of the return.

The quest to establish an approach for successful adoption and implementation of IT innovations in organizations is still an ongoing concern for Information System (IS) researchers. A substantial amount of research has been carried out in a variety of perspectives, technologies and contexts employing different units of analysis, theories and research methods in examining the processes and the factors influencing the adoption of IT innovations in organizations. Nonetheless, there is still a lack of research offering a complete model to describe the IT innovation adoption process. Current innovation adoption theories and models need modification and development to feature perspectives necessary for organizational adoption process. In addition, the IT literature has yet to recognize a set of characteristics that would influence the adoption and implementation of IT innovations in organizations.

Innovation adoption and user acceptance of IT has become an established research area in IS notion (Venkatesh et al., 2003). Reviewing and re-evaluating existing literature on IT innovation adoption would help researchers to identify currently un-explored research problems and assist in identifying appropriate units of analysis, theories and methods for their investigation (Williams et al., 2009). In addition, such an approach identifies the existing strengths, weakness and limitations of IT innovation studies and provides new opportunities for alternative research methods to explore (Venkatesh et al., 2007). Re-examining and summarizing past findings of innovation adoption research initiates novel, productive and rigorous investigations.

The research presented in this Thesis seeks to understand the process of adoption of IT innovations in organizations. A thorough investigation was carried out to recognize the theoretical representation of the processes involved in the adoption and implementation of IT innovations in organizations. In sequence, the study examines the key factors in different contexts that influence the adoption and the user acceptance of IT in organizations.

This chapter outlines the basic composition of the research. Section 1.2 provides an overview of the research conducted in this Thesis by providing background on the adoption process of IT innovations in organizations. Subsequently, current gaps in the adoption process of IT innovations in organizations are addressed in Section 1.3. In Section 1.4, the research aims and objectives are presented. The chapter concludes in Section 1.5 by summarizing the organization of the Thesis.

1.2 Research background

An innovation can be thought as an idea, a product, a program or a technology that is new to the adopting unit (Rogers and Shoemaker, 1971; Zaltman et al., 1973; Cooper and Zmud, 1990). The adoption of innovation is the introduction of ideas, products, processes, systems and technologies regarded as novel to the adopting organization (Rogers, 1995). Researchers and practitioners have made considerable efforts to increase the understanding of the innovation adoption process and, during the past two decades, IT has become the focal point in the study of innovation adoption. The adoption of IT in an organization allows businesses to improve their efficiency and effectiveness. At present, due to the importance of IT, it is generally perceived that organizations should innovate to gain competitive advantage.

The organizational innovation literature is rich with empirical work on innovation adoption behaviour. Researchers and practitioners have attempted to examine innovation behaviour of firms, the determinants from various contexts that influence the adoption process of IT and the processes of technological change within the organization. Studies of IT innovation adoption have been considered from both an individual and organizational perspective (Subramanian and Nilakanta, 1996; Lai and Guynes, 1997; Damanpour and Schneider, 2006). Research has proposed several theories, models and frameworks for examining innovation adoption process. Kwon and Zmud (1987) first identified the association between technology adoption and IT innovation adoption. As IT is considered a technological innovation, theories based on technological innovation may rightfully apply in empirical studies of IT adoption.

It is evident from the literature that the main motive for an organization to adopt an innovation is the likely improvement in their performance and a notable gain in profit (Zhu et al., 2006a). IS research has identified several other factors that influence an organization’s decision to adopt an innovation (Thong and Yap, 1995; Premkumar, 2003; Damanpour and Schneider, 2006). A number of studies have examined the factors influencing adoption of IT in an organization (Chau and Tam, 1997; Looi, 2005; Teo et al., 2009).

The innovation adoption process in organizations is considered successful only if the innovation is accepted and integrated into the organization and individuals continue to use the innovation over a period of time (Gopalakrishnan and Damanpour, 1997; Bhattacherjee, 1998). Meyer and Goes (1988) describe innovation adoption spanning from an organizations' first awareness of an innovation to acquisition until widespread deployment. Most past studies on IT innovation adoption only examine the processes and factors contributing to the adoption of IT until acquisition of innovation with no judgement on whether the innovation grows to be part of their regular practice. On the other hand, studies on user acceptance have only examined the behaviour and attitude of individuals accepting an innovation. Two types of organizational adoption decisions can be identified; one is the decision made by the organization and the other is the decision made by the individuals within an organization. However, studies rarely examine the adoption process and user acceptance of IT in organizations collectively.

1.3 Current gaps in IT adoption research

In spite of the significance of IT innovation adoption and the vast amount of literature available, knowledge of the IT adoption phenomenon for organizations is still limited (Carter et al., 2001, Abdul Hameed et al., 2012a). Understanding process and factors influencing the adoption and implementation of IT usually exhibit inconclusive outcomes. The contradictory nature of innovation studies have been mostly attributed to a failure to recognize innovation antecedents and can be perceived very differently according to the specific organizational condition involved (Wolfe, 1994). As a result, factors found to be influential in one organizational setting may not have any weight or inversely impact in a different situation.

Examining the processes involved in the adoption and user acceptance of IT is fundamental for ensuring successful adoption and implementation process (Abdul Hameed et al., 2012a). Most of the existing theories and models of IT innovation describe either the decision to adopt an innovation or the individual behaviour to accept and use an innovation. No single model explains both innovation adoption and use of technology, jointly. Moreover, the majority of past IT literature has focused on the adoption decision stage of IT innovation adoption and has rarely examined adoption and use of IT in organizations simultaneously. There is a lack of research offering a complete model to explain IT innovation adoption processes and user acceptance of IT in organizations.

In addition, innovation adoption theories and user acceptance models only explain the perception of individual’s attitude and behaviour towards adoption and acceptance of an innovation. None of the extant innovation adoption theories or user acceptance models reflects adoption of innovation in an organizational context. There is a necessity for expanding current innovation adoption theories and models to incorporate the context of an organization.

Understanding the course of actions in the adoption and implementation of IT in organization that would lead to a successful development is still one of the challenges facing the IS community. Research in this regard has so far produced mixed and inconclusive outcomes. Innovation adoption research has examined various factors considered as determinants that either enable or hinder adoption and implementation of IT in organizations. However, studies addressing determinants of innovation adoption processes have often yielded contradicting and conflicting findings. A long-standing criticism of IT innovation research has been the inconsistency of its findings (Downs and Mohr, 1976; Meyer and Goes, 1988). Wolfe (1994) indicates that the most consistent theme found in the organizational innovation literature is the inconsistency of study findings. Later, Rye and Kimberly (2007) support this claim by stating that the inconsistency in research findings has been a defining theme in adoption and diffusion research.

Despite the large amount of literature examining factors that facilitate or inhibit IT adoption, IT literature falls short in understanding and validating a set of characteristics that influence the adoption and use of an innovation. Past research makes it almost impossible to draw firm conclusions on the effects of different factors influencing IT innovation adoption process. However, it is fundamental to identify factors that enable or inhibit its implementation process to address the full IT innovation adoption process.

Furthermore, it is important to address the reasons why there have been so much contradiction and disagreement in past studies on identifying the determinants of IT adoption process. IT adoption research conducted in different surroundings, sectors, groups and demographic conditions often produce varying results (Damanpour, 1988). Research needs to investigate the effect of these research conditions when examining the true association between various determinants and IT innovation adoption.

1.4 Research aim and objectives

The principal aim of the research presented is to recognize the process of adoption of IT innovations in organizations and to examine the key factors that influence the adoption and user acceptance of IT in organizations.

To examine the process, the study seeks to theoretically construct a model for IT innovation adoption process in organizations. IT innovation adoption processes in organizations involve both organizational adoption of IT and user acceptance of IT. Furthermore, the study intends to develop an overall model that could be used by the organizations to more effectively undertake IT innovation adoption and implementation.

Given the aims, the objectives of the research presented in this Thesis are to:

1. Fill the knowledge gap in the IT literature for understanding the process of adoption and implementation of IT innovations in organizations.
2. Identify a theoretical model which examines the adoption and implementation of IT innovations in organizations.
3. Identify major determinants which influence adoption and use of IT innovations in organizations.
4. Recognize the cause of contradictory findings in the study of adoption of IT innovations in the past.
5. Develop an overall model for successful IT adoption and implementation in organizations.

1.5 Thesis organization

Motivated to examine IT adoption in organizations which includes adoption process and the user acceptance of IT, the study performs an exploratory and explanatory study. The findings of the exploratory study facilitate the explanatory examination. The Thesis describes the accomplishment of both these studies. The organization of the thesis is as follows.

Chapter 2 discusses the theoretical issues considered for studying IT innovation adoption and implementation in organizations. The study reviews IT innovation literature to understand the different perspectives and levels of analysis used in the study of innovation adoption. The research further scrutinizes the processes considered in past studies to assess the different phases involved in IT innovation adoption. The study also explores the theories and models used in innovation adoption and technology acceptance research. In addition, the study investigates frameworks developed by researchers for organizational innovation adoption. Furthermore, the discussion highlights the factors hypothesized about in the literature as influencing IT innovation adoption in organizations.

Chapter 3 outlines the methodology employed for research. The chapter aims to explain and justify the selection of particular research approach, methodology, data collection and analysis methods that were chosen to conduct the research. The chapter begins by presenting the research questions for the study and provides an overview of the research processes adopted. The philosophical assumption for the research through underlying ontology and epistemology are also discussed. The chapter explains in detail methodologies adopted for both the exploratory and explanatory study. Data collection methods and sample selection procedures for the study are also discussed.

In Chapter 4, the study presents the exploratory study for the research. The study explains the theoretical analysis performed to formulate a conceptual model for the adoption and implementation of IT innovations in organizations. The chapter explains how the study examined the IT literature to identify the processes involved of IT innovation adoption together with the theories, models and frameworks used in IT innovation adoption and user acceptance of IT. The research identifies the theoretical explanations provided by different theories on technology adoption. The study then extracts prominent theories, models and frameworks used in the IS literature for IT innovation adoption and user acceptance of IT. The chapter then explains how the study combines the most suitable innovation theories, models and frameworks that depict IT innovation adoption in organizations.

Chapter 5 describes the statistical methodology for the explanatory study. The study presents the concept of aggregating findings from past studies and statistical technique employed for the study. This procedure is used to examine the determinants of IT innovation adoption. The chapter outlines the selection of determinants of IT innovation adoption for later statistical analysis. In addition, the discussion highlights the research conditions which may affect the relationship between determinants and IT innovation adoption.

Chapter 6 describes the results of the statistical analysis examining the relationship between various determinants and IT innovation adoption. The study validates the important determinants of IT innovation adoption by aggregating past findings on their relationship to obtain an overall conclusion about their association. In doing so, the study uncovers major determinants affecting IT innovation adoption as well as quantifies their relative importance. By aggregating past findings, the study validates those existing findings and clarifies inconsistencies that might be present in primary studies. To emphasize this point, the study explores the perceptive of different research conditions that affect the relationship between various determinants and IT innovation adoption.

Chapter 7 interprets the findings of the exploratory study and the explanatory study of the research. By combining the findings of the exploratory study that provided a process model and explanatory study that produced factor model, the study presents an overall model for IT innovation adoption. The integrated model can be used to guide the organization for a successful IT innovation adoption process.

Chapter 8 concludes the research. The study describes an overview of the research and the lessons learnt by conducting the research. The chapter explains how each of the objectives outlined for the research was accomplished. The chapter further highlights the academic contribution of the research together with the implications for research and practice.

Chapter 2

Background Research

Adoption process of IT innovations in organizations

2.1 Introduction

The study of innovation adoption began as early as 1940s; however, the IS community only started to focus on innovation and diffusion research from the mid-1980s onwards. During the past two decades, researchers and practitioners have made considerable efforts to increase their understanding of various aspects of the innovation adoption process. IT has become the focal point in the study of innovation adoption. IT enables organizations to be more efficient and to gain competitive advantage.

A significant amount of research has been conducted in examining the process and the factors influencing the adoption of IT innovations in organizations. IT adoption literature provides various models and diverse conceptual frameworks for understanding the adoption of IT innovation. In addition, several past studies have investigated various factors that influence the adoption and the use of IT in different situations. In spite of the significance of IT innovation adoption and the vast amount of existing literature, due to the complex nature of the innovation adoption phenomenon, understanding of IT innovation adoption process requires additional exploration.

This research aims to theoretically construct a model for IT adoption processes in an organization. The study presents two independent research streams: the process of adoption of IT innovation *and* factors that influence the adoption of IT in organizations. Hence, the research encompasses the recognition of the process of IT innovation adoption and identification of the determinants that either facilitate or inhibit the adoption process.

In this chapter, the study explores past literature on IT adoption. The research identifies the key issues for studying IT adoption and implementation in organizations. The study analyses past empirical evaluation on innovation adoption to understand the theories and models used in innovation adoption and technology acceptance research. In addition, the research gathers popular frameworks developed by researchers to examine IT innovation adoption in organizations. The IT literature provides a rich body of facts which inform various theoretical models and frameworks for examining IT adoption as well as a range of critical factors which theoretically influence successful adoption of IT in organizations.

The organization of the chapter is as follows. To establish the basis for the study of IT innovation adoption, Section 2.2 discusses some definitions of IT innovation adoption in IS literature and Section 2.3 highlights the reasons for IT adoption. Based on the IT literature, Section 2.4 outlines some of the issues in studying IT innovation adoption. To explore the process of adoption of IT, Section 2.5 brings to light some of the most prominent theories and models used in investigating innovation adoption and technology acceptance of IT. Following this in Section 2.6 a discussion is presented on some well-known theoretical frameworks used in examining IT innovation adoption in organizations. In identifying the factors influencing the adoption of IT in organization, Section 2.7 discusses a summary of the different categories of determinants considered in IT literature. Finally, in Section 2.7, the study describes the meaning of IT innovation success and failure in context of IT innovation adoption.

2.2 Definitions of IT innovation adoption

Damanpour and Schneider (2006: 216) state that "Innovation is studied in many disciplines and has been defined from different perspectives". Innovation is associated with change; however, different disciplines define innovation that aligns to their individual perceptions.

2.2.1 Definition of innovation

Innovation has been defined in a variety of ways by researchers. Mohr (1969) termed it as the implementation of changes that are perceived new to an organization. According to Rogers and Shoemaker (1971), Zaltman et al., (1973) and Cooper and Zmud (1990) an innovation can be thought as an idea, a product, a program or a technology that is new to the adopting unit. Nohria and Gulati (1996) defined innovation as policies, structures, methods, processes, products or marketing opportunities seen as novel by its adopters. Boer and During (2001) suggest innovation as the creation of new product-market-technology-organization combinations. So, in practice, innovation implies exploitation of new initiatives, products, processes, systems, attitudes or services that have been put into effect to add value or improve the quality of work. Organizational innovation can be defined as the possession of ideas, systems, practice, products or technologies that are new to the adopting organization (Zaltman et al., 1973; Damanpour and Wischnevsky, 2006).

Innovation is a driver for the economies of any organization and permits a new method of approaching problems. Introduction of an innovation in an organization generates new values and can lead to some major changes in working practice. Innovation has been studied in a variety of academic disciplines and at different levels of analysis (Damanpour and Schneider, 2009); disciplines such as anthropology, sociology, communication, education, economics, management, organizational studies and IT amongst others have all been the subject of innovation study (Fichman and Carroll, 1999).

2.2.2 Definition of Information Technology (IT)

The most important technological innovation is the computer-based IS or simply IT. According to the Information Technology Association of America (ITAA), IT is defined as the study, design, development, implementation, support or management of computer-based ISs. It refers to anything related to computing technology such as networking, hardware, software, the internet and the individuals that work with these technologies. It can also be defined as the use of computer hardware and software to manage information. Moreover, the most common definition of IT is all forms of technology used to create, store, process, retrieve and present information in its various forms.

Turban et al., (2008) describe IT as collection of computer systems used by an organization. They also define IT as the technological elements of IS used to collect, process, store, analyze and disseminate information for a specific purpose. IT deal with using electronic computers for data management, networking, engineering, computer hardware, software design, database design, database management and systems administration. IT is a means of improving the efficiency and effectiveness of operational, tactical and strategic processes in organizations. The outcomes of using IT take account of several practical benefits including increased profit, raising market share, providing high quality service and raised competitiveness. IT enables organizations to be more capable and to gain a competitive advantage.

2.2.3 Definition of IT adoption and diffusion

IS researchers have suggested that IT adoption and technological innovation adoption are practically equivalent (Kwon and Zmud, 1987; Thong, 1999). Adoption of innovation is a process that results in the introduction and use of a product, process, or practice that is new to the adopting organization (Kimberly and Evanisko, 1981; Damanpour and Wischnevsky, 2006). Rogers (1983) stated that adoption is the decision to make full use of the innovation and Damanpour (1991) defines adoption of innovation as the generation, development and implementation of new initiatives or activities.

Rogers (1995) describes innovation adoption process as the decision to adopt innovation and physical acquisition of technology. While the adoption is often associated with the decision to accept innovation, the notion of diffusion is often associated with an attempt to spread innovation to a large population using communication channels (Rogers, 1983; Zaltman et al., 1973). Rogers (1983) defines diffusion as the process during which an innovation is communicated through certain channels over time among members of a social system. According to Rogers (1983) and Rogers (1995), adoption and diffusion of innovation would be achieved by the decision to accept an innovation and not whether the innovation has been put to use by the adopter. However, many researchers argue that this as a partial characterization of adoption and diffusion of innovation (Zaltman et al., 1973; Thong and Yap, 1995). For instance, Thong and Yap (1995) argue that the innovation adoption process only provides a meaningful representation if it assesses both decision to accept the innovation and how the technology is actually put into use by the potential adopter. Zaltman et al., (1973) also considered adoption of innovation to include technology implementation and divided the innovation adoption process into initiation and implementation stages.

2.3 Reason for IT adoption in organizations

The increase in the use of computers has created an unprecedented demand for IT. Identifying why and how firms adopt IT is fundamental for ensuring a successful adoption process (Swanson and Wang, 2005). The motivation for the adoption of IT by individuals and organizations has been the benefits expected after its acquisition. The introduction of IT is likely to cause changes in work procedures and increase computer anxiety among employees (Thong and Yap, 1995). IT has a significant impact on organizational operations and it is generally believed that IT increases competitiveness and allows a greater marketing opportunity. Businesses have a particular interest in adopting IT for its role in the improvement of organizational performance (Rogers, 1983; Damanpour, 1991). IT adoption presents potential adopters with new ways of running business operations and a means of exploring opportunities (Brancheau and Wetherbe, 1990). Fichman (2001) asserts that organizations that have necessary resources, a strong motivation to innovate and a favourable organizational climate are more likely to adopt innovation.

Actual IT innovation adoption in an organization can be initiated by either a response to a change in the environmental conditions in which it operates or at the point when innovation becomes a requirement for their routine organizational operations. Equally, IT innovation adoption can be prompted by a decision of management in the belief that it will bring improvements to the organizational performance (Subramanian and Nilakanta, 1996). Damanpour and Schneider (2006) also suggest that the adoption of innovation is a decision by the senior manager or by the influence of external conditions.

2.4 Issues in studying IT innovation adoption

In the domain of IT, innovation adoption research has been undertaken in terms of IS implementation research (Kwon and Zmud, 1987), technology acceptance research (Davis, 1989) and innovation diffusion research (Brancheau and Wetherbe, 1990). Despite the differences in their theoretical principles and distinctive constructs used, each of these research streams attempts to explain the importance of innovation adoption and IS success (Agarwal and Prasad, 1997). Innovation adoption research can be categorized as a dichotomy of innovation process research and innovation variance research (King, 1990; Subramanian and Nilakanta, 1996). Innovation process research examines the process of diffusion of innovation and innovativeness of organization (Rogers, 1983). Innovation variance research focuses on understanding and examining the organizational determinants of innovation adoption and the effects of innovation adoption on organizational performance (Subramanian and Nilakanta, 1996). In this context, researchers distinguish between two main approaches for the study of innovation adoption research: the *process* approach and the *factor* approach (Rogers, 1983; Benbasat, 1984). The process approach examines the behaviour of organizations which it experiences over time in the adoption and implementation of new innovation. The factor approach identifies the innovation attributes which supposedly influence patterns of innovation adoption and diffusion over time. Wolfe (1994) describes approaches for innovation process research as a process theory model that investigates the nature of the innovation process and includes stage models and process models.

The process model differentiates adoption and diffusion of innovation as two separate developments. *Adoption* models examine individual decisions to accept or reject a particular innovation while *diffusion* models explain how a population adopts or rejects a particular innovation (Straub, 2009). The majority of studies on IT innovation adoption have focused only on the adoption process; studies of the diffusion process are as essential to better understand the innovation adoption phenomenon in organizations (Premkumar et al., 1994). Chin and Marcolin (2001) suggest that the future of IT innovation diffusion research needed to explore both (1) the patterns of IT adoption over time to address the causes of events in the adoption process and (2) the different forms of usage to examine the approaches to exemplify deeper usage of IT. Hence, a research model for IT innovation adoption in organizations should embody constructs that enhance our understanding of the various stages of the adoption and implementation process.

Studies of IT adoption and implementation typically evaluate various characteristics that facilitate or inhibit adoption (Premkumar and Roberts, 1999). Researchers have examined IT adoption and IT implementation on a range of innovations in different contexts allowing studies on IT innovation adoption to build on that basis.

The research described in this Thesis develops a model for the process of innovation adoption and the use of IT in organizations. Together, the study examines factors in different contexts that influence various stages of adoption process in an organization. As the study includes understanding innovation adoption phenomenon in organizations and examining the effects of various determinant on IT adoption process it can be regarded as both innovation process research and innovation variance research. The current research study uses a combination of process approach and factor approach.

2.4.1 Stages of IT innovation adoption

The process of adoption of innovation in organizations has been categorized as a stage-based process (Hage and Aiken, 1970; Zaltman et al., 1973; Pierce and Delbecq, 1977; Zmud, 1982; Grover and Goslar, 1993; Rogers, 1995; Klein and Sorra, 1996; Angle and Van de Ven, 2000). The study explores different stages considered in the IT literature to identify the most appropriate representation of the model of IT innovation adoption process for organizations.

Researchers have described the process of adoption of innovation into different sequences of phases. Rogers (1995) defines the process as ‘adopters’ passing through awareness or knowledge, attitude formation to persuasion to a decision to adopt or reject the innovation followed by implementation and, finally, confirmation of the decision. Researchers have described the process of adoption of innovation into other sequences of phases. Thompson (1965) describes innovation assimilation as a sequence progressing from initiation to adoption to implementation. Implementation, according to Thompson (1965) is the extent to which the development, feedback and adjustment of innovation are conducted so that it becomes ingrained into the organization settings. Hage and Aiken (1970) divided the stages of innovation adoption into evaluation, initiation, implementation and routinization. Zaltman et al., (1973) partitioned a six stage process as knowledge, awareness, attitudes formation, adoption-decision, initial implementation and sustained implementation. The series of activities described by Kwon and Zmud (1987) include initiation and progression through to adoption, adaptation, acceptance, routinization and infusion. Klein and Sorra (1996) specify stages of awareness, selection, adoption, implementation and routinization while Angle and Van de Ven (2000) split the process into initiation, development, implementation and termination. The study by Darmawan (2001) describes a four stage innovation model and presented as initiation, adoption, implementation and evaluation.

Adoption of IT innovation has been widely recognized as a three stage process of initiation, adoption-decision and implementation (Pierce and Delbecq, 1977; Zmud, 1982; Tornatzky and Fleischer, 1990; Rogers, 1995). These three phases of initiation, adoption-decision and implementation are more often referred to as pre-adoption, adoption-decision and post-adoption in the IS literature.

More recently, researchers explain innovation adoption in terms of assimilation and describe awareness, interest, evaluation, commitment, limited deployment, partial deployment and general deployment as an assimilation life cycle (Fichman, 2001; Rai et al., 2009). Fichman (2001) argues that a measure obtained by aggregating the assimilation stages of innovation would better explain the innovation adoption process. However, Fichman and Carroll (1999) define the assimilation process as starting from initial awareness to possession of innovation and full-scale deployment within the organization. Similarly, Gallivan (2001) identifies three distinct phases in assimilation as (1) primary authority adoption decision, (2) secondary adoption and organizational assimilation processes and (3) organizational acceptance and consequences. Zhu et al., (2006a) describe stages of innovation assimilation as initiation, adoption and routization in their study on technology diffusion perspectives on e-business. This categorization of innovation assimilation is consistent with the pre-adoption, adoption-decision and post-adoption in IS literature. Rai et al., (2009) describe assimilation as a representation of aggregate innovation that emerges from the action of individuals whose cognitions and behaviours are influenced by the organizational structure. Rai et al., (2009) adopt this aggregated approach to investigate the assimilation of electronic procurement innovations. Fichman (2001) states that the aggregated assimilation combines different kinds of innovation behaviour such as propensity to adopt innovation, propensity to adopt them earlier and the propensity to implement them in a more rapid and sustained fashion.

In the light of the innovation literature on the stages of innovation adoption, the cycle of stages illustrated by different research falls (more or less) into the pre-adoption, adoption-decision and post-adoption phases. Hence, the study described in this Thesis considered an IT innovation adoption process with three stages of initiation (pre-adoption), adoption-decision and finally, implementation (post-adoption) stages. The study considers the initiation (pre-adoption) stage consisting of activities related to recognizing a need, acquiring knowledge or *awareness*, forming an *attitude towards the innovation* and *proposing innovation* for adoption (Rogers, 1995; Gopalakrishnan and Damanpour, 1997). Initiation leads to adoption-decision if a proper fit of innovation is found for organizational needs and which have technological capabilities. The adoption-decision stage described by Meyers and Goes (1988) reflects the *decision to accept* the idea and evaluates the proposed ideas from a technical, financial and strategic perspective, together with the *allocation of resources* for its acquisition and implementation. Because the adoption-decision sanctions resources for the possession of innovation in the organization, it is believed to be a step towards widespread use of technology (Zhu et al., 2006b). The study also considers the implementation stage (post-adoption) which involves *acquisition of innovation*, preparing the organization for use of the innovation, performing a trial for confirmation of innovation, *acceptance of the innovation by users* and continued *actual use of the innovation* to ensure that the innovation becomes ingrained and developed into a routine feature of the organization with the expected benefits being realized (Rogers, 1995).

The majority of IT innovation adoption studies have focused on the adoption-decision stage only and only a limited number of studies have examined the adoption and use of IT in organizations (Zhu et al., 2006a). Here, the researchers investigate the intent to adopt and the innovativeness of adopter and non-adopter. However, as Tornatzky and Klein (1982) point out, research on innovation adoption needs to focus on both adoption-decision and implementation stages. An innovation is not truly adopted by its possession alone; it needs to be actually put into use by the adopting organization (Damanapour and Schneider, 2009). Without full implementation, the benefit of innovation and its resulting effectiveness cannot be met. To explore the full IT adoption process, research needs to understand the pre-adoption, adoption-decision and post-adoption behaviour including usage of innovation.

The study in this Thesis considers the adoption process as one that involves both organizational adoption of IT and user acceptance of IT. User acceptance of IT and use of IT for organizational operations are assumed to be part of the implementation stage of innovation adoption process. Zalman et al., (1973) for example, describe a two stage innovation adoption model with ‘primary adoption’ as organizational decision to adopt the technology and ‘secondary adoption’ which contributes individual acceptance of the technology by users. Gallivan (2001) identifies three secondary adoption conditions which ensure user acceptance of IT once the primary adoption-decision has occurred. According to Gallivan (2001), following the adoption-decision, organizations may choose to (1) mandate the use of innovation throughout the organization, or (2) provide the necessary infrastructure and support to facilitate diffusion voluntarily, or else (3) introduce the innovation as a pilot project and later fully implement depending on the outcome of pilot.

The innovation process is deemed to be successful only if the innovation is accepted and integrated into the organization and individual users continue using the innovation over a period of time (Gopalakrishnan and Damanpour, 1997; Bhattacherjee, 1998). Lack of user acceptance is thought to be the main obstacle to the success in the adoption of new IT (Al-Ghatani, 2004). Innovations that are not accepted by their intended users will not result in any desired benefit.

The IT implementation literature has shown that some differences exist in the determinants at IT innovation adoption stages and for the use of innovation (Karahanna et al., 1999). Also, the antecedents of innovation may have varying impact at different stages of innovation adoption (King, 1990; Wolfe, 1994).

2.4.2 Different levels of analysis and perspectives

Innovation is studied from multiple perspectives at different levels of analysis (Slappendel, 1996; Damanpour and Schneider, 2009). Identifying these different perspectives provides a practical means for researchers to explore the underlying theoretical assumption for organizational innovation adoption. King (1990) describes studies of innovation adoption in organizations at three levels: (1) individual, (2) group and (3) organizational level. Early studies on innovation adoption concentrated mainly on behaviour of the individual and hence performed an individual level analysis. Group level, which has received the least attention by researchers, has been aimed at work groups operating within an organization. Organizational level research analyses the effect of innovation adoption on overall performance of the organization (Slappendel, 1996). Over the last few decades, researchers have looked at IT adoption from both organizational and individual level viewpoints (Subramanian and Nilakanta, 1996; Lai and Guynes, 1997; Damanpour and Schneider, 2006, Chan and Ngai, 2007).

Researchers make a choice when analyzing data. When individual level data is aggregated to the organizational level, it introduces aggregation bias which raises the likelihood of inconsistency in reported results in terms of effects of different factors (Sellin, 1990). Darmawan (2001) states that individual level data generalized to the organizational level diminish predictive power; results are often over or under-estimated. Variations in the outcome can be explained by the failure to distinguish between differences in unit of analysis, environment and technology characteristics which impact organizational innovation adoption (Chau and Tam, 1997).

As the research presented in this Thesis aims to explore the IT adoption process in organizations taking into account the organizational adoption of innovation and the user acceptance of IT, the study needs to reflect on two levels of analysis. *Organizational* level adoption begins when the organization seeks knowledge of the innovation until the acquisition of the technology. *Individual* level adoption measures user acceptance and the actual use of innovation. Hence, the organizational level adoption involves the pre-adoption and adoption-decision stages of innovation adoption while individual adoption involves the post-adoption phase of the innovation adoption.

With the prospect of organizational innovation adoption, potential adopters of technology are the adopting organization, its sub-departments and the individuals within the organization. Pierce and Delbercq (1977) reviewed innovation adoption in organizations in the context of organization, structure and member attitude and presented three perspectives of organizational adoption research. Slappendal (1996) identified these three perspectives and referred to them as ‘individualist’, ‘structuralist’ and ‘interactive process’ perspectives.

Table 2.1 gives an overview of Slappendal’s three perspectives.

Table 2.1 Slappendal’s three perspectives of adoption research (source: Slappendal, 1996)

	Individualist	**Structuralist**	**Interactive process**
Basic assumption	Individuals cause innovation	Innovation determined by structural characteristics	Innovation produced by the interaction of structural influences and the action of individuals
Conceptualization of an innovation	Static and objectively defined objects and practices	Static and objectively defined objects and practices	Innovations are subject to reinvention and reconfiguration. Innovation are perceived
Conceptualization of the innovation process	Simple linear, with focus on the adoption stage	Simple linear, with focus on the adoption stage	Complex process
Core concepts	Champion, Leaders, Entrepreneur	Environment, Size, Complexity, Differentiation, Formalization, Centralization, Strategic type	Shocks, Proliferation, Innovative capability, Context
Research Methodology	Cross-sectional survey	Cross-sectional survey	Case studies, case histories
Main authors	Rogers	Zaltman et al.	Van de Ven et al.

An individualist perspective assumes that individuals within the organization are the major source of change, where as the structuralist perspective assumes that the innovation is determined by organizational characteristics (Slappendal, 1996). The individualist perspective focuses only on the action of individuals ignoring characteristics of the contexts within which they operate, while the structuralist perspective does not account for the contribution of individuals. Alone, neither of these approaches can examine complex innovation adoption processes in organizations. The interactive process perspective regards innovation as either caused by individual or structural factors through an analysis of their interconnections and would better explain organizational innovation adoption in different contexts (Slappendal, 1996). For the study in this Thesis, IT adoption process in organizations includes the characteristics of organizations and the behaviour of individuals within the organization; hence, the research considered the interactive process perspective most appropriate to undertake the study.

2.5 Theories of innovation adoption

No single theory of innovation adoption exists and it seems unlikely that a definitive one will emerge (Wolfe, 1994; Fichman and Carroll, 1999). Due to the fundamental differences between innovation types it has been widely accepted by researchers that it may not be possible to develop a unifying theory of innovation adoption that can be applied to all types of innovations (Downs and Mohr, 1976; Kimberly and Evanisko, 1981; Thong and Yap, 1995). In addition, due to the changing nature of IT innovation, it is not feasible to generalize the adoption model into an overall representation. However, researchers have been utilizing several theories and theoretical models to explain the individual adopter’s attitude, innovation adoption behaviour, user acceptance of IT and various determinants in different contexts of IT innovation adoption. Several adequate but limited theories of innovation have been identified in the IS literature and applied under different conditions (Wolfe, 1994)

The most commonly used theoretical models were the Diffusion of Innovation Theory (Rogers, 1983), Perceived Characteristics of Innovating (Moore and Benbasat, 1991), Theory of Reasoned Action (Fishbein and Ajzen, 1975), Theory of Planned Behaviour (Ajzen, 1991), Technology Acceptance Model (Davis, 1989), Technology Acceptance Model 2 (Venkatesh and Davis, 2000), Technology Acceptance Model 3 (Venkatesh and Bala, 2008), Technology, Organization and Environment (TOE) model (Tornatzky and Fleischer, 1990) and the Unified Theory of Acceptance and Use of Technology (UTAUT) model (Venkatesh et al., 2003). Other models employed in the innovation adoption studies include social cognitive theory (Bandura, 1989), Task-Technology Fit (Goodhue and Thompson, 1995), Tri-core model (Swanson, 1994), Diffusion/Implementation Model (Kwon and Zmud, 1987), IT innovation adoption research model (Agarwal and Prasad, 1998a) and the framework for innovation adoption and implementation (Gallivan, 2001). Together with these models, some researchers have used institutional theory (Chatterjee et al., 2002) and resource-based theory (Barney, 1991). The following sub-sections describe some of these theories.

2.5.1 Diffusion of Innovation (DOI) Theory

The consensus of IS researchers is that the study of adoption of IT originated from the theory of Diffusion of Innovation (DOI). The model introduced by Rogers (1983) and Rogers (1995), has been the most widely used theoretical basis for the study of IT innovation adoption (Pervan et al., 2005). DOI is a communication or sociological theory used to describe patterns of adoption. Rogers (1983) defines diffusion as a process by which an innovation is communicated through certain channels over a period of time among the members of a social system. Here, it is communicated through certain channels implying that the participants create and share information to reach a mutual understanding. Rogers used adoption in the context of the decision to accept innovation. However, the main motive of DOI is to communicate the innovation message and encourage potential adopters to accept the innovation. According to Rogers, knowledge of the technology is processed by the potential adopters to form a perception about the characteristic of the innovation. Awareness of the innovation with other contextual factors allows the adopters to decide either to accept or reject the innovation.

DOI was originally formulated to consider the analysis of individual level adoption behaviour, but in recent work it has been applied to studies assessing organizational level adoption (Lai and Guynes, 1997). Rogers (1983) defined some attributes of innovation perceived as assisting diffusion of technological innovation. DOI appears to be the most broadly accepted model for identifying the main characteristics of IT innovation adoption (Premkumar and Roberts, 1999; Thong, 1999). In the DOI, Rogers (1995) proposed five attributes of innovation which play a key role in an individual’s attitudes towards innovation adoption. These five attributes are relative advantage, compatibility, complexity, trialability and observability of the innovation. Rogers (1995) suggests that technological innovation will be adopted smoothly and diffuse faster if it possesses these five attributes. Studies of innovation adoption have used these attributes in their search for factors influencing technological innovation adoption.

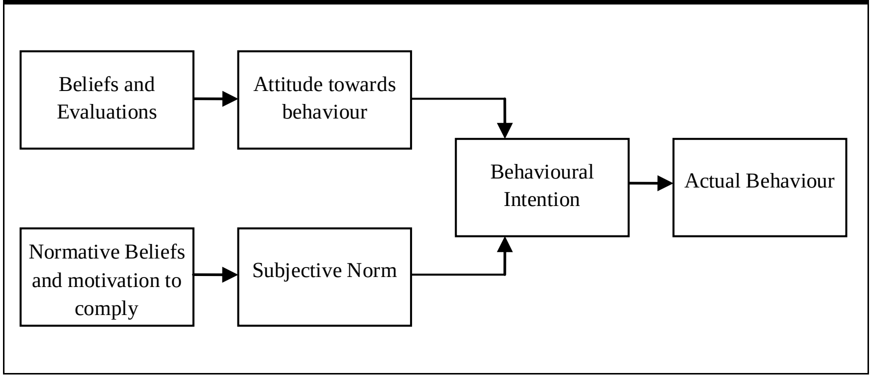
The literature shows that the DOI has a solid theoretical foundation and has had constant empirical support (Premkumar and Roberts, 1999; Truman et al., 2003). It is a useful theory for studying a variety of IT innovations (Moore and Benbasat, 1991) and serves as a theoretical framework for research in IT adoption diffusion (Teo and Tan, 1998; Tan et al., 2009). Using DOI as a basis, Premkumar and Roberts (1999) identified use of various communication technologies and the factors that influence the adoption of these technologies for small businesses in rural communities in the United States (US). Using DOI, Truman et al., (2003) examined the use and the acceptance of smart card technology by merchants and consumers in the US state of Manhattan. Bradford and Florin (2003) used a model of DOI to theoretically develop and empirically test the role of diffusion factors on the implementation success of Enterprise Resource Planning (ERP) systems.

Although the DOI remains a popular model for investigating the adoption of innovation in organizations, it has received substantial criticism in its application at an organizational level (Chau and Tam, 1997). One of the major limitations of DOI when used at organizational adoption is that it applies an individualist approach and takes no account of the influence of characteristics of the organization and its environmental factors (Lee and Cheung, 2004). Brancheau and Wetherbe (1990) suggest that DOI cannot be used to fully explain IT innovation adoption in organization. The model focuses primarily on the innovations being adopted autonomously by individuals (Fichman and Carroll, 1999). DOI only considers the attributes of innovation itself whilst innovation adoption is multi-dimensional and should consider other contexts such as the environment in which it operates. As DOI only reflects the behaviour of individuals in the adoption of new technological innovation, many researchers have combined DOI with other theories to describe the adoption process in organizations (Chwelos et al., 2001; Mehrtens et al., 2001). Another apparent limitation of DOI is its inability to address the full implementation process of IT. The model provides no rationale for determining whether the innovation is put into use by the adopter. A successful adoption of IT can only be achieved if that technology is put into use by the adopter. Despite the limitation of DOI, several studies have exploited the model in their research to investigate innovation adoption processes in organizations (Iacovou et al., 1995; Premkumar and Roberts, 1999; Zhu et al., 2006a; Chan and Ngai, 2007; Tan et al., 2009).

2.5.2 Theory of Reasoned Action (TRA)

Fishbein and Ajzen (1975) introduced the Theory of Reasoned Action (TRA) drawn from social psychology. It was one of first theories to explain user acceptance behaviour. According to the TRA, individual behaviour is driven by one’s intention to perform a behaviour which, in turn, is determined by the person's attitude and subjective norm regarding the behaviour in question. Attitude is determined by one’s salient beliefs (positive or negative feelings) about the results of performing the behaviour multiplied by the evaluation of those results. Subjective norm refer to the person’s perception of the social pressure put on them to perform the behaviour. In other words, subjective norm is the influence that a person experiences on adoption-decision by others and the persuasion that may come from a peer’s subordinates or superiors (Dwivedi et al., 2012). Thus, subjective norm is determined by the normative beliefs of adopters based on perceived expectations of specific referent individuals or groups that motivate one to fulfil these behaviours. Figure 2.1 illustrates TRA proposed by Fishbein and Ajzen (1975).

Figure 2.1 Theory of Reasoned Action by Fishbein and Ajzen (1975)

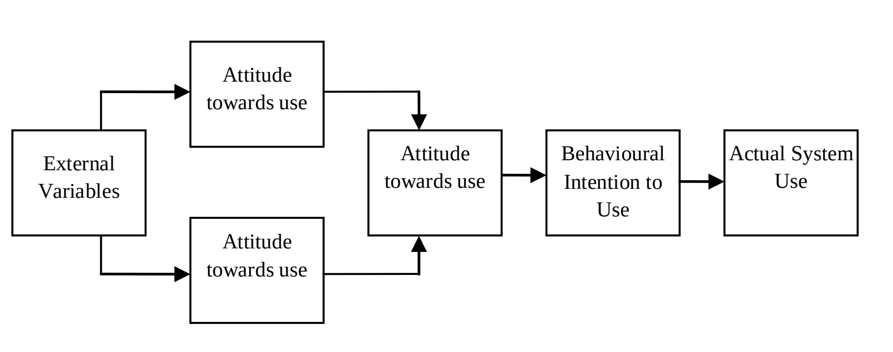


TRA is a more general model that explains human intention and has proven to be successful in predicting and explaining human behaviour for a wide variety of domains (Davis et al., 1989). TRA asserts that external factors such as system design characteristics, user characteristics, task characteristics and organizational characteristics influence behaviour indirectly through attitude towards use and subjective norm. This makes it suitable to apply for the study of IT perspective (Davis et al., 1989).

2.5.3 Technology Acceptance Model (TAM)

The Technology Acceptance Model (TAM) introduced by Davis (1989) aims to predict user acceptance of IT and explain the behaviour of individual’s IT acceptance. TAM is an adaptation of TRA specifically modified to address IT user acceptance. TAM constructs are based on the attitudes and behavioural intention in determining technology adoption, acceptance and usage. In contrast to TRA model, the conceptualization of TAM excludes the determinant of subjective norm element as a construct of behavioural intention. Igbaria et al., (1997) state that both the TAM and TRA models adequately predict user intention and usage of IT; however, TAM was found to be easier to use, as well as a powerful model to determine IT user acceptance behaviour. It describes how the intention to use a technology is affected by the attitude of the user and their feeling towards the technology. Figure 2.2 illustrates the TAM proposed by Davis (1989).

Figure 2.2 Technology Acceptance Model proposed by Davis (1989)



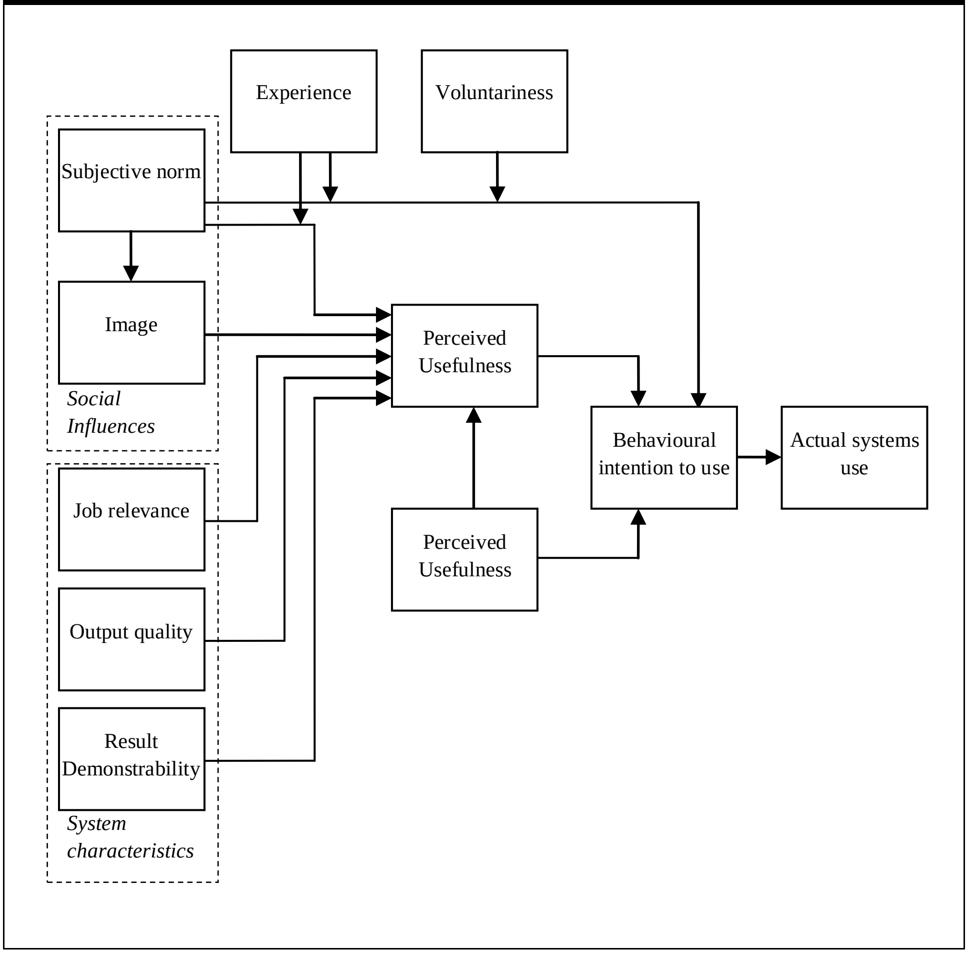
TAM hypothesizes that IT adoption has two perceived attributes that influence user adoption, namely 'perceived usefulness' and 'perceived ease of use' (Davis, 1989; Davis et al., 1989). Perceived usefulness is 'the degree to which a person believes that using a particular system will enhance his or her job performance' and perceived ease of use is 'the degree to which a person believes that using a particular system will be free of effort' (Davis, 1989: 320). TAM considers that perceived usefulness and perceived ease of use are essential constructs influencing the use of IT. These two attributes affect a user's attitude towards using the information system and a user's attitude directly relates to a user's intention which will, in turn, determine the system usage of the technology. TAM also explains how benefits of usage become more important if it is perceived as easy to use. Hence, perceived ease of use influences perceived usefulness; that is, even if an innovation is perceived useful, it will only be used if it is perceived easy to use (Dwivedi et al., 2012).

A key purpose of TAM is to examine the impact of external factors on internal beliefs, attitudes, intentions and eventual use of the technology (Davis et al., 1989). Mathieson et al., (2001) describe the benefits of utilizing TAM in IS research as threefold: (1) it focuses on IT usage, (2) the validity and reliability of the instruments it uses and, finally, (3) its parsimony. TAM has received considerable empirical support in addressing user acceptance and IT usage (Taylor and Todd, 1995; Mathieson, 1991).

2.5.4 Technology Acceptance Model (TAM) 2

TAM has been modified and extended with additional attributes to predict behavioural intention to user acceptance of IT (Venkatesh and Davis, 1996). Since TAM does not include social influence, Venkatesh and Davis (2000) extended TAM and presented two theoretical processes of social influence and system characteristics in TAM2. These two processes explain determinants of perceived usefulness. Studies have shown that user acceptance of IT is determined to a larger extent by perceived usefulness (Davis et al., 1989; Adams et al., 1992; Straub et al., 1995; Szajna, 1996). Figure 2.3 illustrates TAM2 proposed by Venkatesh and Davis (2000).

Figure 2.3 Technology Acceptance Model 2 proposed by Venkatesh and Davis (2000)



In TAM2, subjective norm and image are the two determinants of social influence while the system characteristics are derived from job relevance, output quality and result demonstrability (Venkatesh and Davis, 2000). The TAM2 model is more powerful than the original TAM but less parsimonious (Dwivedi et al., 2012).

Venkatesh and Bala (2008) further extended TAM2 and introduced TAM3 with two additional theoretical constructs of facilitating conditions and individual differences that describe the determinants of perceived ease of use. The determinants of perceived ease of use included in TAM3 were originally suggested by Venkatesh (2000). The construct of facilitating conditions comprises of (1) computer self-efficacy, (2) perception of external control, (3) computer anxiety and (4) computer playfulness; the determinants of individual differences are (1) perceived enjoyment and (2) objective usability (Venkatesh and Bala, 2008). TAM3 can be thought as a derivative of a combination of TRA, TAM and TAM2 to predict individual behaviour towards an innovation through innovation utilization or system use.

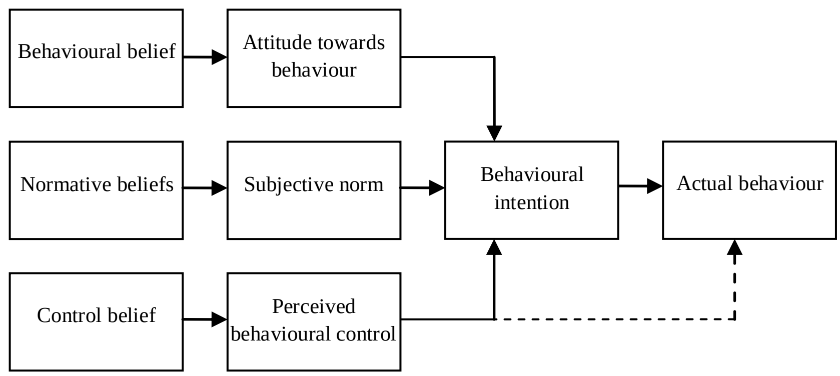
As an addition to TAM2, Venkatesh and Bala (2008) use ‘experience’ and ‘voluntariness’ as two moderating variables in TAM3. Experience moderates the relationship (1) subjective norm to perceived usefulness, (2) computer anxiety, computer playfulness, perceived enjoyment, objective usability to perceived ease of use, (3) perceived ease of use to perceived usefulness and (4) perceived ease of use to behavioural intention. Voluntariness moderates the relationship between subjective norm and behavioural intention.

2.5.5 Theory of Planned Behaviour (TPB)

The Theory of Planned Behaviour (TPB) shown in Figure 2.4 is also derived from TRA. Like TRA, the fundamental feature of TPB is to predict an individual’s intention to perform a given behaviour. Ajzen (1991) extended TRA by adding a new component “Perceived Behavioural Control” (PBC) in TPB, as a variable that affects the intention towards behaviour. PBC refers to the perceived ease of difficulty of performing the behaviour and is assumed to reflect internal and external constraints on behaviour. Hence, TPB perceives that attitude, subjective norm and PBC are three independent determinants of behavioural intention. PBC addresses the behaviours in situations where individuals have less control over that behaviour.

PBC affects behaviour directly or indirectly through behavioural intention. Ajzen (1991) posits out that in conditions where behavioural intentions have minimal effect on behaviour, PBC alone can be used to predict actual behaviour. Ajzen (1991) postulates in TPB that attitude towards use, subjective norm and PBC are a function of salient beliefs relevant to that behaviour. Attitude towards use is affected by behavioural beliefs such that the behaviour will produce the intended outcome. Subjective norms are assumed to be affected by normative beliefs which refer to one's compliance with the thoughts of the people important to them regarding whether they should or should not perform the behaviour in question.

Figure 2.4 Theory of Planned Behaviour proposed by Ajzen (1991)



PBC is also affected by control beliefs. The control belief contributes to the PBC by determining individual perception towards internal and external behaviour (Lin, 2006). PBC mediates internal behaviour through computer self-efficacy and the determinant of external behaviour through facilitating conditions. Hence, PBC encompasses two components of *self-efficacy* and *facilitating conditions*. Computer self-efficacy refers to the judgement of one's ability to use a computer (Compeau et al., 1999), while facilitating conditions represents the resources needed to engage in a behaviour (Lean et al., 2009). Inclusion of PBC in TPB allows the model to predict conditions for both volitional and non-volitional behaviour. Hence, TPB has become a particularly useful model to predict user acceptance of IT innovations in organizations, where the use of IT is not entirely voluntary.

2.5.6 Perceived Characteristics of Innovating (PCI)

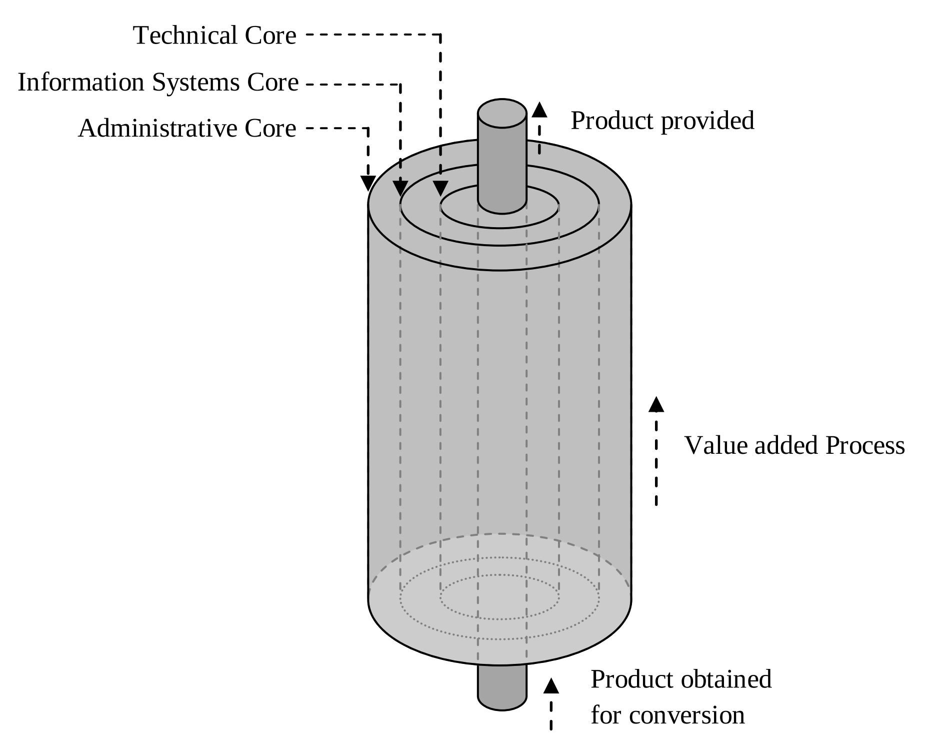
Moore and Benbasat (1991) extended Rogers (1983) perceived characteristics of innovation to establish a new set of characteristics called "Perceived Characteristics of Innovating (PCI)" as predictors of IT innovation adoption behaviour. They extended Rogers' (1983) five attributes of innovation (relative advantage, compatibility, complexity, trialability and observability) by introducing two new characteristics: image and voluntariness. In addition, they split Rogers' (1983) observability into result demonstrability and visibility. Moore and Benbasat (1991) found that all characteristics of PCI were relevant to acceptance behaviour and such perceptions have been used to explain both system usage as well as usage intention.

Image is the perceived improvement of social status by adopting the innovation. This is the same construct as TRA and TPB construct of subjective norm. This implies that using certain innovation may improve an adopter's status. Voluntariness is the degree to which an innovation is adopted voluntarily. This is identical to the TPB construct of PBC. Result demonstrability is the observability of the result to the others. Direct observation of others using an innovation develops a positive attitude towards that innovation which results in adoption of the innovation. Visibility describes the observability of the usage of an innovation to other. PCI has been used to predict the adoption of innovation and has found to be a useful tool for the study of adoption and diffusion of innovations (Plouffe et al., 2001; Zhu and He, 2002).

2.5.7 Tri-more model

Swanson (1994) proposed a tri-core model to identify the core knowledge that contributes to the development of organizational IS innovation. Figure 2.5 illustrates the Tri-core model introduced by Swanson (1994).

Figure 2.5 Tri-core model by Swanson (1994)



The Tri-core model is an extension of Daft's (1978) dual core model to include ISs core to administrative and technical cores. The model suggests that a deficiency in any one of the cores can cause IS innovations to fail. Swanson (1994) argues that the IS innovation is aided by IS products and services into the cores of functional IS, business administration and business technology.

In the tri-core model, Swanson (1994) defines three basic types of IS innovation within organizations (Types I, II and III) and hypothesizes that each of the innovation types maps into one of the three cores. Type I innovation is defined as process innovation and is mapped to an IS core itself; Types II and III are directed towards the administrative and technical cores of the business (Swanson, 1994).

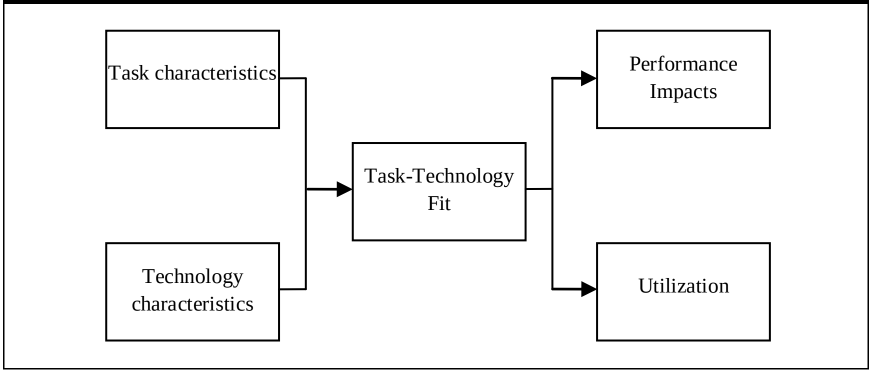
Type I innovation focuses on the IS administrative tasks (IS administration termed as Type I [a] and IS task termed as Type I [b]). Type II innovation is defined as IS product and services and consequently mapped to administrative core. Type III innovation integrates IS product and services with core business technology and has an impact on business administration. The Type III category is further divided into three areas: Type III [a] is process innovation such as computer integrated manufacturing, Type III [b] is product innovation such as Remote Customer Order Entry and finally, Type III [c] refers to integration innovation such as Inter-organizational Information Systems (Swanson, 1994).

2.5.8 Task- Technology Fit (TTF)

Task Technology Fit (TTF) introduced by Goodhue and Thompson (1995) states that IT is more likely to have a positive impact on individual performance and be utilized when the innovation provides features that match the tasks that the user must perform. TTF was developed to evaluate individual level of analysis of IT as well as to predict and explain use of innovation from the perspective of tasks.

Goodhue and Thompson (1995) state that when the use of innovation is not voluntary, performance impacts will depend more and more upon the task-technology fit. The TTF model is composed of four constructs: task characteristics, technology characteristics, task-technology fit and performance or utilization. Eight factors are proposed to measure task-technology-fit: quality, locatability, authorization, compatibility, ease of use or training, production timeliness, system reliability and relationship with users. TTF posits that user evaluations are influenced directly by both system characteristics and task characteristics and TTF is related to both performance impact and utilization. Figure 2.6 illustrates the TTF model proposed by Goodhue and Thompson (1995).

Figure 2.6 Task-Technology Fit model by Goodhue and Thompson (1995)



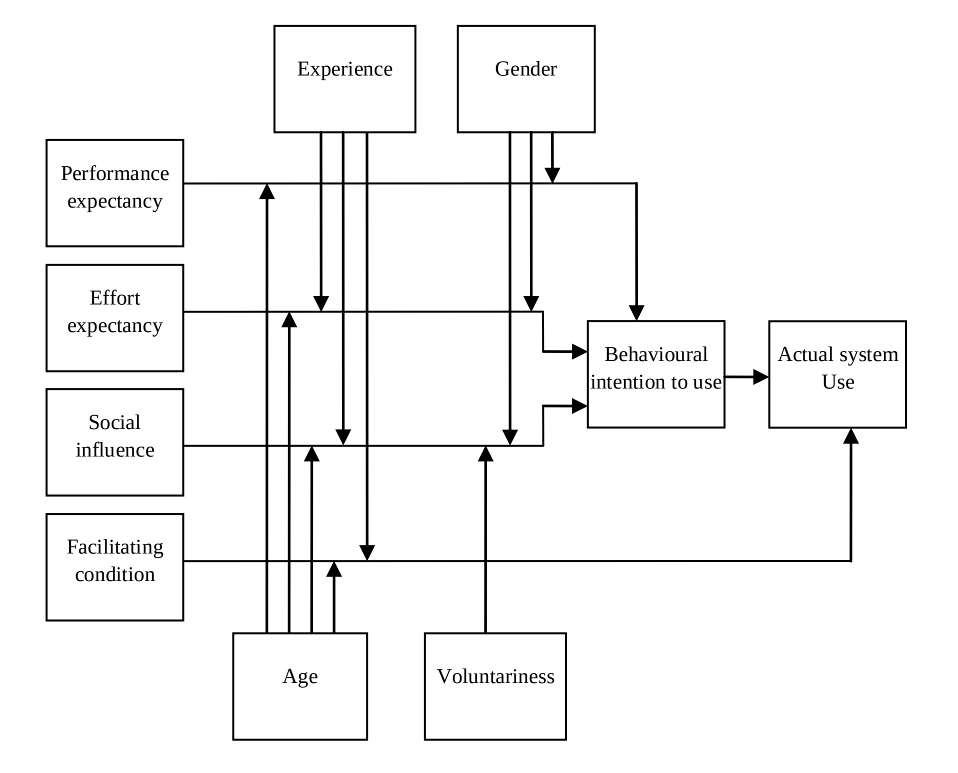
2.5.9 Unified Theory of Acceptance and Use of Technology (UTAUT)

The Unified Theory of Acceptance and Use of Technology (UTAUT) is a technology acceptance model formulated by Venkatesh et al., (2003) and seeks to explain user intention to use ISs and subsequent usage behaviour. They created this model by combining eight user acceptance models previously used in IS literature to synthesize a more complete picture of the user acceptance process. The UTAUT model contains four core determinants of intention and usage of IT namely: performance expectancy, effort expectancy, social influence and facilitating conditions. In addition, the model posits that these four determinants are mediated through gender, age, experience and voluntariness of use.

Venkatesh et al., (2003) defines performance expectancy as the degree to which an individual believes that using the system will help the user to attain gains in job performance, effort expectancy as the degree of ease associated with the use of the system and social influence as the degree to which an individual perceives that people important to them believe that they should use the new system; finally, facilitating conditions as the degree to which an individual believes that an organizational and technical infrastructure exists to support use of system. Venkatesh et al., (2003) describe how UTAUT can better predict technology acceptance behaviour compared to the eight primary models with which it was derived.

UTAUT hypothesize that performance expectancy is moderated by gender and age, effort expectancy moderated by gender, age and experience. Social influence is expected to be moderated by gender, age, experience and voluntariness. Finally, facilitating condition is moderated by age and voluntariness of use. Figure 2.3 illustrates the UTAUT model.

Figure 2.7 Unified Theory of Acceptance and Use of Technology proposed by Venkatesh et al. (2003)



2.6 Frameworks for organizational innovation adoption

Innovation adoption in organizations is multidimensional; that is, it is influenced by factors from several dimensions (Tornatzky and Fleischer, 1990; Wolfe, 1994; Rogers, 1995). As innovation theories do not provide a complete explanation of IT innovation adoption at the organizational level, IS researchers have combined individual level adoption models such as DOI, TRA and TAM with other contexts within the organization to provide more affluent and illustrative models (Chau and Tam, 1997). Researchers have built analytical and empirical models to describe and predict IT innovation adoption in organizations.

Generally, a framework of organizational IT innovation adoption encompasses attributes from different contexts that affect the innovation adoption process. Researchers and practitioners have attempted to identify various factors as potential determinants of IT innovation adoption in organizations. Studies have also empirically validated various attributes in different contexts that influence the adoption of IT. For organizational level analysis, determinants includes features of the innovation itself, attributes of the organization, environmental factors with which the organization interacts and characteristics of individuals within the organization (Tornatzky and Fleischer, 1990; Rogers, 1995). Organizational level adoption frameworks sometimes incorporate characteristics from a user acceptance context (Karahanna et al., 1999; Luo et al., 2010). These studies extend user acceptance models such as TRA, TAM or TPB to develop their framework to examine user acceptance constructs.

Kwon and Zmud (1987) developed a framework integrating classical innovation research and IS implementation research to identify five broad categories of determinants for IT adoption namely: technology or innovation factors, structural or organizational factors, environmental factors, individual factors and task factors. Iacovou et al., (1995) in their study examining the influence of factors in the adoption of Electronic Data Interchange (EDI) utilized a framework with organizational and environmental contexts. Kimberly and Evanisko (1981) identified determinants of Chief Executive Officer (CEO), organizational and environmental characteristics in recognizing the factors that impact the adoption of technological and administrative innovations in hospitals. In developing an integrated model of IS adoption in small businesses, Thong and Yap (1995) deployed a model with characteristics of CEO and organizational characteristics. Tornatzky and Fleischer (1990) present a framework for technological innovation decisions with technological, organizational and environmental factors. This model was known as the ‘TOE framework’ and has become a useful theoretical perspective for examining contextual factors affecting the adoption of IT innovations in organizations.

2.6.1 Technology-Organization-Environment (TOE) Model

The TOE Model is described in Tornatzky and Fleischer’s ‘The process of technology innovation’ (1990). The TOE framework is an organizational level model which explains three different contextual attributes of a firm that influence adoption decision. These three elements are technological, organizational and environmental contexts. The technology context describes technologies that are currently used by the organization and the technologies available in the market relevant to the firm. Organizational context refers to the characteristics and resources of the firm, such as size of the organization and volume of slack resources. Finally, the environmental context describes the structure of the industry and the conditions surrounding the organization in which it conducts its business.

The TOE model posits that attributes from all these three contexts influence innovation adoption in organizations.

Past research has demonstrated that the TOE model has broad applicability and possesses explanatory power across a number of research surroundings (Thong, 1999; Quaddus and Hofmeyer, 2007; Ifinedo, 2011). Research has validated that three TOE contexts influence innovation adoption. Studies that employed the TOE model assumed a unique set of factors from each context depending on the specific technology or condition under which it is being examined. Models that replicate the TOE framework attempt to examine processes at the organizational level of IT adoption. TOE characteristics have been validated by several studies and have received consistent empirical support (Iacovou et al., 1995; Thong, 1999). Later, Thong (1999) used the same model as the TOE framework with the inclusion of CEO characteristics.

The TOE model has been broadly supported in empirical work and has been shown to be useful in the investigation of a wide range of innovations and contexts (Dwivedi et al., 2012). Also, it remains among the most prominent and widely utilized model of organizational innovation adoption since its introduction.

2.7 Determinants of IT innovation adoption in organizations

An organization adopts IT innovation to facilitate an internal requirement or in response to an external demand. Research has identified different factors that influence the adoption of IT innovations in organizations (Thong and Yap, 1995). Carter et al., (2001) state that the rate of adoption and implementation depends on the characteristics of the innovation, networks used to communicate the information about the innovation and the characteristics of those who adopt it.

Research in IT innovation adoption have proposed a range of factors that enable (drivers) and inhibits (barriers) to IT adoption. Drivers have a positive impact towards IT innovation adoption while barriers have a negative effect on adoption. Factors influencing innovation adoption are grouped into different categories in the IS literature. For example Kwon and Zmud (1987) identified five variable categories that may influence diffusion of IT innovations, namely: technology, organization, environmental, task and user characteristics. Thong (1999) developed and tested a model including characteristics of innovation, organization, environment and CEO characteristics as explanatory variables for IT innovation adoption. Four major categories commonly identified in the IT literature are (innovation) technological, organizational, environmental and individual factors (Thong, 1999; Grandon and Pearson, 2004a, Chan and Ngai, 2007). Tornatzky and Fleischer (1990) categorized as internal (organizational), external (environmental) and technological (innovation) factors. IT innovation adoption studies have identified factors from other contexts that impact the adoption processes. Among the individual characteristics, the attributes of organizational leader or CEO has been suggested as an important predictor in the innovation processes of organization (Rogers, 1983).

Iskandar et al., (2001) highlighted that a CEO's managerial attributes are considered important in the adoption of IT innovation. The influence of individual user's innovation acceptance determinants has also been examined in organizational IT innovation adoption. User acceptance characteristics are, by and large, assessed by the studies that perform individual level assessment of IT innovation adoption (Igbaria, 1993; Agarwal and Prasad, 2000). These studies used user acceptance models such as TRA, TAM or TPB in organizational level analysis and examined attributes from these models in IT innovation adoption in organizations.

In a technological context, researchers have named perceived benefits, cost, complexity and compatibility as key determinants. For organizational characteristics, the most popular variables include the size of the organization, support from the top management, resources available and IT expertise within the organization (Premkumar and Roberts, 1999; Jeon et al., 2006). Competitive pressure, demands from their trading partners and customers, support from government and environmental uncertainty have also been studied as environmental factors (Chwelos et al., 2001; Quaddus and Hofmeyer, 2007). In terms of individual aspects, researchers have examined CEO IT knowledge, CEO attitude towards IT and innovativeness of the CEO, amongst others (Thong and Yap, 1995; Damanpour and Schneider, 2009). Perceived usefulness and perceived ease of use have been consistently used as user acceptance determinants of IT in organizations.

2.8 IT innovation adoption success and failure

The fundamental aim of IT is to improve individual decision-making performance and ultimately organizational effectiveness (Raymond, 1990). Adoption of IT innovation in organizations seeks to enhance their efficiency and effectiveness. However, possession of IT does not always lead to a performance gain (Agarwal and Prasad, 1997). Rogers (1995) stated that IT adoption process could result in either the innovation being accepted to support the functions of an organization or rejected. Not all IT adoption process leads to success and a study report published by Standish Group (2009) shows that only 32% of all IT projects succeed. Success of an IT project means that is completed on time, within budget and achieves the required functionality.

Innovation adoption is a stage-based process which proceeds as a series of events over time. Rogers (1995) defined that the adoption of innovation as the decision to accept the innovation, not whether the innovation works. However, the process of innovation adoption can be considered successful only if the innovation is effectively adopted and used by the potential user to perform their intended tasks. Hence, IS effectiveness is a commonly used measure for IT success which reflects the use of IT for improving organizational performance (Raymond, 1990). The success and failure of IT implementation has been associated with the acceptance and usage of IT (Raymond, 1985; Delone, 1988). Kishore and McLean (1998) distinguish between ‘success of adoption’ and ‘success from adoption’. They define ‘success of adoption’ as the adoption and effective use of innovation while ‘success from adoption’ as benefits obtained from innovation adoption or the innovation adoption outcome. In other words, success of adoption is the success of the adoption process itself. Gaining benefit from innovation is crucial for an organization investing in research and development (Kunz and Warren, 2011). Value from innovation can only be achieved with a successful innovation adoption process.

Studies have been conducted to examine the IT adoption success and failure and the majority of these studies investigate the individual and organizational success variables which dictate the success or failure in IT innovation adoption (Kwon and Zmud, 1987). In the IT literature, the concept of success has multiple characterizations. The most frequently suggested measure of success of IT might be cash flow (Williams, 1978; Seibt, 1979). Another way to measure success of IT innovation adoption is through cost-benefit analysis. However, measuring cost and benefit has not always been feasible and the studies which have employed such methods showed inconclusive results (Cragg, 2002). IT literature has suggested several other measures of IT innovation adoption success; these include system use, user satisfaction, impact on individual performance and impact on organizational performance. Ein-Dor and Segev (1978) state that innovation success is determined by IT impact on individual and organizational performance. Zmud (1979) defined IT innovation adoption success as the extent to which IT is used by management. Levels of integration of IT into the organizational functions are also used as a surrogate measure of system success (Iacovou et al., 1995). An organization’s inability to achieve intended benefits of innovation may reflect either a failure of implementation or a failure of the innovation itself (Klein and Sorra, 1996).

The IS success model presented by Delone and McLean (1992) evaluates system success using six different constructs namely, systems quality, information quality, system use, user satisfaction, individual impact and organizational impact. The model postulates that system quality and information quality are the key determinants of system use and user satisfaction. These two determinants influence the individual impact which, in turn, manipulates the organizational impact. Furthermore, the model shows how system use and user satisfaction are interdependent. Later, Delone and McLean (2003) updated the model by combining individual impact and organizational impact to be net benefits. In addition, they add a new construct 'service quality' as an antecedent of system use and user satisfaction along with system quality and information quality.

Delone and McLean's (2003) model has proved a useful framework for measuring IS success (Petter et al., 2008). Using their model, two surrogate measures of system use and user satisfaction can be used to measure IT innovation adoption success. These two measures have frequently been used as a surrogate measure of IT success; level of utilization and user information satisfaction (Raymond, 1985; Montazemi, 1988; Melone, 1990; Delone and McLean, 1992). System use is the degree to which users use the capabilities of an IT; user satisfaction is the level of approval by the user with the reports, web sites, support services, etc. (Petter et al., 2008). The most generally accepted measure of computer acceptance of IT appears to be user satisfaction (Montazemi; 1988; Raymond, 1990; Yap et al., 1992) and system usage (Delone, 1988; Soh et al., 1992). User satisfaction and system use has been used to measure IT success at an organization level by many prior studies (Raymond, 1985; Delone, 1988, Montazemi, 1988; Yap et al., 1992). Wixom and Todd (2005) highlighted that the perception of IT success has been investigated within user satisfaction and technology acceptance literature.

Delone (1988) suggests that user satisfaction is shown by the actual usage of the system. Delone and McLean (2003) also argue that increased user satisfaction will lead to a higher intention to use, which subsequently affects the use of the system. User satisfaction has been adopted as an important determinant of IS success (Delone and McLean, 1992; Rai et al., 2002). Agarwal and Prasad (1997) suggest that system success is equivalent to individual use of the innovation. Ein-Dor and Segev (1982) also suggest that IS success can be measured using system use. Agarwal and Prasad (1997) suggest that system usage is a measure of successful system implementation and future use and indicates that the system will be institutionalized in future. The findings of Stylianou et al., (1996) indicates that user IT acceptance, system usage and user satisfaction are highly correlated.

Technology acceptance models and theories attempt to explain and predict IT user acceptance behaviour, manifested through IT utilization and system use. Characteristics that influence the use of the innovation have also been studied by many researchers (Davis, 1989, Davis et al, 1989, Thompson et al., 1991) and usage of IT has been the primary indicator of technology acceptance (Davis et al., 1989; Adams et al., 1992). Thus, system success can be associated with the individual use of the innovation. Drucker (1987) suggests that IT acceptance is one of the critical success factors in achieving business success. Furthermore, Petter et al., (2008) state that user acceptance of IT is a necessary precondition for success in IT innovation adoption. System usage has a noticeable practical value for managers interested in evaluating the impact of IT (Straub et al., 1995).

2.9 Summary

The research described in this Thesis aims to understand the process of innovation adoption of IT in organizations. The study explores the processes involved in the adoption and implementation of IT innovations in organizations and to examine the factors influencing the adoption and use of IT innovation in organizations. Furthermore, the study intends to develop an overall model for the adoption of IT innovation in an organization.

The chapter described some of issues relating to the study of innovation adoption. The chapter also described in detail some of the most prominent innovation adoption theories and user acceptance model and identified some of the major frameworks used in examining organizational adoption of IT innovations. In addition, chapter emphasized on the different categories of determinants considered in IT literature. Finally, the chapter put forward the concept of IS success and failure relating to IT innovation adoption.

Chapter 3

Research Design and Methodology

Adoption process of IT innovations in organizations

3.1 Introduction

The chapter aims to explain and justify the research approach, methodology, data collection and analysis method chosen to conduct the research described in this Thesis. It investigates the possible ways of solving the research questions and describes the reasons why the chosen research design and methodology was most relevant to the research presented. To undertake a research study, researchers are expected to carefully select an appropriate underlying assumption of conducting research or paradigm, a research methodology and a set of methods for collecting and analysing data.

The chapter starts by presenting the research question and research sub-questions for the study in Section 3.2. The subsequent sections explain and justify the research approach, methodology, data collection and analysis method appropriate to address the issues identified in the research sub-questions. Hence, Section 3.3 explains the nature of research by categorizing into different types of research and identifying the type of research that best fits the current research. Section 3.4 describes three different research purposes identified in the literature and categorizes the appropriate research purpose that best serves for the different research questions put forward. Section 3.5 explains the organization of the study to address the aims and objectives of this research.

An underlying philosophical assumption or research paradigm guides the process of the research. Section 3.6 describes the philosophical assumptions and justifies the choice for the philosophical foundation for the research through underlying assumptions of ontology and epistemology. Based on the philosophical assumption, Section 3.7 then justifies the main research approaches by discussing the deductive and inductive approaches and quantitative and qualitative approaches to research associated with the methods of data collection. The research then describes the research design and the different phases of the study to answer the question (Section 3.8). Following this, the research presents an overview of two methodologies used in research analysis namely: systematic review and meta-analysis (Sections 3.9 and 3.10, respectively). Section 3.11 explains the methodology adopted for each stages of the research and Section 3.12 describes the method employed for data collection. Finally, in Section 3.13 the process involved in searching and selecting the samples for the study are presented.

3.2 Research question

The aim of the research as described in Section 1.4 was to understand the process of adoption of IT innovations in organizations and to examine the key factors that influences the innovation adoption and user acceptance of IT in organizations. To address the aim, in Section 1.4 the study suggested a number of objectives:

(1) Fill the knowledge gap in the IT literature for understanding the process of adoption and implementation of IT innovations in organizations.

(2) Identify a theoretical model which examines the adoption and implementation of IT innovations in organizations.

(3) Identify major determinants which influence adoption and use of IT innovations in organizations.

(4) Recognize the cause of contradictory findings in the study of adoption of IT innovation in the past.

(5) Develop an overall model for successful IT innovation adoption and implementation in organizations.

Considering the aim and the objectives of the study, the central research questions for the study are:

1) What are the processes involved in the adoption and the use of IT innovations in organizations?
2) What are the key factors that guide a successful adoption and implementation of IT innovations in organizations?

To answer the main research questions, there are various issues that need to be explored and understood in the adoption and implementation of IT innovations in organizations. To emphasize these particular concerns, the study formulated the following research sub-questions.

1) What are the main theoretical models in the study of IT innovation adoption in organization?
2) What are the processes identified in the literature for the adoption of IT in organizations?
3) What are the factors identified in the literature that influenced the adoption of IT in organizations?
4) What are the factors identified in the literature that influenced the use of IT by the individuals within an organization?

5) What factors can be identified as key determinants that influence the process of adoption and implementation of IT in organizations?
6) What factors can be identified as key determinants that influence the use of IT by individuals within an organization?
7) What are the reasons for the inconsistency in the past literature, for the study of the adoption and use of IT in organizations?
8) How would an organization achieve a successful adoption and implementation of IT?

3.3 Nature of the research

Research can be categorized as empirical or non-empirical. Empirical research is based on scientific methods and the information gained is by experience, observations or experiments. The main principle of empirical research is that the data is used to test a theory. Bryman and Bell (2007) describe empiricism as the general approach to the study of reality for which the knowledge gained must be subjected to rigorous of testing. In non-empirical research, the researcher can make subjective arguments and prove their argument without validating with data. Research that does not conduct any form of investigation and is only performed by searching and reviewing literature on a certain subject is classed as non-empirical research. A research study can be purely empirical, non-empirical or a combination of both.

Another distinction made in representing research types are either ‘naturalistic inquiry’ or ‘experimental-type research’ (DePoy and Gitlin, 2011). Naturalistic inquiry focuses on the perception and interpretation of human understanding of a particular phenomenon. A naturalist study involves observing and recording a phenomenon in a natural setting. Experimental-type research is commonly used in scientific disciplines and is often referred to as scientific research. Unlike naturalistic inquiry, scientific research is based on observation and measurement. Hence, experimental-type research is associated with making predictions and hypothesis testing (Depoy and Gitlin, 2011). Although these are two opposite research types, recent research studies have combined naturalistic inquiry and experimental-type research termed a ‘mixed method’.

The evaluation for the study described in this Thesis can be realized as empirical in nature. In addition, the research demanded an experimental-type assessment to establish the relationship between various contextual factors and IT innovation adoption in organizations.

3.4 Purpose of the research

Hussey and Hussey (1997) classified the type of research in terms of purpose, process and logic. The purpose of research is to increase knowledge by describing, understanding or predicting an activity (Clark-Carter, 2004). The research has different purposes that are best served by different research design. The most common research purposes classified in the literature are threefold: one of exploratory, predictive (explanatory) and descriptive (Hussey and Hussey, 1997; Saunders et al., 2006).

An exploratory research seeks to explain new insights into a complex phenomenon (Robson, 2002). The primary purpose of this type of research is to explore and understand the nature of a complex phenomenon and to gather new facts regarding the problem. Exploratory research helps determine the best research design, data collection methods and selection of subjects. Three principal ways of conducting exploratory research are literature search, interviews with experts and focus groups. Exploratory research recognizes the significance of studying a phenomenon and is conducted once the focus of the study has been established (Gray, 2009). The results of exploratory research provide significant insight into the study problem. However, the findings typically do not generalize to the population at large. The value of exploratory research is that it puts in place the groundwork for other kinds of research, or compares and provides exciting variations between well-studied areas and those that are not well-studied.

The first four research sub-questions of the current study were explorative in nature. The research explored IS literature to understand the nature and process of IT innovation adoption in organizations. The study gathers and understands the main theoretical models used in the study of innovation adoption in organizations.

Studies that establish causal relationships between variables are regarded as predictive or explanatory (Saunders et al., 2006). Predictive research can be thought as being concerned with causes of a phenomenon. It explains the inter-relationships that exist within or around a phenomenon to set up links between the relationships. Predictive research is normally based on existing studies where a researcher typically develops certain hypotheses to be tested and verified with empirical evaluation to either support or refute those hypotheses. These types of research are usually experimental-type research and are characteristically empirical in nature.

The last four research sub-questions seek to examine the determinants that influence the innovation adoption and user acceptance of IT and to develop an overall model for IT innovation adoption in organizations. An explanatory examination enables the study to establish the association between various determinants and IT innovation adoption.

The purpose of descriptive research is to express precisely an account of a person, an event or a situation (Robson, 2002). It describes the phenomenon by summarizing the information about the research topic identified and draws conclusions from the data gathered (Saunders et al., 2006). Punch (2000) states that descriptive research informs the study, issues that are new and topics that have not being explored previously. Hence, this type of research is suited to a naturalistic inquiry. Jackson (1994) asserts that all research is descriptive in nature. Saunders et al., (2006) suggests that the descriptive research may be the foundation for exploratory or explanatory research.

3.5 The structure of the current research

The research described in this Thesis may be considered as comprising three parts: (1) a theoretical analysis to develop a conceptual model for the adoption and the use of IT in organizations (2) a statistical analysis to examine the major determinant of adoption and the use of IT in organization and finally (3) an interpretation phase that combines the results of the theoretical analysis and the results of the statistical investigation to achieve an overall framework for the adoption and use of IT in organizations. Tornatzky and Klein (1982) suggest that an ideal innovation adoption study should utilize research approaches that are reliable, replicable and permit some degree of statistical power.

3.5.1 Theoretical analysis

As an initial step, the research required an explorative approach to understand the process in which the adoption and implementation of IT innovations in organizations has been pursued. This phase of exploration allowed the research to perform a theoretical analysis to understand the advances in the study of adoption of IT. Theoretical analysis enabled the research to formulate a conceptual model for the adoption and implementation of IT innovations in organizations. The objective of theoretical analysis of the study was to:

- Identify, by examining IT literature the main theoretical models used in studying the adoption and the implementation of IT innovations in organizations.
- Examine IT literature to recognize the processes in which IT innovation adoption in organizations has been carried out.
- Identify from the IT literature the factors that influence the adoption and the use of IT in organizations.

- Develop a conceptual model for the adoption and use of IT in organizations based on the theories, processes and factors identified in the literature.

The theoretical analysis answers the first four research questions of the study. The theoretical analysis formed the foundation for the second part of the study.

3.5.2 Statistical analysis

The theoretical analysis proposes a model which includes various factors that influence the adoption and the use of IT in organizations. Statistical analyses were then performed to identify which of the factors identified in the literature actually influences in practice. The aim of the statistical analysis was to:

- Examine which of the factors identified in the theoretical analysis are the key determinants for the adoption of IT innovations in organizations.
- Examine which of the factors identified in the theoretical analysis are the key determinants for the user acceptance of IT in organizations.
- Examine the reason for inconsistency in findings of past literature on the factors influencing the adoption of IT.

Statistical analysis identified the factors influencing that adoption of IT innovations in organizations and answers the fifth sub-question of the research. The analysis examined the factors that influenced the user acceptance of IT in organizations and responds to the sixth sub-question of this research. The literature has shown that studies examining the factors in adoption of IT have produced contradictory outcomes. The statistical analysis explores different research conditions that affect the relationship between the various determinants and IT innovation adoption in organization. Finally, the analysis examined the effects of these research conditions to understand the contradictory findings of the past research, addressing the seventh research sub-question.

3.5.3 Interpretation phase

The study combines the results obtained in the theoretical analyses and statistical analyses to obtain an overall framework for the adoption and use of IT innovation in organizations. The aim of this phase was to:

- Proposed an overall model which incorporates the process in which IT is adopted and implemented in organizations and the factors that supposedly influence the innovation adoption processes.

- Discuss the importance of such a model for a successful adoption and implementation of IT innovations in organizations.
- Discuss the aggregated results in terms of the contribution in the body of knowledge of IS adoption research area.

This phase of the research answers the final research sub-question.

3.6 Research philosophy

Selecting an overall research philosophy is the choice between two major research beliefs namely, positivist and interpretive; each can be explained through ontological, epistemological and methodological positions in the design and the conduct of the research. Research philosophy allows the study to identify the knowledge necessary to address the research problem and the strategies that can be used to obtain, analyse and interpret the information (DePoy and Gitlin, 2011). The research philosophy contains important assumptions about the way the researcher views the world (Saunders et al., 2006). These assumptions allow the researcher to decide on a research strategy and a method for the research.

In a research study, the way of looking at the world view is also known as 'paradigm'. The notion of paradigm in research was first introduced by Kuhn (1970). Creswell (2009) described a research paradigm as a school of thought or a framework for thinking about the manner in which the research inquiry should to be conducted to establish reality. According to Guba (1990), paradigms can be characterized through their ontology (reality), epistemology (knowledge) and methodology. Hence, identifying a philosophical foundation reveals underlying assumptions of ontology, epistemology and methodology.

3.6.1 Ontology

Ontology is the nature of the world or the nature of reality. The consideration of ontology is whether the social entity should be realised as threefold: (1) an '*objective world*' independent of social actors (2) a '*socially constructed world*' built from the perception and the actions of social actors and finally, (3) '*individually constructed world*' in which research views the world on the construction of reality by the individuals through experiences (Fox et al., 2007). Some research disciplines are more parallel to one of these world views, while other disciplines seem to represent a combination of models. In line with the three world views of either objective, socially constructed and individually constructed, researchers have distinguished between three main ontological positions as objectivism, constructivism and realism (Matthews and Ross, 2010)

Bryman and Bell (2007) stated that objectivism is an ontological position that asserts that "social phenomena and their meanings have an existence that is independent of social actors". The compositions of the social world are objective entities that are not subjective to human beliefs, perceptions, culture and language that it describes. The objective world uses scientific research i.e., use of experiments to gather data to test research hypotheses (Fox et al., 2007). Objectivism allows the reality of a social phenomenon to be verified using reliable measures.

In contrast, constructivism is the ontological position that emphasizes the dynamic role of social actors through their perception and consequent actions for constructing social phenomena and social reality. Social phenomena constantly changes as people and their society changes (Bryman and Bell, 2007). There is no single reality - instead shared social reality is constructed through language (Fox et al., 2007). The researcher, as a part of social world, ascribes their own meanings and understandings to their study (Matthews and Ross, 2010).

As the objectivism and constructivism presents opposite points to uncover reality of the social world, Matthews and Ross (2010) define realism as 'an ontological position which accepts reality partly from the social members involved in it and that can be known through the senses. It is not the social actors alone who construct their reality but the researchers who are also co-constructers. Data is made sense of by the researcher through reflexivity; the researcher aims to obtain some level of objectivity and guarantee that the experiences, biases and interpretations do not influence the research results.

The study described in this Thesis adopts an objectivist approach as the ontological position that uses scientific research for an experimental-type, predictive evaluation. In the view of objectivist ontology for the research, the study assumes that there exists just one single truth which can be objectively predictable in the adoption of IT innovations in organizations. The reality can be derived and explained through observations and the measurements have to be considered unbiased if appropriately obtained.

3.6.2 Epistemological considerations

Epistemology refers to the assumptions about knowledge and how it is obtained. It helps answer the questions "how do we come to know it" (DePoy and Gitlin, 2011). Epistemology presents a philosophical stance for deciding what kinds of knowledge are possible and to ensure that they are sufficient and valid (Crotty, 2004). Saunders et al., (2006) describe positivism, interpretivism and realism as three main epistemologies and the central tenet of each approach is outlined below.

Positivism is an epistemological position that supports the use of natural science methods in the study of social reality (Bryman and Bell, 2007). The positivist paradigm assumes an objective world and is adopted by the researcher who seeks objectivity in their explanation of social reality. Positivists argue that science can be conducted in a value-free, objective manner and a neutral process can discover a single 'truth'. The justifications are derived based on empirical verification and tested theories. Typically, the positivist approach aims to authenticate the appropriateness of an existing theory by establishing pre-determined hypothesis. Here, the social phenomena are explained by observing the causes and effects (Henn et al., 2006). The researcher seeks to predict and explain causal relationships among key variables. Henn et al., (2006) state that in a positivist research approach, the research design has to be highly structured with a large sample size and needs to perform a reliable statistical analysis.

In contrast, the interpretivism paradigm provides an understanding of social reality from the perspective of the researcher. Interpretivism emphasizes that there is no one reality; rather, reality is based on an individual's perceptions and experiences (Robson, 2002). The interpretive paradigm is concerned with understanding human behaviour from the participant's own belief. Different subjective interpretations of reality are all considered as scientific knowledge of the problem. Hence, the research tries to find the participant's interpretation of their surrounding world. Subjectivity and bias are taken for granted in interpretive research. Henn et al., (2006) indicate that interpretive research tends to be somewhat unstructured and flexible but can be designed for a small scale data collection using an intensive but descriptive account of the phenomena.

Realism is another epistemological position which relates to scientific enquiry and is very similar to positivism. Realism begins from positivism but is further strengthened with the support of social reality of the underlying structures or mechanisms (Matthews and Ross, 2010). According to such a view, no research can ever be entirely objective or value free (Henn et al., 2006).

Aligned to the objectivist ontological position, the research described in this Thesis considers a positivist paradigm. Gray (2009) states that the theoretical perspective closely ties with objectivist ontology is the positivism. Moreover, the purpose of this research was to ascertain the reality of events experienced in organizations for the adoption and the implementation of IT innovations and to identify the underlying factors that lead to a successful innovation adoption process. Given the research aims and objectives set out, the study described in this Thesis needs a rigorous assessment of the relationships identified as determinants in the adoption of IT innovations in organizations. In order to predict the causal relationships between the key variables and IT innovation adoption, the research thus required a positivist viewpoint.

3.7 Research approach

Selection of the research approach is an important decision in the design of a research (Creswell, 2009). Research approach can be classified as deductive versus inductive and quantitative versus qualitative. Hussey and Hussey (1997) identified research logic as deductive versus inductive and a research process as quantitative versus qualitative.

3.7.1 Deductive versus inductive research

The choice between the deductive and inductive research approach has been discussed by a number of authors (Hussey and Hussey, 1997; Gray 2009). Here, the consideration is whether the research should begin with theory or theory itself results from the research (Gray, 2009). Hussey and Hussey (1997) described deductive research as studies that test a theory by empirical observation (theory testing) and, in the case of inductive research, theories are developed from the observations of empirical reality (theory building).

In the deductive approach, the researcher initially formulates a number of hypotheses based on theories and conceptual frameworks. Theory guides and influences the collection and analysis of data and the research answers the hypotheses posed by theoretical consideration (Bryman and Bell, 2007). In the deductive approach, following hypotheses testing, the principles are either confirmed, disprove or modified. On the other hand, in an inductive approach, the researcher puts together the concepts and theories based on the collected empirical data. Through the inductive process, data is collected and analysed to distinguish different patterns which may suggest the existence of certain relationships between different concepts (Gray, 2009). Hence, a deductive approach is commonly known as ‘top down’ and inductive as ‘bottom up’.

A deductive research process attempts to explain causal relationships between two or more concepts, which consequently lead to the development of a hypothesis. The hypothesis is tested through empirical observation or experimentation. Before the experimental data collection, underlying concepts must be operationalised enabling the data to be analysed quantitatively. The approach pursues scientific principles and the operational indicator gathers what is observed only, inhibiting subjective or intangible evidence. The results obtained with an adequate sample size can be generalised to a wider context (Saunders et al., 2006). Table 3.1 illustrates the difference between the deductive and inductive research approaches summarized by Saunders et al., (2006).

Table 3.1 Major differences between deductive and inductive approaches to research by Saunders et al., (2006)

Deductive emphasises	Inductive emphasises
scientific principles	gaining an understanding of the meanings humans attached to events
moving from theory to data	a closer understanding of the research context
the need to explain causal relationships between variables	the collection of qualitative data
the collection of quantitative data	a more flexible structure to permit changes of research emphasis as the research progresses
the application of controls to ensure validity of data	a realization that the researcher is part of the research process
the operationalization of concepts to ensure clarity of definition	less concern with the need to generalise
a highly structured approach	
researchers independence of what is being researched	
the necessity to select samples of sufficient size in order to generalise conclusions	

When considered against its philosophical background, in line with positivist paradigm and scientific research, a deductive approach was considered most applicable for the study in this Thesis. The objective of using the deductive approach was to understand and to predict the relationship between various attributes with IT innovation adoption. After establishing a theoretical foundation for the adoption of IT innovation, data was collected to deduce the major determinants enabling a successful IT innovation adoption process in organizations. This allowed the results of research to be generalised to a wider context.

3.7.2 Qualitative versus quantitative research

Another domain used in categorizing research approach is quantitative and qualitative research (Adams et al., 2007). Bryman and Bell (2007) characterized a research approach as quantitative and qualitative and outline the research assumptions, design and techniques. The choice of research methods and techniques depends on whether the data collected was either quantitative or qualitative (Hussey and Hussey, 1997). Both quantitative and qualitative methods can be exploited successfully whilst depending on the research problem the methods can be combined in a single study (Punch, 1988). Quantitative and qualitative research has distinctive approaches in terms of the role of theory, epistemological positions and ontological concerns (Bryman and Bell, 2007).

Quantitative research is used in almost all research disciplines such as biological, epidemiological, sociological and business (Adams et al., 2007). Bryman and Bell (2007) suggests that quantitative research is based on the methodological principles of positivism and use of numeric forms in the data collection; at the same time, it uses a deductive approach for data analysis to establish causal relationship between theory and research. Surveys and experiments are dominant data collection techniques for quantitative research and use some form of statistical analysis to deduce the results (De Vaus, 2002). The sample size collected for quantitative research approach is considerably larger compared to qualitative research.

Qualitative research is empirical research where the data is not in the form of numbers. Qualitative research is based on textual data collection and predominantly uses an inductive approach for data analysis with an emphasis on the generation of theories (Bryman and Bell, 2007). Qualitative research is based on an interpretive paradigm with a constructivist ontological position that believes in multiple realities and evaluates data by studying things within a context and considers subjective meanings that social actors bring to the situation (De Vaus, 2002). Qualitative research is often regarded as less valid and reliable compared to quantitative research (Gray, 2009). However, qualitative methods have long been used in the social science research (Adams et al., 2007). Case studies are often seen as the principal form of qualitative research.

Influenced by the objectivist ontological position and positivist epistemological stance for the research, the principle approach for the study in this Thesis was quantitative research. In addition, as the research adopts a deductive research approach, the best fit line of inquiry for this study should be quantitative. Adopting quantitative research, the study results gained recognition in terms of reliability, validity and generalisability. Quantitative research allows the research to use experimental research methodology for testing pre-defined hypotheses. Experimental methods allowed the use of mathematical and statistical means to obtain results that reflect reality in the adoption of IT innovations in organizations. As described by Crewell (2009), from the results of quantitative research analysis, the researcher is able to generalize the effects among the population. The research seeks to obtain results that are objective, valid and replicable for the adoption of IT innovations in organizations and hence use of a quantitative approach would address the aims of the study.

3.8 Research design

To achieve the objectives of the research, the study was designed to be carried out in three different phases. The first stage was theoretical analysis and conducted as an exploratory study. In this stage, the study attempts to develop a conceptual model for the adoption and user acceptance of IT innovations in organizations. The study examines and analyses the IT literature to determine the most commonly used processes, theories and frameworks on the adoption and implementation of IT innovations in organizations. It also evaluates IS literature for the empirical relationships that revealed in the adoption of IT innovations in organizations to take them into account for theory construction. Based on the processes, theories, and frameworks identified in the literature, theoretical analysis proposes a process model for the adoption and implementation of IT innovations in organizations. The model also identifies a range of factors from different contexts that influence the adoption and implementation of IT in different contexts.

The conceptual model was the basis of the second stage of the research which involves an explanatory study. The research performed a statistical analysis of factors identified in the exploratory study to empirically validate the key determinants that influenced the adoption and the implementation of IT innovations in organizations. The study examined these determinants to verify the strength of significance and its association to the adoption and implementation of IT innovations in organizations. In addition, the study examined the effect of different research conditions for the association between these factors and IT innovation adoption in organizations. By examining key determinants of IT innovation adoption, the research empirically validates a factor model that explains adoption and implementation of IT innovations in organizations.

As a final stage, the study combines the process model derived from the theoretical analysis in the first phase and the factors model verified in the statistical analysis of the second phase of the research to develop an overall model that relates to a successful adoption and utilization of IT innovations in organizations.

3.9 Systemic Literature Review (SLR)

One of the most practical methods of getting a better overview of a particular issue is to accumulate knowledge of several different but related studies. A finding of an individual study is not sufficient to generalize on a particular issue. To draw together a more comprehensive body of knowledge, findings of a number of related studies can be aggregated to find an overall outcome. Aggregating the existing literature on a topic allows validation of existing research findings and clarification of the inconsistency that might exist among the primary studies (King and He, 2005). The key to summarizing the results from relevant research is to standardize the outcome from each study in a manner that facilitates comparisons across studies.

Accumulation of information from the existing literature for the purpose of researching on a particular issue is known as a 'systematic literature review (SLR)'. According to Gomms (2008), a SLR is a research review that follows a standard method for collecting information. Fink (2010) describes a SLR as a systematic, explicit and reproducible method for collecting and combining existing research knowledge. Also, Petticrew and Roberts (2006) define SLRs as literature reviews that adhere closely to a set of scientific methods that explicitly aim to limit systematic error (bias), mainly by attempting to identify, appraise and synthesize all relevant studies to answer a particular question (or set of questions). SLRs analyse a consensus view on a topic. The purpose of a SLR is to find an accurate conclusion to a problem and to find avenue for future work (Ellis, 2010).

SLRs involve explicit and rigorous methods to critically assess and synthesize relevant research studies (Sutton et al., 2000). A review procedure that is systematic reduces biases (Petitti, 2000). Cooper et al., (2009) lists the focus of systematic reviews as: (1) to draw together the findings of individual studies (2) to identify methods used to carry out the research (3) to identify theories that were used to explain the phenomena and (4) to examine the practices or treatments used to study the facts. A SLR allows mapping out areas of uncertainty in research to identify gaps in the research area and recommend opportunities for future research (Petticrew and Roberts, 2006).

Gomm (2008) describes five characteristics that a SLR may hold: (1) the review should include studies that addresses a similar research question (2) the review should include a comprehensive collection of published and unpublished studies to account for the research findings that resulted in significant and insignificant outcomes (3) the study selection should make use of an inclusion and exclusion criteria to screen out lower quality studies

(4) the review should identify results from all selected studies and finally, (5) a review may exercise a statistical analysis to evaluate an overall outcome.

3.9.1 Application of SLR

The first stage of the research described in this Thesis involved developing a conceptual model for the adoption and implementation of IT innovations in organizations. The study seeks to perform an exploratory investigation of past IT literature to synthesize this model. A comprehensive body of combined knowledge and aggregated findings of almost all studies germane to IT innovation adoption is necessary for the development of a conceptual model. Hence, the study needed to explore literature on innovation adoption models, processes, frameworks and factors influencing the adoption and the use of IT in organizations. A thorough review of research relevant to IT innovation adoption was a pre-requisite to theoretically synthesize a model. Hence, a SLR was considered the most appropriate technique for the theoretical analysis. Use of a SLR allowed the study to gather an up-to-date summary of the relevant theories, models, frameworks and factors considered in the adoption and implementation of IT to explicitly formulate a conceptual model. The use of a SLR allowed the study to rigorously analyze and critically evaluate models used in adoption of IT innovations in organizations and enable the research to develop a complete overall model for assessing adoption of IT innovation in organizations.

3.9.2 Evaluating data collected for SLR

The information collected for a SLR can be qualitative in nature or more often the data aggregated to find overall effect through quantitative statistics (Hunter and Schmidt, 1990; Rosenthal and DiMatteo, 2001). A quantitative approach combines independent observations into an average measurement and draws overall conclusions regarding the magnitude and direction of results (Ellis, 2010).

King and He (2005) identified four methods for evaluating a SLR: (1) narrative review (2) descriptive review (3) vote-counting and (4) meta-analysis. Narrative and descriptive review are qualitative in nature and details an explanatory summary of past studies. These two types of reviews are affected by several biases and do not have a method to analyse the collected information (Hunter et al., 1982). Vote counting and meta-analysis use quantitative methods to aggregate results.

Researchers have used statistics such as ‘tests of significance’ and other ‘effect sizes’ to combine the quantitative findings of individual studies. In the past, ‘statistical tests of significance’ has been the key information utilized for aggregating quantitative studies (Hunter et al., 1982). Vote counting is the most common method exploited to aggregate the statistical tests of significance. Expected results from vote counting are threefold: (1) positive significance (2) negative significance and (3) non-significance. The result of the significance with the highest frequency reflects the direction of its relationship (Rosenthal and DiMatteo, 2001). However, results of aggregated statistical tests of significance often leads to substantial errors in review studies and falls short of deducing a distinctive overall conclusion (Hunter et al., 1982). A more precise statistical technique that exploits effect sizes to combine previous independent quantitative research finding is meta-analysis.

3.10 Meta-analyses

Glass (1976) categorizes research in terms of data analysis structure as primary, secondary and meta-analysis. Primary research involves analysing data collected for a particular study while secondary research is the re-analysis of previously collected data to answer a research question with a different analytical technique. Meta-analysis introduced by Smith and Glass (1977) is described as a statistical technique for reviewing, amalgamating and summarising previous quantitative research and has been used to find the relative impact of independent variables as well as the strength of relationship between variables (Glass et al., 1981). The basic principle of meta-analysis is to statistically analyse a large collection of analysed results from individual studies obtained through a SLR and combine them to find an average outcome (Rosenthal and DiMatteo, 2001). Hence, Glass et al., (1981) refers to meta-analysis as ‘analysis of analyses’.

Meta-analysis is often referred to as a SLR; however, meta-analysis involves two procedures: systematic review followed by quantitative methods to get a more broad view of the research issues. Hence, meta-analysis is the analytical or statistical part of the SLR and presents a numerical result for the SLR (Sutton et al., 2000). Rosenthal and DiMatteo (2001) assert that the meta-analysis procedure provides (1) a combined numerical result of the reviewed studies (2) estimation of the descriptive statistics (3) the extent of inconsistencies in the studies and (4) an assessment of the effects of research conditions in the research findings.

Over the past 30 years, meta-analysis has become a widely accepted research tool for integrating research, encompassing a family of procedures used in a variety of disciplines.

By combining results across studies, meta-analysis represents a more accurate outcome of the relationship for the population than the effects obtained by individual studies (Rosenthal and DiMatteo, 2001). Cooper et al., (2009) describe six steps in conducting a meta-analysis: (1) problem formulation (2) literature search (3) data evaluation (4) data analysis (5) interpretation of the results and (6) presentation. The six steps involved in a meta-analysis outlines the processes engaged in primary research.

The first step in meta-analysis as in any other research is problem formation. Here, the research variables are defined and the concepts needed for the research are identified. The next step in the meta-analysis is the data collection as in primary studies. Unlike primary studies, where the target population is individuals or groups, the target population for meta-analysis are the individual studies. In the data evaluation stage, studies are selected in terms of quality and discards inadequate studies. In this stage, studies are examined in terms of methodological rigour to assess their quality. As in primary studies, the next stage is the analyses and interpretation of data. Analytical processes in a meta-analysis involve statistical procedures to obtain aggregated results of the problem. As in primary studies, the next step in the meta-analysis is to report the findings of the research. Lipsey and Wilson (1993) affirm that meta-analysis results are more credible than findings of the outcomes of other conventional review methods.

Meta-analysis has become a constructive method in quantitative analysis developed amongst conceptual, methodological and statistical techniques (Hunter et al., 1982; Hedges and Olkin, 1985; Lipsey and Wilson, 1993). Compared to other statistical techniques, the results show a strong, dynamic pattern of positive overall effects. King and He (2005) state that the use of meta-analysis in IS field has also increased steadily. Guzzo et al., (1987) describe meta-analysis as an objective method for conducting a SLR. As meta-analysis involves a series of procedures for systematically accumulating relevant studies and quantitatively analyzing research results, it follows a positivist paradigm.

3.10.1 Advantages of meta-analysis

A meta-analysis allows the researcher to develop an overall representation of study results in the research literature. A methodology requires a thorough search of literature and rigorous evaluation of published and unpublished data relevant to the specific research question. Aggregating important information from several studies in a meta-analysis procedure enables assessment of similarities and differences amongst other study findings and relationships therein to be uncovered (Rosenthal and DiMatteo, 2001).

Meta-analysis aggregates the results of effect sizes or the magnitude of effects collected from similar studies (Glass et al., 1981). Unlike combining the two choices provided by the results of statistical tests of significance (significance and non-significance), the use of effect size allows meta-analysis to combine small and non-significant effects to depict an overall view of the research (Rosenthal and DiMatteo, 2001). Thus, due to the robustness of the procedure, the results obtained through meta-analysis are assumed to be more reliable and accurate (King and He, 2005).

Meta-analysis permits summation of the results of large numbers of studies in a systematic way. The results of single studies are based on samples taken from a particular research setting which are often context specific; in most cases, the sample size is too small to achieve a definitive view (Sutton et al., 2000). In meta-analysis, the population is better represented by large and combined samples compared to single studies overcoming the sampling errors. Meta-analysis allows correction of sampling errors in primary studies to achieve a true magnitude of the relationship between variables.

Meta-analysis is particularly useful in subject areas where the results of various studies are contradictory. Primary studies aggregated in the meta-analysis would probably be of different quality which uses different analytical techniques to obtain their results and at times their findings are contradictory (Sutton et al., 2000). Inconsistency in research findings for a particular research area impedes the growth of theoretical knowledge (Rosenthal and DiMatteo, 2001). In addition to sample errors, inconsistency in the findings of individual studies is largely due to statistical error and measurement variations. Meta-analysis also accounts for these errors in individual studies to establish an overall relationship.

Tests of significance have been use to aggregate result of literature study. Differences in the interpretation of results of statistical tests of significance contribute to the inconsistency in these aggregation techniques. The validity of an outcome becomes doubtful if erroneous or incorrectly interpreted tests of significance are aggregated. Meta-analysis overcomes these drawbacks and explains the inconsistencies by aggregating the observed effect sizes.

In addition, meta-analysis allows examination of the effect of different research conditions (e.g., subject group, type of organization) for the relationship between the dependent and independent variable. With the large amount samples from different research conditions, meta-analysis may have the statistical power to identify the influence of other conditions for the relationships considered (Sutton at al., 2000). Rosenthal and

DiMatteo (2001) state that exposure to different research conditions in a meta-analysis allows the researcher to make more definitive conclusions. When data is sub-grouped into the different research conditions, the effect of these surroundings for relationships studied can be assessed. Examination of different research conditions allows theory development and adds knowledge to research enterprise (Rosenthal and DiMatteo, 2001). Furthermore, exposure to different research conditions allowed identification of relationships that would not necessarily be apparent from individual studies (King and He, 2005).

Meta-analysis is a useful tool for assessing the current state of the understanding in the research area and identifying knowledge gaps in the literature (Guzzo et al., 1987). By recognizing the missing knowledge, meta-analysis can suggest and direct future research in the area. Meta analysis also provides a solid foundation for the evolution of theories.

3.10.2 Limitations of meta-analysis

Meta-analysis presents several benefits in analysing quantitative studies (Hunter et al., 1982; Rosenthal and DiMatteo, 2001). However, as with other research methods, it is accompanied by certain limitations (Sutton et al., 2000). One of major limitation of meta-analysis is the inherent sampling bias towards quantitative studies that reports the effect sizes. Studies that use qualitative research methods such as case studies, interviews or secondary data to examine a research topic have to be ignored when conducting meta-analysis. Apart from this, there are some other major issues that need to be considered when conducting meta-analysis. These concerns need to be addressed sufficiently when collecting and analyzing data for the meta-analysis to minimize the effects of subsequent limitations.

3.10.2.1 Publication bias and file drawer problem

One of the major limitations of meta-analysis like all other review studies is the publication bias (Rosenthal, 1991). That is, research studies that obtained significant results are more likely to be published, while research which produce non-significant outcomes often get less attention. In addition, researchers are less likely to publish the work that produces insignificant outcomes. This tendency is sometime known as the *file-drawer problem*, as the studies that produce in-significant results are assumed to be less interesting and kept in a file drawer.

Meta-analysis requires both significant and non-significant results to examine the overall picture of the situation. When the published research represents the sample for meta-analysis, the result obtained may be biased towards significance outcomes. When large numbers of studies are aggregated, the results obtained appear to be precise and convincing, even though the observed association is entirely due to bias (Sutton et al., 2000).

3.10.2.2 Garbage in and garbage out

Research studies use different research methodologies, sampling units and analytic techniques. Some studies conduct rigorous examination leading to accurate results while others are often poorly designed with inadequate samples. Certain areas of research have less well-developed frameworks to conduct a quality and reliable data collection and data analysis for a study (Sutton et al., 2000). In general, the review process of meta-analysis does not distinguish the design standards of the primary studies. Meta-analyses have been criticized for mixing studies of varying qualities and this issue is referred to as *garbage in garbage out* (Rosenthal and DiMatteo, 2001). Studies of poor quality may result in misleading information and if included in a meta-analysis, aggregated conclusions may be erroneous.

3.10.2.3 Combining Apples with Oranges

Rosenthal and DiMatteo (2001) emphasize that studies are rarely identical. Primary studies may report different results because of variation in the populations they conduct their study on. Studies which examine the same variable seldom use the same methods, measurements or procedures to perform research. One criticism of meta-analysis is that it may aggregate studies with disproportionate research goals, measures and procedures. Such practices are referred to as *combining apples with oranges* (Hunter and Schmidt, 1990). However, Rosenthal and DiMatteo (2001) argue that mixing apples and oranges is sometimes useful, particularly if one intends to generalise on fruits. Furthermore, they suggest that combining identical studies diminishes its ability for generalizability. Also, Hunter and Schmidt (1990) state that meta-analysis evaluates study results rather than studies.

3.10.2.4 Small sample size

The effectiveness of a meta-analysis depends on both the number of studies considered and the total overall sample size included. Convincing results from an aggregation are obtained if more studies are included in an analysis (King and He, 2005). However, if the number of studies for meta-analytic considerations is limited, the conclusions from these analyses may not be very accurate.

3.10.3 Application of meta-analysis for the research

The second stage of the research was to evaluate which of the factors identified in the conceptual model were key predictors for the adoption and implementation of IT innovations in organizations. This stage involved analyzing the quantitative data collected on the relationship between factors and IT innovation adoption in the SLR. The study adopts a meta-analysis for analyzing this quantitative analyzed data. A meta-analysis allowed an understanding of the heterogeneity between studies which investigated factors influencing the adoption of IT innovations. Use of meta-analysis in this study becomes particularly useful as research indicated that one of the short-comings of the studies examining the factors influencing the adoption of IT is the inconsistency of study finding (Rye and Kimberly, 2007). Meta-analysis permitted the study to explore different research conditions that supposedly influenced the relationship between the factors and IT innovation adoption to examine variations in the findings of past investigations.

3.11 Research Methodology

Large numbers of research methodologies have been identified in the literature. Methodology refers to the overall approach to the research process, from the theoretical foundation to the collection and analysis of the data (Hussey and Hussey, 1997). Methodology symbolizes a number of considerations based on philosophical perspectives together with various practical issues (Henn et al., 2006). The epistemological and ontological assumptions of the research consequently influence the methodological decisions.

Lipsey and Wilson (1993) describe the methods used in a SLR and meta-analysis parallel to survey research, in which the results and the characteristics of individual studies are summarized, quantified, coded, and assembled into a database that is statistically analyzed much like any other quantitative survey data. Depoy and Gitlin (2011) suggest that a survey design is the most appropriate approach used in predicting relationships among characteristics. A SLR and meta-analysis can be envisaged as a survey of existing research where characteristics considered for individual studies are regarded as independent variables.

For a study with a positivist philosophical stance with deductive and quantitative research, survey method would be the most suitable research technique. Hence, the research described in this Thesis adopted a survey methodology to extract information from the studies relevant for the adoption and implementation of IT innovations in organizations.

3.12 Sample selection and searching for studies

A sample selection consists of applying specified procedures for locating studies that meet specified criteria for inclusion. The study performed an exhaustive literature search for technology adoption and user acceptance models and frameworks used in the past research on technology adoption.

The initial search for the literature on the adoption and implementation of IT were carried out using the tenets that: (1) it should be an empirical study on innovation adoption and user acceptance of IT (2) the study should examine innovation adoption in organizations (3) dependent variables include initiation, adoption, implementation, infusion, integration, assimilation or usage and (4) the study should perform the analysis at an organizational context or individual level in an organizational setting.

The study searched for literature by identifying a list of possible keywords. These are synonyms and alternative terms for innovation adoption and implementation. Choosing the appropriate keywords is one of the most important concepts in a literature search. The search process should cover all the main keywords and if any of the main keywords are not included in the literature search, overall quality of the study will be adversely affected. The keywords used to obtain the relevant articles for the adoption and implementation of IT were: ‘innovation’, ‘adoption’, ‘diffusion’, ‘infusion’, ‘integration’, ‘implementation’, ‘assimilation’ and ‘IT usage’. All probable words commonly used in IT innovation adoption studies were considered to draw together all possible studies. To increase the validity of the search and to cover as much literature in the area as possible; the study searched for major journal and bibliographic databases such as ABI/INFORM Research, Business Source Premier, EBSCO, Pro-Quest, JSTOR and Scopus. In addition, Google search citation indices and the bibliographies of review articles were also scrutinized for consideration. The literature covered in the Journal articles provided up-to-date knowledge in terms of research and development of innovation adoption in organizations.

3.13 Summary

The chapter initially presents the main research questions for the study. The two central research questions were: (1) what are the processes involved in the adoption and the use of IT innovations in organizations and (2) what are the key factors that guide a successful adoption and implementation of IT innovations in organizations. To answer the central research question, the study sub-divided into eight research sub-questions.

The structure of the study is divided into three different phases. The first stage of the research is a theoretical analysis using an exploratory study. Here, the study developed a conceptual model for the adoption and the use of IT innovations in organizations. The conceptual model is the basis of the second stage for the research. The second stage involves a statistical analysis to evaluate the key determinants of innovation adoption in organizations. The final stage is the integration of results of theoretical analysis and statistical analysis to derive an overall model for IT innovation adoption in organization.

The research philosophy that guides the study takes an objectivist ontological position and positivist epistemological stand. In addition, the study can be realised as deductive in nature and uses a quantitative research approach. The methodology adopted for the exploratory study is a SLR and statistical analysis used a meta-analysis. The study uses a survey method to collect data for both SLR and meta-analysis.

Chapter 4

Proposed Framework for the Adoption of IT in Organizations

Adoption process of IT innovations in organizations

4.1 Introduction

Examining the processes involved in the adoption and user acceptance of IT is fundamental for ensuring successful adoption and implementation. However, there is a lack of research offering a complete model to fully explain the IT innovation adoption process and user acceptance of IT in organizations.

This chapter explains the theoretical analysis performed to understand the process of innovation adoption in organizations. A theoretical analysis enables the study presented in this Thesis to formulate a conceptual model for the adoption and implementation of IT innovations in organizations. The study explores past studies on IT innovation adoption employing a SLR to identify the main theoretical models used in studying the process of adoption and implementation of IT innovations in organizations. The research then extracts prominent theories, models and frameworks used in the IS literature for IT innovation adoption and user acceptance.

The organization of this chapter is as follows. Section 4.2 describes how the study synthesizes the conceptual model for IT innovation adoption. Section 4.3 summarizes innovation adoption process and different types of model to explain the IT innovation adoption in organization. Section 4.4 describes the sample for the SLR study and Section 4.5 details the inclusion and exclusion criteria for the SLR. In Section 4.6, the study explains the data collection and data extraction process; Section 4.7 provides details of the coding of the reviewed data. Some characteristics of the reviewed literature are summarized in Section 4.8. The development of the theoretical model by integrating innovation adoption theories and framework is presented in Section 4.9. The conceptual model for the IT innovation adoption in organization is presented in this section. Finally, Section 4.10 the study list factors from different context that influence the adoption of IT innovations in organizations.

4.2 Constructing a conceptual model for IT innovation adoption

Examining the processes involved in the adoption and user acceptance of IT is fundamental for ensuring successful adoption and implementation of IT. However, the literature shows that there is a shortage of a model which fully explains the IT innovation adoption process and user acceptance of IT in organizations. As the first phase of the research presented in this Thesis, a conceptual model was developed to explain the process of adoption and implementation of IT innovations in organizations. The study theoretically constructs an integrated model for IT innovation adoption processes in organizations.

To develop a general model which explains the adoption process and user acceptance of IT in organizations, the research systematically reviewed literature on the stages of innovation adoption, theories of innovation adoption, models of technology acceptance and popular frameworks developed by researchers for organizational adoption with factors supposedly influencing adoption and implementation of IT innovations in organizations. Conducting a SLR helped the study to develop the conceptual model by critically analyzing the relevant theories, frameworks and factors germane to the adoption process.

4.3 Process of IT innovation adoption

The research performed a theoretical analysis to develop the conceptual model for the adoption of IT and the user acceptance of IT in organizations. The study developed a process theory model as described by Wolfe (1994), encompassing the aspects of innovation process and causes of emergence, development, growth and termination of innovation. The conceptual model for the study presented in this Thesis illustrates a theoretical representation of the processes involved in the adoption of IT innovation in organizations. Wolfe (1994) describes the organizational innovation process that takes the process theory research approach. Research here focuses on the sequence of activities in the development and implementation of innovation. Wolfe (1994) describes that in process theory research, organizational innovation processes are divided into simple distinguishable stages and the research focuses on the antecedent events and determinants of each of these different stages. Wolfe (1994) differentiates between two generations of process theory models of research in organizational innovation adoption namely the stage model and process model. Stage model research identifies the different stages involves in the innovation adoption process. This type of research adds to the understanding of innovation process by proposing various stage models of organizational innovation. The process model according to Wolfe (1994) explains the processes, sequences and the conditions which determine innovation process.

By studying the various stage models suggested in the literature, the study identified pre-adoption, adoption-decision and post-adoption stages essentially maps all the different stages described in the literature. Hence, the stages model described by Thompson (1965) and later Rogers (1995) for the adoption and implementation of IT innovations as:

initiation (pre-adoption), adoption-decision and implementation (post-adoption) were considered for the research presented in this Thesis. Rogers (1995) describes the initiation stage as that involves *awareness, attitude formation towards the innovation* and *proposing the innovation for adoption*; adoption-decision stage as the *decision to accept* the innovation and *allocate resources for its implementation;* finally, the activities involved in the implementation stage are the *acquisition of innovation, acceptance of the innovation by the users* and the *actual use of the innovation.*

A sequential stage model alone may not explain the innovation adoption process phenomenon (Wolfe, 1994). The adoption process needs to describe and explain the process, sequences and conditions significant for the innovation (Rogers, 1983; Wolfe 1994). A stage model depicts the sequence of stages in innovation adoption process; the process model research further explains the processes and the conditions which determine the innovation development (Wolfe, 1994). Apart from process models the study of innovation is concerned with factor models. Subramanian and Nilakanta (1996) suggest that innovation variance research is focused on identifying and examining factors that determine innovation adoption. Hence, a combination of process and factor model may describe the innovation adoption process. This includes innovation process research and innovation variance research as described by Subramanian and Nilakanta (1996).

Research of IT innovation adoption considers distinctive perspectives and different levels of analysis (Slappendal, 1996). Among the three different perspectives in IT innovation adoption research, the study presented in this Thesis considers an interactive process perspective. IT innovation adoption process takes into account the characteristics of the organization and the actions of the individuals within the organization. In addition, the research considered two levels of analysis namely the organizational and individual level. The study considers the organizational level process from the point when organization seeks knowledge of the innovation until the organization physically obtains the innovation. Pre-adoption and adoption-decision stages were thus examined as organizational level processes. The post-adoption stage of innovation adoption was scrutinized as individual level analyses. The post-adoption stage determines the user acceptance and actual use of the innovation. In addition, the study considers both organizational and individual determinants influencing the innovation adoption process.

4.4 Study context

The study performed a SLR of innovation adoption theories, user acceptance models and organizational adoption frameworks used in past research. As described by Lipsey and

Wilson (1993), eligible research studies were viewed as the population for systematic sampling and surveying. The quality of eligible primary studies was assessed according to the criteria define for the inclusion and exclusion of studies. The selection of studies was carried out using certain screening protocols. Using criteria defined for screening for the inclusion and exclusion of relevant studies, the research gathered a number of studies examining IT innovation adoption and use of IT in organizations.

4.5 Inclusion and exclusion criteria for systemic review

Once the relevant information from all studies has been identified using an exhaustive search of literature, the next step in the SLR was to define the eligibility criteria for the inclusion and exclusion of the studies. Inclusion criteria alone often yield many more articles for review than a combination of inclusion and exclusion criteria yields (Fink, 2010). The study clearly defines the inclusion and exclusion criteria for the selection of articles for the SLR. The reason for defining eligibility criteria was to ensure reproducibility and to minimize the selection of studies for the SLR (Petitti, 2000). As suggested by Petitti (2000), defining eligibility criteria allows the selection process to be systematic which, in turn, reduces bias.

A literature search involves a thorough screening of literature for inclusion and exclusion of relevant studies. Fink (2010) describes two ‘screens’ namely practical and methodological screening for selecting the studies in a well-organized SLR. Once the initial search for studies relevant to IT innovation adoption was completed, the studies were subjected to practical and methodological screening. For collecting relevant studies for this research, practical and methodological screens guarantee efficiency, relevancy and accuracy of the sample.

Practical screening allows filtering of a wide range of related and potentially useful studies. Practical screening identifies studies in terms of study content, publication language, research design, research methods, etc. The practical screen criteria used for the study were to: (1) include studies that were published in English (2) include journals in different disciplines by not limiting the search to IS and management journals (3) include studies that focused on IT innovation adoption and implementation in organizations and individual acceptance of IT in organizations (4) include only peer reviewed published studies and (5) if two or more studies using the same data were encountered, selection was based on methodological rigour of the study.

The second screening was the methodological quality selection. Fink (2010) asserts that the study quality of the primary studies can be assessed by considering its methodological quality. Methodological quality refers to the scientific standard applied in designing and implementing the study. Methodological screening mines across related studies to extract best quality research studies available in the literature. Fink (2010) identifies four standards to identify methodological quality of studies: (1) internal and external validity of the research design (2) data sources used for the study is reliable and valid (3) use of appropriate data analysis method and (4) results obtained should be meaningful in practical and statistical terms.

A quality study follows a rigorous methodological standard in terms of their research design, sample selection, data collection and analysis, interpretation of findings and reporting of the study results. As suggested by Cooper (1998), due to poor data quality and compromised validity of the study methodology, some studies may be screened out or discarded from the collected literature. The methodological screens for the study were: (1) the research should employ an empirical evaluation (2) the study should use experimental-type design (3) the study should use random or probability sampling method (4) the study should describe data collection method adequately (5) the study should perform some test of reliability for data collection (6) the study should use valid measures for collecting data (7) the study should use one of the standard data analysis technique and finally, (8) the study should present limitations of design, sampling and data collection.

One of the methodological screening criteria was that the individual studies should use random or probability sampling. In random sampling, every sampling unit has an equal chance of being selected among the population and hence considered relatively unbiased. The criteria relating to the test of reliability in the data collection ensures that data collection methods of individual studies are relatively free from measurement errors. The validity condition screens the study design for internal and external validity. Internal validity for a study design guarantees that it is free from bias and a design with satisfactory external validity allows generalizability of research results to a larger population (Cooper, 1998).

Serious concerns always emerge regarding the methodological rigour of unpublished studies and inclusion of such studies in a SLR and meta-analysis. Inclusion of unpublished work poses the risk of lowering the quality and credibility of data. Hence, a decision was made to exclude unpublished studies for the research to ensure that every single finding included in the SLR met satisfactory methodological quality. However, the exclusion of unpublished studies results in publication bias. Sutton et al., (2000) cautioned on the effects on bias and file drawer problem on overall result when conducting SLR and meta-analysis. The review process made every effort to cover as many studies as possible relating to the adoption of IT innovations in organizations from different variety of journals to reduce publication bias. Another decision made during the study selection was in the case of two or more studies using the same data. In such instances, the study that employed the most rigorous methodological approach was chosen.

To focus more on the research questions and to support the goals of the research, the studies collected in the initial search were reviewed for the second time for practical and methodological screening and eligibility criteria for SLR. The second review did not eliminate any further studies.

4.6 Data collection

By applying the selection criteria, the search process extracted a total number of one-hundred-and-fifty-two studies in the adoption and use of IT innovations in organizations. Some of these studies investigated more than one innovation and several studies examined different stages of adoption. The study considered each of these innovations and stages of adoption as individual innovation adoption relationships. From one-hundred-and-fifty-two studies, a total of two-hundred-and-thirty-five IT innovation adoption relationships were obtained for the analysis. Information from each of these studies was gathered to develop the conceptual model for the adoption and implementation of IT innovations in organizations.

Pink (2010) suggests that data collection is the essence of an empirical study and the validity of a research depends on the accuracy of data. As for a study that involves collecting data from the literature, the quality and validity of the studies data are important. Researchers use a variety of methods to collect data. A reliable data collection method is one that is free from measurement errors.

For each study, the research identified the level of analysis for the study, the stage of innovation adoption considered, the theoretical model employed and the determinants considered in different context that influence the adoption of IT. In addition, various other demographic information were also collected from each individual studies.

The conceptual model developed using SLR formed the basis for the second phase of this research that examined the key determinants of adoption and implementation of IT innovations in organizations using a meta-analysis. The sample for meta-analysis was also the individual studies gathered through the SLR.

4.6.1 Survey questionnaire

The SLR and meta-analysis is analogous to a primary study which measures data across multiple respondents for analysis (Lipsey and Wilson, 1993). For SLR and meta-analysis summation, each individual study is treated as an individual respondent of a primary study. Observations are made systematically and based on the review of the literature data for each individual study (Pink, 2010). As with a primary study, SLR and meta-analysis research requires a standardised record form for data collection. To survey the literature for SLR and meta-analysis and to record the information extracted from the primary studies, self administered questionnaires are often viewed as the most efficient method.

Once the study had identified literature eligible for review, a survey questionnaire was developed to collect the necessary data for the research reported in this thesis. A questionnaire is one of the basic research techniques for gathering structured information (Creswell, 2009). The survey questionnaire was specifically designed to extract information for the SLR to develop the conceptual model for the adoption of IT innovations. This allowed the study to collect data consistently across primary studies and permit reproducibility of research. In addition, the questionnaire was developed to gather effect sizes for the meta-analysis to evaluate the factors influencing the adoption of IT innovations in organizations.

The survey item development was made easier by the fact that the studies were reviewed before questionnaire development. The questionnaire composed of demographic information of the study, details of the research conditions, study features, theoretical details of the study and a list of factors influencing the adoption of IT. Measures of effect sizes and study characteristics were taken from each of the studies and their distribution across studies were examined. The survey questionnaire consisted of 18 questions (largely closed) and options to choose from different available answers. Appendix A shows the questionnaire developed for the research to record the information for the SLR and meta-analysis.

4.6.2 Data extraction

Practical and methodological screening for inclusion and exclusion criteria resulted in sample studies for data extraction. Data was systematically obtained from each study using the survey questionnaire. For each of the studies reviewed, the level of analysis for the study, the stage of innovation adoption considered, the theoretical model employed and the determinants considered in different context that influence the adoption of IT were identified. Some of these studies investigated more than one innovation and several studies examined different stages of adoption. The study considered each of these innovations and stages of adoption as individual innovation adoption relationships.

To test the survey questionnaire, a pilot review was carried out. The aim of the pilot was to maximize the reliability of the data extraction, as the researcher was the sole reviewer for this study. A sample of ten studies were randomly selected and reviewed twice in a gap of two weeks. Two reviews were manually cross checked for accuracy. No major differences were found in extracting the information.

The final extraction was then carried out for each of the two-hundred-and-thirty-five innovation adoption relationships. As one individual reviewed all the studies, inconsistency in interpreting the study results may not be a major issue; however, accuracy in data extraction needs to be addressed. To check the accuracy of the data extraction, all information gathered from the studies was double-checked. In addition, a random sample of the publications were reviewed for the second time and compared with the original survey forms. The disparities identified were negligible in the data extraction stage, verifying the accuracy of the data collection.

4.7 Coding of studies

Before conducting the analysis, key features of each study were coded such as demographic information, the level of analysis, the stage of innovation adoption considered, the theoretical model employed and the determinants considered in different context that influence the adoption of IT. For each study, stage of adoption of IT was considered the dependent variable and the factors influencing the adoption of IT the independent variable. Hence, studies that considered different stages of innovation were considered as different innovation adoption relationship. In addition, studies that included more than one innovation were coded separately and treated as individual data sets.

The reviewed studies used different names to describe some of the independent variables. Hence, in coding the factors influencing the adoption of IT, the study refers the context in which the variables were used in the corresponding studies. Table B1 of Appendix B shows the relationships extracted from the studies that assesses in terms of organization level analysis and Table B2 of Appendix B illustrates the relationships reviewed from studies that performed individual level analysis for the adoption of IT innovation.

4.8 Characteristics of the reviewed literature

The study extracted data from one-hundred-and-fifty-two relevant studies with two-hundred-and-thirty-five IT innovation adoption relationships. Among these one-hundred-and-fifty-two studies, one-hundred-and-sixteen studies considered IT innovation adoption in terms of organization level adoption with one-hundred-and-eighty-eight IT innovation adoption relationships and thirty-six studies with forty-seven IT innovation adoption relationships were assessed as individual level analysis in an organizational setting.

The sample studies comprise of studies published between years 1981 to 2011. Table 4.1 illustrates the publication dates for the studies in term of organizational and individual analysis included in the SLR. Compared to the three decades of research on IT innovation adoption, a notable increase in the empirical studies examining the adoption of IT innovations in organizations has become available during the last ten years. As the majority of literature the study considered was reasonably up to date, the overall findings of the research depict the current state of the adoption process in organizations.

Table 4.1 Number of reviewed studies with respect to year of publication

Year	No of Studies		Year	No of Studies		Year	No of Studies	
	Organizational	Individual		Organizational	Individual		Organizational	Individual
1981	2	0	1991	1	0	2001	11	2
1982	2	0	1992	2	1	2002	3	2
1983	0	0	1993	4	2	2003	9	2
1984	0	0	1994	3	0	2004	11	0
1985	0	0	1995	5	2	2005	6	3
1986	0	0	1996	6	2	2006	6	3
1987	0	0	1997	6	1	2007	10	1
1988	2	0	1998	2	1	2008	2	2
1989	0	0	1999	3	2	2009	10	3
1990	1	0	2000	2	4	2010	5	1
						2011	2	2
Total	7	0	Total	34	15	Total	75	21

The study searched publications from different disciplines that examined IT innovation adoption. The one-hundred-and-fifty-two samples studies were published in sixty-two different journals. The majority of the literature belongs to top class journals in IS and management. Highest numbers of articles were reviewed from Information and Management, followed by MIS Quarterly, Journal of Management Information System, Omega - International Journal of Management Science, Decision Sciences, European

Journal of Information Systems and Information Systems Research. Table 4.2 illustrates number of articles obtained from different journals.

Table 4.2 Number of reviewed studies with respect to publication source

Name of the Journal	No. of. Articles	Name of the Journal	No. of. Articles
Information & Management	18	Electronic Markets	1
MIS Quarterly	12	http://is2.lse.ac.uk/asp/aspecis/20040033.pdf	1
Journal of Management Information System	11	Industrial Marketing Management	1
Omega, International Journal of Management Science	8	Information Resources Management Journal	1
Decision Sciences	7	Information Systems Journal	1
European Journal of Information Systems	7	Interacting with Computers	1
Information Systems Research	6	International Journal of Accounting Information Systems	1
Journal of Global Information Technology Management	6	International Journal of Electronic Commerce	1
IEEE Transaction of Engineering Management	5	International Journal of Knowledge Management	1
Academy of Management Journal	3	International Journal of Management Sciences	1
Decision Support Systems	3	Internet Research	1
International Journal of Information Management	3	Journal of Direct Marketing	1
Journal of Organizational Computing and Electronic Comme	3	Journal of Electronic Commerce Research	1
Management Science	3	Journal of Engineering and Technology Management	1
Communications of the Association for Information Systems	2	Journal of Enterprise Information Management	1
Computers in Human Behavior	2	Journal of Global Business and Technology	1
Industrial Management & Data Systems	2	Journal of Global Information Technology	1
Information System Frontier	2	Journal of Information Technology Management	1
International Journal of Medical Informatics	2	Journal of International Marketing	1
Journal of Computer Information Systems	2	Journal of Medical Systems	1
Journal of Global Information Management	2	Journal of Personal Selling & Sales Management	1
Journal of Information Technology	2	Journal of Public Administration Research & Theory	1
Applied Economics	1	Journal of Small Business and Enterprise Development	1
Asia Pacific Journal of Human Resources	1	Journal of Strategic Information Systems	1
British Journal of Management	1	Journal of Systems and Software	1
Business Process Management Journal	1	Public Administration Review	1
Computer Standards & Interfaces	1	Social Work	1
Cyberpsychology & Behavior	1	Technological Forecasting & Social Change	1
Database	1	Technology Analysis & Strategic Management	1
Database Advances	1	Technovation	1
Database for Advances in Information systems	1	The Journal of American Academy of Business	1
Electronic Commerce Research and Applications	1		

Innovation adoption studies were carried out in different research settings. The reviewed literature consists of studies performed in organizations in twenty-three different countries. The majority of the reviewed literature (42%) was based on a research setting in the USA. This is followed by Singapore, Taiwan and Hong Kong, respectively. Table 4.3 illustrates distribution of the reviewed literature based on the country in which it was performed.

Table 4.3 Number of reviewed studies with respect to country it was performed

Country	Number of Studies		Country	Number of Studies	
	Organizational	Individual		Organizational	Individual
Australia	5	2	Pakistan	1	0
Brunei	3	0	Saudi Arabia	1	2
Canada	6	0	Singapore	10	0
Chile	1	0	South Korea	4	0
China	3	3	Spain	1	0
Germany	1	0	Taiwan	8	1
Finland	0	2	Thailand	1	1
Hongkong	6	2	United Kingdom	2	1
Italy	1	0	Ukraine	0	1
Malaysia	3	0	USA	49	15
New Zealand	3	1	Many	7	4
Nigeria	0	1			

Studies use different data collection methods to examine the adoption and implementation of IT innovations in organizations. The reviewed literature was categorized to have used a survey, case study or secondary data collection methods to study the adoption of IT innovations in organizations. Among the studies reviewed, one hundred and twenty nine (85%) of studies used survey method to examine the adoption of IT innovations in organizations. Table 4.4 illustrates different data collection methods used in the reviewed literature for both organizational and individual level studies.

Table 4.4 Different data collection methods used in the reviewed literature

Data Collection Method	Number of Studies	
	Organizational	Individual
Survey	94	35
Case study	16	1
Secondary data	6	0

The studies used different statistical treatments or analyses to examine the adoption of IT innovations in organizations. Sixty-five studies (43%) used correlation in their analysis; twenty-two studies (14%) were based on regression techniques while eight (5%) used discriminant analysis. Descriptive studies were conducted by twelve (8%) of these studies; nine (6%) uses Partial Least Square (PLS) and thirty-six studies (24%) employed other forms of statistical evaluation. Table 4.5 illustrates different data analysis used in the reviewed literature.

Table 4.5 Different data analysis methods used in the reviewed literature

Data Analysis Method	Number of Studies	
	Organizational	Individual
Corrleation	45	20
Regression	19	3
Discriminant	8	0
Descriptive	11	1
Partial Least Square	3	6
Other	30	6

4.9 Theoretical model for IT innovation adoption

Table 4.6 shows the different theoretical models and framework used in the reviewed studies.

Table 4.6 Different theoretical models used in innovation adoption literature

Innovation Theories/Frameworks	No of Studies	
	Organizational Level Analysis	Individual Level Analysis
Diffusion Of Innovation (DOI)	28	3
Perceived Characteristics of Innovating (PCI)	1	0
Technology Acceptance Model (TAM)	11	26
Theory of Planned Behaviour (TPB)	4	12
Theory of Reasoned Action (TRA)	5	14
Technology Acceptance Model 2 (TAM2)	0	2
Technology Organization Environmental Model (TOE)	35	0
TriCore	2	0
Task Technology Fit (TTF)	0	1
Unified Theory of Acceptance and Use of Technology (UTAUT)	0	1
None / Others	81	12

The literature showed that amongst all the innovation adoption theories: Diffusion of Innovation (DOI) theory, Technology Acceptance Model (TAM), Theory of Reasoned Action (TRA) and the Theory of Planned Behaviour (TPB) have been widely used in IT innovation adoption studies. The result suggests that DOI was more extensively used in the studies that performed organizational analysis and TAM, TRA, TPB were utilized mainly for individual level analysis. The statistics also illustrate that the TOE framework has been comprehensively approved for organizational level studies of IT innovation adoption.

The purpose of DOI is to understand the process in which an innovation is diffused into a social system (Rogers, 1983). DOI is the most suitable and consistent framework extensively validated in IS to explain the adoption of technical innovations. DOI theory has long been an important part in empirical studies of IT innovation adoption and implementation of IT in organizations. Fichman (1992) highlighted that DOI has been useful in understanding the process in which IT innovation adoption development and its perception on the perceived attributes or innovation factor either facilitates or impedes IT innovation adoption and implementation. Rogers (1995) describes five perceived innovation attributes that influence the adoption of IT and these innovation attributes explain the rate of innovation adoption.

TRA has been well-known as a basis for the research on the determinants and the effects of behavioural intention. The actual behaviour in TRA is hypothesized to be driven by beliefs, attitude, subjective norm and behavioural intention. Behavioural intention has been identified as the best predictor for actual behaviour and behavioural intention is determined by two belief constructs of attitude towards use and subjective norm. Attitude is a function of individual's belief about the behaviour while subjective norm is normative belief of the individual who exercise the behaviour. Davis et al., (1989) applied TRA to individual acceptance of IT and found that the attitude and subjective norm predicts user acceptance behaviour. However, Davis et al., (1989) suggests that TRA partially explains the determinants of adoption behaviour, because it only emphasizes some of the overall determinants of the behaviour.

TAM suggests that IT usage is determined by two principal determinants of perceived usefulness and perceived ease of use and hypothesizes that these two attributes explain the innovation adoption behaviour of individual. Perceived usefulness is a better determinant for computer usage compared to perceived ease of use (Davis, 1989; Davis et al., 1989). TAM has been widely applied in explaining user acceptance behaviour of a variety of innovations and users (Venkatesh et al., 2003).

TPB hypothesizes that individual behaviour is determined primarily by behavioural intention, which, in turn, is determined by attitude, subjective norm and PBC (Ajzen, 1991). TPB derives attitude and subjective norm from TRA and hence has the same functionality. It has been successfully applied explaining individual acceptance of various different IT innovations (Taylor and Todd, 1995; Mathieson, 1991).

The literature on IT innovation adoption suggests that most researchers conduct their studies by integrating theories used in IS with a framework that covers contextual antecedents. Hence, a theoretical model for adoption of IT innovations in organizations may consist of a combination of innovation adoption theories and contextual frameworks of IT innovation adoption. The model needs to depict the process involved in the adoption phenomenon and the various factors from different contexts that affect the different stages of innovation adoption process.

4.9.1 Limitation of innovation adoption theories

DOI, TRA, TAM and TPB do not provide a complete explanation for technology adoption and implementation in organizations. The DOI model focuses primarily on innovations adopted autonomously by individuals (Fichman and Carroll, 1999). TRA, TAM and TPB offer theoretical bases for examining the factors that influence individual acceptance of IT (Igbaria et al., 1997). Limitations of DOI, TRA, TAM, and TPB are that these models use an individualist approach and do not support IT innovation adoption at an organizational level. Even though researchers argue that the content of models could equally be applied for organizational level, these models do not take into account the internal and external attributes of the organization that may affect IT innovation adoption and diffusion. Chau and Tam (1997) highlighted that conflicting results of the organizational innovation reported could be attributed for the contextual differences of those studies and innovation adoption must be studied within appropriate contexts.

The study in this Thesis considers innovation adoption in organization through an interactive perspective which takes into account both individual and organizational behavioural characteristics. Hence, use of TRA, TAM and TPB precisely assesses the user acceptance of IT. DOI can be suitably utilized as the basis for the adoption process model. These models need further adjustment to characterize it for an organizational level adoption process. To achieve this, the study exploited frameworks that include other organizational antecedents to incorporate within individual level theories.

4.9.2 Integrating innovation adoption theories and frameworks

Bagozzi (2007) argues that it would be irrational to imagine that a single model can explain the innovation adoption behaviour for various technologies in different surroundings. Literature on IT innovation suggests that most researchers conduct their studies by either extending individual innovation theories or by integrating two or more theories to explain innovation adoption in organization. DOI remains one of the most popular models examining individual behaviour in adopting new technological innovation. In DOI, Rogers (1983) views the concept of innovation adoption as the decision to accept innovation and not the perceptions of the innovation actually being used by the adopter. DOI is still actively used in research into innovation adoption either directly or integration with other theories (Straub, 2009).

As DOI only reflects the behaviour of individuals in the adoption of new technological innovation, many researchers have combined DOI with other theories to describe the adoption process and use of IT in organizations (Chwelos et al., 2001; Mehrtens et al., 2001). IT users are often unwilling to accept innovation unless it brings certain performance gain. This brings the issue of the need to understand the individual acceptance and the rejection of technology in innovation adoption research and to explore the possible means to enhance the user acceptance in the IT implementation process. As DOI does not incorporate the post-adoption behaviour of innovation adoption process, user acceptance models need to be incorporated to fully explain pre-adoption, adoption-decision and post-adoption stages of IT innovation adoption. Hence, DOI can be utilized as the basis for the adoption process model; at the same time, TRA, TAM and TPB could have a constructive role assessing the user acceptance of IT.

In the past, research has combined DOI with TRA to describe adoption behaviour of IT (Agarwal and Prasad, 2000; Looi, 2005; Quaddus and Hofmeyer, 2007). Karahanna et al., (1999) combines DOI and TRA in a theoretical framework to examine differences in pre-adoption and post-adoption beliefs in IT innovations; results showed that variations exist in the determinants of adopters, user belief and attitude for the two stages of adoption of IT. Combining DOI and TRA can theoretically validate adoption characteristics and adoption-implementation behaviour. However, the two theories do not contribute significant knowledge to user acceptance of new IT.

Integrating DOI or DOI and TRA with TAM helps to derive a model that fully explains the adoption process and user acceptance of IT. Igbaria et al., (1997) stated that TRA and TAM offers useful theoretical foundation for examining the factors influencing IT acceptance. Igbaria et al., (1996) combined TRA and TAM to develop a motivation model for micro-computer usage. Although DOI and TAM were derived from two different disciplines, the two theories have analogous attributes. The relative advantage attribute of DOI measures exactly the same characteristics as the perceived usefulness construct of TAM. The complexity attributes of DOI are similar to the perceived ease of use attributes of TAM. Hence, DOI and TAM complement each other and have often been combined to explain innovation adoption.

TAM has been utilized in IS adoption research by many researchers and has proven to be successful in predicting and explaining usage of IT across a variety of system (Adams et al., 1992; Igbaria et al., 1997; Gefen and Straub, 1997; Agarwal and Karahanna, 2000; Venkatesh et al., 2003). A number of IS studies have examined the effect of perceived usefulness and perceived ease of use on behavioural intention and system usage of the innovation and found them as important determinants of self reported usage (Davis et al., 1989; Adams et al., 1992; Straub et al., 1995; Szajna, 1996). Studies have also found that perceived usefulness and perceived ease of use are positively associated with behavioural intention and system use (Agarwal and Prasad, 1999; Horton et al., 2001; Zhang et al., 2011). Igbaria et al., (1997) uses TAM as a theoretical basis for examining factors affecting user acceptance of personal computers and found that perceived usefulness and perceived ease of use to have a strong effect on system use.

Research has attempted to combine DOI and TAM or DOI, TRA and TAM to validate their empirical findings. Lean et al., (2009) used an integrated theoretical model of DOI and TAM to evaluate the factors influencing the intention to use e-government service in Malaysia. Although they found that DOI model had a better explanatory power compared to TAM, constructs of both DOI and TAM predicted the intention to use e-government services according to their research findings. Similarly, Al-Ghatani (2004) used DOI and TAM to empirically examine computer technology acceptance success factors in Saudi Arabia. Agarwal and Prasad (1997) attempted to examine the role of innovation characteristics and perceived voluntariness in the acceptance of IT in particular the World Wide Web, employing DOI, TRA and TAM. Their findings validate the theoretical relationship between DOI's perceived characteristics of innovation and adoption behaviour. In addition, their findings suggest that the integrated model effectively explains the adoption and usage of IT. Looi (2005) use DOI, TRA and TAM in a quantitative analysis to identify factors influencing e-commerce adoption. Likewise, in the analysis of internet based Information Communications Technology adoption in Malaysian SMEs, Tan et al., (2009) integrated DOI, TRA and TAM in their research model.

The research presented in this Thesis attempts to develop a model for the adoption and implementation of IT innovations in organizations where the use of innovation would not entirely be under the control of the users. DOI, TRA and TAM are all based on voluntary adoption decision and do not account for behaviours where use of technology is mandated. Davis (1989) developed TAM to explain user acceptance behaviour of software applications such as word processing and spreadsheet in voluntary conditions.

Although, TAM has often been used to explain user acceptance in organizations, for which user acceptance is not voluntary, Dwivedi et al., (2012) have cautioned researchers from using this model to situations that are not voluntary.

As TRA or TAM does not take into account the situation under which an individual lacks extensive control over their targeted actions, TAM and TPB have been widely employed to examine the issues of IT innovation. Combining these two theories together offer a better explanation for IT innovation adoption and implementation in organizations (Riemenschneider et al., 2003). Taylor and Todd (1995), for instance, combined TAM and TPB to investigate the role of prior experience in IT use. TPB was developed to predict behaviour across many settings and after comparing TAM and TPB Mathieson (1991) suggests that TAM provides very general information on user opinion of the system, while TPB provides more specific user beliefs. TPB will serve the secondary adoption conditions suggested by Gallivan (2001).

Determinants of TPB include PBC which reflect an individual's perception towards internal and external behaviour (Lin, 2006). The predictor of internal behaviour of PBC is self-efficacy and external behaviour is a facilitating condition (Zhang and Gutiernez, 2007; Lin 2006). Hence, as suggested by Brown et al., (2002), inclusion of TPB would allow the model to predict circumstances for both volitional and non-volitional behaviour. As Ajzen (1991) suggests, PBC becomes increasingly useful as the volitional control over the behaviour decreases. In situations such as organizational innovation adoption where user have little or no choice, PBC can facilitate or moderate the relationship between behavioural intention and behaviour (Armitage and Conner, 2001). In organizational adoption where behaviour is not under volitional control of the user, PBC can determine the use of innovation regardless of their behavioural intention to use that innovation. Thus, greater PBC often leads to an increase in user intention to use the innovation (Armitage and Conner, 2001). In examining small business executive's decisions to adopt IT, Harrison et al., (1997) found that attitude towards use, subjective norm and PBC were strong determinants of user acceptance.

Theories alone would not fully explain all the aspects of organizational innovation adoption (Brancheau and Wetherbe, 1990). DOI, TRA, TAM and TPB models discussed are the individual adoption and acceptance of technology and, if applied to an organization, would only explain the individual acceptance behaviour within the organization with no account for factors within and outside the organization. Hence, the research on organizational adoption has combined the adoption and implementation theories with frameworks from different contexts to examine innovation adoption. Parallel to combining innovation adoption theories research has combined DOI, TRA, TAM and TPB with different contextual frameworks to address innovation adoption in organizations (Quaddus and Hofmeyer, 2007). Frameworks such as TOE have allowed researchers to evaluate various factors from different contexts which influence IT innovation adoption. The IT literature suggests that the TOE framework has been tested for a variety of IT innovation adoption studies (Iacovou et al., 1995; Chau and Tam, 1997; Zhu et al., 2006a).

Researchers have combined DOI, TRA, TAM and TPB with different contextual frameworks to examine innovation adoption in organizations. Extant research has found that factors within the context of technology, organization and environment significantly influence the adoption and implementation of IT innovations in organizations. Lee and Cheung (2004), use the Iacovou et al., (1995) model which includes determinants from technological, organizational and environmental contexts to study internet retailing adoption of SMEs in Hong Kong. Chwelos et al., (2001) extended the model of Iacovou et al., (1995) to empirically test a model for EDI adoption. Zhu et al., (2006a) applied DOI with the TOE framework to identify the determinants of post-adoption digital transformation of European companies. Thong (1999) studied IS adoption in small businesses using data from 166 Singaporean firms to demonstrate the relationship between IT innovation adoption with technological, organizational and environmental characteristics using the TOE framework. Kuan and Chau (2001) use the TOE framework to address the major factors influencing the adoption and the impact of EDI in small businesses. Teo et al., 2009 studied adopters and non-adopters of e-procurement in Singapore using technology, organization and environmental factors. Quaddus and Hofmeyer (2007) used the TOE model with DOI, TRA and TAM in the investigation of the factors influencing the adoption of Business-to-Business (B2B) trading exchanges in small businesses in Australia.

Research has applied the TOE model to several innovation adoption studies and possesses explanatory power across a number of different contexts (Dwivedi et al., 2012). The TOE model has been used to explain the adoption of inter-organizational systems (Premkumar and Ramamurthy, 1995; Khalid and Brain, 2004), e-business (Wang and Cheung, 2004; Jeon et al., 2006; Zhu et al., 2006a; Li et al., 2010), EDI (Iacovou et al., 1995; Chwelos et al., 1995; Kuan and Chau, 2001) and various other application (Mehrtens et al., 2001; Teo et al., 2009; Kim and Garrison, 2010). Zhu and Kraemer (2005) applied the TOE framework to examine e-business usage in the retail industry. Chau and Tam (1997) studied the role of TOE factors on open system adoption using data from 89 organizations. The TOE has been among the most prominent and widely utilised frameworks of organizational adoption since its development and the model has been broadly supported in empirical work (Dwivedi et al., 2012). TOE can be extended with frameworks from other innovation domains (Chau and Tam, 1997). Hence, the TOE framework provides an appropriate theoretical foundation for a study examining the factors associated with the adoption of IT innovations in organizations.

Table 4.7 Combination of innovation adoption models in the reviewed studies (Organizational level)

Theories / Models	No. of Studies
DOI + TRA	5
DOI + TAM	8
DOI + TPB	3
DOI + TOE	12
DOI + TRA + TAM	4
DOI + TRA + TPB	2
DOI + TRA + TOE	2
DOI + TRA + TAM + TPB	2
DOI + TRA + TAM + TOE	1
DOI + TRA + TAM + TPB + TOE	1

Table 4.8 Combination of innovation adoption models in the reviewed studies (Individual Level)

Theories / Models	No. of Studies
TAM + TRA	12
TAM + TPB	8
TAM + DOI	3
TAM + TRA + TPB	4
TAM + TRA + DOI	1
TAM + TRA + TPB + DOI	-

Table 4.7 illustrates the number of organizational level adoption studies that utilized different combinations of innovation adoption theories (DOI, TRA, TAM and TPB) and frameworks (TOE) identified from the reviewed literature. Table 4.8 shows the use of

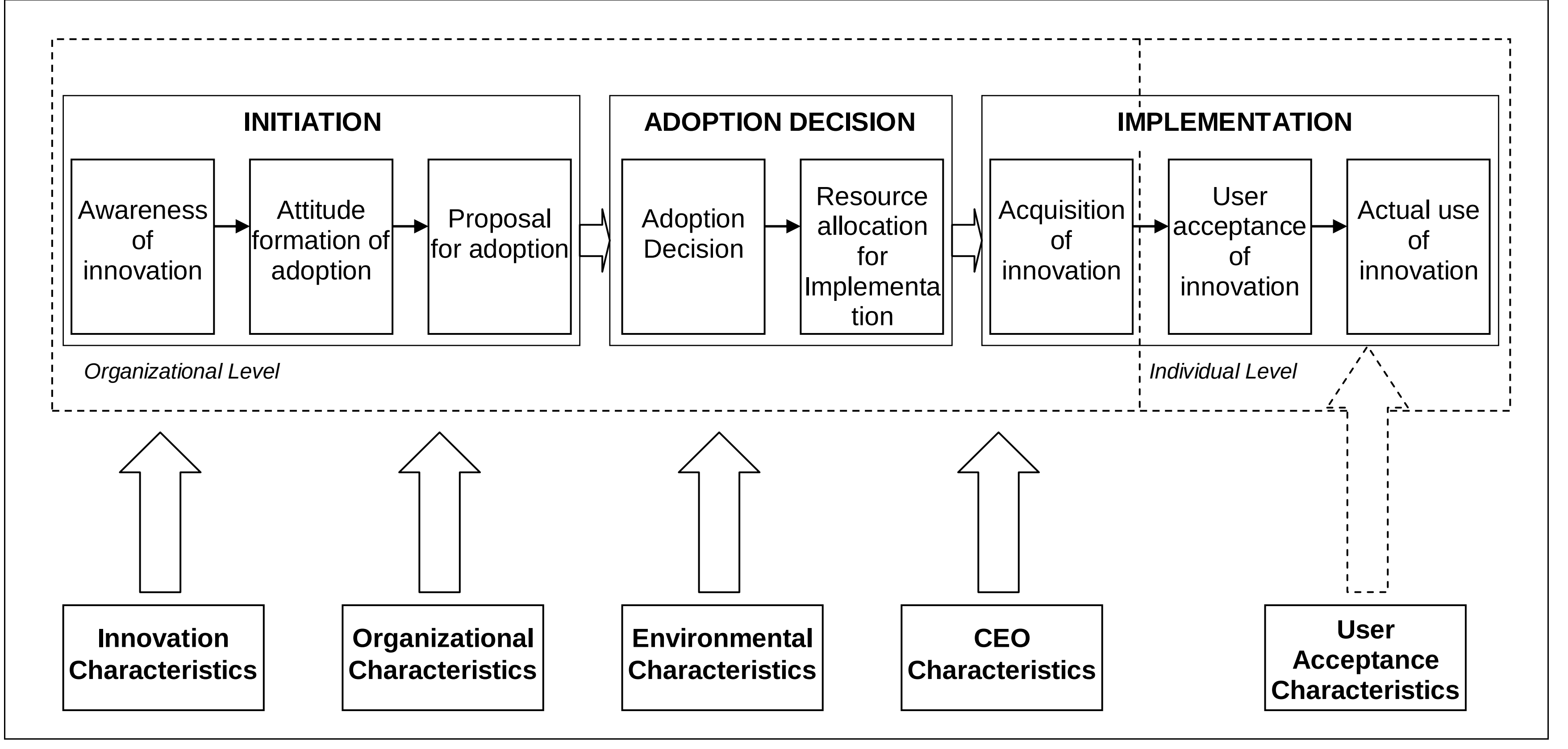
different combinations of innovation adoption theories and frameworks for the individual level adoption studies reviewed.

Based on the IT innovation adoption literature, a model was drawn by integrating innovation adoption theories with popular frameworks. The model is a combination of DOI, TRA, TAM, TPB and TOE with the addition of the context of CEO characteristics and user acceptance attributes. In the model, the study identifies that IT innovation as passing through the stages described in Section 2.4.1. The model employs an interactive process approach and considers two levels of adoption processes. Activities involved in pre-adoption, adoption-decision and post-adoption until the acquisition of innovation are examined at an organizational level perspective and user acceptance in terms of individual level.

For the adoption process at the organizational level, the model integrates DOI with a framework consisting of contexts of TOE with the addition of attributes from CEO. As the focus of the research presented in this Thesis was to examine the process of IT innovation adoption in organization and to identify the factors that influence the adoption processes in different context, the DOI model seemed an appropriate model to utilize in the IT innovation adoption model for organization. Combining DOI with the framework allows the study to evaluate perceived characteristics in the context of innovation, organization, environment and CEO that affects initiation, adoption-decision and implementation stages of innovation adoption. Different attributes of each context impact different stages of innovation to varying extents.

In the user acceptance of IT in an individual context, the model utilizes attributes from TRA, TAM and TPB model. The TRA model provides constructs for users normative beliefs towards using the innovation while perceived attributes of TAM determine attitudes of users in the user acceptance of IT. The model utilised TPB to cover the user acceptance of IT in volitional and non-volitional behaviour. Hence, the research integrates the TRA (mainly the effect of social influences on user acceptance), the TAM (mainly the effect of perceived usefulness and perceived ease of use on user acceptance) and the TPB (mainly the effect of PBC on the user acceptance). The model demonstrates that user acceptance attributes driven from TRA, TAM and TPB impacts at the individual level adoption process. Figure 4.1 illustrates the proposed conceptual model for the IT innovation adoption process in organizations.

Figure 4.1 Conceptual model for the IT innovation adoption process in organizations



4.10 Determinant of IT innovation adoption

The following sub-sections describe the factors extracted in the SLR in the context of innovation, organization, environment, CEO and user acceptance. Table B3 of Appendix B shows the determinants examined for the studies which assesses in terms of organization level analysis and Table B4 of Appendix B illustrates the determinants extracted from studies that performed individual level analysis for the adoption of IT innovation.

4.10.1 Innovation characteristics

The importance of innovation attributes for the adoption and implementation of IT and perception of innovation influencing the adoption decisions has been documented in the IT literature (Rogers, 1983). Specific characteristics of innovation are examined as factors that explain innovation adoption in organizations. DOI theory provides a set of innovation attributes that may affect the adoption decision (Rogers, 1995). Table 4.9 lists innovation characteristics considered in the reviewed literature. For each characteristic, we show the number of studies examined and total number of innovation adoption relationships.

Table 4.9 List of innovation factors considered in the innovation adoption literature

Code	Innovation Characteristics	No. of SDY	No. of REL	Code	Innovation Characteristics	No. of SDY	No. of REL
I01	Relative advantage	60	81	I11	Profitability	1	1
I02	Cost	20	31	I12	Social approval	1	1
I03	Complexity	30	44	I13	Business process re-engineering	1	1
I04	Compatibility	37	54	I14	Strategic decision aid	2	2
I05	Trialability	9	11	I15	Scalability	1	1
I06	Observability	8	10	I16	Task Variety	2	2
I07	Security	11	13	I17	Managerial productivity	2	2
I08	Demonstrability	2	3	I18	Organizational support	2	4
I09	Communicability	2	5	I19	Critical mass	2	3
I10	Divisibility	1	1	I20	Perceived risk	1	1

No. of SDY - Number of studies, No. of REL - Number of relationships

The foundation of research into the adoption of new technologies emerged from Rogers' (1983) innovation diffusion theory (DOI). The focus of DOI is on the characteristics of the innovation that either facilitates or hinders adoption. Rogers (1995) identified relative advantage, compatibility, complexity, trialability and observability as five major innovation attributes. Among these attributes, relative advantage, compatibility and complexity of innovation were most consistently found in the IS literature (Tornatzky and

Klein, 1982). Researchers have investigated various other innovation factors that influence the adoption of IT innovations in organizations.

Tornstzky and Klein (1982) in their meta-analysis of innovation characteristics of IT innovation adoption considered relative advantage, complexity, communicability, divisibility, cost, profitability, compatibility, trialability, observability and social approval. Mirchandani and Motwani (2001) studied the relationship between relative advantage, compatibility and cost of innovation amongst others in the adoption of e-commerce in US firms. Zhu et al., (2006a), in their study of e-business diffusion in European organizations tested relative advantage, compatibility, cost and security. Tan et al., (2009) examined the relationship of relative advantage, compatibility, complexity, trialability, observability, cost, security and internet adoption barrier in Malaysian SMEs.

4.10.2 Organizational characteristics

Table 4.10 lists organizational characteristics which the research reviewed and its citation statistics.

Table 4.10 List of organizational factors considered in the innovation adoption literature

Code	Organizational Characteristics	No. of SDY	No. of REL	Code	Organizational Characteristics	No. of SDY	No. of REL
O01	Top management support	40	51	O22	External integration	3	4
O02	Organization size	53	102	O23	Managerial obstruction	1	3
O03	IT expertise	40	59	O24	Culture	3	3
O04	Organization readiness	12	14	O25	Job relevance	2	2
O05	Product champion	16	18	O26	Perceived barrier	1	1
O06	Centralization	14	35	O27	Information sharing culture	2	2
O07	Formalization	13	27	O28	Trust	1	1
O08	IS dept size	9	34	O29	Motivation	3	3
O09	IS infrastructure	16	28	O30	Internal pressure	3	3
O10	IS investment	6	16	O31	Technology level	3	12
O11	Information intensity	13	21	O32	Openness	2	2
O12	Resources	23	44	O33	Norm encouraging change	2	2
O13	Training	10	13	O34	Role of IT	3	3
O14	Earliness of adoption	1	2	O35	Strategic planning	8	17
O15	No. of. business lines	3	3	O36	Age of IS	1	1
O16	No.of customers	1	2	O37	No of competitors	1	2
O17	Organizational complexity	3	5	O38	Satisfaction with exisitng system	3	3
O18	Barrier to adoption	1	1	O39	Job rotation	2	2
O19	Image	3	4	O40	User involvement	3	4
O20	Expansion	1	1	O41	Degree of integration	4	11
O21	Specialization	7	28	O42	External Communication	1	3

No. of SDY - Number of studies, No. of REL - Number of relationships

The most frequently examined attributes in adoption of IT innovations in organizations were the characteristics of organization. Researchers have advocated the primary importance of organizational determinants compared to other contexts as predictors for innovation adoption (Kimberly and Evanisko, 1981; Damanpour, 1991). In an empirical study examining the adoption of administrative and technological innovation in hospital settings in USA, Kimberly and Evanisko (1981) examined organizational size, centralization, specialization, functional differentiation and hospital age as organizational attributes.

Iacovou et al., (1995) considered organizational readiness as one of the factors that influenced EDI adoption. Premkumar and Ramamurthy (1995) considered top management support, product champion and IS infrastructure. To study the organizational characteristics and organizational performance, Subramanian and Nilakanta (1996) examined organizational size, centralization, formalization, specialization and resources. Lai and Guynes (1997) studied the influence of organizational characteristics on Integrated Services Digital Network (ISDN) adoption decisions and verified openness, norms encouraging change, slack resources, size, centralization, formalization, complexity and expansion as relevant characteristics.

Rai and Bajwa (1997) in an investigation of the adoption of executive information systems verified the importance of organizational size, IS department size, and top management support. Premkumar and Roberts (1999) considered top management support, organizational size and IT expertise as three organizational variables in their study of US small businesses. Thong (1999) studied, amongst others, business size, employees IS knowledge and information intensity to address organizational factors facilitating IT innovation adoption and implementation in Singaporean small businesses. Eder and Igbaria (2001) in research on intranet diffusion and infusion in organizations examined top management support, organizational size, IT infrastructure, organizational structure and IS structure. Tsao et al., (2004) assessed top management support, organizational readiness and IT investment with respect to organizational perspective in identifying success factors of business-to-business (B2B) e-commerce adoption in Taiwanese companies. Similarly, Teo and Ranganathan (2004) in discriminating adopters and non-adopters of B2B e-commerce in Singaporean firms considered the demographic profile of the organization, presence of champion, formal plan, years of e-commerce experience, expected and realized benefits from e-commerce, management support and risk orientation as organizational factors.

Alam (2009), Seyal et al., (2004) and Seyal et al., (2007) considered culture as an organizational factor. Within the boundary of an organization, the issue of culture includes factors internal and external to an organization. In many organizational and individual level studies, these factors have been considered as separate attributes in the context of organization, environment and individuals. Veiga et al., (2001) suggest that an individual's cultural beliefs are connected to individual perception of perceived usefulness and perceived ease of use of IT. Veiga et al., (2001) integrated cultural issues with TAM and presents cultural indicators as attributes that influence perceived usefulness and perceived ease of use by the user. The adoption process and all the factors considered in IT innovation adoption in an organization taken together might be representative of culture.

4.10.3 Environmental characteristics

Organizations adopt innovation in response to an external demand or to achieve an advantage of an environmental opportunity (Damanpour and Schneider, 2006). IT has not only being used for internal needs; instead, organizations often communicate with customers, suppliers and other trading partners. In a rapidly changing environment innovation is often essential and vindicated. Hence, environmental factors are increasingly being studied in innovation adoption studies. Research has shown that external environment plays an important role in the adoption of IT innovation and has been widely considered in IT innovation adoption in organizations (Tornatzky and Fleischer, 1990; Damanpour and Schneider, 2006). Organizations interact with the external environment to carry out their business and this includes competitors, trading partners, customers, government and its regulation. A list of environmental attributes extracted from the reviewed literature is given in Table 4.11 with the number of times each factor has been examined and found to be significant.

Table 4.11 List of environmental factors considered in the innovation adoption literature

Code	Environmental Characteristics	No. of SDY	No. of REL	Code	Environmental Characteristics	No. of SDY	No. of REL
E01	Competitive pressure	28	44	E09	Partners depence	1	1
E02	External pressure	22	34	E10	Government pressure	1	1
E03	Government support	12	15	E11	No. of competitors	1	2
E04	Vendour support	11	17	E12	External expertise	1	1
E05	Partners support	4	7	E13	Consultant effectiveness	2	2
E06	Partners readiness	5	6	E14	Trust with partners	1	1
E07	Environmental Uncertainity	8	15	E15	Globalization	2	2
E08	Vertical linkage	2	5	E16	Social influence	1	1

No. of SDY - Number of studies, No. of REL - Number of relationships

Cragg and King (1993) considered competitive pressure and vendor support as environmental attributes in their examination of computing in small businesses in New Zealand. Grover and Goslar (1993) in examining the initiation, adoption and implementation of telecommunication technologies consider environmental uncertainty. Premkumar and Roberts (1999) examined competitive pressure, pressure from trading partners, trading partners support and vertical linkage. Kuan and Chau (2001) assessed the influence of government support and external pressure. Chwelos et al., (2001) in their EDI adoption model examined competitive pressure, external pressure, trading partners support and trading partner's innovation readiness as environmental attributes. Examining the factors influencing adoption of B2B trading exchange in small businesses, Quaddus and Hofmeyer (2007) considered competitive pressure, government support, trading partners support and vendor support as environmental aspects.

4.10.4 CEO characteristics

Successful adoption and implementation of an innovation relates to a large extent on the initiatives of individuals within the leadership position in an organization. Research on technology adoption in organizations has also explored CEO characteristics which influence the IT innovation adoption process (Damanpour, 1991; Grover and Goslar, 1993; Fichman and Kemerer, 1997). Rogers (1983) suggests that the innovation adoption is related to the innovation decision process. When the knowledge of the innovation is gathered, an attitude will be formed towards the innovation as to whether to adopt or reject innovation (Rogers, 1995). Top managers often make the final decision to adopt IT based on the internal needs of the organization or environmental changes (Damanpour and Schneider, 2006). The CEO also takes responsibility for the management and the use of technological innovation in organizations (Pinheiro, 2010). The ability of CEO to support the innovation adoption and create a new situation has been the starting point of the development of many organizations (Thong and Yap, 1995). A firm's strategic decision to adopt or reject an innovation often reflects the personal characteristics of its top manager. The characteristics of the organizational leader influence the performance of the organizational effectiveness through their strategic decisions (Chuang et al., 2009). In studies on technology adoption, attributes including behaviour and attitude of CEO have been considered as determinants of IT innovation adoption in organizations (Kimberly and Evanisko, 1981; Thong 1999; Damanpour and Schneider, 2006). This is because such individuals are involved in all decision-making in the organization and their characteristics impact adoption decision processes. An organizational leader can influence staff motivation and job satisfaction, encourage and reward on the acceptance of the innovation (Damanpour and Schneider, 2009). The influence of CEO may be more significant in organizations with no dedicated IT professionals employed, often in the case of small firms (Warren and Fuller, 2009). Attributes such as age, gender and the education level of CEO have all been considered as an organizational demographic condition in the adoption of IT (Chuang et al., 2009).

In examining the CEO characteristics and organizational characteristics in IT innovation adoption of small businesses, Thong and Yap (1995) examined CEO innovativeness, CEO attitude towards change and CEO IT knowledge amongst others in IT innovation adoption of small businesses. Larsen (1993) studied the effect of middle manager age, middle manager tenure in position and middle manager education level which contributed to implementing IT innovation in organizations. Damanpour and Schneider (2006) investigated manager age, manager gender, manager education level, manager tenure in position and manager attitude towards innovation while focusing on the organizational, environmental and top manager effect on the phases of the adoption of innovations in organizations. CEO characteristics considered in the reviewed literature are summarized in Table 4.12.

Table 4.12 List of CEO factors considered in the innovation adoption literature

Code	CEO Characteristics	No. of SDY	No. of REL	Code	CEO Characteristics	No. of SDY	No. of REL
C01	CEO innovativeness	10	17	C05	Managers age	4	6
C02	CEO attitude	9	11	C06	Managers gender	3	5
C03	CEO IT knowledge	12	17	C07	Managers educational level	4	4
C04	Managers tenure	7	10	C08	CEO involvement	2	7

No. of SDY - Number of studies, No. of REL - Number of relationships

4.10.5 User Acceptance Characteristics

Constructs of TRA, TAM and TPB contribute most towards user acceptance attributes. The TRA construct of behavioural intention, attitude towards use and subjective norm were found to be significant attributes. The two attributes of TAM, perceived usefulness and perceived ease of use were key determinants of user IT acceptance. The PBC factor of TPB was found to be significant and sub-constructs of PBC (computer self-efficacy and facilitating conditions) which determined non-volitional behaviour were also found to be significant characteristics.

TRA uses subjective norms which refer to the social pressure to accept behaviour. Pressure from management plays an important role in the user acceptance of IT in organizations.

TAM has been the most widely employed user acceptance model. TAM emphasizes that perceived usefulness and perceived ease of use of the technology are the major motivating factors in predicting individual acceptance and use of IT. Since the introduction of TAM, a significant amount of studies empirically tested TAM to determine the influence of perceived usefulness and perceived ease of use for intention to accept innovation and system usage (Adams et al., 1992; Agarwal and Prasad, 1999; Igbaria et al., 1997). In their models, they considered beliefs about perceived usefulness and perceived ease of use as major factors influencing attitude towards use which, in turn, affects the intention to use. For example Igbaria et al., (1997) in a study on factors affecting personal computer acceptance found that perceived usefulness and perceived ease of use directly impact user behaviour.

Studies that investigated an individual's acceptance of IT employing TAM found that perceived usefulness as a strong predictor of user's behavioural intention of the use of the technology (Henderson et al., 1998; Agarwal and Karahanna, 2000; Plouffe et al., 2001). Perceived usefulness of IT can have a tremendous influence on an individual's intention of using the technology which leads to greater usage. In addition, past literature has verified the impact of perceived usefulness to system usage (Adams et al., 1992; Roberts and Henderson, 2000). System usage has been used as a measure of success of the innovation adoption. TAM has been extended to identify the features of perceived usefulness. TAM3 states that perceived usefulness is determined by the characteristics of social influence and systems characteristics. Determinants of social influence are subjective norm and image; system characteristics are job relevance, output quality and result demonstrability.

Likewise, studies have investigated the significance of perceived ease of use on user acceptance of technology. Perceived ease of use was found to have direct and positive impact on user behavioural intention of technology acceptance (Agarwal and Karahanna, 2000; Gefen et al., 2003; Stylianou et al., 2003). Studies have shown that there is a significant relationship between perceived ease of use and perceived usefulness (Davis, 1989; Liaw and Huang, 2003; Wang et al., 2003). The studies further suggest that perceived usefulness plays an important role in mediating the relationship between perceived ease of use on both behavioural intention and system usage (Davis 1989, Davis et al., 1989). TAM3 suggests that perceived ease of use of an innovation is predicted by facilitating conditions and individual differences. Characteristics of facilitating condition are computer self efficacy, perception of external control, computer anxiety and computer playfulness; individual differences are determined by perceived enjoyment and object usability.

Table 4.13 illustrates in the light of reviewed literature, user acceptance determinants investigated at the organizational level.

Table 4.13 List of user acceptance factors considered in the organizational level adoption literature

Code	User Acceptance Characteristics	No. of SDY	No. of REL	Code	User Acceptance Characteristics	No. of SDY	No. of REL
A01	Perceived usefulness	9	10	A12	User training	1	1
A02	Perceived ease of use	8	9	A13	User involvement	-	-
A03	Perceived voluntariness	2	3	A14	Organizational support	-	-
A04	Anxiety	-	-	A15	Organizational usage	-	-
A05	Attitude towards use	3	4	A16	Educational level	-	-
A06	Compatibility	-	-	A17	User age	-	-
A07	Behavioural intention	1	1	A18	Self-efficacy	-	-
A08	Subjective norms	2	2	A19	Facilitating conditions	-	-
A09	Perceived enjoyment	1	1	A20	Perceived behavioural control	-	-
A10	Perceived playfulness	1	1	A21	Financial incentives	-	-
A11	User experience	-	-	A22	Technical assistance	-	-

No. of SDY - Number of studies, No. of REL - Number of relationships

Table 4.14 shows the results of the user acceptance attributes examined in the reviewed individual level studies.

Table 4.14 List of user acceptance factors considered in the individual level adoption literature

Code	User Acceptance Characteristics	No. of SDY	No. of REL	Code	User Acceptance Characteristics	No. of SDY	No. of REL
A01	Perceived usefulness	29	37	A12	User training	2	2
A02	Perceived ease of use	25	33	A13	User involvement	1	1
A03	Perceived voluntariness	2	5	A14	Organizational support	7	7
A04	Anxiety	4	6	A15	Organizational usage	2	2
A05	Attitude towards use	12	13	A16	Educational level	2	5
A06	Compatibility	8	9	A17	User age	2	5
A07	Behavioural intention	9	14	A18	Self-efficacy	7	9
A08	Subjective norms	14	17	A19	Facilitating conditions	5	9
A09	Perceived enjoyment	5	7	A20	Perceived behavioural control	6	6
A10	Perceived playfulness	1	3	A21	Financial incentives	2	2
A11	User experience	8	11	A22	Technical assistance	3	3

No. of SDY - Number of studies, No. of REL - Number of relationships

4.11 Summary

The study performed a theoretical analysis to synthesize a conceptual model for IT innovation adoption in organizations. The study performed a SLR and explored past literature on the stages of innovation adoption, theories of innovation adoption, models of technology acceptance and popular frameworks developed for organizational innovation adoption. Based on the results of SLR, the study developed a conceptual model for IT innovation adoption in organizations.

The study integrated theoretical perspectives of IT innovation adoption theories, user acceptance models and popular frameworks to build the integrative structure. The model depicted a stage-based representation comprising of pre-adoption (initiation), adoption-decision and post-adoption (implementation) phases. The model described two levels of analysis: organizational level process starting from initiation stage until the acquisition of innovation and individual level process which explains the user acceptance and use of IT in organization. Hence, to include the characteristics of organizations and the behaviour of individuals within the organization, the model considered an interactive process perspective. The structure is a combination of DOI, TRA, TAM, TPB and frameworks that consist of characteristics of innovation, organization, environment, CEO characteristics and user acceptance determinants.

The theoretical analysis thus, answers the first four research sub-questions. Firstly, the theoretical analysis verified the main theoretical models in the study of innovation adoption in organization. Secondly, the study identified the processes involved in the adoption of IT innovations in organizations. Thirdly, the SLR categorized factors that influence the adoption of IT in organizations. Fourthly, the analysis identified factors that influence the use of IT by the individuals within organizations.

Chapter 5

Analysis of the Determinants of IT Innovation Adoption

Adoption process of IT innovations in organizations

5.1 Introduction

Researchers have explored various factors thought to influence the innovation adoption of IT in organizations (Kimberly and Evanisko, 1981; Meyer and Goes, 1988; Damanpour and Gopalakrishnan, 1998). The conceptual model developed using a SLR in Chapter 4 identified characteristics from context of innovation, organization, environment, CEO and user acceptance determinants. Past studies examining the various determinants and IT innovation adoption have yielded equivocal results (Subramanian and Nilakanta, 1996). Inconsistency of findings in studies examining the factors influencing the adoption of IT innovation has been one of the short-comings. Studies examining determinants of IT adoption in different research settings often produce varying results (Damanpour, 1991). Tornatzky and Fleischer (1990) stated that different factors influence the adoption of different innovations and the extent to which they impact upon the adoption process. Hence, apart from identifying the key determinant of innovation adoption and use of IT in an organization, the study identifies the reasons for inconsistency in the past literature.

To examine the key determinants of innovation adoption and use of IT in organizations, the study performed a statistical analysis of past findings. The study used meta-analysis to aggregate the findings of past studies that examined the relationship between various determinant and IT innovation adoption. Meta-analysis verifies the strength and magnitude of the relationship between independent and dependent variables. In addition, meta-analysis enables assessment of similarities and differences in past studies and explains the contradictory findings of different studies. One of the important aspects of a meta-analysis is the investigation of different research conditions for the relationship between two variables and explains much of the inconsistencies of past findings.

The organization of this chapter is as follows. In the next section (Section 5.2) the characteristics of studies examining the factors influencing the adoption of IT innovations in organizations are described. Section 5.3 describes the concept of aggregating the findings of the past studies and meta-analysis technique. Section 5.4 explains in detail the meta-analysis procedure used to analyse the factors influencing the adoption and use of IT in organizations. Section 5.5 describes the selection of moderator conditions for the analysis. Study selection for the meta-analysis is explained in Section 5.6. Finally, in Section 5.7 the study describes the selection of determinants for the meta-analysis from the context of innovation, organization, environment, CEO and user acceptance.

5.2 Studies examining the determinants of IT innovation adoption

IS literature has identified various factors as potential determinants of IT innovation adoption in organizations (Thong and Yap, 1995) and researchers have empirically validated various attributes in different contexts that influence the adoption of IT (Iacovou et al., 1995; Thong and Yap, 1995; Premkumar, 2003; Chan and Ngai, 2007). In general, these studies investigated the influence of characteristics of innovation, the organization, the environment in which an organization operates and of individuals within organizations. In terms of individual level analysis, studies have also examined the determinants of user acceptance of IT in organizations.

In the theoretical analysis of this research for developing a conceptual model of IT innovation adoption in organization, the study has identified various determinants in these five contexts. In Section 4.10, the study summarized various attributes in different contexts that have been examined in past studies as potential determinants of IT innovation in organizations. Based on one-hundred-and-fifty-two different studies that examined various determinant of IT innovation adoption, the study identified twenty innovation characteristics, forty-two organizational characteristics, sixteen environmental characteristics, eight CEO characteristics and twenty-two user acceptance determinants.

5.2.1 Interpreting the results of past studies on IT innovation adoption

Studies examining the determinants of IT innovation adoption were investigated both quantitatively and qualitatively. The results of studies examining the relationship between the different attributes and IT innovation adoption are normally interpreted in term of tests of significance. Statistical tests of significance are used in hypothesis testing and involve comparing the observed values with theorized values (null hypothesis). When the null hypothesis is rejected or the observed value differs from theorized value, the effect is said to be statistically significant. Statistical significance gives the probability that a relationship exists between dependent and independent variables and is determined by both effect size and size of sample studied (Rosenthal and DiMatteo, 2001). Common measures of effect sizes are the ‘correlation coefficients’ between independent and dependent variables.

Values of the correlation coefficient range between -1 and +1; values that fall between 0 and -1 indicate a negative relationship and values between 0 and +1 indicate a positive relationship. A correlation coefficient of 0 demonstrates that the variable has no relationship. Correlation coefficients do not have a precise interpretation but are usually classified in terms of its statistical significance as weakly, moderately or strongly significant. Cramer (1999), for example classifies a correlation coefficient of between 0 and ±0.05 as 'no significance', between ±0.06 and ±0.10 as 'weak significance', between ±0.11 and ±0.15 as 'moderate significance' and finally, between ±0.16 and ±1.0 as 'strong significance'. De Vaus (2002) on the other hand classifies correlation between 0 and ±0.09 as 'insignificant', ±0.10 and ±0.29 as 'weak significance', ±0.30 and ±0.49 as 'moderate significance', ± 0.5 and ± 0.69 as 'strong significance', ±0.70 and ±0.89 as 'very strong significance'; finally, ±0.9 and ±1.0 as 'near perfect significance'. Since the usual interpretation of effect size is that values < ±0.1 are negligible, ±0.1 to ±0.3 small, ±0.3 to ±0.5 moderate and > ±0.5 large, the De Vaus (2002) classification fits this coding more appropriately and the study herein thus followed that classification for the research.

5.3 Aggregating the findings of past studies and meta-analysis

A finding of an individual study is not sufficient to generalize on a particular issue. The findings of a number of independent studies on a particular subject can be combined to reach an overall solution. Data aggregated in this way to find overall effect size is normally quantitative. In the past, 'statistical tests of significance' were the key information utilized to aggregate quantitative studies (Hunter et al., 1982). As the test of significance is determined by both effect size and sample size, two studies with identical effect size could produce conflicting results in terms of significance and the aggregated tests of significance could produce ambiguous results (Hunter et al., 1982). To statistically combine previous quantitative research findings and to evaluate a more accurate estimation for a relationship, researchers use meta-analysis. Meta-analysis calculates the effect size of individual studies and then combines them to obtain an average effect size (Rosenthal and DiMatteo, 2001).

The study aggregated the findings of past literature examining the relationship between various determinants and IT innovation adoption. The results of the studies examining the relationship between different attributes and IT innovation adoption are normally interpreted in term of tests of significance. In addition, several past studies have performed different statistical techniques which have provided an effect size for the relationship between the determinants and IT innovation adoption. In the study described, the statistical tests of significance provided by the literature were aggregated to verify the importance of each of the determinants for the IT innovation adoption in organizations. The research used a meta-analysis technique to evaluate effect size findings of past studies examining various attributes affecting IT innovation adoption; these are then aggregated to obtain overall conclusions regarding the magnitude and direction of the relationships.

As described in Section 3.10, meta-analysis refers to a series of procedures for quantitatively accumulating 'effect sizes' across studies and analysing research findings to reach an overall conclusion. Effect sizes can be expressed in similar forms as correlation coefficients (Cooper at al., 2009). The most commonly followed meta-analysis procedures to compute the overall measure of relationship between variables were described by Glass et al., (1981) and by Hunter et al., (1982). The meta-analysis procedure described by Hunter et al., (1982) also includes methods to correct sampling errors, errors of measurement and range of variance (Damanpour, 1991). For the research described in this Thesis, the meta-analytic steps described by Hunter et al., (1982) were adopted to analyse the correlation results of studies on factors affecting the adoption of IT innovations.

5.4 Meta-analysis procedure

Meta-analysis uses a sequence of procedures to aggregate statistical results from independent studies to find a more accurate estimation. The procedure involves accumulating effect sizes across studies, combining them and evaluating them to obtain an average effect size. The study applied the accumulation procedures described in Hunter et al., (1982), to derive overall results of the studies. For the calculation, we used studies that performed correlation analysis for each of the independent variables. The statistics extracted from the studies were the correlation coefficients and we performed five basic steps in our analysis.

(1) Compute the mean correlation coefficient for the studies.

(2) Calculate the variance across studies; the study names this as the 'observed variance'.

(3) Calculate the effect of variance by the sampling error; this is the 'sampling error variance'.

(4) Compute the percentage of observed variance explained by sampling error variance.

(5) Compute 95% confidence interval using mean correlation.

For step 1, the study computed the mean population correlation by converting each of the observed correlation into a population correlation and then averaging them. To calculate the mean population correlation, each correlation coefficient was multiplied by its corresponding sample size and divided by total sample size. Thus, the study used the following formula to calculate mean correlation.

$$\text{Mean Correlation} = \frac{[(Samplesize\ 1\ x\ Correlation\ 1) +\ \ldots + (Samplesize\ n\ x\ Correlation\ n)]}{[(Samplesize\ 1) + \cdots + (Samplesize\ n)]}$$

The results obtained for each individual observed effect size were a weighted mean correlation by their corresponding sample size. This frequency weighted average gave a greater weight to results obtained from larger samples. Averaging the population correlation eliminates the effect of sampling error (Hunter et al., 1982). Many meta-analysis methods assume that the observed correlation value is approximately normal. However, often a correlation coefficient is not normally distributed and its variance is not constant. When the observed correlation value is far from zero and the sample size is small, the sampling may not be estimated as a normal distribution. To normalize and to stabilize the variance, a 'Fisher's z-Transformation' is often used (Hayakawa, 1987), and happens to be a rather effective normalizing transformation. Hence, for each of the mean correlation values obtained, Fisher's z-transformation values were calculated. The same values were also used to calculate a confidence interval.

For step 2, the observed variance across studies was calculated. The observed variance was calculated using the following formula:

$$\text{Observed Variance} = \frac{[Samplesize\ 1(Correlation\ 1 - Mean\ correlation)^2 +\ \ldots +\ Samplesize\ n(Correlation\ n - Mean\ correlation)^2]}{[(Samplesize\ 1 + \cdots + Samplesize\ n)]}$$

The observed variance is explained by variations due to population correlation and sample correlations produced by sampling error. The sampling error adds to the variance of correlations across studies (Hunter et al., 1982). Variation due to population correlation can be obtained by eliminating variation due to sampling error.

To eliminate sampling error due to variance, in step 3, first, the effect of variance by sampling error was derived. The variance due to sampling error is calculated using the mean population correlation and average sample size.

$$\text{Sampling error variance} = \frac{[(1 - Mean\ correlation)^2]^2}{[Average\ sample\ size - 1]}$$

Where average sample size is:

$$\text{Average sample size} = \frac{[(Samplesize\ 1 + \cdots + Samplesize\ n)]}{[Total\ number\ of\ Studies]}$$

By subtracting sampling error variance from the variance in the sample correlation (observed variance), the variance due to population correlation can be obtained.

$$Variance\ of\ population\ correlation = Observed\ variance - Sampling\ error\ variance$$

To account for a moderator effect of the individual attributes, step 4 calculated the percentage of observed variance explained by sampling error variance. Hence, explained variance was calculated using the following formula:

$$\text{Explained Variance} = \frac{Sampling\ error\ variance}{Observed\ variance} x\ 100$$

If the percentage of the observed variation is due mostly sampling error variance, a moderator effect can be assumed as minimal. However, if the percentage obtained in step 4 is not sufficiently high, a substantial amount of observed variance is due to variation in population correlations. This indicates that the study requires the examination of moderator effect. Peters et al., (1985) suggested that the moderator effect should be performed if the sampling error variance is less than 60% of the observed variance. For every independent variable that showed a sampling error variance of less than 60% of observed variance, the study introduced moderating conditions and performed a meta-analysis for each condition.

Finally, to find the significance of the independent variable in IT innovation adoption, the study computed a 95% confidence interval (step 5) using the values obtained from z-transformation of mean correlation. The confidence intervals cannot be computed directly using mean correlation coefficient due to variance in sample size of individual studies. Use of Fisher's z-transformation value makes it possible to calculate these values indirectly. The confidence interval was calculated using the following formula.

$$\text{Confidence interval} = z\ value\ of\ mean\ correlation\ \pm (1.96\ x\ \frac{1}{\sqrt{(Samplesize - 3)}})$$

The relationship between independent variable and IT innovation adoption is regarded as statistically significant if the confidence interval does not include zero. If the 95% confidence interval is in the range 0 to 1, it indicates a positive association; if the interval falls between 0 to -1, it implies a negative association.

5.5 Moderators for the relationships between determinants and IT innovation adoption

The review of studies based on factors affecting the adoption of IT innovations showed mixed results in its findings. IT innovation adoption research conducted in different research conditions often produces varying results (Damanpour, 1991). The boundary conditions with which the research was performed may affect the results obtained for association between various determinants and IT innovation adoption (Abdul Hameed et al., 2012b). It was therefore necessary to explore different conditions that may have influenced the relationship between different determinants and IT innovation adoption. Using meta-analysis procedures, it becomes possible to examine the effects of these conditions commonly known as *moderators*. A moderator is therefore a different research context (e.g., size of organization, type of organization) that affects the strength and direction of the relationship between different characteristics and IT innovation adoption (Guzzo et al., 1987). Examining the effect of these conditions on the relationship between determinants and IT innovation adoption introduces a third variable into the analysis.

The study examined the effect of four moderator categories on the relationship between determinants and IT innovation adoption in organizations. They were *stage of innovation, type of innovation, type of organization* and *size of organization*. The study chose these four factors since these were most commonly quoted statistics in the individual studies reviewed. Damanpour (1991) in a meta-analysis of organizational characteristics influencing adoption of IT examined the effect of stage of adoption, type of innovation and type of organization. In the next four sub-sections, each of the four moderators for the study is explained.

5.5.1 Stage of innovation

The process of innovation adoption has been divided into multiple stages in the IS literature. Rogers (1983) described innovation adoption as a three stage process consisting of initiation, adoption-decision and implementation. Research distinguishes innovation adoption into other different phases (Hage and Aiken, 1970; Kwon and Zmud, 1987). Although researchers split the adoption process into various stages, all these phases fit into three groups of pre-adoption, adoption-decision and post-adoption stages consistent with Rogers' (1983) model of initiation, adoption-decision and implementation. Hence, the study described in this Thesis used a three-stage model of initiation, adoption-decision and implementation to distinguish the stages of IT innovation adoption.

The study considers the initiation (pre-adoption) stage as consisting of activities related to recognizing a need, acquiring knowledge or awareness, forming an attitude towards the innovation and proposing innovation for adoption (Rogers, 1995; Gopalakrishnan and Damanpour, 1997). The adoption-decision stage described by Meyers and Goes (1988) reflects the decision to accept the idea through negotiations to obtain the organizational backing at various levels of the organizational hierarchy and evaluate the proposed ideas from a technical, financial and strategic perspective, together with the allocation of resources for its acquisition and implementation. The study also considers the implementation stage (post-adoption) which involves preparing the organization for use of the innovation, performing a trial for confirmation of innovation, acceptance of the innovation by the users and continued actual use of the innovation. This ensures that the innovation becomes ingrained and developed into a routine feature of the organization with expected benefits realized (Rogers, 1995).

5.5.2 Type of innovation

Among the different types of innovation identified by researchers is product versus process, technical versus administrative and radical versus incremental (Damanpour, 1991).

Product innovation can be defined as the introduction of a product or service which significantly improves operations. Process innovation, on the other hand, is the implementation of new system or process which changes a method of working and associated procedures. Some variation has been identified in adoption activities of product and process innovations and distinctive organizational skills are required in the adoption of each of these innovation types (Utterback and Abernathy, 1975; Tornatzky and Fleicsher, 1990; Damanpour and Gopalakrishnan, 2001). Different factors influence both the adoption of product and process innovations and the extent to which these innovations impact the adopting organization (Tornatzky and Fleischer, 1990). Product innovations are mainly adopted due to the demands from partners or customers and have a market focus while process innovations are adopted due to an internal need essentially to increase efficiency (Utterback and Abernathy, 1975). Damanpour and Gopalakrishnan (2001) verified that organizations adopt more product innovations compared to process innovation and adopt them faster. Their suggestion was that product innovations are perceived as relatively more advantageous than process innovations. They argued that product innovations were more observable and easily promoted into an organization. Also, they suggest that product innovation is comparatively autonomous and is less difficult in the development stage and experience less resistance to their implementation allowing faster adoption. Hence, the study considered product innovation and process innovation as a moderating condition in the adoption of IT innovations in organizations.

5.5.3 Type of organization

IT innovation has a huge impact in leveraging productivity and efficiency of any organization. Organizations adopt IT to enhance the scope of their products and services. Within organizations, innovation activities involve adding new services, improving production capability, expanding existing processes or improving the service delivery process. Almost all industries, public or government utilize IT to improve efficiency and effectiveness. Most IT research discusses manufacturing and service as the two main industry types for evaluating the impact of IT in organizations. Damanpour (1991) identified organization type as manufacturing or service and profit or not-for-profit. Researchers have conducted studies based only on manufacturing industry or service industry.

According to the definition of Standard Industry Classification (SIC) - United Kingdom (UK), manufacturing organizations are engaged in the mechanical or chemical transformation of materials or substances into new products (automotive, chemical, food production, household items, medical etc.) while service industries are engaged in providing a wide variety of services for individuals, businesses and government establishments and other organizations (financial institutions, travel, healthcare, merchandising, transport, telecommunication, etc). The most important objectives of IT innovation adoption for both manufacturing and service organizations have been to increase market share, reduce cost and improve efficiency. Nie and Kollogg (1999) identify unique characteristics of the organizations of the service sector such as customer participation, intangibility, heterogeneity and labour intensity compared to manufacturing organizations. These differences are likely to influence IT innovation adoption patterns within these two organizational groups. Due to these differences, factors influencing the usage of IT in the manufacturing sector are different from the service sector (Cheng et al., 2002). Organizations in the service sector tend to have higher information content in their product and services compared to firms in manufacturing industries. Prajogo (2006) found that whilst service firms innovate to the same level as manufacturing organizations, service firms yield less benefits compared to manufacturing, suggesting that it takes longer for service organizations to have impact on business performance as innovation in services are more difficult to be perceived by customers. In addition, Voss et al., (1992) found that innovations are more rapidly implemented in service organizations compared to manufacturing firms. The current study therefore makes a distinction between manufacturing and services organizations.

5.5.4 Size of organization

Innovation adoption research tends to target its studies based on the size of the organization. Researchers usually make a distinction between large and small organizations in conducting their empirical studies. Large and small organizations possess certain distinct characteristics of their own and are fundamentally different in a number of aspects (Thong, 1999). The challenges they face, the opportunities and management issues they deal are incomparable. Small businesses pose a greater risk in IT innovation adoption due to the lack of technical and financial resources, inadequate IT infrastructure and a short-range management perspective (Soh et al., 1992). Contextual factors that influence IT innovation adoption in larger organizations may not be applied to small businesses. In the analysis presented, the study therefore used size of organization as a moderating condition and categorized them as large and small organizations.

5.6 Study selection for meta-analysis

SLR for the theoretical analysis allowed the study to gather all relevant literature on the adoption of IT in organizations. All one-hundred-and-fifty-two studies gathered using the SLR examined the relationship between different attributes and IT innovation adoption. Due to methodological screening imposed in the inclusion and exclusion of studies for SLR, all studies have performed reliable analytical techniques to verify the relationships. Consequently, all the reviewed literature has provided statistical tests of significance for the relationships between various innovation, organizational, environmental, CEO or user acceptance determinants and IT innovation adoption in organizations.

To calculate the effect size for each individual variable using the meta-analysis procedure of Hunter et al., (1982), the study used the values of the correlation coefficient. The sample studies collected for the SLR used different analytical techniques. Hence, the study imposed additional criterion for the study selection for meta-analysis. The addition condition was that the study should perform correlation analysis for the relationship between independent and dependent variable.

Among one-hundred-and-fifty-two studies reviewed, sixty-five studies provided correlation values for the meta-analysis with one-hundred-and-six IT innovation adoption relationships. Forty-five of the sixty-five studies performed the analysis at an organizational level and twenty studies assess at the individual level. Studies that executed at the organizational level analysis were used to perform the meta-analysis for innovation, organizational, environmental and CEO characteristics, while individual level studies were used for meta-analysis examination of user acceptance characteristics.

5.6.1 Coding for meta-analysis

Before conducting the analysis, we coded dependent and independent variables. Initiation, adoption-decision and implementation of IT were considered dependent variables and the factors influencing the adoption of IT innovations, the independent variables. Studies that considered different stages of IT innovation adoption were considered as an individual sample. Also, studies that included more than one innovation were coded separately and treated as individual data sets. The independent variables were the characteristics that influenced initiation, adoption-decision and implementation of an IT innovation. The reviewed studies used different names to describe some of the independent variables. Hence, in coding the independent variable, we refer to the context in which the variables were used in the individual studies.

In addition, information on four moderators was also coded for each study. Four moderators and their categories were defined as (1) stage of innovation: initiation, adoption, implementation, mixed (2) type of innovation: product, process, mixed (3) type of organization: manufacturing, service, mixed and (4) size of organization: large, small, mixed.

5.7 Selection of determinants of IT innovation adoption for the meta-analysis

The study gathered all factors in one-hundred-and-fifty-two studies considered in the SLR. The characteristics of innovation, organization, environment, CEO and user acceptance were extracted and coded for the meta-analysis. To calculate the effect size for each individual variable using the meta-analysis procedure by Hunter et al., (1982), the study used the values of the correlation coefficient. Sixty-five studies provided correlation values for the meta-analysis with one-hundred-and-six IT-adoption relationships. To perform the meta-analysis, two correlation values were required for the relationship between each individual factor and IT innovation adoption. However, to allow examination of moderator conditions with two correlation values, the study made a consideration that the meta-analysis would be performed for individual factors with more than four correlation values.

5.7.1 Innovation characteristics

The study gathered all innovation factors considered in one-hundred-and-fifty-two studies. Among the studies, seventy-six studied innovation characteristics and examined one-hundred-and-two IT innovation relationships. To calculate the effect size for each individual variable using meta-analysis procedure by Hunter et al., (1982), the study used the values of the correlation coefficient. Twenty-eight studies provided correlation values for the analysis with thirty-six IT-adoption relationships. To perform the meta-analysis, four correlation values were required for the relationship between each individual innovation factor and IT innovation adoption. The study chose all innovation factors that provided more than four correlation values. Table 5.1 illustrates the number of studies that performed correlation analysis and the number of correlation relationships for each innovation attribute.

Table 5.1 Number of correlation values for individual innovation characteristics

Code	Innovation Characteristics	No. of SDY w COR	Total No. of REL	Code	Innovation Characteristics	No. of SDY w COR	Total No. of REL
I01	Relative advantage	20	25	I11	Profitability	0	0
I02	Cost	7	7	I12	Social approval	0	0
I03	Complexity	13	18	I13	Business process re-engineering	1	1
I04	Compatibility	10	14	I14	Strategic decision aid	0	0
I05	Trialability	3	4	I15	Scalability	0	0
I06	Observability	3	4	I16	Task Variety	2	2
I07	Security	3	3	I17	Managerial productivity	0	0
I08	Demonstrability	1	1	I18	Organizational support	1	2
I09	Communicability	0	0	I19	Critical mass	1	2
I10	Divisibility	0	0	I20	Perceived risk	0	0

No. of SDY w COR - Number of studies with correlation, Total No. of REL - Total number of relationships

The study performed a meta-analysis for relative advantage, cost, complexity, compatibility, trialability and observability as innovation characteristics that influenced the adoption of IT innovations in organizations. These factors are the independent variable in terms of innovation characteristics for the meta-analysis with the dependent variable adoption (initiation, adoption-decision and implementation). Appendix C shows the studies considered in the analysis for innovation characteristics. It shows sample size, result of test of significance, correlation values and other demographic statistics for each study.

Table 5.2 illustrates the innovation factors considered for the meta-analysis and their expected association with IT innovation adoption.

Table 5.2 Innovation characteristics and its expected association with IT innovation adoption

Independent Variables	Description	Expected Relationship
Relative advantage	The degree to which an innovation is perceived as being better than the idea it supersedes	Positive
Cost	The total expenses incurred in the adoption and the implementation of the new innovation	Negative
Complexity	The degree to which an innovation is perceived as relatively difficult to understand and use	Negative
Compatibility	The degree to which an innovation is perceived as being consistent with the existing values, past experiences and needs of the receivers	Positive
Observability	The degree to which the which the results of the innovation are visible to others	Positive
Trailability	The degree to which an innovation may be experimented within a limited basis	Positive

5.7.1.1 Relative Advantage

Relative advantage of an innovation is the degree to which an innovation is perceived as being better than a competing or preceding idea (Rogers and Shoemaker, 1971; Rogers, 1995). One of the fundamental adoption-decisions in organizations has been the assessment of its benefits. Relative advantage has been identified as one of the most significant factors driving the adoption and use of IT innovations in organizations (Premkumar et al., 1994; Iacovou et al., 1995). Rogers (1995) asserts that the relative advantages of an innovation are increased efficiency, economic benefits and enhanced status. Relative advantages of an innovation is a key variable in all studies associated with IT innovation adoption and are frequently described in terms of *direct* and *indirect* benefits. Direct benefits are immediate and tangible benefit that the organizational will enjoy such as operational cost savings, improved cash flow, increased productivity and improved operational efficiency. The benefits that are less tangible are indirect benefits such as competitive advantage, improvement in customer service, better relations with business partners and other opportunities that arise with the introduction of the innovation (Chwelos et al., 2001). Indirect benefits are difficult to measure. Many research studies used relative advantage or perceived benefits in examining the factors affecting the adoption of IT and found them to be some of the top determinants of innovation adoption (Tornatzky and Klein, 1982; Premkumar et al., 1994; Rogers, 1995). Relative advantage is expected to be positively related to the adoption of IT (Rogers, 1995).

5.7.1.2 Cost

The cost incurred in possessing an innovation is an important factor when considering the adoption and implementation of an innovation. The literature suggests cost as an inhibitor to IT innovation adoption and the less expensive the innovation, the more likely it will be adopted and used by organizations (Downs and Mohr, 1976; Tornatzky and Klein, 1982; Rogers, 1995). The cost of computer hardware and software has rapidly declined in recent years; however, for organizations which operate in limited resources, the cost of IT is still a major impediment. The cost of an innovation is expected to be negatively affected the adoption and implementation of the innovation. The costs incurred in adoption of new technology include administrative, implementation, training and expenditure for maintenance. Cost is a critical factor in an adoption decision and a relatively easy characteristic to measure (Tornatzky and Klein, 1982; Zhu et al., 2006a).

5.7.1.3 Complexity

Complexity is the degree to which an innovation is perceived as difficult to understand and use (Rogers and Shoemaker, 1971; Rogers, 1995). Innovations that are more difficult are less likely to be adopted by organizations. Complex innovation tends to diffuse slowly within an organization with limited competence; hence, the organization is unable to exploit the full benefit of the new innovation. Complexity of innovation creates uncertainty in the adoption-decision process of IT innovation and therefore increases the risk of the adoption process (Premkumar and Roberts, 1999). Furthermore, complex innovations are unlikely to propagate a successful adoption process and hence to bring about the efficiency required. In addition, it is also suggested that complexity of innovation leads to greater resistance to transform due to the lack of skills and knowledge of the users (Rogers, 1983). For the adoption of IT in organizations, complexity of an innovation is expected to influence negatively (Tornatzky and Klein, 1982; Seyal and Rahman, 2003). A number of studies used this attribute while studying the negative effect of adoption (Karahanna et al., 1999).

5.7.1.4 Compatibility

Compatibility is defined as the degree to which innovations are perceived as consistent with the needs, existing values, past experiences and technological infrastructure of the adopter (Rogers and Shoemaker, 1971; Rogers, 1995). The more incompatible the new innovation is with the existing processes and systems, the more resistance the organization will experience (Premkumar et al., 1994) and resistance to the adoption of an innovation within the organization will hinder its usage. If the innovation is compatible with organizational needs and existing work practices, it would incur less effort to deal with incompatibility and is more likely to adopt it. Compatibility of an innovation is positively related to adoption and implementation of the innovation (Tornatzky and Klein, 1982; Premkumar et al., 1994).

5.7.1.5 Trialability

Rogers (1995) defines 'trialibility' as the degree to which the innovation may be experimented with. Being able to try innovations before adoption reduces uncertainty of potential adopters and innovations that can be tried are more likely to be adopted (Tornatzky and Klein, 1982). Trialability is important in the initiation stages of adoption. However, its implication will affect the usage of the innovation. Literature suggests a positive relationship between trialability and innovation adoption (Rogers, 1995).

5.7.1.6 Observability

Observability is the degree to which the results and the advantages of an innovation are visible to others (Rogers and Shoemaker, 1971; Rogers, 1995). Observability is sometimes referred to as 'visibility'. The more visible or observable the usage and the outcome of the innovation, the more likely the innovation will be adopted and implemented in organizations (Tornatzky and Klein, 1982). Observability is expected to have a positive relationship with innovation adoption (Rogers, 1995).

5.7.2 Organizational characteristic

A total of one-hundred-and-five reviewed articles examined the relationship between organizational characteristics and IT innovation with one-hundred-and-seventy-three different innovation adoption relationships. Among one-hundred-and-five studies that examined organizational characteristics, forty studies conducted a correlation analysis providing seventy organizational characteristics-IT innovation adoption relationships. Table 5.3 illustrates the number of studies that performed correlation analysis and the number of relationship gathered for each individual organizational factor. Organizational factors with more than four correlation relationships were selected for meta-analysis evaluation.

Table 5.3 Number of correlation values for individual organizational characteristics

Code	Organizational Characteristics	No. of SDY w COR	Total No. of REL	Code	Organizational Characteristics	No. of SDY w COR	Total No. of REL
O01	Top management support	14	18	O22	External integration	1	2
O02	Organization size	21	38	O23	Managerial obstruction	1	3
O03	IT expertise	13	24	O24	Culture	3	3
O04	Organization readiness	2	2	O25	Job relevance	1	1
O05	Product champion	3	4	O26	Perceived barrier	0	0
O06	Centralization	4	11	O27	Information sharing culture	1	1
O07	Formalization	5	12	O28	Trust	0	0
O08	IS dept size	3	12	O29	Motivation	2	2
O09	IS infrastructure	7	12	O30	Internal pressure	0	0
O10	IS investment	2	2	O31	Technology level	0	0
O11	Information intensity	5	7	O32	Openness	0	0
O12	Resources	10	21	O33	Norm encouraging change	0	0
O13	Training	2	2	O34	Role of IT	0	0
O14	Earliness of adoption	1	2	O35	Strategic planning	2	2
O15	No. of. business lines	1	3	O36	Age of IS	0	0
O16	No.of customers	1	2	O37	No of competitors	1	2
O17	Organizational complexity	1	3	O38	Satisfaction with exisitng system	1	1
O18	Barrier to adoption	0	0	O39	Job rotation	0	0
O19	Image	1	1	O40	User involvement	1	2
O20	Expansion	0	0	O41	Degree of integration	1	3
O21	Specialization	3	15	O42	External communication	1	3

No. of SDY w COR - Number of studies with correlation, Total No. of REL - Total number of relationships

Meta-analysis was conducted for top management support, organizational size, IT expertise, product champion, centralization, formalization, IS department size, IS infrastructure, information intensity, resources and specialization. Details of the studies considered for the analysis of organizational characteristics is illustrated in Appendix D.

Table 5.4 provides a description of each of these organizational characteristics and the expected association with IT innovation adoption.

Table 5.4 Organizational characteristics and its expected association with IT innovation adoption

Independent Variables	Description	Expected Relationship
Top management support	Extent of commitment of resource and support from the top management to the innovation	Positive
Organizational size	Number of employees within the organization or total sales revenue	Positive
IT expertise	Prior experience of IT in term knowledge of individuals and within the organization	Positive
Product champion	Existence of high level individual to promote the innovation within the organization.	Positive
Centralization	Level of centralization of decision making in organization	Negative
Formalization	The extent of the use of rules and formal procedures within the organization	Negative
IS department size	Existing IT function and dedicate IT personal within the organization	Positive
IS infrastructure	Availability of IT resources within the organization for the adoption	Positive
Information intensity	Degree to which information is presented in the product or services	Positive
Resources	Amount of financial, technical and human resources for the adoption process	Positive
Specialization	The diversity of technological knowledge exists in the organizations	Positive

5.7.2.1 Top Management Support

A recurring, organizational factor studied by IS researchers is top management support. Top management support is one of the consistently found and highly critical factors influencing IT implementations (Thong et al., 1996). It is commonly believed that top management support plays a vital role in all stages of IT innovation adoption (Rai and Bajwa, 1997). If management understands the benefit of IT, they are more likely to allocate necessary resources to implement new innovations. Top management's role in allocating required resources and providing a supportive climate in user acceptance of innovation is important (Grover and Goslar, 1993). Top management support allows the organization to realise the benefit of IT and provides assurance to functional managers to carry out its implementation. There is also evidence in the innovation literature which suggests that top management support is positively related to the adoption of new technologies in organizations (Tornatzky and Klein, 1982).

5.7.2.2 Organizational Size

Organizational size has been the most frequently examined factor in the study of organizational innovation adoption (Thong and Yap, 1995; Lai and Guynes, 1997; Premkumar and Roberts, 1999; Thong, 1999). Technological adoption literature has found that larger organizations have more capital with higher economies of scale, making adoption and use of IT more feasible (Utterback, 1974; Moch and Morse, 1977). Hence, researchers have found that availability of slack resources in larger organizations facilitates innovation adoption (Zhu et al., 2006a). Swanson (1994) asserts that larger organizations processes information in bigger volume for more specialized tasks which provides more facilities for innovations. As size of an organization determines other organizational aspects, particularly slack resources, decision-making and organizational structure, organizational size is the most important factor influencing IT innovation adoption (Rogers, 1995). Some researchers have argued that flexible organizational structure and centralized decision-making in smaller organizations assists innovation adoption (Zhu et al., 2006b). The IT literature argues that there is a relationship between organizational size and IS implementation success (Delone, 1981; Raymond, 1990; Iacovou et al., 1995)

Small businesses often face severe financial limitations, shortage of IT expertise and short range management perspective which results in substantial obstacles to the adoption of IT compare to large organizations. However, the impact of organizational size on IT innovation adoption is mixed; in some studies it is found to be an important attribute (Thong, 1999; Premkumar and Roberts, 1999; Teo et al., 2009) while other research has found it to be insignificant (Grover and Goslar, 1993; Chan and Ngai, 2007). As a result, the effect of organization size on the initiation, adoption and implementation of IT has produced inconclusive results (Rai and Bajwa, 1997). Nevertheless, most research has hypothesized that larger organizations tend to adopt IT more rapidly than small organizations. Hence, it might be expected that a positive relationship exists between organizational size and IT innovation adoption.

5.7.2.3 IT Expertise

In an organization, knowledge of IT is a major factor in the adoption of new technologies (Fichman and Kemerer, 1997). Organizations which possess the awareness of IT may have a better idea of new technology and the benefits they may bring to achieve organizational objectives. An organization with existing knowledge of new innovation makes adoption effortless and retains knowledge for innovation adoption.

The slow rate of IT innovation adoption process in organizations has been attributed to the lack of expertise and skills in IT. The essential long-term success and continuing growth of IT in an organization is the availability of skilled IT professionals (Teo et al., 2007). The IT literature shows that IT expertise is a key determinant of organizational innovation adoption (Thong, 1999; Kuan and Chau, 2001).

5.7.2.4 Product Champion

Product champion can be loosely defined as an individual who performs the task of spreading knowledge of new technology within the organization. The presence of a product champion is critical to the introduction of new technologies in organizations (Premkumar and Ramamurthy, 1995; Bruque and Mayano, 2007; Chan and Ngai, 2007). The existence of a product champion influences all stages of innovation adoption. In the initiation stage, the product champion will persuade management to acquire technology and create awareness of the innovation within the organization. In the adoption and implementation stage, the product champion plays an important role in overcoming resistance to the innovation and facilitating user acceptance by providing various types of training (Premkumar and Ramamurthy, 1995).

5.7.2.5 Centralization

Centralization is the degree to which power and control are concentrated in the hands of relatively few individuals in an organization (Rogers, 1983). More concentrated decision-making is associated with a centralized organizational structure (Eder and Igbaria, 2001). Moch and Morse (1977) suggest that a centralized organizational structure can affect the decision to adopt innovation. Grover and Goslar (1993) found that centralization of an organization has a negative relationship with initiation and adoption, but has a positive relationship with implementation. Similarly, Rogers (1983) found that centralization initially inhibited innovation, but is facilitated once innovation is in place. IS literature shows mixed results for the relationship between centralization and IT innovation adoption. Some studies show centralization to have a negative association with IT innovation adoption (Zmud, 1982, Damanpour, 1991) but for others a positive relationship has been observed (Kimberly and Evanisko, 1981).

5.7.2.6 Formalization

Formalization is the degree to which an organization follows the rules and procedures on the role of performance of its members (Rogers, 1983). In an IT context, formalization can also be considered as an IS structure or technology strategy within an organization. An organization that establishes formal procedures are better prepared to adopt IT (Chau and Tam, 1997). The organization should inform implementation intentions to staff and assign individual responsibilities for processes. Also, the organization should clarify the expected implication on the value of the working system after adoption (Bradford and Florin, 2003). In the IS literature, formalization has been hypothesized to have a negative association with initiation and adoption stages and a positive association with the implementation stage (Grover and Goslar, 1993). The literature has found conflicting empirical evidence for the relationship between formalization and IT innovation adoption.

5.7.2.7 IS Department Size

IS department size has been subject to scrutiny in many empirical studies in IT innovation adoption. The relationship between IS department size is likely to have a significant impact in the adoption of IT innovation. Empirical evidence suggests that IS department size has a positive influence on all stages of IT innovation adoption (Grover and Goslar, 1993). A larger IS department size means that the organization possesses more IT resources and technical skills which, in turn, facilitates innovation adoption.

5.7.2.8 IS Infrastructure

IS Infrastructure is essential to successfully implement and gain advantages from IT innovation adoption (Premkumar and Ramamurthy, 1995). Existence of IS infrastructure makes it easier for an organization to adopt innovation. To implement some complex systems, certain IS infrastructure needs to exist in an organization. A better IT infrastructure within an organization will result in better provision put forward for IT innovation adoption which affects the level of integration of innovation. Prior studies reveal a positive association between the existence of IS infrastructure and adoption of IT innovations (Wang and Cheung, 2004). Organizations with well established IS infrastructure were more likely to adopt IT innovation.

5.7.2.9 Information Intensity

Information intensity refers to the degree to which information is presented in the product or service (Thong and Yap, 1995; Thong, 1999). Different organizations require varying information processing capacity. The type and frequency of data exchanged, amount of transactions the organization deals with and the amount of products or services the organization handle can influence the adoption and use of innovation. In addition, organizations that handle large amounts of paperwork in their operations and that has a wider scope for increasing the efficiency of the transactions are likely to adopt new IT. Businesses with higher transaction frequencies demand improvements in their communication with suppliers and customers because of the higher potential benefits (Iskandar et al., 2001). Although the IT literature has shown contradictory results for the relationship between information intensity and IT innovation adoption, it is commonly hypothesized that more information intensive environments are more likely to adopt IT innovation.

5.7.2.10 Resources

In theory, availability of resources has a strong impact on IT innovation adoption. Organizational slack resources may be a fundamental ingredient for innovation adoption (Lai and Guynes, 1997). Resources include financial, technological and human resources. Financial resources refer to the availability of funding for IS investment. IS literature has suggested that financial resources have a significant impact on all stages of innovation adoption of IT. Technological resources are the IT infrastructure installed in the organization, while human resources are the existing IT knowledge within that organization. Lack of technological infrastructure and IT knowledge can be a major barrier for IT innovation adoption (Wang and Cheung, 2004). The majority of IT literature found resources to have a positive association with IT innovation adoption and use (Fletcher et al., 1996; Subramanian and Nilakanta, 1996; Nystrom et al., 2002).

5.7.2.11 Specialization

Specialization refers to the diversity of technological knowledge in an organization (Kimberly and Evanisko, 1981). Specialization reflects the number of different specialities found in an organization. Increasing the number of specialists in an organization assist broadening of overall knowledge and facilitates conceptualizing new ideas (Kimberly and Evanisko, 1981; Subramanian and Nilakanta, 1996). It has been hypothesized that a positive relationship exists between specialization and adoption of IT innovations. Specialization facilitates exposure to more technologies and to use more advanced IT applications (Grover et al., 1997). A higher degree of specialization within an organization has been found to facilitate innovation adoption (Kimberly and Evanisko, 1981; Damanpour, 1991; Fichman, 2001).

5.7.3 Environmental characteristics

Among the one-hundred-and-fifty-two studies reviewed for the research, fifty-nine studies examined one or more environmental determinants that influenced the adoption of IT in organization. These studies provided eighty-six IT innovation adoption relationships with environmental attributes. Thirty relationships from twenty studies offered data for the meta-analysis. Appendix E shows the studies considered in the analysis for environmental characteristics. It shows the sample size for each study, result of tests of significance and correlation coefficient for each environmental factors and IT innovation adoption relationships.

Table 5.5 Number of correlation values for individual environmental characteristics

Code	Environmental Characteristics	No. of SDY w COR	Total No. of REL	Code	Environmental Characteristics	No. of SDY w COR	Total No. of REL
E01	Competitive pressure	12	18	E09	Partners depence	1	1
E02	External pressure	5	7	E10	Government pressure	0	0
E03	Government support	6	8	E11	No. of competitors	1	2
E04	Vendour support	1	1	E12	External expertise	0	0
E05	Partners support	1	1	E13	Consultant effectiveness	0	0
E06	Partners readiness	1	1	E14	Trust with partners	0	0
E07	Environmental Uncertainity	1	4	E15	Globalization	1	1
E08	Vertical linkage	0	0	E16	Social influence	1	1

No. of SDY w COR - Number of studies with correlation, Total No. of REL - Total number of relationships

Table 5.5 illustrates the studies with correlation values for environmental factors. Only three factors: competitive pressure, external pressure and government support were with required data for the meta-analysis. Table 5.6 details three environmental variables considered in the study and the expected association with IT innovation adoption based on the literature.

Table 5.6 Environmental characteristics and its expected association with IT innovation adoption

Independent Variables	Description	Expected Relationship
Competitive pressure	The competition faced by the business in its particular industry	Positive
External pressure	Pressure from trading partners and customer to adopt a particular innovation	Positive
Government support	The government initiatives and policies to promote IT adoption and use	Positive

5.7.3.1 Competitive Pressure

Competitive pressure is the level of competition within the environment the organization operates. A successful business approach is to build a competitive advantage in the market-place. In highly competitive industries, firms needs to constantly update technological advances and strategic innovation (Wang and Cheung, 2004). Despite a lack of internal need, organizations may adopt IT in response to competitive demands (Premkumar and Ramamurthy, 1995). It is the rivalry within the similar organizations that drives most businesses to become more innovative. It is generally believed that competition necessitates innovation adoption and increases the probability of adoption of IT innovations (Kimberley and Evanisko, 1981). Innovations can improve an organization’s awareness to market changes and enhances customer services. A number of studies have shown that competitive pressure influences the adoption of IT (Chwelos et al., 2001; Looi, 2005; Zhu et al., 2006b). Competitive pressure is generally perceived to have a positive influence on the adoption of IT (Gatignon and Robertson, 1989) and is one of the widely stated reasons for organizations to adopt IT.

5.7.3.2 External Pressure

External pressure here refers to the influence from trading partners and customers. The pressure exercised by powerful trading partners to adopt an innovation influences the adoption decision of an organization (Iacovou et al., 1995). An organization that adopts a particular innovation would demand their partners to possess a similar innovation to fully utilise the innovation at an inter-organizational level. Similarly, the demands from potential customers to possess an innovation have a strong impact on the adoption of IT in organizations (Abereijo et al., 2009; Abdul Hameed and Counsell, 2012). Small businesses are very vulnerable to customer pressure, since they are more likely to be economically dependent on larger customers for their survival. The pressure from trading partners and customers is particularly high for small organizations compared to larger businesses (Iacovou et al., 1995). Studies have provided evidence that significance of external pressure in IT innovation adoption and hypothesized external pressure can have a positive relationship on IT innovation adoption (Chan and Ngai, 2007; Chwelos et al., 2001; Teo et al., 2009).

5.7.3.3 Government Support

Government involvement plays an important role in promoting technological innovation in organizations (Lin, 2008). By implementing guidelines and providing financial assistance, policy makers can facilitate the adoption of IT innovations in organizations. Government through regulations can encourage the adoption of innovation in organizations (Tornatzky and Fleischer, 1990). Also, government can encourage IT adoption by providing training, technical support, independent advice and other incentives. Several researchers in recent years have studied the role of government in the adoption of IT and it is generally agreed that government support has a positive relationship on IT innovation adoption (Jeon et al., 2006; Looi, 2005).

5.7.4 CEO characteristics

Table 5.7 shows the studies and relationship for CEO characteristics for the meta-analysis.

Table 5.7 Number of correlation values for individual CEO characteristics

Code	CEO Characteristics	No. of SDY w COR	Total No. of REL	Code	CEO Characteristics	No. of SDY w COR	Total No. of REL
C01	CEO innovativeness	5	7	C05	Managers age	4	6
C02	CEO attitude	5	7	C06	Managers gender	3	5
C03	CEO IT knowledge	9	14	C07	Managers educational level	4	4
C04	Managers tenure	5	8	C08	CEO involvement	0	0

No. of SDY w COR - Number of studies with correlation, Total No. of REL - Total number of relationships

Among the one-hundred-and fifty-two reviewed studies for the research, twenty-seven studies examined CEO characteristics. Only nineteen relationships were gathered for meta-analysis from fourteen studies that performed correlation analysis. The study performed meta-analysis for seven CEO characteristics.

Table 5.8 CEO characteristics and its expected association with IT innovation adoption

Independent Variables	Description	Expected Relationship
CEO innovativeness	CEO's enthusiasum in the adoption of new innovations	Positive
CEO attitude	CEO's positive perception of the adopting and implementing IT	Positive
CEO IT knowledge	CEO's basic knowledge of technological innovation	Positive
Managers tenure	The number year the manager is in the management position	Positive
Manager's age	The age of the senior manager of an organization	Negative
Manager's gender	The gender of the senior manager of an organization	Negative
Managers educational level	The level of education attained by the senior manager of an organization	Positive

CEO innovativeness, CEO Attitude, CEO IT knowledge, manager's tenure, manager's age, manager's gender and manager's educational level were examined for meta-analysis. Appendix F shows the studies considered in the analysis for CEO characteristics. Table 5.8 illustrates the CEO characteristics considered for the meta-analysis and its expected association with IT innovation adoption.

5.7.4.1 CEO Innovativeness

CEOs can influence IT innovation adoption by virtue of their innovativeness and interest toward change. Due to the dominant role of CEO particularly in small businesses, these aspects are essential in the adoption of IT. CEO willingness to innovate dictates IT innovation adoption (Thong and Yap, 1995). Cragg and King (1993) discuss the role of CEO as a product champion. In small businesses, the CEO is usually the owner and the sole decision maker and CEO's innovativeness and involvement contributes to the success of any IT innovation adoption process (Poon and Swatman, 1998). Innovative CEO's are willing to take risks and prefer solutions that have not been tried before (Thong, 1999). Past literature found CEO innovativeness significantly and positively influenced the adoption of IT innovations (Thong and Yap, 1995; Thong, 1999; Mirchandani and Motwani, 2001).

5.7.4.2 CEO Attitude

The CEO's perception of new innovation plays an important role in IT innovation adoption. CEO's innovativeness and favourable attitude towards new technology positively affects IT innovation adoption (Damanpour, 1991). According to Rogers (1983), the creation of attitude towards an innovation happens before a decision to adopt has been made. Top management's favourable attitude assists all stages of IT innovation adoption. In the initiation stage, managers' help develop awareness among the organizational members; in the adoption-decision stage they are responsible for allocating necessary resources and in the implementation stage they can create an environment for smooth integration into the organizational settings. Mehrtens et al., (2001) found a direct link between CEO's positive attitude towards adoption of IT and success of adoption process. Every adoption process is associated with uncertainty; however, a CEO with more positive attitude challenges these risks and continues to maintain their enthusiasm by committing increasing amounts of resources.

5.7.4.3 CEO IT knowledge

Individual characteristics of CEO play an important role in the adoption and assimilation of IT in organizations. Amongst these, CEO's IT knowledge was found to have a strong correlation with IT innovation adoption (Thong and Yap, 1995; Jeon et al., 2006; Chan and Ngai, 2007). IT innovation adoption and implementation are more likely to be successful if the CEO possesses a high levels of IT knowledge (Thong, 2001). A CEO with more IT knowledge is able to assess the benefits of new technology and more likely to adopt innovation. CEOs with adequate IT knowledge have a more accurate outlook from the new innovation and will be more willing to participate in the IT implementation process (Thong, 2001).

Lack of IT knowledge creates uncertainty and it is only the awareness through knowledge that informs confidence in new innovation which facilitates adoption (Rogers, 1995). Gable and Raman (1992) found that CEOs in small organizations lack the basic knowledge of IT and have insufficient awareness of the potential benefits of IT innovation adoption. CEOs with no IT knowledge are less likely to commit resources to IT innovation adoption.

5.7.4.4 Manager's Tenure

Manager's tenure refers to the length of time the CEO has been in their current job. Researchers found contradictory results when examining manager's tenure. Experienced managers with their organizational 'know how' can facilitate a smooth adoption processes and at the same time use their authority to establish an atmosphere for a successful IT implementation (Kimberly and Evanisko, 1981). CEOs with longer tenure have a better knowledge of organizational operations and are more competent in handling unforeseen events that may arise due to the adoption of IT. Hence, more experienced managers will be more advantageous for the adoption of more complex innovation (Damanpour and Schneider, 2009).

On the other hand, some researchers argue that top managers new to their position bring innovative ideas and are more open to change (Huber et al., 1993). In an empirical study Sharma and Rai (2003) found that organizations with a CEO on a shorter tenure had a higher adoption rate. However, the majority of studies that have investigated manager tenure verified a significant influence on IT innovation adoption (Damanpour and Schneider, 2006). Hence, a positive association can be predicted for the relationship between manager's tenure and IT innovation adoption.

5.7.4.5 Manager's Age

Research in innovation adoption suggests that age of the senior manager influences adoption processes (Damanpour and Schneider, 2006; 2009). Younger managers are more interested in new innovative ideas and are more willing to take risks than older managers (Danmanpour and Schneider, 2006; Chuang et al., 2009). Three reasons why a young manager tends to adopt more innovation than an older manager identified by Damanpour and Schneider (2006) were: (1) a younger manager had a more solid perception in their decision making for the reason that their cognitive abilities such as learning, intellectual and memory are better (2) younger managers were more willing to take risks involved in IT innovation adoption and finally, (3) their technical knowledge was more up to date compared to older managers. Although older managers may be more experienced in organizational operations and are more familiar with the critical issues that may arise during adoption processes, they tend to avoid risks (Chuang et al., 2009). Based on reasoning, the majority of research has hypothesized that managers age negatively influenced the adoption and implementation of IT (Damanpour and Schneider, 2006; Chuang et al., 2009).

5.7.4.6 Manager's gender

The gender characteristics of an organizational leader play an important role in the adoption and implementation of IT (Igbaria et al., 1989). Researchers have identified that men and women are different in their communication skills, socializing with others and their ability to take risks which might influence the adoption process (Hooijberg and DiTomaso, 1996). In the IS literature, the difference between men and women has been examined in terms of computer attitudes, computer use and computer practices (Palvia and Palvia, 1999). Research findings on the effect of gender on innovation adoption are mixed. For the use of IT by both genders, Igbaria et al., (1998) found that males use more software packages while females are keener on using application packages. Gefen and Straub (1997) found that some differences exist between men and women in their initial expectation from the performance of the innovation; however, gender differences do not affect actual use. Damanpour and Schneider (2006) and Chuang et al., (2009) found no gender differences among CEO's in the adoption and implementation of IT innovation in organizations.

5.7.4.7 Manager's educational level

Rogers (1995) stated that manager's ability to reduce uncertainty of the new innovation would facilitate innovation adoption. CEO's educational level plays an important role in both identifying the need for innovation, reduced uncertainty in adoption process and creating a favourable environment for its implementation (Damanpour and Schneider 2006). Educated top managers are expected to demonstrate novel thinking and use more complex and diverse methodologies for problem solving (Damanpour and Schneider, 2009). Hence, a highly educated top manager is expected to have a better understanding on the value of IT and positively influences the adoption and implementation of new innovations in organizations.

5.7.5 User Acceptance characteristics

To assess user acceptance characteristics, among the one-hundred-and-fifty-two studies, the research reviewed thirty-six studies that performed an individual level analysis for the IT innovation adoption in organization. The reviewed literature showed that some organizational level studies have also considered user acceptance characteristics. However, the research evaluated the user acceptance of IT in an individual context; studies that analysed in terms of individual in an organizational setting were considered for the analysis. From the thirty-six studies that assessed user acceptance characteristics, only twenty studies provided correlation values for the user acceptance characteristics.

As the study used three theoretical models of TRA, TAM and TPB to assess user acceptance of IT, the study only considered the constructs of these three models for the meta-analysis. Hence, potential characteristics for the meta-analysis user acceptance determinants were subjective norm from TRA, perceived usefulness and perceived ease of use from TAM and finally, facilitating conditions and computer self-efficacy from TPB. In addition, among these constructs, the study considered the variables that provided more than four correlation values.

Table 5.9 Number of correlation values for user acceptance characteristics

Code	User Acceptance Characteristics	No. of SDY w COR	Total No. of REL	Code	User Acceptance Characteristics	No. of SDY w COR	Total No. of REL
A01	Perceived usefulness	11	16	A08	Subjective norm	4	7
A02	Perceived ease of use	9	14	A19	Facilitating conditions	2	5

No. of SDY w COR - Number of studies with correlation, Total No. of REL - Total number of relationships

Table 5.9 illustrates the number of studies that performed correlation analysis and number of relationships that were gathered for each individual use acceptance characteristics. Meta-analysis was carried out for perceived usefulness, perceived ease of use, subjective norm and facilitating conditions. Appendix G shows the studies considered in the analysis for user acceptance determinants. It shows sample size for each study, tests of significance and correlation values for the relationship between determinants and IT innovation adoption.

Table 5.10 provides a description of each of the variables and its expected association for IT innovation adoption in organizations.

Table 5.10 User acceptance characteristics and its expected association with IT innovation adoption

Independent Variables	Description	Expected Relationship
Perceived Usefulness	the degree to which a person believes that using a particular system would enhances one's job performance	Positive
Perceived Ease of Use	the degree to which a person believes that using a particular system would be free of effort	Positive
Subjective norm	social influences from individuals or groups, either agreeing or disagreeing on a particular behavior	Positive
Facilitating conditions	the belief about the availability of resources for facilitating the behavior.	Positive

5.7.5.1 Perceived usefulness

Perceived usefulness is defined as "the degree to which a person believes that using a particular system would enhance his or her job performance" (Davis, 1989, pp. 320). Perceived usefulness is a factor derived from TAM which hypothesizes that perceived usefulness affects IT usage due to reinforcement values of outcomes. Research found that user acceptance of IT is driven to a large extent by perceived usefulness (Davis et al., 1989; Adams et al., 1992). Davis et al., (1989) reported that perceived usefulness was a major determinant of behavioural intention to use. If an individual perceives an innovation to be helpful for their work, it is more likely it will be adopted and use. Literature reported that perceived usefulness is positively related with system usage and several studies confirmed the effect of perceived usefulness on behavioural intention to use (Igbaria and Iivari, 1995; Roberts and Henderson, 2000; Burton-Jones and Hubona, 2005). Hence, perceived usefulness is positively related to user acceptance of IT.

5.7.5.2 Perceived ease of use

Perceived ease of use refers to "the degree to which a person believes that using a particular system would be free of effort" (Davis, 1989, pp. 320). Perceived ease of use is one of a principal belief constructs of TAM in explaining technology usage. Innovations that are perceived to be less complex and easier to use are more likely to be accepted and used by the potential users. Individuals want to minimize the effort needed in their behaviour (Venkatesh, 2000). Hence, perceived ease of use is positively related to user acceptance of IT. Ease of use has been examined by several studies and found to be a key variable in explaining the user acceptance of IT (Davis et al., 1989; Adams et al., 1992; Money and Turner, 2005; Karahanna et al., 2006)

5.7.5.3 Subjective norm

According to the TRA model, besides an individual's perception and beliefs, social influences may impact behaviours. Fishbein and Ajzen (1975) describe such influences as the normative belief to perform certain behaviour and termed subjective norms. In this context, a subjective norm is referred to as one's perception that people who is important to that individual thinks that they should or should not perform the behaviour under consideration (Ajzen and Fishbein, 1980). As far as IT acceptance is concerned, such beliefs refer to the influence of salient individuals whose opinion one would comply with in using an innovation (Zhang and Gutierrez, 2007). Users may choose to use an IT innovation if the people who are important to them say that they should use it.

Several studies have investigated the role of subjective norm. Subjective norm has been shown to be a significant attribute for user acceptance of technology in several previous studies (Igbaria et al., 1996; Karahanna et al., 1999; Venkatesh and Davis, 2000) however, Davis et al., (1989) and Mathieson (1991) found no direct effect. Studies have confirmed the effect of subjective norm for the acceptance of personal computer (Al-khaldi and Wallace, 1999), websites (Riemenschneider et al., 2003), telemedicine (Chau and Hu, 2001), IS (Adamson and Shine, 2003), banking systems (Brown et al., 2002) and MIS (Zhang and Gutierre, 2007).

5.7.5.4 Facilitating conditions

A facilitating condition is defined as the degree to which an individual believes that organizational and technical infrastructure exists to support use of the system. TPB proposed facilitating conditions as a determinant of PBC. Literature suggests a positive relationship between facilitating conditions and IT innovation use (Venkatesh et al., 2003). In addition, Venkatesh et al., (2003) suggest that facilitating conditions have a direct association with usage behaviour.

5.8 Summary

This chapter described the meta-analysis procedure employed to identify key factors that influence IT innovation adoption in organizations. The meta-analysis procedure described by Hunter et al., (1982) was considered for the study and aggregated the values of correlation coefficient to derive an overall effect for the relationship between factors and IT innovation adoption. Thus, for the meta-analysis, the studies that provided correlation values for the relationship between various determinants and IT innovation adoption were selected.

The study identified four moderator conditions which affect the relationships between various determinants and IT innovation adoption. They are the stage of innovation, type of innovation, type of organization and size of organization. To perform the meta-analysis moderator effect, the conditions were categories as (a) stage of innovation: initiation, adoption and implementation; (b) type of innovation: product and process; (c) type of organization: manufacturing and service; and (d) size of organization: large and small.

Chapter 6

Results and Discussions of the Meta-analysis

Adoption process of IT innovations in organizations

6.1 Introduction

One of the aims of the research presented in this Thesis was to identify major determinants that influenced the adoption and use of IT innovations in organizations. The study performed meta-analysis of past findings on IT innovation adoption determinants of innovation, organization, environment, CEOs and user acceptance. This was performed according to procedures explained by Hunter et al., (1982) and carried out the five steps described in Section 5.4 for each of the five categories of factors.

The study evaluated the aggregated tests of significance for each of the individual characteristics that influence IT innovation adoption in organizations. To find the strength and magnitude each of the factors, the study performed the meta-analysis on past empirical findings. The result of the correlation coefficients provided by the individual studies for the association between the individual characteristics and IT innovation adoption were aggregated to find the overall effect size for the relationship.

In addition, to find the effect of each four moderators identified in Section 5.5, for the relationship between each individual attribute and IT innovation adoption, the studies were divided into the sub-categories of moderator and meta-analysis was performed for each individual sub-group. The results for each sub-group were then compared to find the effects of these conditions on the relationship between individual factors and IT innovation adoption.

The rest of the chapter is arranged as follow: Sections 6.2, 6.3, 6.4, 6.5 and 6.6 illustrate results of aggregated tests of significance, meta-analysis and meta-analysis moderator effect for innovation, organizational, environmental, CEO and user acceptance characteristics, respectively.

6.2 Results of innovation characteristics

The review of literature enabled the extraction of a total of seventy-six studies that considered innovation characteristics influencing the adoption of IT. From these seventy-six studies, a set of one-hundred-and-two innovation characteristics and IT adoption relationships were assessed. Four relationships studied the initiation stage, seventy-two assessed the adoption-decision stage, twenty-three studied the implementation stage and three relationships studied the mixed stage of innovation adoption.

For the six innovation characteristics considered for the meta-analysis, the study gathered seventy-three studies with ninety-seven innovation adoption relationships.

6.2.1 Results of aggregated tests of significance

For all seventy-three studies extracted for the meta-analysis, the study performed tests of significance for one or more innovation characteristics. The study aggregated the results of the significance tests to determine the importance of each of the innovation characteristics for IT adoption. Table 6.1 illustrates the results of the aggregated tests of significance for innovation characteristics. For each independent variable, the table shows the total number of studies that considered the variable in column two and the total number of innovation adoption relationships in column three. Columns four and five show the total number of studies that found the variable significant and insignificant, respectively. Finally, the last column shows the computed percentage of studies that found the variable to be a significant attribute.

Table 6.1 Aggregated tests of significance for innovation characteristics

Innovation factors	No. of Studies	No of Innovation	Significant	Not Significant	% Significance
Relative advantage	60	81	64	17	79
Cost	20	31	12	19	39
Complexity	30	44	21	23	48
Compatibility	37	54	29	25	54
Trialability	9	11	7	4	64
Observability	8	10	7	3	70

The table shows that percentage of significance was more than 50% for innovation characteristics, except cost and complexity. Hedges and Olkin (1985) suggest that it would be reasonable for a study to consider an established relationship to exist between two variables when a majority of prior studies had found statistically significant results. Hence, results of aggregated tests of significance indicated existence of a relationship between relative advantage, compatibility, trialability and observability of innovation and IT adoption.

However, the result does not give the magnitude of the strength of the relationship between individual attributes. Yet, one obvious conclusion from the aggregated tests of significance was the inconsistency of findings in the reviewed studies on IT innovation adoption.

6.2.2 Meta-analysis: Innovation characteristics results

Meta-analysis was carried out to find the relationship between six innovation factors and IT innovation adoption. Table 6.2 illustrates the results of the analysis and the strength of individual innovation characteristics.

Table 6.2 Meta-analysis results of innovation characteristics

Factors	INN SDY	SAM SIZ	MEN COR	ZTR VAL	OBS VAR	SAM EVA	EXP VAR	COF INT
Relative Advantage	25	6137	0.3551	0.3710	0.0191	0.0031	16	0.35, 0.40
Cost	7	1829	0.2564	0.2620	0.0644	0.0034	5	0.22, 0.31
Complexity	18	8673	0.0681	0.0680	0.0703	0.0021	3	0.05, 0.09
Compatibility	14	4323	0.3191	0.3310	0.0202	0.0026	13	0.30, 0.36
Trailability	4	2647	0.3646	0.3820	0.1371	0.0011	1	0.34, 0.42
Observability	4	2647	0.3913	0.4130	0.0091	0.0011	12	0.37, 0.45

No. of Innovation Studied - INN SDY, Sample Size - SAM SIZ, Mean Correlation - MEN COR, ZTR VAL - Z- Transformation,
Observed Variance - OBS VAR, Sampling Error Variance - SAM EVA, Explain Variance - EXP VAR, 95% Confidence Interval - COF INT

Table 6.2 shows, for each independent variable, the total number of innovations considered for analysis (INN SDY) and total sample size (SAM SIZ). The strength of significance for each individual independent variable is denoted by mean correlation (MEN COR). The next column is Fishers' z-transformation value for the mean correlation (ZTR VAL). The calculated value for observed variance (OBS VAR) and computed sampling error due to variance (SAM VAR) are given in columns six and seven of the table, respectively. The percentage of explained variance (EXP VAR) indicates examination of the variable for moderator effects. The final column, 95% confidence interval (COF INT) indicates the association between the independent variable and IT innovation adoption.

The 95% confidence intervals of meta-analysis results verified the association (interval does not include zero) between all innovation characteristics and IT innovation adoption. The findings of the association between individual innovation factors and IT innovation adoption were in the direction as hypothesized (Table 5.2). The mean correlation results found relative advantage, compatibility, trialability and observability to have a moderate significance (correlation value between ±0.30 to ±0.49) and cost to have weak significance (correlation value between ±0.10 to ±0.29) for the relationship with IT innovation adoption. Complexity of an innovation was found to have no significance (correlation value between 0 to ±0.09) for the relationship with IT innovation adoption. The result for complexity was unexpected and the moderator effect on the relationship between complexity and IT innovation adoption was carried out to explain the outcome of this results. One possible reason might be that organizations regard more complex innovations to have better potential and hence eventually adopt IT to achieve a competitive edge in the industry.

6.2.3 Moderator effect results: Innovation characteristics

Theory suggests that moderator effect can be examined if the sampling error variance is less than 60% of observed variance. As shown in the 'explained variances' of Table 6.2, all variables have sampling error variance less than 60% of observed variance. The study therefore performed moderator effects for all six innovation characteristics.

6.2.3.1 Findings of moderator effect on relative advantage

The result of moderator effects for the relationship between relative advantage and IT innovation adoption is illustrated in Table 6.3.

Table 6.3 Meta-analysis moderator effect results for relative advantage

Moderator	INN SDY	SAM SIZ	MEN COR	ZTR VAL	OBS VAR	SAM EVA	EXP VAR	COF INT
Stage of Innovation								
Initiation	1	78	0.3200	0.3320	0.0000	0.0000	0	0.11, 0.56
Adoption	17	3743	0.3628	0.3800	0.0191	0.0034	18	0.35, 0.41
Implementation	5	2023	0.3159	0.3270	0.0154	0.0020	13	0.28, 0.37
Mixed	2	293	0.5364	0.5990	0.0057	0.0035	61	0.48, 0.71
Type of Innovation								
Product	18	2695	0.4220	0.4500	0.0237	0.0045	19	0.41, 0.49
Process	3	2452	0.3374	0.3510	0.0049	0.0010	20	0.31, 0.39
Mixed	4	990	0.2167	0.2200	0.0098	0.0037	37	0.16, 0.28
Type of organization								
Manufacturing	0	0	-	-	-	-	-	-
Service	5	614	0.4110	0.4370	0.0162	0.0057	35	0.36, 0.52
Mixed	20	5523	0.3489	0.3640	0.0191	0.0028	15	0.34, 0.39
Size of Organization								
Large	1	141	0.3000	0.3100	0.0000	0.0000	0	0.14, 0.48
Small	11	1879	0.3837	0.4040	0.0415	0.0043	10	0.36, 0.45
Mixed	13	4117	0.3439	0.3590	0.0089	0.0025	28	0.33, 0.39

No. of Innovation Studied - INN SDY, Sample Size - SAM SIZ, Mean Correlation - MEN COR, ZTR VAL - Z- Transformation,
Observed Variance - OBS VAR, Sampling Error Variance - SAM EVA, Explain Variance - EXP VAR, 95% Confidence Interval - COF INT

The mean correlation results of the meta-analysis verified that all four moderators had a significant effect on the relationship between relative advantage and IT innovation adoption. The mean correlation results for the relationship between relative advantage and IT innovation adoption found moderate significance (correlation value between ±0.30 to ±0.49) for both the adoption and implementation stages of innovation adoption. This result was consistent with some past studies on relative advantage (Premkumar and Ramamurthy, 1995; Wang and Cheung, 2004).

Mean correlation results for both product and process innovation found moderate significance (correlation value between ±0.30 to ±0.49) for the relationship between relative advantage and IT innovation adoption. However, results show that the relative advantage was a better determinant of product innovation compared with process innovation. Similarly, the meta-analysis results found moderate significance (correlation value between ±0.30 to ±0.49) for the relationship between relative advantage and IT innovation adoption in both large and small organizations. The strength of the mean correlation results showed that relative advantage was a better predictor for small organizations.

The significance of relative advantage might be explained in terms of the awareness of the direct and indirect benefits of IT. Organizations small or large are now aware of the advantages of adopting IT such as improving operational efficiency, economic benefits, reaching of global markets etc. Another interesting finding was the importance of relative advantage for the adoption of IT in small organizations. One argument might be that once the benefits of IT become evident, progression of implementation happens more rapidly in small organizations due to its centralized management structure and short-term decision making practices.

6.2.3.2 Findings of moderator effect on cost

Meta-analysis of innovation factors showed cost to be a significant attribute for adoption of IT in organizations. Table 6.4 illustrates the results of meta-analysis of the moderator effect for the relationship between cost and IT innovation adoption. The mean correlation results of meta-analysis found weak significance (correlation value between ±0.10 to ±0.29) for the relationship between cost and IT innovation adoption for all moderator sub-groups except size of organization moderator. The mean correlation and the 95% confidence interval verified that all moderator sub-groups had a positive association (interval does not include zero) between cost and IT innovation adoption.

The mean correlation result showed cost to have a weak significance (correlation value between ±0.10 to ±0.29) for the relationship between the adoption sub-category of stage of innovation and 'product' sub-category of innovation type.

One of the important results obtained from the analysis was the magnitude of the strength of the relationship between cost and IT innovation adoption for small organizations. The mean correlation results verified a moderate significance (correlation value between ±0.30 to ±0.49) for the relationship between cost and IT innovation adoption of small organizations. This result supports many of the past findings on the cost of IT innovation adoption (Jeon et al., 2006; Alam, 2009). The initial investment of an innovation could mean a substantial amount of savings for a small organization.

Table 6.4 Meta-analysis moderator effect results for cost

Moderator	INN SDY	SAM SIZ	MEN COR	ZTR VAL	OBS VAR	SAM EVA	EXP VAR	COF INT
Stage of Innovation								
Initiation	0	0	-	-	-	-	-	-
Adoption	6	1628	0.2686	0.2750	0.0710	0.0032	4	0.23, 0.32
Implementation	1	201	0.1574	0.1590	0.0000	0.0000	0	0.02, 0.30
Mixed	0	0	-	-	-	-	-	-
Type of Innovation								
Product	6	1104	0.2475	0.2530	0.1065	0.0048	5	0.19, 0.31
Process	1	725	0.2700	0.2770	0.0000	0.0000	0	0.20, 0.35
Mixed	0	0	-	-	-	-	-	-
Type of organization								
Manufacturing	0	0	-	-	-	-	-	-
Service	1	725	0.2700	0.2770	0.0000	0.0000	0	0.20, 0.35
Mixed	6	1104	0.2475	0.2530	0.1065	0.0048	5	0.19, 0.31
Size of Organization								
Large	1	141	-0.2100	-0.2130	0.0000	0.0000	0	-0.05, -0.38
Small	3	634	0.4581	0.4950	0.0600	0.0030	5	0.42, 0.57
Mixed	3	1054	0.1975	0.2000	0.0186	0.0026	14	0.14, 0.26

No. of Innovation Studied - INN SDY, Sample Size - SAM SIZ, Mean Correlation - MEN COR, ZTR VAL - Z- Transformation,
Observed Variance - OBS VAR, Sampling Error Variance - SAM EVA, Explain Variance - EXP VAR, 95% Confidence Interval - COF INT

6.2.3.3 Findings of moderator effect on complexity

As shown in Table 6.2, the result of the meta-analysis found complexity an insignificant (correlation value between 0 to ±0.09) attribute for the adoption of IT innovations. Table 6.5 illustrates the results of meta-analysis of moderator effect on the relationship between complexity and IT innovation adoption. The mean correlation results of the meta-analysis of moderator sub-groups found either a weak significance (correlation value between ±0.10 to ±0.29) or insignificant (correlation value between 0 to ±0.09) relationship with IT innovation adoption. This result was consistent with many past findings (Fletcher et al., 1996; Lai and Guynes, 1997; Damanpour and Schneider, 2009).

However, one of the interesting results in the meta-analysis of moderator effect for the relationship between complexity and IT innovation adoption appeared in the stage of innovation moderator. Complexity was found to have a weak significance (correlation value between ±0.10 to ±0.29) for both the adoption-decision stage and the implementation stage. The study found that the association between complexity and IT innovation adoption for the implementation stage was in the opposite direction. This means that in the implementation stages, organizations tend to adopt more sophisticated innovations. One possible argument for this might be that organizations tend to consider less complex innovations in the initiation and adoption-decision stages. Nonetheless, in anticipation of greater potential if the organization decides to adopt a more complex innovation, they are more likely to spend more time and effort in familiarizing themselves with the new innovation and accepting these complex innovations.

Table 6.5 Meta-analysis moderator effect results for complexity

Moderator	INN SDY	SAM SIZ	MEN COR	ZTR VAL	OBS VAR	SAM EVA	EXP VAR	COF INT
Stage of Innovation								
Initiation	1	1276	0.1800	0.1820	0.0000	0.0000	0	0.13, 0.24
Adoption	10	4127	0.1773	0.1790	0.0190	0.0023	12	0.15, 0.21
Implementation	5	3012	-0.1459	-0.1470	0.1046	0.0016	2	-0.11, -0.18
Mixed	2	258	0.2648	0.2710	0.0113	0.0068	60	0.15, 0.39
Type of Innovation								
Product	9	1080	0.1169	0.1170	0.0671	0.0082	12	0.06, 0.18
Process	7	7005	0.0543	0.0540	0.0753	0.0010	1	0.03, 0.08
Mixed	2	588	0.1425	0.1430	0.0044	0.0033	74	0.06,0.22
Type of organization								
Manufacturing	1	51	-0.6930	-0.8540	0.0000	0.0000	0	-0.57, -1.0
Service	5	1151	0.0673	0.0670	0.0259	0.0043	17	0.01, 0.12
Mixed	12	7471	0.0734	0.0740	0.0736	0.0016	2	0.05,0.10
Size of Organization								
Large	2	137	-0.1862	-0.1880	0.1523	0.0138	9	-0.02, -0.36
Small	4	887	0.1936	0.1960	0.0134	0.0042	31	0.13, 0.26
Mixed	12	7649	0.0581	0.0580	0.0723	0.0016	2	0.04, 0.08

No. of Innovation Studied - INN SDY, Sample Size - SAM SIZ, Mean Correlation - MEN COR, ZTR VAL - Z- Transformation,
Observed Variance - OBS VAR, Sampling Error Variance - SAM EVA, Explain Variance - EXP VAR, 95% Confidence Interval - COF INT

Similarly, while the meta-analysis results of the moderator effect of size of organization for the relationship between complexity and IT innovation adoption found weak significance (correlation value between ±0.10 to ±0.29), the association between complexity and IT innovation adoption for large organizations appeared in the opposite direction. One plausible explanation might be that complex innovations are perceived to have greater potential and large organizations can risk possessing these innovations to gain a competitive edge. On the other hand, small organizations due to lack of financial, technical and human resource cannot afford to take such risks.

6.2.3.4 Findings of moderator effect on compatibility

Compatibility of an innovation was found to have moderate significance (correlation value between ±0.30 to ±0.49) for IT innovation adoption (Table 6.2). Table 6.6 illustrates the meta-analysis results of the moderator effects on the relationship between compatibility and IT innovation adoption. The results of the meta-analysis found moderate significance (correlation value between ±0.30 to ±0.49) for the relationship between compatibility and IT innovation adoption for most moderator conditions. The result supports the findings of several past empirical outcomes (Mirchandani and Motwani, 2001; Plouffe et al., 2001; Al-Gahtani, 2004; Jeon et al., 2006).

Table 6.6 Meta-analysis moderator effect results for compatibility

Moderator	INN SDY	SAM SIZ	MEN COR	ZTR VAL	OBS VAR	SAM EVA	EXP VAR	COF INT
Stage of Innovation								
Initiation	0	0	-	-	-	-	-	-
Adoption	8	2214	0.3163	0.3280	0.0115	0.0029	25	0.29,0.37
Implementation	5	1937	0.2991	0.3090	0.0254	0.0021	8	0.26, 0.35
Mixed	1	172	0.5800	0.6620	0.0000	0.0000	0	0.51, 0.81
Type of Innovation								
Product	7	881	0.3662	0.3840	0.0325	0.0060	18	0.32,0.45
Process	3	2452	0.3734	0.3920	0.0032	0.0009	28	0.35, 0.43
Mixed	4	990	0.1426	0.1440	0.0108	0.0039	36	0.08, 0.21
Type of organization								
Manufacturing	1	51	0.2900	0.2990	0.0000	0.0000	0	0.02, 0.58
Service	3	340	0.3541	0.3700	0.0523	0.0068	13	0.26, 0.48
Mixed	10	3932	0.3164	0.3280	0.0176	0.0021	12	0.30, 0.36
Size of Organization								
Large	1	51	0.2900	0.2990	0.0000	0.0000	0	0.02,0.58
Small	5	949	0.2888	0.2970	0.0283	0.0045	16	0.23, 0.36
Mixed	8	3323	0.3282	0.3410	0.0178	0.0019	11	0.31,0.38

No. of Innovation Studied - INN SDY, Sample Size - SAM SIZ, Mean Correlation - MEN COR, ZTR VAL - Z- Transformation, Observed Variance - OBS VAR, Sampling Error Variance - SAM EVA, Explain Variance - EXP VAR, 95% Confidence Interval - COF INT

The mean correlation results suggest that compatibility was a significant determinant for both product innovation and process innovation. One explanation for this might be that process innovations involve changing the entire working system; this demands an alternative method that performs better and is well-suited to the functions of the organization. Correspondingly, product innovation often involves addition of a product or service which also requires a higher degree of compatibility with an existing product or system.

The study found that compatibility was an important predictor for service firms. One plausible explanation for this might be that service firms are characterized by more customer participation in their operations; compatibility of innovation with the work practice of business partners and potential customers are critically important.

6.2.3.5 Findings of moderator effect on trialability

As shown in Table 6.2, the mean correlation results of the meta-analysis found moderate significance (correlation value between ±0.30 to ±0.49) for the relationship between trialability and IT innovation adoption. Table 6.7 illustrates the meta-analysis results of four moderator effects on the relationship between trialability and IT innovation adoption.

Table 6.7 Meta-analysis moderator effect results for trialability

Moderator	INN SDY	SAM SIZ	MEN COR	ZTR VAL	OBS VAR	SAM EVA	EXP VAR	COF INT
Stage of Innovation								
Initiation	0	0	-	-	-	-	-	-
Adoption	2	1285	0.4287	0.4580	0.0001	0.0001	100	0.40, 0.51
Implementation	1	1190	0.2960	0.3050	0.0000	0.0000	0	0.25, 0.36
Mixed	1	172	0.3600	0.3770	0.0000	0.0000	0	0.23, 0.53
Type of Innovation								
Product	2	267	0.3742	0.3930	0.0004	0.0004	100	0.27, 0.51
Process	2	2380	0.3635	0.3810	0.0046	0.0006	14	0.34, 0.42
Mixed	0	0	-	-	-	-	-	-
Type of organization								
Manufacturing	0	0	-	-	-	-	-	-
Service	1	172	0.3600	0.3770	0.0000	0.0000	0	0.23, 0.53
Mixed	3	2475	0.3649	0.3830	0.0044	0.0009	21	0.34, 0.42
Size of Organization								
Large	0	0	-	-	-	-	-	-
Small	1	95	0.4000	0.4240	0.0000	0.0000	0	0.22, 0.63
Mixed	3	2552	0.3633	0.3810	0.0042	0.0009	21	0.34, 0.42

No. of Innovation Studied - INN SDY, Sample Size - SAM SIZ, Mean Correlation - MEN COR, ZTR VAL - Z- Transformation, Observed Variance - OBS VAR, Sampling Error Variance - SAM EVA, Explain Variance - EXP VAR, 95% Confidence Interval - COF INT

The results of the mean correlation for all moderator sub-groups showed moderate significance (correlation value between ±0.30 to ±0.49), for the relationship between trialability and IT innovation adoption. This result is consistent with some of the past findings (Seyal and Rahman, 2003; Al-Gahtani, 2004). Furthermore, the 95% confidence interval verified a positive association (interval does include zero) between trialability and IT innovation adoption for all moderating conditions.

The availability of new technology on a trial basis would help organizations in their decision to adopt the innovation. As confirmed from the meta-analysis results, trialability was a better determinant of the adoption stage compared to implementation stage. This result supports the findings of some of the literature (Karahanna et al., 1999; Al-Gahtani, 2004).

6.2.3.6 Findings of moderator effect on observability

The meta-analysis result found that observability of an innovation had a moderate significance (correlation value between ±0.30 to ±0.49) in the adoption of IT. Table 6.8 illustrates results of the meta-analysis of moderator effect on the relationship between observability and IT innovation adoption. The mean correlation results for all sub-groups of moderating conditions showed moderate significance (correlation value between ±0.30 to ±0.49) for the relationship between observability and IT innovation adoption. The 95% confidence interval verified a positive association (interval does not include zero) for all the sub-groups of four moderators on the relationship between observability and IT innovation adoption.

Table 6.8 Meta-analysis moderator effect results for observability

Moderator	INN SDY	SAM SIZ	MEN COR	ZTR VAL	OBS VAR	SAM EVA	EXP VAR	COF INT
Stage of Innovation								
Initiation	0	0	-	-	-	-	-	-
Adoption	2	1285	0.3194	0.3310	0.0026	0.0013	48	0.28, 0.39
Implementation	1	1190	0.4880	0.5330	0.0000	0.0000	0	0.48, 0.59
Mixed	1	172	0.2600	0.2660	0.0000	0.0000	0	0.12, 0.42
Type of Innovation								
Product	2	267	0.3454	0.3600	0.0132	0.0059	44	0.24, 0.48
Process	2	2380	0.3965	0.4190	0.0084	0.0006	7	0.38, 0.46
Mixed	0	0	-	-	-	-	-	-
Type of organization								
Manufacturing	0	0	-	-	-	-	-	-
Service	1	172	0.2600	0.2660	0.0000	0.0000	0	0.12, 0.42
Mixed	3	2475	0.4005	0.4240	0.0084	0.0009	10	0.38, 0.46
Size of Organization								
Large	0	0	-	-	-	-	-	-
Small	1	95	0.5000	0.5490	0.0000	0.0000	0	0.34, 0.75
Mixed	3	2552	0.3873	0.4090	0.0090	0.0009	9	0.37, 0.45

No. of Innovation Studied - INN SDY, Sample Size - SAM SIZ, Mean Correlation - MEN COR, ZTR VAL - Z- Transformation, Observed Variance - OBS VAR, Sampling Error Variance - SAM EVA, Explain Variance - EXP VAR, 95% Confidence Interval - COF INT

One interesting result of moderator effect on the relationship between observability and IT innovation adoption appeared in the ‘type of innovation’ sub-groups. The meta-analysis showed that observability of an innovation was more significant for process innovation than it was for product innovation. One possible justification might be that since process innovation involves changing the entire working procedures, organizations require visible proof of its success before a decision can be made to adopt it.

6.3 Results of Organizational Characteristics

From the one-hundred-and-fifty-two studies, a total of one-hundred-and-five studies considered organizational factors with a set of one-hundred-and-seventy-three innovation adoption relationships. Nine relationships considered the initiation stage of adoption, one-hundred-and-twenty-two relationships examined adoption-decision stage, forty-nine verified relationships at the implementation stage and eight assessed mixed stages of innovation adoption. For the eleven organizational characteristics considered for the meta-analysis, the study gathered ninety-six studies with one-hundred-and-sixty-two innovation adoption relationships.

6.3.1 Results of aggregated tests of significance

Table 6.9 shows the aggregated significance tests results for the independent variables considered for the meta-analysis. The table shows for each organizational factor, the number of studies that considered the attribute, total number of relationships found from those studies, number of relationships found to be significant or in agreement with the hypothesis and the number of relationships found to be insignificant or in disagreement with the hypothesis.

Table 6.9 Aggregated tests of significance for organizational characteristics

Organizational factors	No. of Studies	No of Innovation	Significant	Not Significant	% Significance
Top management support	40	51	39	12	76
Organizational size	53	102	64	38	63
IT expertise	40	59	43	16	73
Product champion	16	18	15	3	83
Centralization	14	35	16	19	46
Formalization	13	27	10	17	37
IS department size	9	34	22	12	65
IS infrastructure	16	28	19	9	68
Information intensity	13	21	11	10	52
Resources	23	44	23	21	52
Specialization	7	28	22	6	79

In terms of the percentage, 83% of studies found product champion significant while specialization, top management support and IT expertise were found to be significant by 79%, 76% and 73% studies, respectively. Only 37% of the studies found formalization to be a factor relevant to IT innovation adoption. Applying the suggestion of Hedges and Olkin (1985) for the aggregated tests of significance, the results showed that except for formalization and centralization, all other organizational variables were found to be germane to the IT innovation adoption in organizations.

The results do not provide any mechanism for generalizing and identifying the impact of different organizational attributes for IT innovation adoption. However, significance test results again demonstrate the inconsistency of findings in the IT innovation studies.

6.3.2 Meta-analysis: Organizational characteristics results

Table 6.10 shows the meta-analysis results for the relationship between the eleven organizational factors and IT innovation adoption.

The meta-analysis results confirmed the relationship between organizational attributes and IT innovation adoption except for centralization and formalization. The results of the 95% confidence interval found an association (interval does not include zero) with IT innovation adoption for all factors. Mean correlation results showed that the strongest relationship with innovation adoption was IS department size (moderate significance - correlation value between ±0.30 to ±0.49). The impact of IS department size on IT innovation adoption was evident from the thirty-four reviewed relationships on the variable, of which twenty-two found significance (Fichman, 2001; Pervan et al., 2005).

Table 6.10 Meta-analysis results of organizational characteristics

Factors	INN SDY	SAM SIZ	MEN COR	ZTR VAL	OBS VAR	SAM EVA	EXP VAR	COF INT
Organizational Size	38	14496	0.1922	0.1950	0.0193	0.0024	13	0.18, 0.21
IT Expertise	24	6605	0.2581	0.2640	0.0368	0.0032	9	0.24, 0.29
Resources	21	8555	0.2069	0.2100	0.0254	0.0023	9	0.19, 0.23
Top Management Support	18	2699	0.2941	0.3030	0.0136	0.0056	41	0.27, 0.34
Specialization	15	5522	0.2697	0.2770	0.0320	0.0023	7	0.25, 0.30
IS Department Size	12	4922	0.4015	0.4250	0.0107	0.0017	16	0.40, 0.45
Centralization	11	1914	-0.0786	-0.0790	0.0516	0.0057	11	-0.12, -0.03
Formalization	12	1701	0.0872	0.0870	0.0275	0.0070	25	0.04, 0.13
IS Infrastructure	12	7579	0.2734	0.2810	0.0160	0.0014	9	0.26, 0.30
Information Intensity	7	1239	0.2186	0.2220	0.0164	0.0052	31	0.17, 0.28
Product Champion	4	855	0.1450	0.1460	0.0193	0.0045	23	0.08, 0.21

No. of Innovation Studied - INN SDY, Sample Size - SAM SIZ, Mean Correlation - MEN COR, ZTR VAL - Z- Transformation, Observed Variance - OBS VAR, Sampling Error Variance - SAM EVA, Explain Variance - EXP VAR, 95% Confidence Interval - COF INT

The results also suggest that top management support, organizational size, IT expertise, product champion, IS infrastructure, information intensity, resources and specialization had only a weak significance with IT innovation adoption (correlation value between ±0.10 to ±0.29). Among these factors, product champion, organizational size and resources were found have the weakest relationship. It had been widely expected that resources and organizational size would be more influential in organizational IT innovation adoption. One possible reason for this result might be the relatively low setup cost of IT in the past few years. As a result, the amount of resources that have to be committed to the adoption of IT has become minimal. Also, managers are aware of the benefits of IT and might be less reluctant to commit resources to IT innovation adoption.

The mean correlation results of formalization and centralization showed insignificance (correlation value between 0 to ±0.09) for the relationship between these variables and IT innovation adoption. The reviewed literature suggests that formalization and centralization were two variables which demonstrated the largest inconsistencies in findings. The result for formalization was consistent with the meta-analysis result of organizational attributes by Damanpour (1991). For centralization, the meta-analysis found a negative association which corroborates findings of many past studies (Eder and Igbaria, 2001). However, Damanpour (1991) found centralization to have significant and negative association with IT innovation adoption.

6.3.3 Moderator effect results: Organizational characteristics

The result for explained variance (EXP VAR) for the relationship between organizational attributes and IT innovation adoption showed that all organizational factors examined have sampling error variance less than 60% of the observed variance. Hence, the study performed meta-analysis moderator effects for the relationship between all organizational attributes considered and IT innovation adoption.

6.3.3.1 Findings of moderator effect on top management support

Table 6.11 illustrates the results of the moderator effects on the relationship between top management support and IT innovation adoption. The mean correlation and 95% confidence interval of all four moderators showed significant (values > 0.10) and a positive association (confidence interval does not include zero) for the relationship between top management support and IT innovation adoption. This result supports past findings of top management support (Bradford and Florin, 2003; Liang et al., 2007; Rai et al., 2009).

A significant divergence was observed for the influence of top management support on the adoption of product and process innovation. Mean correlation results of the meta-analysis for the relationship between top management support and IT innovation adoption showed a moderate significance (correlation value between ±0.30 to ±0.49) for product innovation while a weak significance (correlation value between ±0.10 to ±0.29) for process innovation. One probable argument for this result might be that the adoption of process innovation involves a total departure from the existing system to a new ways of performing operations, a collective effort from personnel in different ranks of the organizations are required for effective implementation.

Another notable result of moderator effect showed that top management support was more significant for small organizations than large organizations, although both found moderate significance (correlation value between ±0.30 to ±0.49). The literature also suggests that management support may be much more important in small organizations compared to larger ones (Igbaria et al., 1997). One explanation could be that in small organizations, the top manager is usually the owner and makes all key organizational decisions including adoption of new IT; as such, their support is a vital requirement for the allocation of necessary resources for IT innovation adoption and implementation. In small organizations, it is unlikely that the innovation be adopted without the consent of top manager.

Meta-analysis moderator effect results also showed that top management support was more significant for the adoption-decision stage compared to the implementation stage of IT innovation adoption. It appears that once top management has committed to the IT adoption process, their support becomes less of an issue in the implementation stage of IT innovation adoption.

Table 6.11 Meta-analysis moderator effect results for top management support

Moderator	INN SDY	SAM SIZ	MEN COR	ZTR VAL	OBS VAR	SAM EVA	EXP VAR	COF INT
Stage of Innovation								
Initiation	0	0	-	-	-	-	-	-
Adoption	10	1390	0.3165	0.3280	0.0163	0.0059	36	0.28, 0.38
Implementation	8	1309	0.2703	0.2770	0.0096	0.0053	55	0.22, 0.33
Mixed	0	0	-	-	-	-	-	-
Type of Innovation								
Product	13	2064	0.3234	0.3350	0.0097	0.0051	52	0.29, 0.38
Process	3	233	0.1513	0.1520	0.0315	0.0125	40	0.02, 0.28
Mixed	2	402	0.2265	0.2300	0.0024	0.0024	100	0.13, 0.33
Type of organization								
Manufacturing	1	51	0.4710	0.5110	0.0000	0.0000	0	0.23, 0.79
Service	0	0	-	-	-	-	-	-
Mixed	17	2648	0.2907	0.2990	0.0132	0.0054	41	0.26, 0.34
Size of Organization								
Large	4	754	0.3302	0.3430	0.0038	0.0038	100	0.27, 0.41
Small	4	271	0.3703	0.3890	0.0402	0.0112	28	0.27, 0.51
Mixed	10	1674	0.2655	0.2720	0.0114	0.0052	46	0.22, 0.32

No. of Innovation Studied - INN SDY, Sample Size - SAM SIZ, Mean Correlation - MEN COR, ZTR VAL - Z- Transformation,
Observed Variance - OBS VAR, Sampling Error Variance - SAM EVA, Explain Variance - EXP VAR, 95% Confidence Interval - COF INT

6.3.3.2 Findings of moderator effect on organizational size

Table 6.12 illustrates the results of the meta-analysis of moderator effects on the relationship between organizational size and adoption of IT. For all sub-groups categorized by stage of innovation (initiation, adoption, implementation and mixed), mean correlation and 95% confidence intervals verified a significant (value > 0.10) and positive association (confidence interval does not include zero) between organizational size and IT innovation adoption. This result corroborates some of the past findings on organizational size (Damanpour and Schneider, 2006). It is important to note that organizational size was a more important predictor at the adoption-decision stage of innovation compared to the implementation stage. One argument might be that once the benefits of IT become evident, progression of implementation happens more rapidly in small organizations due to its centralized management structure and short-term decision making practices. Another explanation might be that in small organizations all the key decisions are often made exclusively by the owner and the phases it has to pass for final judgment on the implementation is less than in a large organization. The size of the organization reflects several important aspects of the organization, including resource availability, decision agility and prior technology experience (Rai et al., 2009); these features influence the adoption-decision stage more than any other stage of innovation adoption. It is the adoption-decision stage where an assessment on the allocation of resources for the innovation adoption is carried out and the availability of necessary resources depends to a large extent on the size of an organization.

The results for mean correlation suggest that organizational size was a more significant attribute for process innovation than product innovation. These results can be explained by the fact that process innovation involves replacing the entire system or work procedure; small organizations will not therefore generally have the required resources for such a change (Teo et al., 2009).

Table 6.12 Meta-analysis moderator effect results for organizational size

Moderator	INN SDY	SAM SIZ	MEN COR	ZTR VAL	OBS VAR	SAM EVA	EXP VAR	COF INT
Stage of Innovation								
Initiation	2	3133	0.1752	0.1770	0.0062	0.0006	10	0.14, 0.21
Adoption	23	6936	0.2156	0.2190	0.0237	0.0030	13	0.20, 0.24
Implementation	11	4220	0.1641	0.1660	0.0176	0.0025	14	0.14, 0.20
Mixed	2	207	0.2381	0.2430	0.0632	0.0087	14	0.11, 0.38
Type of Innovation								
Product	20	8085	0.1430	0.1440	0.0221	0.0024	11	0.12, 0.17
Process	15	5657	0.2366	0.2410	0.0066	0.0024	36	0.21, 0.27
Mixed	3	754	0.3859	0.4070	0.0059	0.0029	49	0.34, 0.48
Type of organization								
Manufacturing	6	408	0.2669	0.2740	0.0123	0.0123	100	0.18, 0.37
Service	13	2421	0.2721	0.2790	0.0426	0.0046	11	0.24, 0.32
Mixed	19	11667	0.1730	0.1750	0.0128	0.0015	12	0.16, 0.19
Size of Organization								
Large	13	2125	0.2168	0.2200	0.0585	0.0056	10	0.18, 0.26
Small	8	1411	0.2677	0.2740	0.0319	0.0049	15	0.22, 0.33
Mixed	17	10960	0.1777	0.1800	0.0090	0.0015	16	0.16, 0.20

No. of Innovation Studied - INN SDY, Sample Size - SAM SIZ, Mean Correlation - MEN COR, ZTR VAL - Z- Transformation, Observed Variance - OBS VAR, Sampling Error Variance - SAM EVA, Explain Variance - EXP VAR, 95% Confidence Interval - COF INT

It is important to note the weak significance (correlation value between ±0.10 to ±0.29) of size to IT innovation adoption in most moderating conditions. This validates the fact that organizations of all types and sizes have realised the benefit of IT and have been utilising IT in their operations. The cost of IT has reduced drastically and even small organizations can afford to utilize specialised technologies. The result of organizational size from the meta-analysis by Lee and Xia (2006) were more significant than the results study obtained. The current study included more recent studies and hence this might have influenced the overall result in this case. It would be worthwhile investigating this variable under a new moderator condition 'year of study', to find the effect of organizational size factor.

It was expected that organizational size would have a stronger significance than the study suggested, as size determines other organizational factors such as slack resources and decision-making which, in particular, impacts small organizations. One reason for the weak significance might be that the meta-analysis was performed using more studies for large organizations. Larger organizations are able to allocate resources more easily and can invest on new technologies more rapidly.

6.3.3.3 Findings of moderator effect on IT expertise

The meta-analysis results of the moderator effect on the relationship between IT expertise and adoption of IT are shown in Table 6.13. The mean correlation and 95% confidence interval verified the relationship between IT expertise and IT innovation adoption for most of the moderator conditions examined.

Table 6.13 Meta-analysis moderator effect results for IT expertise

Moderator	INN SDY	SAM SIZ	MEN COR	ZTR VAL	OBS VAR	SAM EVA	EXP VAR	COF INT
Stage of Innovation								
Initiation	1	78	0.2000	0.2030	0.0000	0.0000	0	-0.02, 0.43
Adoption	11	2818	0.3444	0.3590	0.0437	0.0030	7	0.32, 0.40
Implementation	8	1277	0.3152	0.3260	0.0088	0.0051	58	0.27, 0.38
Mixed	4	2432	0.1300	0.1310	0.0178	0.0016	9	0.09, 0.17
Type of Innovation								
Product	17	5759	0.2525	0.2580	0.0398	0.0026	7	0.23, 0.28
Process	5	258	0.1908	0.1930	0.0247	0.0184	74	0.07, 0.32
Mixed	2	588	0.3420	0.3560	0.0031	0.0027	85	0.27, 0.44
Type of organization								
Manufacturing	6	408	0.2114	0.2150	0.0110	0.0110	100	0.12, 0.31
Service	1	135	0.5300	0.5900	0.0000	0.0039	0	0.42, 0.76
Mixed	17	6062	0.2552	0.2610	0.0375	0.0025	7	0.24, 0.29
Size of Organization								
Large	0	0	-	-	-	-	-	-
Small	7	1490	0.4820	0.5260	0.0355	0.0028	8	0.48, 0.58
Mixed	17	5115	0.1929	0.1950	0.0183	0.0031	17	0.17, 0.22

No. of Innovation Studied - INN SDY, Sample Size - SAM SIZ, Mean Correlation - MEN COR, ZTR VAL - Z- Transformation, Observed Variance - OBS VAR, Sampling Error Variance - SAM EVA, Explain Variance - EXP VAR, 95% Confidence Interval - COF INT

The results of the meta-analysis for the type of innovation moderator sub-groups found that IT expertise was a better determinant of product innovation compared with process innovation. One explanation might be that in the adoption of process innovation, organizations normally employ external specialist companies for the entire adoption processes, so that IT expertise within the organization might not be essential. In the case of product innovation, the presence of IT expertise within an organization may help identify additional improvements in the existing system and could utilize internal expertise to add new artefacts to the organizational work procedure.

One of the important findings of the moderator effect on the relationship between IT expertise and IT innovation adoption was its significance (moderate significance - correlation value between ±0.3 to ±0.49) for small organizations. Lack of IT expertise and the insufficient knowledge of the benefits of innovation inhibit small businesses from adopting IT. Small organizations usually seek technical assistance from IT consulting firms or IT vendors for IT implementation.

The results also showed that IT expertise had moderate significance for both adoption-decision and implementation stages of IT innovation adoption. Mean correlation results verified that IT expertise was a marginally better determinant for the adoption-decision stage than implementation. However, most previous findings suggest otherwise (Choe, 1996; Thong, 1999; Fichman, 2001). This finding can be explained by the fact that the studies used in the analysis performed their empirical investigation in small organizations and IT expertise at the implementation stage for small firms might not be important as they look for external expertise for IT implementation. On the other hand, large organizations are more likely to have prior experience of IT which affects the adoption-decision process.

6.3.3.4 Findings of moderator effect on product champion

The meta-analysis results showed that presence of a champion that advocates the promotion of innovation plays an important role in the adoption of IT in organization. As shown in Table 6.10, the mean correlation results showed a weak significance relationship (correlation value between ±0.10 to ±0.29) and the 95% confidence interval verified a positive association (interval includes a zero) for the relationship between product champion and IT innovation adoption in organizations. Table 6.14 illustrates the results of the moderator effect for the relationship between product champion and IT innovation adoption.

One of the most notable results was the significance of product champion for the adoption-decision stage compared to the implementation stage of innovation adoption. In fact, it is the adoption-decision stage where the product champion has the responsibility of convincing higher management that the new innovation is feasible, credible and value of investment. The champion's ability to influence management in the adoption-decision stage counts a great deal for the top management's decision to accept the innovation.

Table 6.14 Meta-analysis moderator effect results for product champion

Moderator	INN SDY	SAM SIZ	MEN COR	ZTR VAL	OBS VAR	SAM EVA	EXP VAR	COF INT
Stage of Innovation								
Initiation	0	0	-	-	-	-	-	-
Adoption	2	453	0.2178	0.2210	0.0165	0.0040	24	0.13, 0.31
Implementation	2	402	0.0630	0.0630	0.0098	0.0050	51	-0.04, 0.16
Mixed	0	0	-	-	-	-	-	-
Type of Innovation								
Product	2	453	0.2568	0.2630	0.0072	0.0039	54	0.17, 0.36
Process	0	0	-	-	-	-	-	-
Mixed	2	402	0.0190	0.0190	0.0030	0.0030	100	-0.08, 0.12
Type of organization								
Manufacturing	0	0	-	-	-	-	-	-
Service	0	0	-	-	-	-	-	-
Mixed	4	855	0.1450	0.1460	0.0193	0.0045	23	0.08, 0.21
Size of Organization								
Large	0	0	-	-	-	-	-	-
Small	0	0	-	-	-	-	-	-
Mixed	4	855	0.1450	0.1460	0.0193	0.0045	23	0.08, 0.21

No. of Innovation Studied - INN SDY, Sample Size - SAM SIZ, Mean Correlation - MEN COR, ZTR VAL - Z- Transformation, Observed Variance - OBS VAR, Sampling Error Variance - SAM EVA, Explain Variance - EXP VAR, 95% Confidence Interval - COF INT

6.3.3.5 Findings of moderator effect on centralization

Table 6.15 illustrates the meta-analysis results of the moderator effects on the relationship between centralization and adoption of IT. The results of mean correlation for most categories of four moderators was found to be insignificant (correlation value between 0 to ±0.09) with the relationship between centralization and IT innovation adoption. The important message from this result was that centralized structure neither inhibits nor facilitates IT innovation adoption.

The moderator effect result of the meta-analysis showed centralization to have a weak significance (correlation value between ±0.10 to ±0.29) for the adoption-decision stage of innovation moderator and adoption of IT in service industry. The 95% condition interval for both these conditions showed a negative association (confidence interval < 0).

It is important to note that all studies considered in this meta-analysis of the relationship between centralization and IT innovation adoption were performed for large organizations. Normally, small organizations have a more centralized form of organization structure (Premkumar, 2003). The study by Grover and Goslar (1993) conducted for mixed-size organizations found centralized decision making to be a significant factor in the initiation, adoption-decision and implementation of IT innovations. Hence, performing a meta-analysis with more studies including that considered for small organizations or SMEs would be insightful.

Table 6.15 Meta-analysis moderator effect results for centralization

Moderator	INN SDY	SAM SIZ	MEN COR	ZTR VAL	OBS VAR	SAM EVA	EXP VAR	COF INT
Stage of Innovation								
Initiation	0	0	-	-	-	-	-	-
Adoption	9	1547	-0.1039	-0.1040	0.0584	0.0057	10	-0.15, -0.05
Implementation	1	281	0.0800	0.0800	0.0000	0.0000	0	-0.04, 0.20
Mixed	1	86	-0.1415	-0.1420	0.0000	0.0000	0	-0.36, 0.07
Type of Innovation								
Product	5	1068	-0.0669	-0.0670	0.0327	0.0047	14	-0.13, -0.01
Process	6	846	-0.0933	-0.0940	0.0750	0.0070	9	-0.16, -0.03
Mixed	0	0	-	-	-	-	-	-
Type of organization								
Manufacturing	0	0	-	-	-	-	-	-
Service	9	1352	-0.1466	-0.1480	0.0572	0.0064	11	-0.20, -0.09
Mixed	2	562	0.0850	0.0850	0.0000	0.0000	0	0.00, 0.17
Size of Organization								
Large	11	1914	-0.0786	-0.0790	0.0516	0.0057	11	-0.12, -0.03
Small	0	0	-	-	-	-	-	-
Mixed	0	0	-	-	-	-	-	-

No. of Innovation Studied - INN SDY, Sample Size - SAM SIZ, Mean Correlation - MEN COR, ZTR VAL - Z- Transformation,
Observed Variance - OBS VAR, Sampling Error Variance - SAM EVA, Explain Variance - EXP VAR, 95% Confidence Interval - COF INT

6.3.3.6 Findings of moderator effect on formalization

Table 6.16 illustrates the results of the meta-analysis of the moderator effects on the relationship between formalization and adoption of IT innovations.

Table 6.16 Meta-analysis moderator effect results for formalization

Moderator	INN SDY	SAM SIZ	MEN COR	ZTR VAL	OBS VAR	SAM EVA	EXP VAR	COF INT
Stage of Innovation								
Initiation	0	0	-	-	-	-	-	-
Adoption	8	1205	0.0553	0.0550	0.0301	0.0066	22	0.00, 0.11
Implementation	3	410	0.1684	0.1700	0.0156	0.0070	45	0.07, 0.27
Mixed	1	86	0.1469	0.1480	0.0000	0.0000	0	-0.07, 0.36
Type of Innovation								
Product	4	699	0.1534	0.1550	0.0088	0.0055	62	0.08, 0.23
Process	8	1002	0.0410	0.0410	0.0354	0.0080	23	-0.02, 0.10
Mixed	0	0	-	-	-	-	-	-
Type of organization								
Manufacturing	1	51	0.4770	0.5190	0.0000	0.0000	0	0.24, 0.80
Service	7	932	0.0529	0.0530	0.0390	0.0075	19	-0.01, 0.12
Mixed	4	718	0.1040	0.1040	0.0021	0.0055	264	0.03, 0.18
Size of Organization								
Large	10	1545	0.0931	0.0930	0.0299	0.0064	21	0.04, 0.14
Small	0	0	-	-	-	-	-	-
Mixed	2	156	0.0285	0.0290	0.0000	0.0000	0	-0.13, 0.19

No. of Innovation Studied - INN SDY, Sample Size - SAM SIZ, Mean Correlation - MEN COR, ZTR VAL - Z- Transformation,
Observed Variance - OBS VAR, Sampling Error Variance - SAM EVA, Explain Variance - EXP VAR, 95% Confidence Interval - COF INT

The meta-analysis results of moderator effect of stage of innovation on the relationship between formalization and IT innovation adoption revealed an interesting result. The 95% confidence interval verified a positive association (interval does not include zero) between adoption and implementation stages of IT innovation adoption. Although the meta-analysis results for formalization and IT innovation adoption were found to be insignificant, the meta-analysis moderator of the stage of innovation confirmed a weak significance relationship (correlation value between ±0.10 to ±0.29) with the implementation stage and insignificance (correlation value between 0 to ±0.09) with the adoption-decision stage. Grover and Goslar (1993) found no relationship between formalization and IT innovation adoption for the initiation, adoption and implementation of IT. However, the results of meta-analysis moderator effect obtained corroborate the findings of Moch and Morse (1977).

The mean correlation and 95% confidence interval results of meta-analysis found that formalization was positively associated (interval does not include zero) with weak significance (correlation value between ±0.10 to ±0.29) with the adoption of product innovation while no significance (correlation value between 0 to ±0.09) was found with process innovation.

6.3.3.7 Findings of moderator effect on IS department size

Table 6.17 illustrates the meta-analysis results of the moderator effects on the relationship between IS department size and adoption of IT.

Table 6.17 Meta-analysis moderator effect results for IS department size

Moderator	INN SDY	SAM SIZ	MEN COR	ZTR VAL	OBS VAR	SAM EVA	EXP VAR	COF INT
Stage of Innovation								
Initiation	1	82	0.3000	0.3100	0.0000	0.0000	0	0.09, 0.53
Adoption	4	1508	0.3926	0.4150	0.0173	0.0019	11	0.36, 0.47
Implementation	3	900	0.3218	0.3340	0.0007	0.0007	100	0.27, 0.40
Mixed	4	2432	0.4400	0.4720	0.0065	0.0011	17	0.43, 0.51
Type of Innovation								
Product	12	4922	0.4015	0.4250	0.0107	0.0017	16	0.40, 0.45
Process	0	0	-	-	-	-	-	-
Mixed	0	0	-	-	-	-	-	-
Type of organization								
Manufacturing	0	0	-	-	-	-	-	-
Service	0	0	-	-	-	-	-	-
Mixed	12	4922	0.4015	0.4250	0.0107	0.0017	16	0.40, 0.45
Size of Organization								
Large	3	246	0.2533	0.2590	0.0012	0.0012	100	0.13, 0.38
Small	0	0	-	-	-	-	-	-
Mixed	9	4676	0.4093	0.4350	0.0100	0.0013	13	0.41, 0.46

No. of Innovation Studied - INN SDY, Sample Size - SAM SIZ, Mean Correlation - MEN COR, ZTR VAL - Z- Transformation, Observed Variance - OBS VAR, Sampling Error Variance - SAM EVA, Explain Variance - EXP VAR, 95% Confidence Interval - COF INT

The result of the meta-analysis indicates that IS department size was a significant determinant for the adoption-decision and implementation stages of IT innovation adoption. The mean correlation suggests that IS department size was most significant for the adoption-decision compared to implementation although both were found to have moderate significance (correlation value between ±0.30 to ±0.49). Organizations with larger IS departments would be able to assess the new innovation more competently and assist top management in the adoption-decision process. Rai (1995) found IS department size had a significant impact on the propagation of computer aided software engineering (CASE) adoption in US organizations.

The study found that IT department size was an important predictor for product innovation. For the relationship between IS department size and IT adoption, the result found a moderate significance (correlation value between ±0.30 to ±0.49) for product innovation. The study found that IT department size was an important predictor for large organizations in the adoption of IT in organizations.

6.3.3.8 Findings of moderator effect on IS infrastructure

Table 6.18 illustrates the meta-analysis results of the moderator effects on the relationship between IS infrastructure and IT innovation adoption.

Table 6.18 Meta-analysis moderator effect results for IS infrastructure

Moderator	INN SDY	SAM SIZ	MEN COR	ZTR VAL	OBS VAR	SAM EVA	EXP VAR	COF INT
Stage of Innovation								
Initiation	1	1857	0.2200	0.2240	0.0000	0.0000	0	0.18, 0.27
Adoption	6	3045	0.2536	0.2590	0.0184	0.0017	9	0.22, 0.29
Implementation	5	2677	0.3329	0.3460	0.0182	0.0015	8	0.31, 0.38
Mixed	0	0	-	-	-	-	-	-
Type of Innovation								
Product	10	7177	0.2794	0.2870	0.0161	0.0012	7	0.26, 0.31
Process	0	0	-	-	-	-	-	-
Mixed	2	402	0.1665	0.1680	0.0019	0.0019	100	0.07, 0.27
Type of organization								
Manufacturing	0	0	-	-	-	-	-	-
Service	2	274	0.4550	0.4910	0.0000	0.0000	0	0.37, 0.61
Mixed	10	7305	0.2666	0.2730	0.0153	0.0012	8	0.25, 0.30
Size of Organization								
Large	2	562	-0.0300	-0.0300	0.0004	0.0004	100	-0.11, 0.05
Small	2	274	0.4550	0.4910	0.0000	0.0000	0	0.37, 0.61
Mixed	8	6743	0.2913	0.3000	0.0086	0.0010	12	0.28, 0.32

No. of Innovation Studied - INN SDY, Sample Size - SAM SIZ, Mean Correlation - MEN COR, ZTR VAL - Z- Transformation,
Observed Variance - OBS VAR, Sampling Error Variance - SAM EVA, Explain Variance - EXP VAR, 95% Confidence Interval - COF INT

The results of mean correlation and 95% confidence interval of implementation sub-category of stages of innovation showed moderate significance (correlation value between

±0.30 to ±0.49) and positive association (confidence interval does not include zero) between IS infrastructure and IT innovation adoption. This result was consistent with most of the past literature on IS infrastructure (Wang and Cheung, 2004; Zhu et al., 2006b). One important aspect of this result was the significance of IS infrastructure at the implementation stage compared to the adoption stage. The adoption stage of innovation showed a weak significance (correlation value between ±0.10 to ±0.29) between IS infrastructure and IT innovation adoption. One plausible explanation would be that better IS infrastructure may be important for application integration which occurs at the IT implementation stage.

Another interesting result obtained was the size of organizations moderator sub-group for the relationship between IS infrastructure and IT innovation adoption. For the relationship between IS infrastructure and IT adoption, the result found a moderate significance (correlation value between ±0.30 to ±0.49) for small organizations and insignificance (correlation value between 0 to ±0.09) for large organizations. The most probable explanation might be that small organizations often lack IS infrastructure necessary for IT innovation adoption. Compared to large organizations, investment to develop non-existing IS infrastructure for small organizations would be a large percentage of their overall savings.

6.3.3.9 Findings of moderator effect on information intensity

The meta-analysis results showed that amount of information the organization processes plays an important role in the adoption of IT innovations in organization. As shown in Table 6.10, the mean correlation results showed a weak significance relationship (correlation value between ±0.10 to ±0.29) and the 95% confidence interval verified a positive association (interval includes a zero) for the relationship between information intensity and the adoption of IT innovation in organizations.

Table 6.19 illustrates the results of the moderator effect for the relationship between information intensity and IT innovation adoption. The result of moderator conditions examined for the relationship between information intensity and IT innovation adoption showed a weak significance (correlation value between ±0.10 to ±0.29). The results showed that the significance of information intensity rendered no difference for the adoption-decision and implementation stages of innovation adoption.

The study found that information intensity was an important predictor for product innovation. For the relationship between information intensity and IT adoption, the result found a weak significance (correlation value between ±0.10 to ±0.29) for product innovation. The study found that information intensity was an important predictor for small organizations in the adoption of IT innovations in organizations.

Table 6.19 Meta-analysis moderator effect results for information intensity

Moderator	INN SDY	SAM SIZ	MEN COR	ZTR VAL	OBS VAR	SAM EVA	EXP VAR	COF INT
Stage of Innovation								
Initiation	0	0	-	-	-	-	-	-
Adoption	4	633	0.2186	0.2220	0.0268	0.0058	21	0.14, 0.30
Implementation	3	606	0.2187	0.2220	0.0055	0.0045	81	0.14, 0.30
Mixed	0	0	-	-	-	-	-	-
Type of Innovation								
Product	4	485	0.2728	0.2800	0.0291	0.0071	24	0.19, 0.37
Process	0	0	-	-	-	-	-	-
Mixed	3	754	0.1838	0.1860	0.0051	0.0037	73	0.11, 0.26
Type of organization								
Manufacturing	2	222	0.3130	0.3240	0.0595	0.0595	0	0.19, 0.46
Service	0	0	-	-	-	-	-	-
Mixed	5	1017	0.1980	0.2010	0.0046	0.0046	98	0.14, 0.26
Size of Organization								
Large	0	0	-	-	-	-	-	-
Small	4	816	0.1922	0.1950	0.0056	0.0046	82	0.13, 0.26
Mixed	3	423	0.2697	0.2770	0.0333	0.0061	18	0.18, 0.37

No. of Innovation Studied - INN SDY, Sample Size - SAM SIZ, Mean Correlation - MEN COR, ZTR VAL - Z- Transformation,
Observed Variance - OBS VAR, Sampling Error Variance - SAM EVA, Explain Variance - EXP VAR, 95% Confidence Interval - COF INT

6.3.3.10 Findings of moderator effect on resources

Table 6.20 illustrates the results of the meta-analysis of the moderator effect on the relationship between resources and adoption of IT. The result indicates that the stage of innovation was a significant moderator for the relationship between resources and IT innovation adoption. The mean correlation result suggests that resources were a better determinant of the implementation stage of adoption (weak significance – correlation value between ±0.10 to ±0.29) compared to the other two stages. This result validates past literature which showed that more resources are required in the implementation stage of innovation adoption (Raymond, 1990; Wang and Cheung, 2004). Results found weak significance (correlation value between ±0.10 to ±0.29) between resources and IT innovation adoption for both product and process innovation.

There are two critical findings from the results of moderator effects on the relationship between resources and IT innovation adoption. First, the significance of resources for the implementation stage of adoption compared to initiation and adoption stages. The literature also suggests that a successful implementation requires a substantial financial investment and competent human resources (Raymond, 1990; Nystrom et al., 2002). In the initiation and adoption-decision stages, the organization is involved only in evaluating and promoting the new innovation among its members. However, it is at the implementation stage of IT innovation adoption where the organization seeks the availability of necessary funds and experts.

Table 6.20 Meta-analysis moderator effect results for resources

Moderator	INN SDY	SAM SIZ	MEN COR	ZTR VAL	OBS VAR	SAM EVA	EXP VAR	COF INT
Stage of Innovation								
Initiation	2	1354	0.1140	0.1140	0.0003	0.0003	0	0.06, 0.17
Adoption	12	4410	0.1803	0.1820	0.0222	0.0026	12	0.15, 0.21
Implementation	6	2705	0.2966	0.3060	0.0304	0.0018	6	0.27, 0.34
Mixed	1	86	0.2091	0.2120	0.0000	0.0000	0	0.00, 0.43
Type of Innovation								
Product	6	674	0.2155	0.2190	0.0059	0.0059	100	0.14, 0.29
Process	15	7881	0.2061	0.2090	0.0270	0.0017	6	0.19, 0.23
Mixed	0	0	-	-	-	-	-	-
Type of organization								
Manufacturing	3	102	0.0233	0.0230	0.0143	0.0143	100	-0.17, 0.22
Service	11	2001	0.1118	0.1120	0.0330	0.0054	16	0.07, 0.16
Mixed	7	6452	0.2393	0.2440	0.0188	0.0010	5	0.22, 0.27
Size of Organization								
Large	8	1002	0.0677	0.0680	0.0573	0.0080	14	0.01, 0.13
Small	2	274	0.2250	0.2290	0.0110	0.0066	60	0.11, 0.35
Mixed	11	7279	0.2254	0.2290	0.0185	0.0014	7	0.21, 0.25

No. of Innovation Studied - INN SDY, Sample Size - SAM SIZ, Mean Correlation - MEN COR, ZTR VAL - Z- Transformation,
Observed Variance - OBS VAR, Sampling Error Variance - SAM EVA, Explain Variance - EXP VAR, 95% Confidence Interval - COF INT

Second, the meta-analysis results verified a weakly significant relationship (correlation value between ±0.10 to ±0.29) between resources and IT innovation adoption for small organizations compared to an insignificant relationship (correlation value between 0 to ±0.09) with large organizations in IT innovation adoption. Large organizations possess more financial, technical and human resources and can take risks by committing these resources. In the event of implementation failure, small organizations suffer more, since the initial investment of IT would be likely to form a relatively larger part of the organization's budget.

6.3.3.11 Findings of moderator effect on specialization

Table 6.21 illustrates the moderator effect result of the relationship between specialization and IT innovation adoption. The results of the meta-analysis for the type of innovation moderator sub-groups found that specialization was a better determinant of product innovation compared with process innovation. The results showed a moderate significance (correlation value between ±0.30 to ±0.49) for product innovation and insignificance (correlation value between 0 to ±0.09) for process innovation. One explanation might be that different specialities within an organization demand the introduction of different products for their particular need instead of the overall system which changes the entire system of work. Past studies have found that specialization within an organization to be a significant determinant for the adoption of product innovation (Damanpour, 1991; Grover et al., 1997; Fichman, 2001).

Table 6.21 Meta-analysis moderator effect results for specialization

Moderator	INN SDY	SAM SIZ	MEN COR	ZTR VAL	OBS VAR	SAM EVA	EXP VAR	COF INT
Stage of Innovation								
Initiation	0	0	-	-	-	-	-	-
Adoption	10	2482	0.2474	0.2530	0.0681	0.0036	5	0.21, 0.29
Implementation	1	608	0.2600	0.2660	0.0000	0.0000	0	0.19, 0.35
Mixed	4	2432	0.2950	0.3040	0.0021	0.0021	0	0.26, 0.34
Type of Innovation								
Product	9	4676	0.3074	0.3180	0.0145	0.0016	11	0.29, 0.35
Process	6	846	0.0617	0.0620	0.0775	0.0071	9	-0.01, 0.13
Mixed	0	0	-	-	-	-	-	-
Type of organization								
Manufacturing	0	0	-	-	-	-	-	-
Service	8	1266	0.2353	0.2400	0.1169	0.0057	5	0.18, 0.30
Mixed	7	4256	0.2800	0.2880	0.0063	0.0014	22	0.26, 0.32
Size of Organization								
Large	8	1266	0.2353	0.2400	0.1169	0.0057	5	0.18, 0.30
Small	0	0	-	-	-	-	-	-
Mixed	7	4256	0.2800	0.2880	0.0063	0.0014	22	0.26, 0.32

No. of Innovation Studied - INN SDY, Sample Size - SAM SIZ, Mean Correlation - MEN COR, ZTR VAL - Z- Transformation, Observed Variance - OBS VAR, Sampling Error Variance - SAM EVA, Explain Variance - EXP VAR, 95% Confidence Interval - COF INT

6.4 Results of Environmental characteristics

From the reviewed studies, a total of eighty-six relationships from fifty-nine studies investigated one or more environmental attributes that influenced IT innovation adoption. Among the relationships extracted, four assessed initiation stages, fifty-eight evaluate adoption-decision and twenty-four investigated implementation stages of innovation adoption. For the three environmental characteristics considered for the meta-analysis, the reviewed literature gathered forty-three studies with sixty innovation adoption relationships.

6.4.1 Results of aggregated tests of significance

Table 6.22 Aggregated tests of significance for environmental characteristics

Environmental factors	No. of Studies	No of Innovation	Significant	Not Significant	% Significance
Competitive pressure	28	44	28	16	64
External pressure	22	34	21	13	62
Government support	12	15	11	4	73

Table 6.22 illustrates the results of aggregated tests of significance for the three environmental characteristics considered for the meta-analysis.

6.4.2 Meta-analysis: Environmental characteristics results

Table 6.23 shows the meta-analysis results of the relationship between 3 environmental factors and IT innovation adoption. The meta-analysis results from a 95% confidence interval confirmed the association (intervals do not include zero) between all environmental variables and IT adoption.

Table 6.23 Meta-analysis results of environmental characteristics

Factors	INN SDY	SAM SIZ	MEN COR	ZTR VAL	OBS VAR	SAM EVA	EXP VAR	COF INT
Competitive Pressure	18	8374	0.1152	0.1160	0.0261	0.0021	8	0.09, 0.14
External Pressure	7	1262	0.2613	0.2680	0.0122	0.0048	40	0.21, 0.32
Government Support	7	6063	0.2252	0.2290	0.0193	0.0010	5	0.20, 0.25

No. of Innovation Studied - INN SDY, Sample Size - SAM SIZ, Mean Correlation - MEN COR, ZTR VAL - Z- Transformation,
Observed Variance - OBS VAR, Sampling Error Variance - SAM EVA, Explain Variance - EXP VAR, 95% Confidence Interval - COF INT

The mean correlation result of the meta-analysis verified the relationship between environmental attributes and IT innovation adoption. Mean correlation results showed that all 3 environmental factors have weak significance (correlation value between ±0.10 to ±0.29) for the adoption of IT innovation. Amongst the strongest relationships with innovation adoption was external pressure. This result is consistent with the several past findings (Premkumar and Ramamurthy, 1995; Teo et al., 2009). The mean correlation results also suggest that governmental support had a weak significance (correlation value between ±0.10 to ±0.29) for IT innovation adoption. However, several past studies have shown a much stronger significance for government support in IT innovation adoption (Looi, 2005; Jeon et al., 2006). Most of the IT literature argues that competitive pressure plays a vital role in the adoption of IT innovations in organizations. However, the meta-analysis showed that competitive pressure was the least important attribute amongst the environmental factors assessed. Nevertheless, the results support findings by Mirchandani and Motwani (2001) for e-commerce; Jeon et al., (2006) for e-business and Zhu et al., (2006a) for e-business.

6.4.3 Moderator effect results: Environmental characteristics

The study performed moderator effects for all 3 environmental characteristics. As shown in Table 6.23, the percentages obtained for the explained variance for all 3 factors were less than 60%.

6.4.3.1 Findings of moderator effect on competitive pressure

The results of the moderator effect for the relationship between competitive pressure and IT innovation adoption is illustrated in Table 6.24.

Table 6.24 Meta-analysis moderator effect results for competitive pressure

Moderator	INN SDY	SAM SIZ	MEN COR	ZTR VAL	OBS VAR	SAM EVA	EXP VAR	COF INT
Stage of Innovation								
Initiation	1	1857	0.1900	0.1920	0.0000	0.0000	0	0.15, 0.24
Adoption	12	3977	0.1387	0.1400	0.0425	0.0029	7	0.11, 0.17
Implementation	5	2540	0.0239	0.0240	0.0063	0.0020	31	-0.01, 0.06
Mixed	0	0	-	-	-	-	-	-
Type of Innovation								
Product	13	7218	0.1381	0.1390	0.0256	0.0017	7	0.12, 0.16
Process	0	0	-	-	-	-	-	-
Mixed	5	1156	-0.0278	-0.0280	0.0056	0.0043	77	-0.09, 0.03
Type of organization								
Manufacturing	1	51	-0.1190	-0.1200	0.0000	0.0000	0	-0.04, 0.16
Service	5	829	0.3542	0.3700	0.0119	0.0046	39	0.30, 0.44
Mixed	12	7494	0.0904	0.0910	0.0206	0.0016	8	0.07, 0.11
Size of Organization								
Large	3	471	0.2814	0.2890	0.0252	0.0054	22	0.20,0.38
Small	8	1478	0.1070	0.1070	0.0568	0.0053	9	0.06, 0.16
Mixed	7	6425	0.1050	0.1050	0.0170	0.0011	6	0.08, 0.13

No. of Innovation Studied - INN SDY, Sample Size - SAM SIZ, Mean Correlation - MEN COR, ZTR VAL - Z- Transformation,
Observed Variance - OBS VAR, Sampling Error Variance - SAM EVA, Explain Variance - EXP VAR, 95% Confidence Interval - COF INT

The results of meta-analysis of moderator sub-groups found either a weak significance (correlation value between ±0.10 to ±0.29) or insignificance (correlation value between 0 to ±0.09) for the relationship with IT innovation adoption except service sub-group of type of organization moderator. For organizations in the service sector, competitive pressure was found to have a moderate significance (correlation value between ±0.30 to ±0.49). One explanation for this result could be that the service sector is operating in a more competitive arena and is more vulnerable to social pressure. Due to the demands of customers and partners, service organizations are more likely to adopt IT due to competitive pressure.

One of the interesting results in the meta-analysis of moderator effect for the relationship between competitive pressure and IT innovation adoption appeared in the 'stage of innovation' moderator. Competitive pressure was found to have a weakly significant (correlation value between ±0.10 to ±0.29) relationship for adoption-decision stage but an insignificant (correlation value between ±0 to ±0.09) association for implementation stages. One credible explanation might be that organizations initiate IT adoption due to pressure from competitors and demands from potential trading partners and customers, but once the decision to adopt has been approved by the organization, they are more willing to implement and utilize the innovation with favourable expectations. Another explanation for the result obtained might be that competitive pressure deters organizations from deeper innovation assimilation; instead, competition forces organizations to keep changing from one innovation to another without allowing sufficient time for a proper infusion of the innovation.

Another notable result of the moderator effect showed that competitive pressure was more significant for large organizations than small organizations, although both found weak significance (correlation value between ±0.10 to ±0.29). These results can be explained by the fact that overall competition which the larger organizations faces is greater than smaller firms and hence, large organizations are more sensitive to the strategic actions of their competitors and they quickly respond to the changes in the competitive environment.

6.4.3.2 Findings of moderator effect on external pressure

Table 6.25 illustrates the meta-analysis results of the moderator effects on the relationship between eternal pressure and adoption of IT.

Table 6.25 Meta-analysis moderator effect results for external pressure

Moderator	INN SDY	SAM SIZ	MEN COR	ZTR VAL	OBS VAR	SAM EVA	EXP VAR	COF INT
Stage of Innovation								
Initiation	0	0	-	-	-	-	-	-
Adoption	5	924	0.2992	0.3090	0.0087	0.0045	52	0.24, 0.37
Implementation	2	338	0.1577	0.1590	0.0071	0.0057	79	0.05, 0.27
Mixed	0	0	-	-	-	-	-	-
Type of Innovation								
Product	5	860	0.3149	0.3260	0.0072	0.0047	65	0.26, 0.39
Process	0	0	-	-	-	-	-	-
Mixed	2	402	0.1465	0.1480	0.0034	0.0034	100	0.05, 0.25
Type of organization								
Manufacturing	0	0	-	-	-	-	-	-
Service	2	274	0.2200	0.2240	0.0016	0.0016	100	0.10, 0.34
Mixed	5	988	0.2727	0.2800	0.0145	0.0044	30	0.22, 0.34
Size of Organization								
Large	1	141	0.3000	0.3100	0.0000	0.0000	0	0.14, 0.48
Small	2	274	0.2200	0.2240	0.0016	0.0016	100	0.10, 0.34
Mixed	4	847	0.2682	0.2750	0.0168	0.0041	24	0.21, 0.34

No. of Innovation Studied - INN SDY, Sample Size - SAM SIZ, Mean Correlation - MEN COR, ZTR VAL - Z- Transformation, Observed Variance - OBS VAR, Sampling Error Variance - SAM EVA, Explain Variance - EXP VAR, 95% Confidence Interval - COF INT

The 95% confidence interval results of the meta-analysis found external pressure and all sub-groups of the moderators to be positively associated (interval does not include zero). The mean correlation results indicate that external pressure was a significant determinant for the adoption of product innovations (moderate significance - correlation value between

±0.30 to ±0.49) and IT innovation adoption in service organizations (weak significance - correlation value between ±0.10 to ±0.29).

The result of the meta-analysis indicates that stage of innovation was a significant moderator of the relationship between external pressure and IT innovation adoption. Although external pressure was found to have weak significance (correlation value between ±0.10 to ±0.29) for both adoption-decision and implementation sub-groups of stage of innovation moderator; the mean correlation suggests that the adoption-decision stage was more significant compared with the implementation stage. This result is consistent with the findings of Iacovou et al., (1995) and Premkumar and Ramamurthy (1995). Similar to relationships between competitive pressure and IT innovation adoption, pressure from trading partners and customers forces organizations to keep changing from one innovation to another allowing less opportunity for an innovation to attain full integration.

6.4.3.3 Findings of moderator effect on government support

As shown in Table 6.23, government support was found to be a significant (weak significance - correlation value between ±0.10 to ±0.29) factor in the adoption of IT. The result supports several past outcomes (Jeon et al., 2006; Seyal et al., 2007). Table 6.26 illustrates the meta-analysis results of the moderator effects on the relationship between government support and IT innovation adoption.

Table 6.26 Meta-analysis moderator effect results for government support

Moderator	INN SDY	SAM SIZ	MEN COR	ZTR VAL	OBS VAR	SAM EVA	EXP VAR	COF INT
Stage of Innovation								
Initiation	1	1857	0.4200	0.4480	0.0000	0.0000	0	0.40, 0.49
Adoption	5	2349	0.1306	0.1310	0.0064	0.0021	32	0.09,0.17
Implementation	1	1857	0.1500	0.1510	0.0000	0.0000	0	0.11, 0.20
Mixed	0	0	-	-	-	-	-	-
Type of Innovation								
Product	7	6063	0.2252	0.2290	0.0193	0.0010	5	0.20, 0.25
Process	0	0	-	-	-	-	-	-
Mixed	0	0	-	-	-	-	-	-
Type of organization								
Manufacturing	0	0	-	-	-	-	-	-
Service	0	0	-	-	-	-	-	-
Mixed	7	6063	0.2252	0.2290	0.0193	0.0010	5	0.20, 0.25
Size of Organization								
Large	0	0	-	-	-	-	-	-
Small	4	492	0.2839	0.2920	0.0010	0.0010	100	0.20, 0.38
Mixed	3	5571	0.2200	0.2240	0.0206	0.0005	2	0.20, 0.25

No. of Innovation Studied - INN SDY, Sample Size - SAM SIZ, Mean Correlation - MEN COR, ZTR VAL - Z- Transformation,
Observed Variance - OBS VAR, Sampling Error Variance - SAM EVA, Explain Variance - EXP VAR, 95% Confidence Interval - COF INT

The results of the meta-analysis found weak significance (correlation value between ±0.10 to ±0.29) for the relationship between government support and IT innovation adoption for all moderator conditions. The mean correlation results suggest that government support was a significant determinant for product innovation and IT innovation adoption for small organizations. It is small organizations who are in need of appropriate incentives and advisory support from the government and for the adoption of IT innovations in small organizations, government support is essential.

6.5 Results of CEO characteristics

The reviewed literature extracted a total of thirty-seven IT innovation adoption relationships from twenty-seven different studies that examined the relationship between one or more CEO characteristics and IT innovation adoption. Among two relationships considered at the initiation stage, twenty-six studied the adoption-decision stage, eight assessed implementation stages and one studied mixed stage of innovation adoption.

6.5.1 Results of aggregated tests of significance

The study aggregated the tests of significance provided by the individual studies to assess the importance of the each of the CEO attributes for the adoption of IT innovations in organizations. Table 6.27 shows the results of aggregated tests of significance for CEO characteristics.

Table 6.27 Aggregated tests of significance for CEO characteristics

Organizational factors	No. of Studies	No of Innovation	Significant	Not Significant	% Significance
CEO innovativeness	10	17	11	6	65
CEO attitude	9	11	10	1	91
CEO IT knowledge	12	17	11	6	65
Manager's tenure	7	10	5	5	50
Manager's age	4	6	1	5	17
Manager's gender	3	5	1	4	20
Manager's educational level	4	4	2	2	50

The percentages of significance showed that CEO attitude was the key determinant among CEO characteristics. CEO innovativeness and CEO IT knowledge were also found to be important predictors for IT innovation adoption. Manager's tenure and manager's educational level were also found to be important adhering to Hedges and Olkin (1985) suggesting that if the majority of studies obtained statistically significant results, this could be evidence that a relationship exists between the variable and IT innovation adoption. However, aggregated tests of significance found manager's age and manager's gender to be insignificant.

6.5.2 Meta-analysis: CEO characteristics results

Meta-analysis was carried out to find the relationship between 7 CEO characteristics and IT innovation adoption. Table 6.28 illustrates the results of the analysis and the strength of individual CEO characteristics for IT innovation adoption.

Table 6.28 Meta-analysis results of CEO characteristics

Factors	INN SDY	SAM SIZ	MEN COR	ZTR VAL	OBS VAR	SAM EVA	EXP VAR	COF INT
CEO Innovativeness	7	1313	0.1812	0.1830	0.0233	0.0050	21	0.13, 0.24
CEO Attitude	7	5018	0.2132	0.2170	0.0043	0.0013	30	0.19, 0.24
CEO IT Knowledge	14	8778	0.1454	0.1460	0.0149	0.0015	10	0.13, 0.17
Managers Tenure	8	5097	0.0866	0.0870	0.0030	0.0015	51	0.06, 0.11
Managers Age	6	4749	0.0138	0.0140	0.0040	0.0013	32	-0.01, 0.04
Managers Gender	5	4650	0.0752	0.0750	0.0040	0.0011	27	0.05, 0.10
Managers Educational Level	4	946	0.0057	0.0060	0.0150	0.0042	28	0.06, 0.07

No. of Innovation Studied - INN SDY, Sample Size - SAM SIZ, Mean Correlation - MEN COR, ZTR VAL - Z- Transformation,
Observed Variance - OBS VAR, Sampling Error Variance - SAM EVA, Explain Variance - EXP VAR, 95% Confidence Interval - COF INT

The 95% confidence interval of meta-analysis results verified the association (interval does not include zero) between all CEO characteristics and IT innovation adoption except manager's age. In addition, the findings for the association between CEO characteristics and IT innovation adoption were in the direction as hypothesized (Table 5.8).The mean correlation results found CEO innovativeness, CEO attitude and CEO IT knowledge to have a weak significance (correlation value between ±0.10 to ±0.29) for the adoption of IT innovations in organizations. The results corroborate past studies that examined these three CEO determinants (Thong and Yap, 1995; Damanpour and Schneider, 2006). The meta-analysis results showed manger's tenure, manager's age, manager's gender and manager's educational level to have an insignificant relationship (correlation value between 0 to ±0.09) with IT innovation adoption. CEO attitude towards IT was found to be the best predictor among this category of factors followed by CEO innovativeness. CEO IT knowledge was also found to be marginally significant.

6.5.3 Moderator effect results: CEO characteristics

The meta-analysis results showed that the sampling error variance for all CEO characteristics were below 60% of observed variance. Hence, meta-analysis moderator effects were carried out for all 7 CEO characteristics to examine the effect of four moderator conditions.

6.5.3.1 Findings of moderator effect on CEO innovativeness

Table 6.29 illustrates the results of the meta-analysis of the moderator effects on the relationship between CEO innovativeness and adoption of IT innovations. The meta-analysis results of moderator effect of size of organization showed some differences between large and small organization on the influence of CEO innovativeness for the adoption of IT innovations. The results show a weak significance for small organizations (correlation value between ±0.10 to ±0.29) and insignificance (correlation value between 0 to ±0.09) for large organizations. The 95% confidence interval for the large sub-group of size of organization also found no association. This result is consistent with the majority of past studies that validated CEO innovativeness as a significant determinant for IT innovation adoption in small organizations (Thong, 1999; Gengatharen and Standing, 2005). One possible argument for this might be that the CEO in small organizations is often the sole decision maker and the small organization depends exclusively on the innovative ability of the CEO.

Table 6.29 Meta-analysis moderator effect results for CEO innovativeness

Moderator	INN SDY	SAM SIZ	MEN COR	ZTR VAL	OBS VAR	SAM EVA	EXP VAR	COF INT
Stage of Innovation								
Initiation	0	0	-	-	-	-	-	-
Adoption	5	942	0.1542	0.1550	0.0197	0.0051	26	0.09, 0.22
Implementation	2	371	0.2496	0.2550	0.0261	0.0048	18	0.15, 0.36
Mixed	0	0	-	-	-	-	-	-
Type of Innovation								
Product	3	482	0.1125	0.1130	0.0346	0.0061	18	0.02, 0.20
Process	1	77	0.5650	0.6400	0.0000	0.0000	0	0.41, 0.87
Mixed	3	754	0.1859	0.1880	0.0004	0.0004	100	0.12, 0.26
Type of organization								
Manufacturing	0	0	-	-	-	-	-	-
Service	2	420	0.0450	0.0450	0.0042	0.0042	100	-0.05, 0.14
Mixed	5	893	0.2452	0.2500	0.0195	0.0050	26	0.18, 0.32
Size of Organization								
Large	2	420	0.0450	0.0450	0.0042	0.0042	100	-0.005, 0.14
Small	4	816	0.2151	0.2190	0.0108	0.0045	42	0.15, 0.29
Mixed	1	77	0.5650	0.6400	0.0000	0.0000	0	0.41, 0.87

No. of Innovation Studied - INN SDY, Sample Size - SAM SIZ, Mean Correlation - MEN COR, ZTR VAL - Z- Transformation, Observed Variance - OBS VAR, Sampling Error Variance - SAM EVA, Explain Variance - EXP VAR, 95% Confidence Interval - COF INT

Another interesting result obtained from the meta-analysis moderator effect was differences in the influence of CEO innovativeness at the adoption-decision stage and implementation stages of IT innovation adoption. Although both adoption-decision and implementation stages showed weak significance (correlation value between ±0.10 to

±0.29), magnitude of the mean correlation result showed that CEO innovativeness impacts more at the implementation stages. This result indicates that CEO innovativeness plays an important role in the integration of innovation into the organization.

6.5.3.2 Findings of moderator effect on CEO attitude

CEO attitude was found to be the most significant CEO attribute in the adoption of IT innovations in organizations (Table 6.28). Table 6.30 illustrates the meta-analysis results of the moderator effects on the relationship between CEO attitude and IT innovation adoption. The result of meta-analysis, stage of innovation moderator verified that CEO attitude was a significant determinant for adoption-decision stage of innovation adoption (weak significance - correlation value between ±0.10 to ±0.29). In addition, results of the meta-analysis found moderate significance (correlation value between ±0.30 to ±0.49) for adoption of IT in small organizations.

Table 6.30 Meta-analysis moderator effect results for CEO attitude

Moderator	INN SDY	SAM SIZ	MEN COR	ZTR VAL	OBS VAR	SAM EVA	EXP VAR	COF INT
Stage of Innovation								
Initiation	1	1276	0.2000	0.2030	0.0000	0.0000	0	0.15, 0.26
Adoption	5	2466	0.2424	0.2470	0.0068	0.0018	27	0.21, 0.29
Implementation	1	1276	0.1700	0.1720	0.0000	0.0000	0	0.12, 0.23
Mixed	0	0	-	-	-	-	-	-
Type of Innovation								
Product	2	299	0.3978	0.4210	0.0011	0.0011	100	0.31, 0.53
Process	4	4553	0.1975	0.2000	0.0018	0.0008	45	0.17, 0.23
Mixed	1	166	0.3110	0.3220	0.0000	0.0000	0	0.17, 0.48
Type of organization								
Manufacturing	0	0	-	-	-	-	-	-
Service	1	725	0.2900	0.2990	0.0000	0.0000	0	0.23, 0.37
Mixed	6	4293	0.2002	0.2030	0.0038	0.0013	34	0.17, 0.23
Size of Organization								
Large	0	0	-	-	-	-	-	-
Small	3	465	0.3668	0.3850	0.0024	0.0024	100	0.29, 0.48
Mixed	4	4553	0.1975	0.2000	0.0018	0.0008	45	0.17, 0.23

No. of Innovation Studied - INN SDY, Sample Size - SAM SIZ, Mean Correlation - MEN COR, ZTR VAL - Z- Transformation, Observed Variance - OBS VAR, Sampling Error Variance - SAM EVA, Explain Variance - EXP VAR, 95% Confidence Interval - COF INT

One of the important findings of the meta-analysis moderator effects was the relationship between CEO attitude and IT innovation adoption in the type of innovation sub-groups. The meta-analysis showed that CEO attitude had a moderate significance (correlation value between ±0.30 to ±0.49) for product innovation and weak significance (correlation value between ±0.01 to ±0.29) for process innovation. As process innovation involves changing the entire working procedures, one would expect CEO attitude to be vital for its adoption and implementation. However, organizations always need to introduce additional features into the existing system to become more competent and successful. Hence, for small organizations where process innovation is often beyond their reach, enthusiastic CEO's are central for introducing new product innovations to enhance the organization's potential. Unlike process innovation, product innovation does not involve change of an entire system and CEOs with a positive attitude face less restriction on executing their innovative strategy.

The study found moderate significance (correlation value between ±0.30 to ±0.49) for the relationship between CEO attitude and IT innovation adoption in small organizations. This result is consistent with some of the prior studies that examined the influence of CEO attitudes on IT innovation adoption (Thong and Yap, 1995; Damanpour and Schneider, 2009).

6.5.3.3 Findings of moderator effect on CEO IT knowledge

The meta-analysis results of the moderator effect on the relationship between CEO IT knowledge and adoption of IT innovation is shown in Table 6.31.

Table 6.31 Meta-analysis moderator effect results for CEO IT knowledge

Moderator	INN SDY	SAM SIZ	MEN COR	ZTR VAL	OBS VAR	SAM EVA	EXP VAR	COF INT
Stage of Innovation								
Initiation	1	1276	0.1400	0.1410	0.0000	0.0000	0	0.09,0.20
Adoption	8	4433	0.2158	0.2190	0.0139	0.0016	12	0.19, 0.25
Implementation	4	2970	0.0403	0.0400	0.0046	0.0013	29	0.00, 0.08
Mixed	1	99	0.2100	0.2130	0.0000	0.0000	0	0.01, 0.41
Type of Innovation								
Product	4	992	0.3127	0.3240	0.0344	0.0033	10	0.26, 0.39
Process	7	7032	0.1162	0.1170	0.0070	0.0010	14	0.09, 0.14
Mixed	3	754	0.1971	0.2000	0.0156	0.0037	24	0.13, 0.27
Type of organization								
Manufacturing	1	99	0.2100	0.2130	0.0000	0.0000	0	0.01, 0.41
Service	3	1145	0.1190	0.1200	0.0008	0.0008	100	0.06, 0.18
Mixed	10	7534	0.1485	0.1500	0.0170	0.0013	7	0.13, 0.17
Size of Organization								
Large	3	519	0.1210	0.1220	0.0032	0.0032	100	0.04, 0.21
Small	5	1326	0.3143	0.3250	0.0274	0.0031	11	0.27, 0.38
Mixed	6	6933	0.1149	0.1150	0.0069	0.0008	12	0.09, 0.14

No. of Innovation Studied - INN SDY, Sample Size - SAM SIZ, Mean Correlation - MEN COR, ZTR VAL - Z- Transformation, Observed Variance - OBS VAR, Sampling Error Variance - SAM EVA, Explain Variance - EXP VAR, 95% Confidence Interval - COF INT

The 95 % confidence interval of the meta-analysis verified the positive association for all four moderators examined. The mean correlation results for the stage of innovation moderator showed that CEO IT knowledge was a determinant for the adoption-decision stage (weak significance - correlation value between ±0.01 to ±0.29) while for implementation stage it was found insignificant (correlation value between 0 to ±0.09). Thong (1999) also found that CEO IT knowledge was significant for likelihood of IT innovation adoption but insignificant for extent of IT innovation adoption in small businesses. The deduction from these results might be that once IT has been adopted, the influence of CEO is less important for the diffusion of innovation.

Like CEO attitude, the meta-analysis moderator effect results showed that CEO IT knowledge was more significant (moderate significance - correlation value between ±0.30 to ±0.49) for product innovation compared to process innovation (weak significance - correlation value between ±0.01 to ±0.29). This result might be explained by the fact that process innovation involves changing the entire system of operation; expertise knowledge and more practical understanding are required at each stage of innovation adoption, as such general understanding of IT by CEO might not be adequate enough to impact on the adoption of process innovation. However, CEO IT knowledge would have considerable impact on the adoption of product innovation for the organization in improving the existing system to become more competent and successful.

Another important finding of the moderator effect on the relationship between CEO IT knowledge and IT innovation adoption was its significance for small organizations (moderate significance - correlation value between ±0.30 to ±0.49) compared to large organizations (weak significance - correlation value between ±0.01 to ±0.29). Studies by Thong and Yap (1995) and Jeon et al., (2006) also found CEO IT knowledge to be an important determinant for IT innovation adoption in small businesses. In small businesses, the CEO makes all the major decisions including adoption of IT innovations; the realization of the benefits and impact of IT by its leader facilitates IT adoption.

6.5.3.4 Findings of moderator effect on manager’s tenure

Table 6.32 illustrates the meta-analysis results of the moderator effects on the relationship between manager’s tenure and adoption of IT innovations. Mean correlation results of all moderator sub-groups were found insignificant (correlation value between 0 to ±0.09) except adoption sub-group of stage of innovation. Some of the past research that has examined manager’s tenure has found it to be a significant attribute for the adoption-decision of IT innovation adoption (Damanpour and Schneider, 2006; 2009). A manager who has been in the job for longer time may have more practical knowledge of the organization and have more influence on allocating resources for the adoption of IT innovations than a person who has been in the job for less time.

Table 6.32 Meta-analysis moderator effect results for manager's tenure

Moderator	INN SDY	SAM SIZ	MEN COR	ZTR VAL	OBS VAR	SAM EVA	EXP VAR	COF INT
Stage of Innovation								
Initiation	1	1276	0.0700	0.0700	0.0000	0.0000	0	0.02, 0.12
Adoption	4	2236	0.1127	0.1130	0.0026	0.0017	68	0.07, 0.15
Implementation	2	1486	0.0787	0.0790	0.0008	0.0008	100	0.03, 0.13
Mixed	1	99	-0.1698	-0.1710	0.0000	0.0000	0	-0.37,0.03
Type of Innovation								
Product	3	445	-0.0134	-0.0130	0.0006	0.0006	100	-0.11, 0.08
Process	5	4652	0.0962	0.0960	0.0022	0.0011	48	0.07, 0.12
Mixed	0	0	-	-	-	-	-	-
Type of organization								
Manufacturing	1	99	-0.1698	-0.1710	0.0000	0.0000	0	-0.37, 0.03
Service	3	1145	0.0786	0.0790	0.0047	0.0026	55	0.02, 0.14
Mixed	4	3853	0.0956	0.0960	0.0008	0.0008	100	0.06, 0.13
Size of Organization								
Large	3	519	-0.0405	-0.0410	0.0043	0.0043	100	-0.13, 0.05
Small	0	0	-	-	-	-	-	-
Mixed	5	4578	0.1010	0.1010	0.0008	0.0008	100	0.07, 0.13

No. of Innovation Studied - INN SDY, Sample Size - SAM SIZ, Mean Correlation - MEN COR, ZTR VAL - Z- Transformation,
Observed Variance - OBS VAR, Sampling Error Variance - SAM EVA, Explain Variance - EXP VAR, 95% Confidence Interval - COF INT

6.5.3.5 Findings of moderator effect on manager's age

Manager's age was found as an insignificant attribute for the adoption of IT innovations in organizations (Table 6.28). The meta-analysis moderator effect for the relationship between manager's age and IT innovation adoption is illustrated in Table 6.33.

Table 6.33 Meta-analysis moderator effect results for manager's age

Moderator	INN SDY	SAM SIZ	MEN COR	ZTR VAL	OBS VAR	SAM EVA	EXP VAR	COF INT
Stage of Innovation								
Initiation	1	1276	0.0300	0.0300	0.0000	0.0000	0	-0.02, 0.08
Adoption	3	2098	0.0088	0.0090	0.0086	0.0014	17	-0.03, 0.05
Implementation	1	1276	0.0100	0.0100	0.0000	0.0000	0	-0.04, 0.06
Mixed	1	99	-0.0392	-0.0390	0.0000	0.0000	0	-0.24, 0.16
Type of Innovation								
Product	0	0	-	-	-	-	-	-
Process	0	0	-	-	-	-	-	-
Mixed	6	4749	0.0138	0.0140	0.0040	0.0013	32	-0.01, 0.04
Type of organization								
Manufacturing	1	99	-0.0392	-0.0390	0.0000	0.0000	0	-0.24, 0.16
Service	2	822	-0.0552	-0.0550	0.0153	0.0024	16	-0.12, 0.01
Mixed	3	3828	0.0300	0.0300	0.0003	0.0003	100	0.00, 0.06
Size of Organization								
Large	1	99	-0.0392	-0.0390	0.0000	0.0000	0	-0.24, 0.16
Small	1	97	-0.3930	-0.4150	0.0000	0.0000	0	-0.62, -0.21
Mixed	4	4553	0.0236	0.0240	0.0004	0.0004	100	-0.01, 0.05

No. of Innovation Studied - INN SDY, Sample Size - SAM SIZ, Mean Correlation - MEN COR, ZTR VAL - Z- Transformation,
Observed Variance - OBS VAR, Sampling Error Variance - SAM EVA, Explain Variance - EXP VAR, 95% Confidence Interval - COF INT

Mean correlation results of all moderator sub-groups for the relationship between manager's age and IT innovation adoption were found to be insignificant (correlation value between 0 to ±0.09). Furthermore, a 95% confidence interval showed no association (interval include zero) between manager's age and IT innovation adoption for all moderating sub-groups. The result corroborates the finding of several past studies which also failed to confirm the proposition (Larsen, 1993; Damanpour and Schneider, 2006).

6.5.3.6 Findings of moderator effect on manager's gender

As shown in Table 6.28, meta-analysis results for the relationship between manager's gender and IT innovation adoption was found to be insignificant (correlation value between 0 to ±0.09). Table 6.34 illustrates the meta-analysis moderator effect results for the relationship between manager's gender and IT innovation adoption. Mean correlation results of all moderator sub-groups for the relationship between manager's gender and IT innovation adoption were found to be insignificant (correlation value between 0 to ±0.09). Damanpour and Schneider (2006) and Damanpour and Schneider (2009) also found no relationship between gender and IT innovation adoption.

Table 6.34 Meta-analysis moderator effect results for manager's gender

Moderator	INN SDY	SAM SIZ	MEN COR	ZTR VAL	OBS VAR	SAM EVA	EXP VAR	COF INT
Stage of Innovation								
Initiation	1	1276	0.0900	0.0900	0.0000	0.0000	0	0.04, 0.14
Adoption	3	2098	0.0694	0.0700	0.0087	0.0014	16	0.03, 0.11
Implementation	1	1276	0.0700	0.0700	0.0000	0.0000	0	0.02, 0.12
Mixed	0	0	-	-	-	-	-	-
Type of Innovation								
Product	0	0	-	-	-	-	-	-
Process	0	0	-	-	-	-	-	-
Mixed	5	4650	0.0752	0.0750	0.0040	0.0011	27	0.05, 0.10
Type of organization								
Manufacturing	0	0	-	-	-	-	-	-
Service	2	822	0.0839	0.0840	0.0217	0.0024	11	0.02, 0.15
Mixed	3	3828	0.0733	0.0730	0.0002	0.0002	100	0.04, 0.10
Size of Organization								
Large	0	0	-	-	-	-	-	-
Small	1	97	0.4870	0.5320	0.0000	0.0000	0	0.33,0.73
Mixed	4	4553	0.0664	0.0660	0.0004	0.0004	100	0.04, 0.10

No. of Innovation Studied - INN SDY, Sample Size - SAM SIZ, Mean Correlation - MEN COR, ZTR VAL - Z- Transformation, Observed Variance - OBS VAR, Sampling Error Variance - SAM EVA, Explain Variance - EXP VAR, 95% Confidence Interval - COF INT

6.5.3.7 Findings of moderator effect on manager's educational level

The result of the moderator effect for the relationship between manager's educational level and IT innovation adoption is illustrated in Table 6.35. Meta-analysis results showed that CEO educational level had no relationship to the receptivity to IT innovation adoption. Similarly, the results of the moderator effect for the relationship between CEO educational level and IT innovation adoption found insignificant relationships for all moderator sub-groups. This finding is consistent with past research (Meyer and Goes, 1988; Larsen, 1993; Damanpour and Schneider, 2006). Nevertheless, it is noteworthy that some prior studies have shown that CEO educational level influences the adoption of IT (Damanpour and Schneider, 2009; Chuang et al., 2009). Damanpour and Schneider (2006) suggested that this inconsistency may be due to the type of innovation considered in the studies. The study was unable to gather much insight from the meta-analysis moderator effect, due to unavailability of data to perform meta-analysis for most of the sub-categories.

Table 6.35 Meta-analysis moderator effect results for manager's educational level

Moderator	INN SDY	SAM SIZ	MEN COR	ZTR VAL	OBS VAR	SAM EVA	EXP VAR	COF INT
Stage of Innovation								
Initiation	0	0	-	-	-	-	-	-
Adoption	3	847	-0.0193	-0.0190	0.0108	0.0036	33	-0.09, 0.05
Implementation	0	0	-	-	-	-	-	-
Mixed	1	99	0.2197	0.2230	0.0000	0.0000	0	0.02, 0.42
Type of Innovation								
Product	1	25	0.1400	0.1410	0.0000	0.0000	0	-0.28, 0.56
Process	0	0	-	-	-	-	-	-
Mixed	3	921	0.0020	0.0020	0.0149	0.0033	22	-0.06, 0.07
Type of organization								
Manufacturing	1	99	0.2197	0.2230	0.0000	0.0000	0	0.02, 0.42
Service	2	822	-0.0242	-0.0240	0.0103	0.0024	24	-0.09, 0.04
Mixed	1	25	0.1400	0.1410	0.0000	0.0000	0	-0.28, 0.56
Size of Organization								
Large	1	99	0.2197	0.2230	0.0000	0.0000	0	0.02, 0.42
Small	1	97	-0.3020	-0.3120	0.0000	0.0000	0	-0.51, -0.11
Mixed	2	750	0.0172	0.0170	0.0005	0.0005	100	-0.05, 0.09

No. of Innovation Studied - INN SDY, Sample Size - SAM SIZ, Mean Correlation - MEN COR, ZTR VAL - Z- Transformation, Observed Variance - OBS VAR, Sampling Error Variance - SAM EVA, Explain Variance - EXP VAR, 95% Confidence Interval - COF INT

6.6 Results of User acceptance characteristics

The research used studies that analysed the behaviour of individual within an organization for the adoption of IT innovations to access the user acceptance characteristics. The reviewed literature found thirty-six empirical studies that evaluated determinants of user acceptance of IT in an organizational setting. As some of studies considered more than one innovation, a total of forty-seven innovation relationships with different user acceptance constructs were obtained.

As described in Section 5.7.5, the study assessed user acceptance of IT using 5 constructs derived from TRA, TAM and TPB. Among these, the user acceptance determinants considered for the meta-analysis were perceived usefulness, perceived ease of use, subjective norm and facilitating condition. A total of thirty-four studies considered one or more of these determinants with forty-five innovation adoption relations for these four factors.

6.6.1 Results of aggregated tests of significance

The study aggregated the results of tests of significance to determine the importance of each of the innovation characteristics in IT innovation adoption. Table 6.36 illustrates the results of the aggregated tests of significance for user acceptance of IT.

Table 6.36 Aggregated tests of significance for user acceptance characteristics

Organizational factors	No. of Studies	No of Innovation	Significant	Not Significant	% Significance
Perceived usefulness	29	37	33	4	89
Perceived ease of use	25	33	26	7	79
Subjective norm	14	17	9	8	53
Facilitating conditions	5	9	8	1	89

Among the factors, perceived usefulness and perceived ease of use were most frequently examined. In terms of the percentage, 89% of studies which considered perceived usefulness and facilitating conditions were found to be significant, 79% of studies found perceived ease of use significant and 53% found subjective norm as relevant attributes for user acceptance of IT innovation. As the majority of studies obtained a statistically significant outcome, this indicates that there is an association between the relationships (Hedges and Olkin, 1985). Thus, aggregated tests of significance showed that all four determinants were important factors for user acceptance of IT innovations in organizations.

6.6.2 Meta-analysis: User acceptance characteristics results

Table 6.37 illustrates the meta-analysis results for the relationship between user acceptance attributes and the use of IT innovations. Meta-analysis results confirmed the relationship between four user acceptance determinants for use of IT.

The 95% confidence interval showed a positive association for all determinants and user acceptance of IT innovations in organizations. The results of the mean correlation for perceived usefulness and perceived ease of use were found to have moderate significance (correlation value between ±0.30 and ±0.49) for the use of IT in organization. Perceived usefulness was the dominant motivator for the user acceptance of IT innovation.

Perceived usefulness and perceived ease of use have been the most commonly examined characteristics of IT user acceptance and have been found to be significant more consistently than other attributes (Adams et al., 1992; Anandarajan et al., 2002; Igbaria and Iivari, 1995).

Table 6.37 Meta-analysis results of user acceptance characteristics

Factors	INN SDY	SAM SIZ	MEN COR	ZTR VAL	OBS VAR	SAM EVA	EXP VAR	COF INT
Perceived Usefulness	16	3282	0.3956	0.4180	0.0123	0.0035	28	0.38, 0.45
Perceived Ease of Use	14	2703	0.3480	0.3630	0.0086	0.0040	47	0.33, 0.40
Subjective Norm	7	6089	0.1710	0.1730	0.0128	0.0011	8	0.15, 0.20
Facilitating Condition	5	5443	0.2647	0.2710	0.0044	0.0008	18	0.24, 0.30

No. of Innovation Studied - INN SDY, Sample Size - SAM SIZ, Mean Correlation - MEN COR, ZTR VAL - Z- Transformation, Observed Variance - OBS VAR, Sampling Error Variance - SAM EVA, Explain Variance - EXP VAR, 95% Confidence Interval - COF INT

Subjective norm and facilitating conditions were found to have a weak significance (correlation value between ±0.10 and ±0.29) for user acceptance of IT. The aggregated tests of significance results showed that past findings of subjective norm were mixed. Among all the factors considered, meta-analysis verified that subjective norm was the least germane attribute for user acceptance of IT. The result of facilitating conditions was also consistent with many past findings (Bhattacherjee et al., 2008; Zhang et al., 2011).

6.6.3 Moderator effect results: User acceptance characteristics

User acceptance of IT was considered at the implementation stage of innovation adoption; hence, the study did not examine the stage of innovation moderator. Moderator effects were examined for all four user acceptance characteristics; meta-analysis results showed that all four factors have explained variance less than 60%.

6.6.3.1 Findings of moderator effect on perceived usefulness

The result of the moderator effects for the relationship between perceived usefulness and IT innovation adoption is illustrated in Table 6.38.

The mean correlation results of the meta-analysis verified that all three moderators had a significant effect on the relationship between perceived usefulness and IT innovation adoption. Also, 95% confidence interval results indicate a positive association (interval does not include zero) for all moderator sub-groups except manufacturing sub-group of type of organizations.

The mean correlation results of the meta-analysis moderator effect showed that perceived usefulness had a significant effect on the adoption of IT in both manufacturing and service organizations. The magnitude of the mean correlation verified that there was not a large difference between these sub-groups, even if perceived usefulness was found to have weak significance (correlation value between ±0.10 and ±0.29) for manufacturing organization and moderator significance (correlation value between ±0.30 and ±0.49) for service firms in the adoption of IT.

Table 6.38 Meta-analysis moderator effect results for perceived usefulness

Moderator	INN SDY	SAM SIZ	MEN COR	ZTR VAL	OBS VAR	SAM EVA	EXP VAR	COF INT
Stage of Innovation								
Initiation	-	-	-	-	-	-	-	-
Adoption	-	-	-	-	-	-	-	-
Implementation	-	-	-	-	-	-	-	-
Mixed	-	-	-	-	-	-	-	-
Type of Innovation								
Product	9	1377	0.3222	0.3340	0.0113	0.0053	47	0.28, 0.39
Process	2	251	0.4672	0.5060	0.0018	0.0049	270	0.38, 0.63
Mixed	5	1654	0.4458	0.4790	0.0069	0.0019	28	0.43, 0.53
Type of organization								
Manufacturing	5	449	0.2950	0.3040	0.0173	0.0094	54	0.21, 0.40
Service	2	602	0.3115	0.3220	0.0107	0.0027	25	0.24, 0.40
Mixed	9	2231	0.4385	0.4700	0.0059	0.0026	45	0.43, 0.51
Size of Organization								
Large	7	1051	0.3045	0.3140	0.0136	0.0055	41	0.25, 0.37
Small	0	0	-	-	-	-	-	-
Mixed	9	2231	0.4385	0.4700	0.0059	0.0026	45	0.43, 0.51

No. of Innovation Studied - INN SDY, Sample Size - SAM SIZ, Mean Correlation - MEN COR, ZTR VAL - Z- Transformation,
Observed Variance - OBS VAR, Sampling Error Variance - SAM EVA, Explain Variance - EXP VAR, 95% Confidence Interval - COF INT

One of most interesting results obtained from the meta-analysis moderator effect was for type of innovation sub-group. Although both process and product innovation were found to have moderate significance (correlation value between ±0.30 and ±0.49) for the adoption of IT, the magnitude of the mean correlation showed that perceived usefulness was a more significant determinant for process innovation compared to product innovation. The results can be explained by the fact the process innovation involves changing the entire work procedure and the transfer from the existing system to the new system will only be considered if it proves to be more valuable.

6.6.3.2 Findings of moderator effect on perceived ease of use

Table 6.39 illustrates the result of the moderator effects for the relationship between perceived ease of use and IT innovation adoption. The results of the meta-analysis found moderate significance (correlation value between ±0.30 and ±0.49) for the relationship between perceived ease of use and IT innovation adoption for all moderating conditions. The results support the findings of several past empirical examinations on the influence of perceived ease of use on user acceptance behaviour (Igbaria et al., 1995; Horton et al., 2001; Karahanna et al., 2006).

Table 6.39 Meta-analysis moderator effect results for perceived ease of use

Moderator	INN SDY	SAM SIZ	MEN COR	ZTR VAL	OBS VAR	SAM EVA	EXP VAR	COF INT
Stage of Innovation								
Initiation	-	-	-	-	-	-	-	-
Adoption	-	-	-	-	-	-	-	-
Implementation	-	-	-	-	-	-	-	-
Mixed	-	-	-	-	-	-	-	-
Type of Innovation								
Product	9	1377	0.3795	0.3990	0.0057	0.0048	85	0.35, 0.45
Process	2	251	0.3572	0.3740	0.0018	0.0061	337	0.25, 0.50
Mixed	3	1075	0.3056	0.3160	0.0108	0.0023	21	0.26, 0.38
Type of organization								
Manufacturing	5	449	0.3294	0.3420	0.0089	0.0090	100	0.25, 0.43
Service	2	602	0.3868	0.4080	0.0012	0.0024	197	0.33, 0.49
Mixed	7	1652	0.3390	0.3530	0.0104	0.0033	32	0.30, 0.40
Size of Organization								
Large	7	1051	0.3623	0.3800	0.0053	0.0051	95	0.32, 0.44
Small	0	0	-	-	-	-	-	-
Mixed	7	1652	0.3390	0.3530	0.0104	0.0033	32	0.30, 0.40

No. of Innovation Studied - INN SDY, Sample Size - SAM SIZ, Mean Correlation - MEN COR, ZTR VAL - Z- Transformation, Observed Variance - OBS VAR, Sampling Error Variance - SAM EVA, Explain Variance - EXP VAR, 95% Confidence Interval - COF INT

The results of the meta-analysis moderator effect for product and process innovation showed no significant difference between the sub-groups for the relationship between perceived ease of use and IT innovation adoption. However, the meta-analysis moderator effect for the manufacturing and service organization showed that perceived ease of use was a better determinant for service organizations. One possible argument for this result might be that service organizations rely on labour strength and servicing for customers. To offer speedy services to their customers, ease of use of innovation may well be a key feature.

6.6.3.3 Findings of moderator effect on subjective norm

Meta-analysis results found a weak significance for the relationship between subjective norm and IT innovation adoption. Table 6.40 illustrates results of the moderator effects for the relationship.

The study could not verify the results for type of innovation moderator sub-groups for subjective norm; however, the mixed sub-group (studies conducted for both product and process innovations) for the relationship between subjective norm and

IT innovation adoption showed a weak significance (correlation value between ±0.10 and ±0.29).

Table 6.40 Meta-analysis moderator effect results for subjective norm

Moderator	INN SDY	SAM SIZ	MEN COR	ZTR VAL	OBS VAR	SAM EVA	EXP VAR	COF INT
Stage of Innovation								
Initiation	-	-	-	-	-	-	-	-
Adoption	-	-	-	-	-	-	-	-
Implementation	-	-	-	-	-	-	-	-
Mixed	-	-	-	-	-	-	-	-
Type of Innovation								
Product	1	151	0.7630	1.0030	0.0000	0.0000	-	0.84, 1.00
Process	0	0	-	-	-	-	-	-
Mixed	6	5938	0.1559	0.1570	0.0040	0.0010	24	0.13, 0.18
Type of organization								
Manufacturing	0	0	-	-	-	-	-	-
Service	4	5292	0.1400	0.1410	0.0021	0.0007	35	0.11, 0.17
Mixed	3	797	0.3766	0.3960	0.0355	0.0028	8	0.33, 0.47
Size of Organization								
Large	0	0	-	-	-	-	-	-
Small	0	0	-	-	-	-	-	-
Mixed	7	6089	0.1710	0.1730	0.0128	0.0011	8	0.15, 0.20

No. of Innovation Studied - INN SDY, Sample Size - SAM SIZ, Mean Correlation - MEN COR, ZTR VAL - Z- Transformation, Observed Variance - OBS VAR, Sampling Error Variance - SAM EVA, Explain Variance - EXP VAR, 95% Confidence Interval - COF INT

The meta-analysis moderator effect result established a weak significance (correlation value between ±0.10 and ±0.29) for the relationship between subjective norm and IT innovation adoption in service organizations, while the study was not able to examine the effect of subjective norm for manufacturing organizations.

6.6.3.4 Findings of moderator effect on facilitating conditions

Table 6.41 illustrates results of the meta-analysis moderator effects for the relationship between facilitating conditions and IT innovation adoption.

The study could not perform a meta-analysis for most moderator sub-groups for facilitating conditions. The meta-analysis moderator effect result found a weak significance (correlation value between ±0.10 and ±0.29) for the relationship between facilitating conditions and IT innovation adoption in service organizations. Al-Khaldi and Wallace (1999) found a significant relationship between facilitating conditions and PC utilization. Anandarajan et al., (2002) in a similar study in Nigeria found a significant relationship between facilitating conditions and system usage which supports the findings the study obtained.

Table 6.41 Meta-analysis moderator effect results for facilitating conditions

Moderator	INN SDY	SAM SIZ	MEN COR	ZTR VAL	OBS VAR	SAM EVA	EXP VAR	COF INT
Stage of Innovation								
Initiation	-	-	-	-	-	-	-	-
Adoption	-	-	-	-	-	-	-	-
Implementation	-	-	-	-	-	-	-	-
Mixed	-	-	-	-	-	-	-	-
Type of Innovation								
Product	1	151	0.2533	0.2590	0.0000	0.0058	0	0.10, 0.42
Process	0	0	-	-	-	-	-	-
Mixed	4	5292	0.2650	0.2710	0.0045	0.0007	14	0.24, 0.30
Type of organization								
Manufacturing	0	0	-	-	-	-	-	-
Service	4	5292	0.2650	0.2710	0.0045	0.0007	14	0.24, 0.30
Mixed	1	151	0.2533	0.2590	0.0000	0.0058	0	0.10, 0.42
Size of Organization								
Large	0	0	-	-	-	-	-	-
Small	0	0	-	-	-	-	-	-
Mixed	5	5443	0.2647	0.2710	0.0044	0.0008	18	0.24, 0.30

No. of Innovation Studied - INN SDY, Sample Size - SAM SIZ, Mean Correlation - MEN COR, ZTR VAL - Z- Transformation, Observed Variance - OBS VAR, Sampling Error Variance - SAM EVA, Explain Variance - EXP VAR, 95% Confidence Interval - COF INT

6.7 Summary

The second phase of the research was to perform a statistical analysis to examine the factors influencing the adoption and implementation of IT innovations in organizations. The study performed a meta-analysis of past findings on the factors influencing the adoption and the use of IT innovation in organizations.

The meta-analysis results verified which of the factors identified in the literature influenced the adoption of IT innovation in organization. In addition, the meta-analysis results validated the most significant user acceptance determinants identified in IT literature which influenced the adoption of IT in organization. Hence, the results of the meta-analysis answers the fifth and the sixth research sub-questions.

The result for explained variance (EXP VAR) for the relationship between various attributes and IT innovation showed that the sampling error variance is less than 60% of the observed variance. Hence, the study performed meta-analysis moderator effect of stage of innovation, type of innovation, type of organization and size of organization for the relationship between each individual determinant and IT innovation adoption.

Chapter 7

Overall Discussion

Adoption process of IT innovations in organizations

7.1 Introduction

As the first phase of this research the study developed a conceptual model for the adoption and implementation of IT innovations in organizations. Chapter 4 discussed the synthesis of the theoretical model for the study. The representation portrays a process model for the adoption of IT innovations in organizations and the study used a SLR to develop the model. The second phase of the research was to identify major determinants that influenced the adoption and use of IT innovations in organizations. The study used meta-analysis of past empirical studies that investigated the adoption of IT innovations in organizations to identify key factors that influence the adoption process. The study integrates the process model and the factor model to represent an overall model for the adoption and use of IT innovations in organizations.

Past research that examined adoption and the use of IT in organization has produced contradictory outcomes. A meta-analysis of moderator effects was carried out to investigate the impact of different research conditions on the adoption and use of IT innovations in organizations. The results verified that the association of various attributes for IT innovation adoption are affected by different moderator condition and explain the inconsistency in past findings investigating determinants of the adoption of IT innovations in organizations.

7.2 Discussion of the process model of IT adoption in organizations

The study developed and proposed a model for the process of IT innovation adoption in organizations. It integrates theoretical perspectives of IT adoption and user acceptance models and popular frameworks to build the integrative structure. The proposed model assesses the IT innovation adoption process navigating from initiation through adoption-decision and then implementation stages. The model described two levels of analysis (organizational and individual level) and considered an interactive process perspective for evaluation. IT innovation adoption, starting from initiation stage until the acquisition of innovation was assessed as an organizational process. Once the organization possesses the innovation, the process of user acceptance of the technology is analysed in terms of the behaviour of individuals within the organization.

The structure is a theoretical combination of DOI, TRA, TAM, TPB and frameworks that consist of determinants from TOE (technology, organization, and environment) with the addition of CEO characteristics and user acceptance determinants. The study considered an innovation process to be successful only if the innovation gets accepted and integrated into the organization and the individual users continue using the innovation. The model exploited a DOI and TOE framework with CEO characteristics to model the adoption process until acquisition of innovation and TRA, TAM and TPB to construct user acceptance of IT.

Although the model described depicts a sequential stage-based process for the innovation adoption of IT, it would not be practical to assume that the adoption development progresses smoothly without any impediment until full integration of the innovation. It is likely that at the end of the initiation stage of innovation adoption, the innovation looked for may not have the technological capabilities for organizational needs. Equally, for financial or strategic reasons, at the adoption-decision stage the innovation under consideration may not be accepted by the decision makers. In such circumstances, the organization may seek a different innovation that would better suit their needs. For the new innovation, the innovation adoption process starts again from the initiation stage and progresses sequentially as described in the model. The model presumes that if proposed processes, sequences and conditions significant for the innovations are followed, the innovation adoption processes is more likely progress effectively.

7.3 Discussion on the factor model of IT adoption in organizations

Meta-analysis results identified the key determinants in the context of innovation, organization, environment, CEO and user acceptance determinants. The following sections discuss the factors found to be important predictors for each of these categories.

7.3.1 Discussion of innovation determinants

The meta-analysis was carried out for six innovation attributes to find the significance and the impact of individual factors on IT innovation adoption. In addition, for the relationship between individual innovation factors and IT innovation adoption, the study examined a meta-analysis moderator effect for four conditions.

The results of the meta-analysis showed that all innovation characteristics considered in the study had a significant relationship with IT innovation adoption except complexity. Relative advantage, cost, compatibility, observability and trialability were found to be significant determinants of organizational adoption of IT innovations. On the other hand, the study found complexity of innovation insignificant for the IT innovation adoption of organizations.

The meta-analysis found relative advantage to be one of the best predictors of IT innovation adoption and organizations perceived benefits as an important pre-requisite to decide on the adoption of IT innovation. This was consistent with the results of prior studies that found it to be a significant variable for IT innovation adoption (Tornatzky and Klein, 1982; Iacovou et al., 1995; Chwelos et al., 2001; Wang and Cheung, 2004; Jeon et al., 2006; Tan et al., 2009; Wu and Chuang, 2010; Ifinedo, 2011). The result suggests that organizations need assurance that expected benefits from the innovation are genuinely possible before its adoption can be considered. The result also indicates that organizations are aware of the direct and indirect benefits of IT and anticipate a positive effect from its acquisition. Firms adopt IT if they recognize the benefit of the technology and take advantage of a new business opportunity. The awareness of the benefits of an innovation encourages the use of the technology and increased satisfaction with its performance leads to a greater implementation success. Perceived benefits include economic profitability, cost effectiveness, reduce turnaround time, increased transaction speed and enhanced efficiency (Iacovou et al., 1995). The benefits of an innovation need to be made known by various marketing and promotional activities by the vendors. Increasing the awareness of benefits of new IT solutions can have a positive impact on the adoption of IT innovation. Awareness can also be increased with better education and training. Without the awareness of capabilities of an innovation, organizations will be unwilling to spend their resources on adoption and an adopted innovation with no exclusive benefit will not be put into effective use.

The study also found cost of innovation to be a decisive factor in determining IT innovation adoption. This result supports previous findings that the lower the cost, the more likely the innovation be considered for adoption and implementation (Kuan and Chau, 2001; Zhu et al., 2006a; Alam, 2009; Lee and Larsen, 2009). The cost of IT hardware and software has reduced dramatically in the past few years. Nevertheless, small firms are still unable to afford sophisticated IT and cost has been considered as a major barrier to the adoption of IT innovations in organizations. There are also some hidden costs associated with the adoption of most innovations and these costs will vary depending on the scope of innovation adoption process and its integration into the existing system. Managers need to evaluate innovation in terms of whether the benefits outweigh the cost and allocate resources for the adoption in a more economical way. In addition, apart from initial investments to obtain the technology, managers need to get a clearer understanding of the need for a lengthy investment on various fronts to realise integration of the innovation.

The study found no relationship between complexity and IT innovation adoption. This finding is surprising and contrary to findings of the innovation literature, as complexity is often believed to inhibit IT innovation adoption (Jeon et al., 2006; Tan et al., 2009; Lean et al., 2009). A possible reason would be due to widespread use of IT, the fact that the majority of employees in organizations are skilful in most computer applications and their experience in different forms of IT may reduce the perceived complexity of the innovation. It is also possible that organizations may seek the aid of vendors and consultants to address any initial complexities that they may face in the adoption of IT innovation. Another explanation might be that in a competitive environment, organizations are more willing to adopt the most advanced technologies available, regardless of its complexity. This tendency can be seen from the results of moderator effects for the relationship between complexity and IT innovation adoption for large firms. The results verified that the relationship is in the opposite direction for larger firms, suggesting that they are more likely to adopt more complex innovations. One plausible explanation for the insignificant relationship between complexity and IT innovation adoption might be that if a firm finds a particular innovation complex, they spend more time and effort exploring its features and gathering information on its application. Furthermore, for larger organizations due to the presence of IT expertise in the organization and the training facilities available for the user, the implication of the complexity of innovation becomes irrelevant. When considering the results obtained for complexity, it is important to note that out of fifteen complexity-IT adoption relationships considered in this study only four studies were targeted at small firms while the remainder were carried out for large or mixed size organizations. Hence, the overall results of complexity might have been inclined towards the relationship with IT innovation adoption for large organizations.

Compatibility emerged as one of the significant innovation attributes for IT innovation adoption. Compatibility of new innovation with respect to work process, business practice and existing IT infrastructure was found to be a significant determinant for IT innovation adoption. The result corroborates the findings of prior compatibility research (Beatty et al., 2001; Mirchandani and Motwani, 2001; Tan et al., 2009; Luo et al., 2010). The result suggests that organizations are more likely to adopt the innovation if it is compatible with their current experiences, existing information infrastructure and active values. The results further indicate that compatibility is equally important in the adoption and implementation stages. For the use of new technology, it is critical that innovation is compatible with existing work processes and well matched to IT infrastructure. If the new innovation is compatible with the existing system, the time and cost of its implementation are reduced considerably, leading organizations to benefit from greater economies of scale.

The study found that trialability of an innovation to have a significant impact in the adoption of IT innovations. Prior studies found trialability as an important attribute for the adoption-decision stage of innovation adoption (Karahanna et al., 1999). Trialability of innovation is important in reducing risk and uncertainty about the innovation. By trying the innovation, organizations can explore and experiment with the value of the innovation before committing to its adoption. If the organization has a chance to test the innovation before adoption, its practical implications might be better evaluated. Hence, organizations that can experiment with the innovation feel more comfortable with it and are more motivated to adopt the innovation.

The study found a strong relationship between observability and IT innovation adoption. If the organization has the opportunity to observe others using the innovation, the effectiveness of the innovation becomes more evident. The study result shows that the observability of innovations was more significant in the adoption-decision stage of innovation adoption of IT. Agarwal and Prasad (1997) also found that observability was significant for current usage but not for future use intentions. By allowing the technology to be visible to the potential adopter, vendors can easily convince organizations to adopt the innovation. Hence, organizations that have the opportunity to observe others using the innovation have a more positive view of the innovation and are more likely to adopt the technology.

7.3.2 Discussion of organizational determinants

The results of the meta-analysis showed that the most significant organizational factor for adoption of IT innovations was IS department size. This was followed by top management support, IS infrastructure, specialization, IT expertise, information intensity, resource, organizational size and product champion. The study did not establish formalization or centralization as determinant factors for IT innovation adoption.

The study conducted tests for moderator effects for all organizational factors as the sampling error variance were found to be less than 60% of the observed variance for all organizational factors. Hence, the study performed meta-analysis moderator effects for eleven organizational attributes.

The findings of the study revealed that IS department size had a positive influence on the adoption and implementation of IT innovations. The results support many of the past empirical finding that examined the significance of the size of IS department to the adoption of IT innovations in organizations (Fichman, 2001; Sharma and Rai, 2003; Pervan et al., 2005). The size of the IS department reflects the availability of IT resources and the organization's capacity in terms of infrastructure committed for adoption and implementation of IT. Also, the size of IT department usually reflects the amount of technical competency within the organization. With better technical competence and human resources, the organization would be more capable of providing training and support for end-users to utilize IT. For a successful adoption and implementation of IT, organizations require a large amount of IT expertise within an organization. Hence, larger IS departments have increased IT expertise, more resources and better infrastructure to facilitate IT innovation adoption and to influence a successful adoption and implementation of new innovation. Adoption of complex innovation in particular requires more IT functions within the organization. It is likely that a smaller IS unit may not have the resources to initiate and sustain changes in the adoption process.

The study found that top management support for the adoption and implementation of IT innovation is essential, especially in the assignment of adequate resources for facilitating the implementation of the innovation. It has been observed in numerous empirical studies in innovation adoption research that top management support is decisive for a successful adoption process of IT innovations in organizations (Karahanna et al., 1999; Eder and Igbaria, 2001; Teo et al., 2007; Troshani et al., 2011). Top management support for an organization's IT initiative is essential for influencing the adoption-decision directly. Top management vision for the use of IT determines the level of support for the adoption of the innovation. It is important that top management realises the potential of IT and assesses what new innovation brings to bottom-line performance in relation to the investment on it. Without their support, IS managers may be unwilling to engage in the adoption-decision which involves use of high percentage of the organizations' savings. In the adoption of IT, top management endorsement becomes useful in getting authorization for organizational commitment and attaining assurance from the firm's trading partners. Past research also suggests that top management support is also important for successful implementation of innovation by overcoming the internal resistance of new technologies which often surface during the implementation stage of IT adoption process (Rai and Howard, 1994; Rai and Bajwa, 1997; Liang et al., 2007; Ifinedo, 2011). Executives work together with trading partners through their leadership in the development and implementation of IT successfully.

A better IT infrastructure within an organization is essential for overall IT expansion in an organization. Organizations that have IT infrastructure in place should be in a better position to adopt and implement IT compared to organizations that lack basic facilities. The study found IT infrastructure as a significant organizational characteristic which impacts adoption and implementation of IT innovations in organizations. The findings suggest that IS infrastructure may influence adoption decisions marginally but it is clearly a pre-requisite for the implementation of IT innovation. Eder and Igbaria (2001), in a study on intranet diffusion and infusion found that a high level of IT integration is associated with greater IT infrastructure flexibility. Large organizations generally have strong established IT infrastructure in place compared to small counterparts and may not be a major issue in the adoption of IT. The moderator effect result shows that IS infrastructure was more significant for small organizations.

Different specialities within an organization facilitate adoption of IT innovations in organization according to meta-analysis results. This indicates the diversity of knowledge within an organization increases the innovativeness of the organization and encourages IT innovation adoption. The meta-analysis result on the influence of specialization on the IT innovation adoption was in agreement with a number of prior studies (Kimberly and Evanisko, 1981; Fichman, 2001). Different groups of specialists in an organization might be helpful in identifying the need for innovation and approve such innovations as being useful for their particular tasks.

The results showed that internal IT expertise to be important for IT innovation adoption. This suggests that organizations with existing technical capability may be in a better position to adopt and implement IT. Hence, organizations without internal IT expertise perceived themselves as not having the competence for IT innovation adoption and take time to implement an IT strategy. An increase in IT competence within an organization can lower the knowledge barriers and help build more realistic beliefs of the new IT. Overcoming the lack of knowledge of IT will lead to a greater probability of its adoption and contribute more effectively to the IS implementation process. For the adoption of complex innovation, extensive knowledge of the innovation and IT competence may be required. If a firm does not possess a sophisticated IT capability, it is less likely that IT assimilation will be successful (Li et al., 2010). In such instances, external support might help. The study found that IT expertise was more important for small organizations compared to large organizations. Lack of internal IT expertise inhibits small businesses from adopting IT innovations (Thong, 1999). For this reason, small businesses are generally reliant on the advice and support from vendors. External IT support may be in the form of IT maintenance and providing professional training. Using an outsourcing strategy, small firms can adopt IT with ease; however, without in-house IT expertise, small organizations might struggle to sustain its continuous use as specialized IT skills and knowledge are required to control and monitor IT operation.

The findings of the study showed that information intensity had a significant positive effect on the adoption of IT innovations in organizations. This also implies that the greater the information intensity of the product or service that the organization is involved in, the more likely they will adopt IT innovations. In addition, organizations with complex information processing needs are expected to adopt IT more than those which deal with simple tasks. Greater information intensity will lead management to recognize the need for IT and, at the same time, economically justifies the adoption and implementation of IT innovation. An organization that requires higher information processing may have to use IT more broadly and may adopt more complex innovations to meet their demands. The meta-analysis moderator effect results showed that it was significant for small organizations. For small organizations involved in complex information processing, further consideration needs to be placed on the switching cost which might be substantial when the scope of tasks are complex.

The results of the meta-analysis verified that resources are important for adoption of IT. The results support the view that resources positively influence initiation, adoption and implementation of IT innovations in organizations. The finding signifies that successful adoption of IT requires a significant financial investment and skilled employees. Equally, the study showed that resources need to be available for full integration and further development of the systems. These results are consistent with previous studies of IT innovation adoption (Lai and Guynes, 1997; Damanpour and Schneider, 2006; Rai et al., 2009). The result suggests that only those organizations with adequate resources would consider the adoption of IT. An abundance of resources enables an organization to experiment and explore different innovations during the initiation stage of innovation adoption (Kim and Garrison, 2010). Resources provide organizations with a degree of flexibility during the adoption-decision stage (Tornatzky and Fleischer, 1990). Additionally, the extra resources can be used to acquire the necessary managerial and technical talent to facilitate the implementation of an innovation (Chau and Tam, 1997). Nystrom et al., (2002) describe that, apart from acquiring resources for the implementation stage, resources is important for preparedness of additional technical and organizational funds and lowering performance standards such as adherence to deadlines.

Hence, as Wang and Cheung (2004) suggest, the more resources the more implementation can be done. Resources also provide a barrier against failure.

Organizational size was found to be a significant factor in IT innovation adoption and use of IT in organizations. The result suggests that even with the decreasing cost of IT, the size of the organization still plays an important role in the innovation adoption decision. For small organizations, IT innovation adoption represents a huge financial endeavour and most of these firms do not have in-house infrastructure and slack for such an investment. Large organizations with more resources have a greater need for technological improvement compared with smaller counterparts. Organizations which are limited in their resources cannot afford to invest in complex innovations and not many small businesses would be willing to undertake such a risky mission. On the other hand, larger firms are capable of mobilizing resources needed for innovation; at the same time, they can cost-effectively utilize them after adoption and also expect to capitalize on the economies of scale. In addition, large organizations may have better IT infrastructure and IS support facilities that could help create the awareness of the new IT and assist the adoption of most suitable innovations. Hence, organizations that are bigger in size are more likely to adopt and use IT successfully. In addition, Thong (1999) suggested that because of their needs, larger organizations tend to adopt more IT than smaller businesses. The positive relationship between organizational size and IT innovation adoption suggests that large organizations are usually in possession of more technology, finance and human resources to execute the IT innovation adoption process. However, the degree of significance the study obtained was somewhat unpredicted. One plausible explanation might be that relatively inexpensive technologies have made even sophisticated innovations accessible to small firms. Another justification might be larger organizations with their complex structure may deter the adoption of new systems making them less flexible to innovative changes. On the other hand, due to the centralization of management in small firms, adoption decisions may be accomplished quicker because fewer individuals are involved compared to larger organizations. Zhu and Kraemer (2005) assert that firm size is associated with structural inertia; that is, large organizations are less agile and flexible compared to small firms which affects adoption and use of IT. As the effect of size is not as influential as predicted, it is still reasonable to expect that greater human, technological and financial resources usually available to large organizations would allow them to adopt IT more successfully.

The study results indicated that the presence of an individual as product champion who provide the necessary efforts to initiate adoption is exceedingly important in a successful adoption and implementation of IT. The result was consistent with the majority of prior studies which consistently found that the presence of champion facilitates the adoption of new technology (Grover, 1993; Premkumar and Potter, 1995; Rai and Patnayakuni, 1996). The existence of champion is essential in adoption initiatives to evaluate information about the innovation and to directly influence the adoption-decision to gain necessary management and financial support for the adoption process. Product champion would help market the innovation within the organization by educating senior management and users on the potential benefits of the technology, create awareness of the technology for the needs of the innovation in the organizational operations and explain the outcomes in organizations after the implementation. Increased awareness of the innovation motivates management and individual users to adopt and use of the technology. The one who acts as an innovation advocate needs to be well-respected among organizational members. The mandatory skill required from a champion is to get various departments of the organization to work together on adoption and to persuade senior management to release resources for implementation. In addition, the work of the product champion may reduce user resistance and ease fears of moving to a new system.

Organizations that had a higher degree of formalization were not found to be predisposed to the adoption of IT innovations in organizations. An insignificant association was obtained for formalization and IT innovation adoption corroborating many of the past findings on IT innovation adoption (Lai and Guynes, 1997; Chau and Tam, 1997; Eder and Igbaria, 2001). On the other hand, several studies have verified the association between formalization and IT innovation adoption (Choe, 1996; Teo and Ranganathan, 2004; Bruque and Moyano, 2007). The result implies that different innovations may exhibit varying formal and informal settings and adaptable administrative control needs to be exercised in line with a particular adoption and implementation process. Formalization was thought to lead to an effective implementation and monitoring of system's success. However, the study findings indicate that organizations do not seem to set out a formal plan; instead, they want a flexible approach to change. The study result of the moderator effects of the stage of innovation showed formalization to have a weak significance for implementation stage.

Centralization was found to have no bearing on adoption or implementation of IT innovations in organizations. The result reinforces the findings of many past studies that investigated centralization in the organizational innovation adoption of IT (Fletcher et al., 1996; Lai and Guynes, 1997; Eder and Igbaria, 2001; Bajwa et al., 2005). Pervan et al., (2005) found that centralized decision-making in an organization limits the access and availability of IT to end users. However, they found that a centralized decision-making tradition influenced the initiation and adoption-decision stage, while no impact was observed at the implementation stage. This finding supports the result the study obtained for the meta-analysis moderator effect of the stage of innovation. However, the study showed a weak negative relationship for adoption-decision which indicates that decentralized decision-making to some extent facilitates adoption of IT. Grover (1993) also found that decentralized decision making was significant for the adoption of inter-organizational systems and it encouraged sharing innovative knowledge. Pervan et al., (2005) found that centralization lead to the adoption of fewer innovations.

7.3.3 Discussion of environmental determinants

The study also carried out a SLR of IT innovation literature to find the major environmental characteristics which influenced the adoption of IT. Meta-analysis of findings was performed to analyse the relative strength and impact of three environmental attributes for the adoption of IT innovations in organizations. The meta-analysis results confirmed a weak significance for external pressure, government support and competitive pressure to IT innovation adoption in organizations. In terms of the magnitude of the relationship, external pressure was found to be most significant, followed by government support. Unexpectedly, competitive pressure was found to be the least significant among the three factors examined. The study also performed meta-analysis moderator conditions for each of the environmental characteristics; this was done to find the impact of these conditions on the relationship between individual environmental factors and IT innovation adoption.

The results of the meta-analysis showed that external pressure was the most important environmental attribute for the adoption of IT innovations in organizations. This means that a recommendation from a strategic trading partner and a demand from a key customer to adopt a certain IT innovation influence the adoption of IT innovations by organizations. However, the magnitude of this factor was less significant than anticipated. This result was unpredictable especially for small organizations, as they are highly dependent on their trading partner and customers. One plausible explanation might be that small organizations are taking the initiative in the adoption of IT rather than being pushed into it. Contrary to this finding, past studies have found external pressure as a very strong determinant in the adoption of IT innovations in organizations (Chwelos et al., 2001; Tung and Rieck, 2005; Teo et al., 2009). For example, Teo et al., (2009) in an empirical study examining electronic procurement adoption in Singaporean firms found that due to external pressure, some organizations are obliged to use the innovation.

The meta-analysis found a weak significance for government support in the adoption of IT. This finding is contrary to the findings of some studies that assert that government support plays a great role in pushing organizations for the adoption of technology (Jeon et al., 2006; Seyal et al., 2007). The contribution of government in the adoption of IT innovations in organizations are mainly through developing dynamic policies, providing financial incentives, building communication incentives and promoting IT in industry. The result suggests that organizations are willing to adopt IT despite support and incentives from the government. The strength of the significance of government support for IT innovation adoption was not as strong as expected. One argument is that IT innovation is a rapidly changing phenomenon and the adoption of IT tends to be driven by individual initiatives rather than institutional support. However, governments are expected to remove barriers for IT innovation adoption and take initiatives in providing infrastructure and subsidies for organizations as well as facilitating access to information and opportunities in the global market. In addition, governments need to provide a range of initiatives to increase awareness of the benefits especially for small businesses to speed up the adoption rate. Governments could provide added support to initiate the adoption of new innovation at early stages.

It is believed that pressure from competitive firms plays a role in the adoption of IT innovations in organizations. The results suggest that competitive pressures do influence the adoption of IT; however, the study found competitive pressure to have only a weak significance for the adoption of IT. When competitors implement valuable innovation, firms in that industry will feel pressure and be interested in becoming more innovative. Most of the literature argues that the greater the competition among similar organizations, the more likely the organization considers IT innovation adoption to gain a competitive edge (Iacovou et al., 1995). The results of the study presented in this Thesis suggest that organizations that adopt IT do not do so entirely because of market pressure within the environment. The adoption decision might be based on other concerns such as benefits and costs. Nevertheless, organizations operating in an environment that is more competitive would tend to experience an increasing demand to adopt the innovation to gain competitive advantage. Zhu et al., (2006b) found that competition is more important for the initiation stages of innovation adoption and strong competition compels organizations to adopt IT more aggressively. However, they found the effect of competition for the deeper usage of IT was insignificant. The meta-analysis could not verify the relationship between competitive pressure and IT innovation adoption for initiation stage due to unavailability of data sets. However, the study showed that competitive pressure is a significant attribute for the adoption-decision stage, but insignificant in the implementation stage which corroborates Zhu et al.'s (2006b) findings. It is reasonable to assume that when firms face strong competition, they tend to initiate and adopt IT; however, with the rapid change in market demand, organizations follow the latest trends in IT and often competition forces organizations to adopt latest technology without sustained assimilation of existing IT.

7.3.4 Discussion of CEO determinants

Meta-analysis was carried out to examine the effect of CEO characteristics on IT innovation adoption in organizations. CEO attitude towards innovation was found to be the most influential attribute followed by CEO innovativeness and CEO IT knowledge. The study found no significance for manager's tenure, manager's age, manager's gender and manager's educational level.

The CEO attitude was found have a weak significance with the adoption of IT. CEOs with an optimistic approach in the adoption of IT are more likely to adopt IT innovations. The meta-analysis moderator effect findings show that CEO attitude towards IT plays an essential role in IT innovation adoption in small organizations. This was consistent with past studies that have examined the impact of CEO attitude on the adoption of IT innovations for small businesses (Thong and Yap, 1995; Seyal and Rahman, 2003). In small businesses, the CEO is often the owner and sole decision maker. Hence, small businesses with CEOs who have positive attitude towards IT innovation adoption are more likely to adopt IT. The appreciation of the relative advantages and benefits of IT innovation by CEOs would increase their positive attitude towards adoption. Some prior research has found CEO attitude to be a more significant attribute compared to the results of the study obtained. It might be possible that due to the widespread awareness of the IT, the majority of CEOs perceived the adoption of IT optimistically and it is the other organizational and innovation attributes that determine its implementation.

CEO innovativeness was found to have a weak significance with the adoption of IT. An innovative CEO will know that IT has a prominent role in businesses and they need to be considered. They should consider innovation as a strategic priority and actively support innovation adoption initiatives. They should be prepared to take any risk to find new ways of improving the operations of the organization. The result of the study also shows that CEO innovativeness was more important for small organizations. With scarce resources in small businesses, IT innovation adoption entails a huge financial investment which cannot allow any failure. Only innovative CEO's in small businesses will be willing to undertake such an uncertain venture. Innovative CEO's are more likely to adopt novel technologies that have not been tried in similar circumstances in anticipation of a positive outcome.

CEO IT knowledge is important to realize the benefits of an innovation adoption. However, the meta-analysis found CEO IT knowledge to have only a weak significance for the adoption of IT. As with other CEO characteristics, the impact of CEO IT knowledge has been overshadowed by organizational and innovation factors that dictate the adoption processes in organizations. Nevertheless, the findings provide evidence that CEO's lack of IT knowledge and insufficient awareness of the potential benefits of IT would inhibit IT innovation adoption. The CEO must be aware of the features of the innovation and some basic understanding of its use. IT knowledge will reduce the uncertainty involved in the adoption. CEO with adequate IT knowledge can contribute more effectively to the IS implementation through their participation in the requirements and design phase.

The study found manager's tenure insignificant for IT innovation adoption. The studies that examined manager's tenure have produced notable inconsistency in their outcome; some studies have found this factor an important predictor for IT innovation adoption (Damanpour and Schneider, 2006; Damanpour and Schneider, 2009) while other studies found as insignificant attribute (Meyer and Goes, 1988; Sharma and Rai, 2003). It is widely expected that managers with experience and positional legitimacy associated with longer job tenure are more capable of directing the adoption smoothly, by creating a favourable environment for adoption and making sure that the new innovation integrates well into the existing processes. One possible argument of the insignificant relationship between manager's tenure might be that a longer period in the same job creates resistance to change and lack of ability to be innovative. Another possible explanation of the finding might be that IT has been widely used by many organizations and the majority of workers nowadays are familiar with different IT applications, functional and political knowledge of managers does not have a say in the adoption process. Similar innovations have been used by related organizations and its applications are well-known within that community. Hence, a manager's experience of the organizational setting does not contribute to realizing the relevance and benefits of an innovation, allowing a smooth adoption and implementation process.

Manager's age was found to be insignificant for IT innovation adoption in organizations. Several prior studies reported that a manager's age is not significantly associated with innovation (Larsen, 1993; Damanpour and Schneider, 2006). According to management studies, young managers were associated with corporate growth; however, the causal relationship between corporate growth and managerial youth has not been empirically proven (Chuang et al., 2009).

The meta-analysis results of CEO characteristics showed that male and female executives did not demonstrate any distinguishing behaviours in IT innovation adoption. As the female has made great strides in reaching management in the past few decades and the number of female managers is rising, the results indicate that effectiveness of handling an adoption process for both genders are quite similar. As evident from Table 6.27, the majority of studies that examined manager's gender found insignificant attributes.

Again, no association was found between manager's educational level and IT innovation adoption. It has been widely expected that managers that are more educated would lead to greater computer use. However, studies that examined a manager's education level have contradictory results; Damanpour and Schneider (2009) and Chuang et al., (2009) found significance while Meyer and Goes (1988) and Larsen (1993) found educational level as an insignificant attribute. Damanpour and Schneider (2009) suggest that through education, managers enhance general knowledge and intellectual capacity that facilitates innovation adoption in organizations. The study result enlightens the fact that the benefits of using IT have been realised by different levels of individuals regardless of their formal education.

7.3.5 Discussion of the user acceptance determinants

The study explored user acceptance determinants of IT by integrating the key theoretical constructs of TRA, TAM and TPB. A SLR was undertaken to determine the studies which examined the influence of perceived usefulness, perceived ease of use, subjective norm and facilitating conditions as determinants of user acceptance of IT.

The study aggregated the results of tests of significance of past studies to establish the importance of the determinants and found all were important determinants of user acceptance of IT. Meta-analysis was then performed to find the strength of the relationship between the determinants and the use of IT. Results showed that all factors had a positive and statistically significant relationship with user acceptance. The results illustrate that perceived usefulness and perceived ease of use have a moderate significance and subjective norm and facilitating conditions have a weak significance for the use of IT.

One of the most significant findings was the relative strength of perceived usefulness. Perceived usefulness was found to be the most significant and this is consistent with past findings (Igbaria and Iivari, 1995; Igbaria et al., 1995; Anandarajan et al., 2002; Money and Turner, 2005; Karahanna et al., 2006). The results verified that the decisive reason for users to exploit IT innovation is that they find the system useful for their needs and tasks. This indicates that users, when recognizing the value of an innovation, are more likely to accept and use IT. Hence, usefulness of an innovation motivates the user to accept IT because it improves their job performance. User understanding of the innovation's full capability influences perceived usefulness and may be enhanced through advertisement and training.

Perceived ease of use of an innovation was also found to have moderate significance with use of IT which corroborates the findings of past studies (Igbaria et al., 1997; Horton et al., 2001). That is, individuals are more likely to have a favourable attitude towards new IT innovations if they believe that using the system will be free of effort, regardless of mandated or voluntary use of technology.

Perceived usefulness and perceived ease of use are two attributes the study drew together from TAM and the results further clarify the analytical ability of TAM to understand user acceptance of IT. Consistent with theory, the results support the basic TAM relationships. Perceived usefulness emerged as the primary antecedent for user acceptance and use of IT and this corroborates findings of prior TAM research (Davis et al., 1989; Karahanna et al., 2006). Previous research comparing the relative explanatory strength of perceived usefulness and perceived ease of use has generated mixed results. However, significance of perceived usefulness with respect to perceived ease of use on user acceptance and use of IT has been confirmed by the majority of prior studies (Davis, 1989; Chau and Hu, 2001; Venkatesh et al., 2008). In the IT adoption process, perceived ease of use is expected to be higher when the user starts using the system; however, when the user gains more experience using the system, perceived ease of use is expected to decrease at the same time as perceived usefulness increases. Researchers have suggested that perceived ease of use is a causal antecedent of perceived usefulness (Davis et al., 1989; Szajna, 1996; Venkatesh et al., 2008). Venkatesh (1999) described perceived usefulness as an extrinsic motivating factor and perceived ease of use as an intrinsic motivating factor.

The significant effects of subjective norm on user acceptance suggests that in an organizational environment, the decision to accept IT by the users is influenced by social factors, in particular, the views of other prominent individuals within those organizations. Taylor and Todd (1995a) suggest that subjective norm is a better determinant for novel users and early stages of the innovation adoption process. Venkatesh and Davis (2000) found that a subjective norm is only significant when the use of IT is mandatory and it weakens over time. This implies that individuals use IT because they think they will be recognized by their superiors as technically more competent. Hence, to persuade users to accept IT, organizations need to establish norms that favour system use. The results of subjective norm and use of IT is consistent with TRA.

The study confirms the important role of facilitating conditions in influencing user acceptance behaviour with positive correlation. This implies that availability of technical resources, knowledge and ability are important for user acceptance of IT. The more users sense availability of resources to use IT, the more likely they are to utilize it. Facilitating conditions is supported by the PBC constructs of the TPB model.

The study found that perceived usefulness and perceived ease of use were important determinants for user acceptance of product and process innovation. The study also found that perceived usefulness was a better determinant for user acceptance of process innovation and perceived ease of use was a more significant attribute for user acceptance of product innovation. In addition, the study found that perceived usefulness and perceived ease of use assists user acceptance of IT in manufacturing organizations. User acceptance of IT in services organizations are enabled with perceived usefulness and perceived ease of use of the innovation and existing facilitating conditions. Furthermore, the study found that ease of use of an innovation was the most important user acceptance determinant for organizations in service sector.

Use of IT in organizations is often mandated which means that the factors influencing users to accept innovation are very different compared with one accepting IT on its own choice (Brown et al., 2002). In a non-volitional environment such as found in organizations, IT implementation can be achieved successfully without a positive attitude by its users (Melone, 1990). Users use the innovation because it is mandated and in a mandated situation, subjective norm and facilitating conditions strengthens user intentions to use the innovation and eventually accept the innovation.

7.4 Discussion of moderator effect for the relationships

Meta-analysis moderator effect findings identify the variables which are most significant for each moderator condition. Table 7.1 illustrates the significance of different variables for each moderator condition.

Table 7.1 Moderator conditions for the relationship between individual characteristics and IT innovation adoption

Moderator conditions	Relative advantage	Cost	Compatibility	Trialability	Observability	Top management support	Organizational size	IT expertise	Product champion	IS department size	IS infrastructure	Information intensity	Resources	Specialization	Competitive pressure	External pressure	Government support	CEO innovativeness	CEO attitude	CEO IT knowledge	Perceived usefulness	Perceived ease of use	Subjective norm	Facilitating condition
Stage of adoption																								
Initiation							★						★											
Adoption	★★	★	★★	★★	★★	★★	★	★★	★	★★	★	★	★	★	★	★	★	★	★	★				
Implementation	★★		★			★	★	★★		★★	★★	★	★			★		★						
Type of innovation																								
Product	★★	★	★★	★★	★★	★★	★	★	★	★★	★	★	★	★★	★	★★	★	★	★★	★★	★★	★★		
Process	★★		★★	★★	★★	★	★	★					★						★	★	★★	★★		
Type of organization																								
Manufacturing							★	★				★★									★	★★		
Service	★★		★★				★				★★		★	★	★★	★				★	★★	★★	★	★
Size of organization																								
Large			★			★★	★			★				★	★					★	★★	★★		
Small	★★	★★	★			★★	★	★★			★★	★	★		★	★	★	★	★★	★★				

For the initiation stage of IT innovation adoption the study found organizational size to be an important attribute. The most important determinants of adoption-decision stage were relative advantage, compatibility, trialability, observability of innovation, top management support, organizational size, IT expertise and IS department size of the organization. The most significant determinants of implementation stage of IT innovation adoption were relative advantage of innovation, organizational size, IT expertise, IS department size and IS infrastructure of the organization.

Adoption of product innovations were found to be influenced by relative advantage, compatibility, trialability and observability of the innovation, top management support, organizational size, IS department size, specialization within the organization, external pressure, CEO attitude, CEO IT knowledge. In addition, user acceptance of product innovation is determined by perceived usefulness and perceived ease of use of innovation. Factors significant for the adoption of process innovations were relative advantage, compatibility, trialability and observability of the innovation and the size of the organization. Users accept process innovation only if it is useful and is easy to use.

For the adoption of IT in manufacturing organizations, the study found the size of the organization and information processing capacity as most important determinants. Users accept innovations in manufacturing sector if they find it is easy to use. In the service sector, meta-analysis found relative advantage, compatibility of the innovation, organizational size, IS infrastructure and pressure from competitors as most significant characteristics. In addition, users accept IT innovation in service industries only if they perceive the innovation as useful and easy to use.

The factors found key to the adoption of IT in large organization were top management support and organizational size. In addition, perceived usefulness and perceived ease of use of the innovation were found to be significant attributes for user acceptance of IT for large organizations. The most important determinants which predict the adoption of IT in small organizations were relative advantage and cost of innovation, top management support, IT expertise, IS infrastructure of the organization, CEO attitude and CEO IT knowledge.

The results of the moderator effect verified that a given set of variables may have different effect depending on the stage of innovation adoption process, type of innovation adopted, type and the size of organization the innovation being considered. The independent variables were not equally effective in predicting adoption of two different innovations in two different organizations at different stages of innovation adoption process. The meta-analysis moderator effect findings showed variation in the relationship between individual factors and IT innovation adoption under different research conditions.

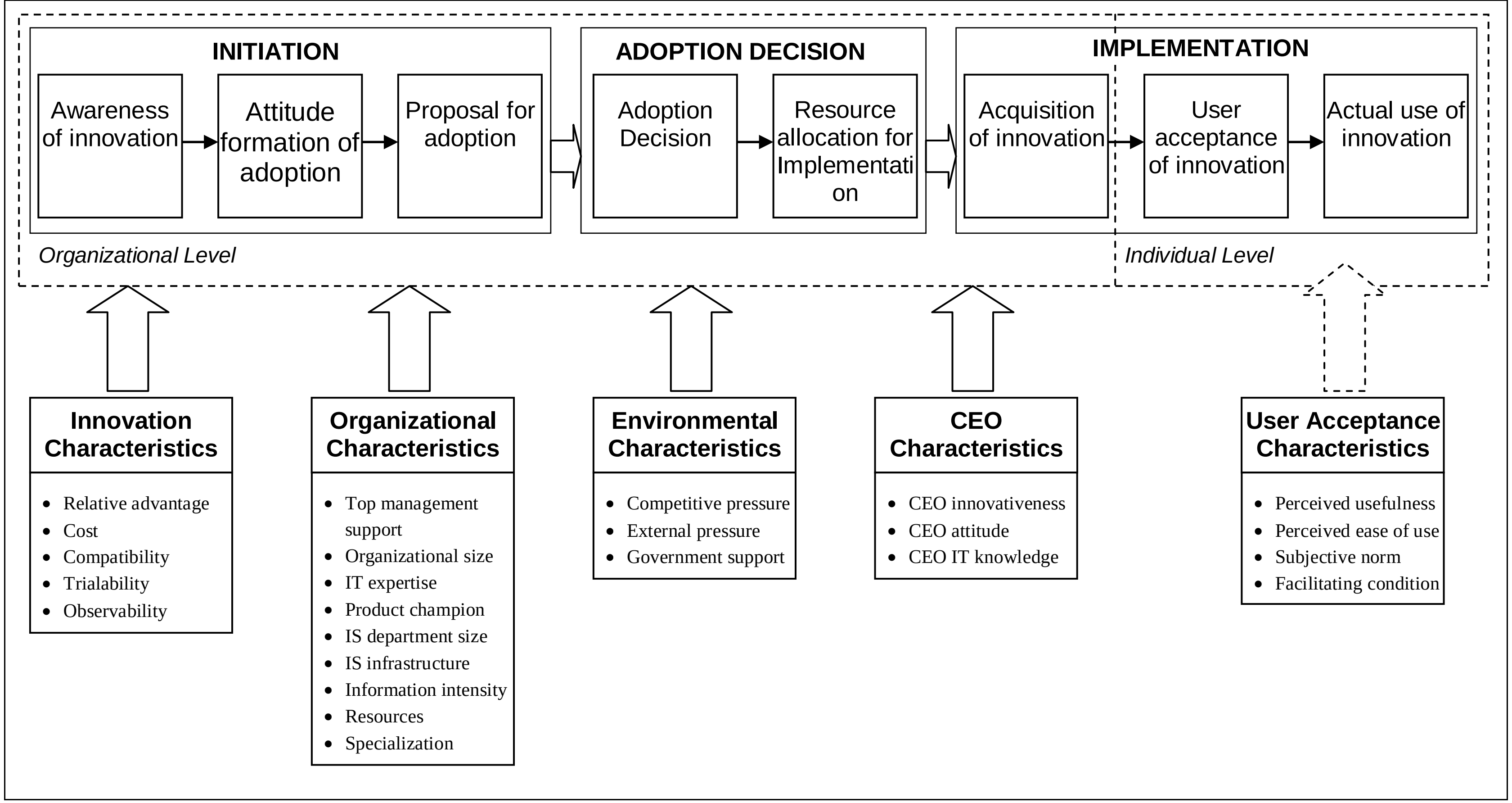
7.5 Overall model for IT innovation adoption in organization

Figure 7.1 illustrates an overall model for the adoption of IT innovation in organizations. The study combined the theoretical model developed based on the SLR and the factor model derived using the meta-analysis of past empirical findings on the adoption of IT innovations in organizations. The model depicts the adoption of IT innovations as a stage based process, progressing from initiation to adoption-decision to implementation stages.

The factor model identifies various determinants that influence various stages of innovation adoption of IT in organizations. Five major categories of determinants were classified that influenced different stages of adoption process. The meta-analysis of past empirical research verified major determinants of these five categories which influenced the adoption of IT innovations in organizations. The model considered the initiation stage until the possession of innovation in terms of organizational process and determinants that influence these progressions were in the context of innovation, organization, environment and CEO. Physical implementation of innovation until the full integration of IT innovation into the organization was treated as an individual adoption process and the characteristics that governed this stage were the user acceptance determinants.

The overall model included specific factors in different contexts that influenced the adoption of IT in organizations. In an innovation context, the key attributes were relative advantage, cost, compatibility, trialability and observability. For organizational determinant it was top management support, organizational size, IT expertise, product champion, IS department size, IS infrastructure, information intensity, resources and specialization. Competitive pressure, external pressure and government support were considered in the environmental context. The major determinants identified in the CEO perspective were CEO innovativeness, CEO attitude and CEO IT knowledge. Finally, the user acceptance determinant of the overall model was perceived usefulness, perceived ease of use, subjective norm and facilitating conditions.

Figure 7.1: Overall model for IT innovation adoption in organization



7.6 Advantages of aggregation of the results

The study results derive credibility and validity with the use of meta-analysis. Use of the meta-analysis allows the study to combine the findings of large number of studies in a systematic way representing samples taken from diverse research contexts. Aggregating findings from several studies in the meta-analysis procedure enabled the study to assess similarities and differences among the individual studies and the relationships therein to be revealed.

Aggregation of test of significance results verified inconsistency in the findings of past studies. Inconsistency in the findings of individual studies contribute much due to statistical error, measurement error and the interpretation of results of tests of significance. The use of effect size (correlation coefficient) in the meta-analysis allowed the study to consider small and insignificant effects to depict the overall strength of the relationships between different factors and IT innovation adoption. In addition, meta-analysis allows correction of errors to achieve a true magnitude of the relationship between variables. Difference in the interpretation of tests of significance also contributes to inconsistency in the findings of individual studies. Use of observed effect sizes in the meta-analysis overcame this drawback and explains the inconsistencies.

In addition, meta-analysis allows examination of the effect of four different research conditions for the relationship between innovation characteristics and IT adoption. With the large amount of samples from different individual studies with different research conditions, meta-analysis was able to identify the influence of those conditions on the relationships considered. The possibility of exposure to different research conditions allowed the study to identify relationships that would not necessarily be apparent from individual studies.

7.7 Summary

The study presented in this Thesis developed a model for the process of IT innovation adoption in organizations by integrating theoretical combination of DOI, TRA, TAM, TPB and frameworks which consist of determinants TOE (technology/innovation, organization, and environment) with the addition of CEO characteristics and user acceptance determinants.

The research presented an overall model for successful adoption and implementation of IT innovation in organizations by combining a theoretical model and the results obtained for the meta-analysis. Organizations may consider the processes emphasized in the model with the factors identified as predictors to achieve a successful adoption and implementation of IT.

Chapter 8

Conclusions and Future Research

Adoption process of IT innovations in organizations

8.1 Introduction

The overall aim of the research presented in this Thesis was to examine the process of adoption of IT innovations in organizations. The research investigated IT innovation adoption in organization and examined the processes and factors contributing to the adoption of IT innovations in organizations. Unlike the majority of past studies that have examined IT innovation adoption until the acquisition of innovation, the research portrayed the full integration of innovation within an organization.

The research was undertaken using two sequential phases; the first phase established the groundwork for the second phase of the study. The first phase of the research was exploratory in nature and, based on that foundation, an explanatory examination was carried out (second phase). The findings of exploratory and explanatory studies were then used to develop an overall model for process of IT innovation adoption in organizations.

This chapter outlines conclusions from the study and suggests future work for this area of research. The chapter starts with an overview of the research conducted. Following this, Section 8.3 discusses the lessons learnt from the research. Section 8.4 describes how the aims and objectives set out for the study were accomplished. Section 8.5 outlines the contributions and novelty of the research. In Section 8.6, the implications of the research are discussed. Limitations of the research are then discussed in Section 8.7 before discussing suggestions for future research in Section 8.8.

8.2 Research overview

To explore and understand various issues in the adoption and implement of IT innovations in organizations, the study explored two research questions.

> What are the processes involved in the adoption and the use of IT innovations in organizations?
>
> What are the key factors that guide a successful adoption and implementation of IT innovations in organizations?

To address the first research question the study performed exploratory research. The research explored the relevance of traditional innovation adoption and user acceptance theories and frameworks when applied to organizational adoption and implementation of IT innovation. The research performed a SLR on innovation adoption and user acceptance literature. Theories and models employed for examining innovation adoption and frameworks utilized to study IT innovation adoption in organizations were analysed. Assessment of the literature showed two important limitations in innovation adoption and user acceptance theories. Firstly, the majority of these theories and models were established to examine the behaviour of individual rather than organization. Secondly, no single model on its own can explain the full IT innovation adoption process. Hence, these theories and models need to be modified and integrated to explain the full adoption and implementation of IT innovations. At the same time, frameworks need to be incorporated into these innovation adoption theories and models to represent the perspectives relevant to organizations.

Frameworks for IT innovation adoption consist of factors in different contexts that influence the adoption process. The SLR described a number of factors in different contexts that influenced adoption of IT innovation and findings classified five categories of attributes germane to innovation adoption of IT in organizations.

Based on the SLR, the study developed and proposed a conceptual framework that would fully explain full IT innovation adoption process in organizations. Theoretical integration of DOI, TRA, TAM, TPB and a framework that consisted of determinants of TOE model with CEO characteristics and user acceptance determinants formed the model. The research demonstrates the usefulness of combining innovation adoption and user acceptance theories together with TOE framework for understanding innovation adoption in organizations. The findings of the exploratory study strongly support the appropriateness of using DOI, TRA, TAM, TPB and TOE to understand adoption and implementation of IT innovations in organizations. In addition, the model demonstrates the combined explanatory power of DOI, TRA, TAM, TPB and TOE perspectives.

For a complete representation of IT innovation adoption, the conceptual model considered an integrative process consisting of both individual and organizational perspectives. The model features variables in different contexts that influence initiation, adoption-decision and implementation stages of IT innovation adoption. The findings of the SLR categorized variables in the context of innovation, organization, environment, CEO and user acceptance as most influential in the adoption of IT innovations in organizations.

In response to the second research question, the study performed explanatory evaluation using meta-analysis on the factors influencing the adoption of IT innovations. The meta-analysis findings demonstrated that five categories of factors identified in the theoretical model influence the adoption of IT. With respect to innovation characteristics, relative advantage, compatibility, cost, observability and trialability were found to have a significant relationship with IT innovation adoption. Top management support, organizational size, IT expertise, product champion, IS department size, information intensity, resources and specialization were important attributes of organizations in the adoption of IT. As an environment determinant, competitive pressure, external pressure and government support were found to be important. In terms of CEO attributes, CEO innovativeness, CEO attitude and CEO IT knowledge were found to have considerable significance. Meta-analysis results also found perceived usefulness, perceived ease of use, subjective norm and facilitating condition as predictors of user acceptance of IT innovations.

The findings of the meta-analysis moderator effect showed varying results for the relationship between determinants and IT innovation adoption for research conducted at different (a) stages of innovation adoption, (b) type of innovation, (c) type of organization, and (d) size of organization.

8.3 Lessons from the research

Studies examining IT innovation adoption in organizations were conducted in a number of sectors and often with a reasonable amount of samples. It was decided that it would be of little contribution towards the knowledge, if the research was to replicate one of these studies and performed in a different setting. At the same time, during the analysis of the literature it was noticed that most of the studies reproduce past studies with different samples and usually reported findings with a noticeable degree of divergence.

As there was a fairly large amount of data available from these studies, it was decided to use this existing data instead of spending time and resources collecting additional data. In addition, it was decided to investigate the reasons why no firm conclusion had been reached in the adoption of IT in organization with all this available literature. Hence, the research analysed the findings of existing literature.

The most important lesson learnt was that a literature review is the most important part of any research. It builds a firm foundation in the terms of the knowledge of the subject and at the same time directs the way forward as in the case of the current research. It helps to choose the methodology adopted, data collection strategies, data analysis procedure and perhaps presentation of the findings.

With respect to meta-analysis, the adopted methodology had a key role to play in the research process. By putting together all available data, the research was better placed than if conducting a primary study especially to answer a research questions about whether an overall study result varied among research setting. Combining data from several studies using meta-analysis provided insights into the nature of relationships among variables and increased the generalizability of the results.

By adopting meta-analysis for this research it was observed that certain possible factors that influence the adoption of IT in organization have to be excluded for methodological grounds. For example, factors such as organizational readiness, internal pressure, user involvement and incentives may be apparent determinants of IT innovation adoption. These factors were eliminated by adopting a methodological screening process for systematic review and meta-analysis.

8.4 Research aims and objectives

The research had aims as described in Chapter 1.

> To recognize the process of adoption of IT innovations in organizations and to examine the key factors that influence the innovation adoption and the user acceptance IT in organizations.

To address these aims, the study set out a number of objectives described in Chapter 1, accomplished as follows:

1. Fill the knowledge gap in the IT literature for understanding the process of adoption and implementation of IT innovations in organizations.

The exploratory study allowed the research to identify problems that needed to be addressed in an IT innovation adoption study. The investigation recognized a knowledge gap in the IS literature in understanding the process of adoption and implementation of IT innovations in organizations. Existing IT innovation adoption theories, models and frameworks were explored and their limitations in explaining full IT innovation adoption in organizations acknowledged. Issues relating to the study of innovation adoption were investigated and a more affluent depiction in terms of perspective of innovation adoption research and the unit of analysis for organizations realised. A more complete explanation of innovation adoption processes was distinguished using a stage-based representation comprising of pre-adoption, adoption-decision and post-adoption phases.

2. Identify a theoretical model which examines the adoption and implementation of IT innovations in organizations

Theories, models and frameworks of IT innovation adoption found in the exploratory study were analysed in order to synthesize a full theoretical explanation for the adoption and implementation of IT innovations in organizations. By integrating past innovation adoption theories, models and frameworks, a comprehensive model for examining IT innovation adoption was developed. The model also encompasses the categories of determinants identified in the exploratory study.

3. Identify major determinants which influence adoption and use of IT innovations in organizations

Statistical analysis verified the key determinants among the factors identified in the exploratory analysis in the first phase of the study. A number of factors in different contexts have been identified as key for the adoption and use of IT in organization in the meta-analysis of past findings. The relative strength of each factor for the pre-adoption, adoption-decision and post-adoption were evaluated in the meta-analysis procedure.

4. Recognize the cause of contradictory findings in the study of adoption of IT innovations in the past

Meta-analysis moderator effect findings verified that innovation adoption was influenced by different determinants to varying degrees depending on the demographic conditions under which it takes effect. Studies examining factors influencing the adoption of IT were thus affected by these conditions. Hence, contradictory findings in past studies on factors influencing the adoption of IT relates to the effect of these moderator conditions.

5. Develop an overall model for successful IT adoption and implementation in organizations

The theoretical model synthesized in the exploratory study and the determinants found key in the meta-analysis for the adoption of IT innovations in organizations formed the overall model for the IT innovation adoption in organization. The combined configuration was expected to guide an organization for a successful IT innovation adoption process.

8.5 Academic contribution and novelty

The contribution of the study includes an enhancement of our understanding of IT adoption and implementation processes in organizations. The findings of this study contribute to both the theoretical and empirical knowledge on organizational adoption and implementation of IT innovations in organizations. One contribution is to provide a review of long-established innovation adoption literature and to examine the suitability of traditional innovation adoption models for IT innovation adoption in organizations.

By empirically validating a theoretically derived model for adoption and implementation of IT innovations in organizations, the study further offers several contributions to the literature on IT adoption. The study proposed a more comprehensive model of the adoption and use of IT in organizations. A theoretical model or framework of innovation adoption seldom considers both the adoption and user acceptance of innovation in a single model. The proposed model contributes to research by producing evidence and empirical support for long espoused theories and principles of the adoption and user acceptance of IT in organizations. Consideration of all relevant literature allows the model to hold a rich theoretical perception and practical strength for the overall representation of adoption of IT innovations in organizations.

In addition, the model combines innovation adoption and user acceptance perspectives into a single representation. The model exhibits novelty by illustrating that the organizational innovation adoption process takes place in two stages; organizational decisions to adopt the innovation are followed by evaluation of users to accept the innovation. These stages are influenced by a number of attributes in different contexts.

Furthermore, the study produced empirical evidence to support theories on the adoption and implementation of IT innovation and the relationships that impact the adoption process. The findings show effectiveness of DOI for the adoption of IT and TRA, TAM and TPB to predict user acceptance of IT. The study provides a new perspective on DOI, TRA, TAM and TPB in an integrative model that represents a more comprehensive illustration of innovation adoption and user acceptance.

The study contributes to IT innovation adoption literature by validating the role of DOI theory in understanding IT innovation adoption. The study supported the suggestion in the innovation adoption literature that DOI has a solid theoretical foundation and empirical support in explaining the IT innovation adoption process. The DOI model was found to be a suitable starting point for identifying the main characteristics of IT innovation adoption as suggested in the innovation adoption literature. The study adds to the innovation adoption literature by confirming the significance of relative advantage, complexity, compatibility, trialability and observability of innovation as perceived characteristics assisting or hindering adoption of an innovation.

The study gives reflects the literature in the use of TRA to enlighten the perception of social influence on user acceptance of an innovation. The study theoretically validates user attitude and behaviour towards accepting an innovation as being influenced by their normative beliefs about using an innovation (as posited in TRA). The subjective norm factor hypothesized in TRA model was found to be a significant attribute in user acceptance of IT innovation, corroborating much of the past literature.

The study adds to the user acceptance literature by confirming that TAM offers a useful theoretical foundation for examining the factors influencing IT acceptance. The study justifies the strength of the two attributes of perceived usefulness and perceived ease of use proposed in TAM to explain user acceptance of IT. Also, the study provides confirmation by relating the strong effect of perceived usefulness and perceived ease of use on system use. The study further supports the user acceptance literature by confirming the strong significance of perceived usefulness compared to perceived ease of use in user attitude towards accepting an innovation.

Another contribution of this study for innovation adoption literature was the importance of TPB in predicting user acceptance of IT in voluntary and mandatory conditions. The study effectively utilized TPB to cover user acceptance of IT in volitional and non-volitional settings. The findings show the importance of facilitating conditions (a construct of PBC) which was a fundamental feature, hypothesized in TPB in predicting an individual intention to accept an innovation in mandatory circumstances.

The model shows the usefulness of theoretical frameworks such as TOE for characterizing the adoption of IT innovations in organizations. The findings of this study have confirmed several factors within the TOE contexts that influence IT innovation adoption in organization supporting several past findings. The study authenticates the explanatory power of the TOE framework and its relevance in investigating organizational innovation adoption in a number of surroundings.

The empirical analysis of the research contributed to knowledge on the determinants of IT innovation adoption. One of the main strengths of the model was that the derivation of its factors from previous conceptual and empirical research. Hence, this study provides a contribution in identifying the factors at the organizational level and at the individual level that influence the adoption and the implementation of IT in organizations. The findings of the study elaborated on the theoretical linkages between attributes and the IT adoption process and highlighted the impact of certain constructs posited in the adoption and user acceptance models needed for successful adoption and implementation of IT. In addition, the study confirmed the relationship between certain variables that exist in the literature which supposedly influence the adoption and implementation of IT.

8.6 Implications of the research

The research findings from this study have significant implications for research and practice. The study shows that classical innovation adoption or user acceptance theories are independently inadequate in explaining the full innovation adoption process. In addition, they do not explain the factors influencing the adoption and user acceptance of IT collectively. Researchers must take into account these limitations of traditional theories when considering any study on innovation adoption in organization. Furthermore, the study also demonstrates the value of using a framework to understand the adoption of innovation in organizations.

The study confirmed relationships that exist between several factors and IT innovation adoption and gathered empirical evidence of the effects these factors for the initiation, adoption-decision and implementation of IT innovations in organizations. It was surprising that in the meta-analysis some determinants were insignificant or the significance was not strong as hypothesized. However, conclusions obtained in this study on the determinants of IT innovation adoption offer a series of predictions that may prove useful for practitioners responsible for IT adoption and implementation processes. Organizations could address these issues when embarking on IT adoption and implementation.

The study found various gaps in the current literature. The findings of the study emphasizes the effect of different research conditions for the relationship between various determinants and IT innovation adoption. The results of the moderator effect showed that some factors were more relevant in specific conditions and need to be addressed more thoroughly in these circumstances in the adoption and implementation of IT. The factors and the conditions that need to be considered for different stages of IT adoption have also been highlighted in the results. Concentrating identified factors in those particular conditions and settings would help to achieve a successful adoption process.

This study also has several implications from a practitioner standpoint. Managers can draw up the theoretical model presented and assess the condition of the adoption process and possible factors that lead to a successful adoption of IT in their organizations. Results serve as guidelines for practitioners to identify and address the facilitating and inhibiting issues in different context in the process of IT adoption. Managers need to consider these important issues when embarking on IT adoption. The result suggests that managers and vendors need to address not only the attributes that facilitate adoption-decision of the IT innovation in organizations but also individual determinants that assist user acceptance of IT.

Managers and vendors need to assess the appropriateness of certain characteristics for the particular IT being considered and the conditions under which the innovation becomes effective. In addition, managers can utilise the model to plan and prepare for the adoption process and establish smooth conditions for IT user acceptance. By recognizing the factors that facilitate and inhibit IT adoption, managers are able to formulate better strategies in adopting and implementation IT innovations.

The model proposed has been specifically aimed at IT innovation adoption in organization. Hence, the proposed model can be utilized in the adoption of a wide range of product and process innovations such as personal computers, internet and web applications, e-commerce applications, e-business applications, mobile applications, e-procurement, inter-organizational-IS, MIS, DBMS, HRIS, GIS, ERP systems, payment systems and banking systems. In addition, the model can be employed in the adoption of IT in any other organizational type such as manufacturing or service industry or organizational size; for instance, large or small organizations. As DOI theory used in the overall model explains the adoption of any type of innovation and TRA, TAM, TPB considers user attitude and behaviour towards acceptance of innovation, the integrated representation of these four theoretical models can precisely be related to adoption and implementation of any type of technological innovation in an organization. Hence, the proposed model can be utilized in the adoption and user acceptance of any technological innovation in organizations. For example, the model can be applied to the adoption and user acceptance of mobile and other telecommunication technologies in organizations.

8.6.1 Strength and the weaknesses of the proposed model

Most of the existing theories and models of IT innovation adoption describe either the decision to adopt an innovation or individual behaviour to accept and use an innovation. No single model explains both innovation adoption and user of technology, jointly. Also, none of the existing innovation adoption theories or user acceptance models reflects adoption of innovation in an organizational context. One of the strongest points of the theoretical model presented in the study described in this Thesis was the illustration of innovation adoption and user acceptance of IT in a single representation. The model demonstrates that organizational innovation adoption takes places in two stages, i.e., the organizational decision to adopt an innovation followed by the users' decision to accept the innovation. This signifies a more complete overall model for IT innovation adoption in organizations. The model gained reliability by the fact that it has been synthesized by combining innovation adoption and user acceptance theories previously used in the IS literature to depict a more integrative structure. In addition, the limitations of individual theories were addressed in developing the structure to derive a more complete model for adoption of IT in organizations.

The model suggests a number of factors in different contexts which influence the adoption of IT innovations in organizations. One of the main strengths of the models is the methodology adopted in deriving these factors. The model obtained these factors by aggregating findings of almost all previous conceptual and empirical research on the determinants of IT innovation adoption. Use of meta-analysis allowed the study to combine a large number of findings in a systematic way representing samples taken from diverse research contexts to examine each of the individual factors presented. The results obtained for the relationship between individual factors and IT innovation adoption using meta-analysis is estimated to be more credible providing the soundness of each of the individual factors in the model.

However, in aggregating the findings, all qualitative studies which examined the determinants of IT innovation adoption have to be ignored, as the meta-analysis procedure only considers effect sizes of the relationships. As a result, some of the subjective interpretations for the cause of relationships have to be ignored and may be considered a weakness of this study.

8.7 Limitations

The study has some limitations that need to be considered when interpreting the results. Small sample size was the biggest limitation for this meta-analysis study. For the meta-analysis, only the studies that performed correlation analysis were included. For some variables, the number of data sets available was inadequate to perform the meta-analysis. Hence, lack of adequate data values limited the study to conduct meta-analysis to only some factors in each context. The meta-analysis considered thirty-one determinants from five dimensions; however, there are many others that have not been included due to unavailability of data. If the study had the opportunity to explore more factors, understanding of IT adoption in different contexts would be more thorough and if performed with more samples, some of the results obtained would have been more precise.

The methodology used and the methodological screening imposed for the inclusion and exclusion of studies may limit the use of data and interpretation of the results. However, such screening was required to filter out studies with less rigour in their investigation, improving the overall sample for the studies. Although this restriction limits the number of studies used for the meta-analysis, the results obtained for the relationships were presumed more accurate.

Due to the lack of IT adoption relationships, the study could not perform the meta-analysis of moderator effects for some individual attributes. Also, most of the meta-analysis for moderator conditions had to be performed with a limited number of data values; if performed with more samples, the understanding of the relationship between individual factors and IT innovation would have been more comprehensive. Lack of data meant that the study fell short of identifying the real impact of different moderating conditions for the relationships studied.

A number of limitations of meta-analysis were identified in Section 3.10.2. As the study conducted a meta-analysis, all these limitations are equally applicable to the current research. The review of studies may have been subjected to publication bias. A comprehensive search was carried out to obtain the studies on IT adoption. However, with every effort to cover all the literature on IT innovation adoption, the study may not be completely immune to publication bias.

8.8 Suggestions for future research

The research provides the impetus for future research on many issues and can proceed in several directions. First, this research proposed a theoretical framework for the adoption and implementation of IT innovations in organizations and empirically validated it by using meta-analysis of past findings. The core of the model has general applicability to any form of innovation adoption and can be tested and extended in various innovation types and various industries. While the theoretical framework proposed incorporates constructs that have been suggested in individual and organizational adoption literature, the synthesis of these constructs are novel and thus require additional validation. Future research could conduct alternative research approaches such as cross-sectional and longitudinal studies to help understanding of the impact of this framework in depth. The model may be tested more intensively in a chosen or a specific industry.

The fact that contextual attributes were found to have significant or insignificant influence confirms the need for further research investigation and many of the findings portend future avenues for productive research. In the review study and meta-analysis various gaps in the understanding of the attributes of IT innovation adoption have been identified due to the lack of past empirical studies. Future studies could concentrate on addressing these gaps to enhance understanding of those areas that have not been covered in past studies.

Researchers can utilize the model in examining IT innovation adoption in organization to validate the appropriateness of the model in different contexts. In addition, researchers can investigate the influence of different factors proposed in the model to verify the relative importance of each of the factors for a range of IT innovations and for different organizational types. The model can be tested on different innovation types such as product or process innovations to determine the applicability of the model for various technological innovations. Equally, the model can be tested on specific organizational types such as large or small organizations or manufacturing or service firms, to establish the suitability of the model in predicting IT innovation adoption in different organizational settings.

Future research could be targeted towards particular industrial sectors and organizational types to understand similarities and differences in characteristics that dictate adoption and user acceptance of IT. Also, by examining the determinants proposed in the model in different innovation and organizational types, studies can verify which factors are, in practice, the key determinants of adoption of a specific innovation or for particular organizational surroundings. Studies could employ a survey methodology to investigate the key determinants on specific conditions and further utilize a qualitative approach gather in-depth knowledge on the most relevant factors.

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Appendix A

Questionnaire for Systematic Review and Meta-analysis

1. Name of the Study:		Study Code
2. Name of the Author/s:		
3. Name of the Journal the study was published:		4. Year Published:
5. Where was the study conducted?		Study settings: Western / Non Western
6. What is the level of analysis used in the study?	Organizational / Individual	
7. What is the total sample used in the study?		
8. What is the subject in which the study was conducted?	Student / Non Student	
9. What is the type of organization which the study conducted?	Large / Small / Mixed	
10. What is the type of industry which the study was conducted?	Manufacturing / Service / Mixed	
11. What is the name of the innovation considered in the study?		
12. What is the type of the innovation the study considered?	Product / Process / Mixed	
13. What type of the study method does the study conducted?	Survey / Case study / Experimental / Secondary data / Theoretical / Other	
14. What type of analysis does the study used?	Correlation / Regression / Discriminant / Descriptive / PLS / Other	
15. What innovation theories do the study used?	Diffusion of Innovation; Perceived Characteristics of; Technology Acceptance Model; Theory of Planned Behaviour; Theory of Reasoned Action; Technology Acceptance Model 2; Technology Acceptance Model 3; Technology Organization Environment Model; Tri-core Model; Diffusion and Implementation Model; IT innovation Research Model; Task Teschnology Fit; Framework for Innovation Adoption and Implementation; Unified Theory of Acceptance and Use of Technology; Other; None	
16 What stage of innovation adoption was considered?	Initiation / Adoption / Implementation	

17. What organizational factors were considered in the study?	Name	Code	Significance	Effect Size
			S / NS	
			S / NS	
			S / NS	
			S / NS	
			S / NS	
			S / NS	
			S / NS	
			S / NS	
			S / NS	
			S / NS	

18. What innovation factors were considered in the study?	Name	Code	Significance	Effect Size
			○ S ○ NS	
			○ S ○ NS	
			○ S ○ NS	
			○ S ○ NS	
			○ S ○ NS	
			○ S ○ NS	
			○ S ○ NS	
			○ S ○ NS	
			○ S ○ NS	
			○ S ○ NS	

19. What environmental factors were considered in the study?	Name	Code	Significance	Effect Size
			○ S ○ NS	
			○ S ○ NS	
			○ S ○ NS	
			○ S ○ NS	
			○ S ○ NS	
			○ S ○ NS	
			○ S ○ NS	
			○ S ○ NS	
			○ S ○ NS	
			○ S ○ NS	

18. What individual or CEO factors were considered in the study?	Name	Code	Significance	Effect Size
			○ S ○ NS	
			○ S ○ NS	
			○ S ○ NS	
			○ S ○ NS	
			○ S ○ NS	
			○ S ○ NS	
			○ S ○ NS	
			○ S ○ NS	
			○ S ○ NS	
			○ S ○ NS	

18. What technology acceptance factors were considered in the study?	Name	Code	Significance	Effect Size
			○ S ○ NS	
			○ S ○ NS	
			○ S ○ NS	
			○ S ○ NS	
			○ S ○ NS	
			○ S ○ NS	
			○ S ○ NS	
			○ S ○ NS	
			○ S ○ NS	
			○ S ○ NS	

Appendix B

Table B1: Relationships extracted from the innovation adoption studies (Organizational level analysis)

Study	INN	STG ADP	SAM SIZ	CTY SDY	TYP INN	TYP ORG	SIZ ORG	DCM	DAM	THR
Agarwal and Prasad (1997).	IT	ADP	73	USA	PRC	SRV	MIX	SUR	REG	DOI, TAM, TRA, OTH
Alam (2009).	Internet	ADP	368	Malaysia	PRD	MIX	SML	SUR	COR	DOI, TAM, OTH
Al-Gahtani (2004).	IT	ADP	1190	Saudi Arabia	PRC	MIX	MIX	SUR	COR	DOI
		IMP	1190	Saudi Arabia	PRC	MIX	MIX	SUR	COR	DOI
Al-Qirim (2007).	Internet + Internal email	ADP	129	New Zealand	PRD	MIX	SML	SUR	OTH	DOI
	Internet + External email	ADP	129	New Zealand	PRD	MIX	SML	SUR	OTH	DOI
	Intranet	ADP	129	New Zealand	PRD	MIX	SML	SUR	OTH	DOI
	Extranet + VPN	ADP	129	New Zealand	PRD	MIX	SML	SUR	OTH	DOI
	Internet + EDI	ADP	129	New Zealand	PRD	MIX	SML	SUR	OTH	DOI
	Website	ADP	129	New Zealand	PRD	MIX	SML	SUR	OTH	DOI

Table B1 continue …..

Study	INN	STG ADP	SAM SIZ	CTY SDY	TYP INN	TYP ORG	SIZ ORG	DCM	DAM	THR
Bajwa et al. (2005).	Collaboration Information Technologies	ADP	119	USA	MIX	MIX	MIX	SUR	REG	OTH
		IMP	119	USA	MIX	MIX	MIX	SUR	REG	OTH
		ADP	140	Australia	MIX	MIX	MIX	SUR	REG	OTH
		IMP	140	Australia	MIX	MIX	MIX	SUR	REG	OTH
		ADP	85	HongKong	MIX	MIX	MIX	SUR	REG	OTH
		IMP	85	HongKong	MIX	MIX	MIX	SUR	REG	OTH
Beatty et al. (2001).	Website	ADP	284	USA	PRD	MIX	MIX	SUR	OTH	OTH
Bradford and Florin (2003).	ERP	IMP	51	USA	PRC	MNF	LRG	SUR	COR	DOI, TOE
Bruque and Moyano (2007).	IT	ADP	15	Spain	MIX	MIX	SML	CSS	DES	OTH
		IMP	15	Spain	MIX	MIX	SML	CSS	DES	OTH
Chan and Ngai (2007).	Internet	ADP	10	Hong Kong	PRD	MIX	MIX	CSS	DES	DOI, TOE
Chau and Tam (1997).	Open System	ADP	89	Hong Kong	PRD	MIX	MIX	CSS	REG	OTH
Choe (1996).	Accounting Information Systems	ADP	78	South Korea	PRC	MIX	MIX	SUR	COR	OTH
		IMP	78	South Korea	PRC	MIX	MIX	SUR	COR	OTH
Chong (2004).	E-Commerce	ADP	115	Australia	PRD	MIX	SML	SUR	REG	OTH
Chuang et al. (2009).	IT	ADP	97	USA	MIX	SRV	SML	SDA	COR	OTH
Chwelos et al. (2001).	EDI	ADP	317	Canada	PRD	MIX	MIX	SUR	COR	DOI, TOE
Cragg and King (1993).	Computing	IMP	6	New Zealand	MIX	MNF	SML	CSS	DES	TOE, OTH
Damanpour (1991).	IT	ADP			MIX	MIX	MIX	SDA	OTH	OTH
Damanpour and Schneider (2006).	IT	INI	1276	USA	PRC	MIX	MIX	SUR	COR	OTH
		ADP	1276	USA	PRC	MIX	MIX	SUR	COR	OTH
		IMP	1276	USA	PRC	MIX	MIX	SUR	COR	OTH

Table B1 continue …..

Study	INN	STG ADP	SAM SIZ	CTY SDY	TYP INN	TYP ORG	SIZ ORG	DCM	DAM	THR
Damanpour and Schneider (2009).	IT	ADP	725	USA	MIX	SRV	MIX	SDA	COR	OTH
DeLone (1981).	Personal Computer	IMP	84	USA	PRD	MNF	SML	SUR	COR	OTH
DeLone (1988).	Personal Computer	IMP	93	USA	PRD	MNF	SML	SUR	OTH	OTH
Eder and Igbaria (2001).	Intranet	ADP	281	USA	PRD	MIX	LRG	SUR	COR	OTH
		IMP	281	USA	PRD	MIX	LRG	SUR	COR	OTH
Fichman (2001).	OO Programming	ADP	608	USA	PRD	MIX	MIX	SUR	COR	OTH
	OO Programming	IMP	608	USA	PRD	MIX	MIX	SUR	COR	OTH
	OO Programming	MIX	608	USA	PRD	MIX	MIX	SUR	COR	OTH
	Relational DMS	MIX	608	USA	PRD	MIX	MIX	SUR	COR	OTH
	CASE	MIX	608	USA	PRD	MIX	MIX	SUR	COR	OTH
	Software Process	ADP	608	USA	PRD	MIX	MIX	SUR	COR	OTH
	Software Process	MIX	608	USA	PRD	MIX	MIX	SUR	COR	OTH
Fletcher et al. (1996).	Database	MIX	86	UK	PRD	SRV	LRG	SUR	COR	OTH
Gemino et al. (2006).	Website	ADP	223	Canada	PRD	MIX	MIX	CSS	REG	OTH
Gengatharen and Standing (2005).	E-Market Place	IMP	28	Australia	MIX	MIX	SML	CSS	DES	OTH
Grandon and Pearson (2004a).	E-Commerce	ADP	83	Chile	PRD	MIX	SML	SUR	DIS	TOE, OTH
Grandon and Pearson (2004b).	E-Commerce	ADP	100	USA	PRD	MIX	SML	SUR	OTH	TAM, TPB, TOE
Grover (1993).	Inter organizational System	ADP	214	USA	PRC	MIX	MIX	SUR	DIS	OTH

Table B1 continue …..

Study	INN	STG ADP	SAM SIZ	CTY SDY	TYP INN	TYP ORG	SIZ ORG	DCM	DAM	THR
Grover et al. (1997).	Out Sourcing	ADP	313	USA	PRD	MIX	LRG	SUR	REG	TriCore
	CASE	ADP	313	USA	PRD	MIX	LRG	SUR	REG	TriCore
	Object Oriented Programming System/ Design (OOPS)	ADP	313	USA	PRD	MIX	LRG	SUR	REG	TriCore
	Large Scale Relational Database (DBMS)	ADP	313	USA	PRD	MIX	LRG	SUR	REG	TriCore
	Executive Information System	ADP	313	USA	PRC	MIX	LRG	SUR	REG	TriCore
	Teleconferencing	ADP	313	USA	PRD	MIX	LRG	SUR	REG	TriCore
	Expert System	ADP	313	USA	PRD	MIX	LRG	SUR	REG	TriCore
	Email	ADP	313	USA	PRD	MIX	LRG	SUR	REG	TriCore
	CAD/CAM	ADP	313	USA	PRD	MIX	LRG	SUR	REG	TriCore
	Electronic Data Interchange (EDI)	ADP	313	USA	PRD	MIX	LRG	SUR	REG	TriCore
Grover and Goslar (1993).	Telecommunication Technologies	INI	154	USA	PRD	MIX	MIX	SUR	REG	OTH
		ADP	154	USA	PRD	MIX	MIX	SUR	REG	OTH
		IMP	154	USA	PRD	MIX	MIX	SUR	REG	OTH
Grover and Teng (1992).	DBMS	ADP	171	USA	PRD	MIX	MIX	SUR	OTH	OTH
Hoffer and Alexander (1992).	Database Machine (DBM)	ADP	76	USA	PRD	MIX	MIX	SUR	OTH	OTH
Hsiao et al. (2009).	Mobile Nursing Information Systems	ADP	84	Taiwan	PRC	SRV	MIX	SUR	DIS	TOE
Hu et al. (2002).	Telemedicine	ADP	113	Hong Kong	PRD	SRV	MIX	SUR	REG	TOE
Iacovou et al. (1995).	Electronic Data Interchange (EDI)	ADP	7	British Columbia	PRD	MIX	SML	CSS	DES	TOE
		IMP	7	British Columbia	PRD	MIX	SML	CSS	DES	TOE

Table B1 continue …..

Study	INN	STG ADP	SAM SIZ	CTY SDY	TYP INN	TYP ORG	SIZ ORG	DCM	DAM	THR
Ifinedo (2011).	Internet-E-Business Technologies	IMP	214	Canada	PRD	MIX	SML	SUR	OTH	TOE
Iskandar et al. (2001).	Electronic Data Interchange (EDI)	ADP	111	USA	PRD	MNF	MIX	SUR	COR	OTH
		IMP	111	USA	PRD	MNF	MIX	SUR	COR	OTH
Jeon et al. (2006).	E-Business	ADP	204	S. Korea	PRD	MIX	SML	SUR	COR	TOE, OTH
Jun and Kang (2009).	E-Commerce	IMP	171	Korea	PRD	MIX	MIX	SUR	OTH	OTH
Karahanna et al. (1999).	IT	ADP	77	USA	MIX	MIX	MIX	SUR	PLS	DOI, TRA, TOE
		IMP	153	USA	MIX	MIX	MIX	SUR	PLS	DOI, TRA, TOE
Khalid and Brian (2004).	Inter-organizational Information Systems	ADP	87	USA	PRC	MIX	MIX	SUR	OTH	TOE, OTH
Khoumbati et al. (2006).	Enterprise Application Integration	ADP	65	UK	PRC	SRV	MIX	CSS	DES	OTH
Kim and Garrison (2010).	Radio Frequency Identification (RFID)	INI	78	South Korea	PRD	MIX	MIX	SUR	COR	TOE
Kimberly and Evanisko (1981).	Administrative Innovation	ADP	210	USA	PRD	SRV	LRG	SDA	COR	OTH
	Technological Innovation	ADP	210	USA	PRD	SRV	LRG	SDA	COR	OTH
Kowtha and Choon (2001).	E-Commerce	ADP	135	Singapore	PRD	SRV	MIX	SUR	COR	OTH
Kuan and Chau (2001).	Electronic Data Interchange (EDI)	ADP	525	USA	PRD	MIX	SML	SUR	REG	DOI, TOE
Lai and Guynes (1994).	ISDN	ADP	153	USA	PRD	MIX	LRG	SUR	OTH	DOI
Lai and Guynes (1997).	ISDN	INI	161	USA	PRD	MIX	LRG	SUR	DIS	OTH
Larsen (1993).	IT	MIX	99	USA	MIX	MNF	LRG	SUR	COR	OTH
Law and Ngai (2007).	Enterprise Resource Planning (ERP)	ADP	96	Hong Kong	PRC	MIX	MIX	SUR	OTH	OTH
Lean et al. (2009).	E-Government	ADP	150	Malaysia	PRD	MIX	MIX	SUR	COR	DOI, TAM

Table B1 continue …..

Study	INN	STG ADP	SAM SIZ	CTY SDY	TYP INN	TYP ORG	SIZ ORG	DCM	DAM	THR
Lee and Shim (2007).	Radio Frequency Identification (RFID)	ADP	126	USA	PRD	SRV	MIX	SUR	OTH	OTH
Lee and Xia (2006).	IT	ADP			MIX	MIX	MIX	SDA	OTH	OTH
Lee and Cheung (2004).	Internet	ADP	3	Hong Kong	PRD	SRV	SML	CSS	DES	TOE, OTH
Lee and Larsen (2009).	Anti-Malware adoption	ADP	239	USA	PRD	MIX	MIX	SUR	OTH	OTH
		IMP	239	USA	PRD	MIX	MIX	SUR	OTH	OTH
Lertwongsatien and Wongpinunwatana (2003).	E-commerce	ADP	386	Thailand	PRD	MIX	SML	SUR	OTH	DOI, TOE
Li et al. (2010).	E-business	ADP	307	China	PRD	MIX	MIX	SUR	OTH	TOE
Liang et al. (2007).	Enterprise Resource Planning (ERP)	IMP	77	China	PRC	MIX	MIX	CSS	COR	OTH
Looi (2005).	E-Commerce	ADP	184	Brunei	PRD	MIX	SML	SUR	COR	DOI, TAM, TRA, OTH
Luo et al. (2010).	Instant Messaging	ADP	140	USA	PRD	MIX	MIX	SUR	OTH	DOI, TAM
Mehrtens et al., (2001).	Internet	ADP	5	New Zealand	PRD	SRV	SML	CSS	DES	TOE, OTH
Meyer and Goes (1988).	Medical Innovation	ADP	25	USA	PRD	MIX	MIX	SUR	COR	TOE, OTH
Mirchandani and Motwani (2001).	E-Commerce	ADP	62	USA	PRD	MIX	SML	CSS	COR	TOE, OTH
Nedovic-Budic and Godschalk (1996).	Geographic Information Systems (GIS)	ADP	4	USA	PRD	SRV	LRG	CSS	DES	DOI
Nystrom et al. (2002).	Imaging Technology	ADP	70	USA	PRD	SRV	LRG	SUR	COR	OTH
Pae et al. (2002).	DataBase Management System (DBMS)	ADP	163	HongKong	PRD	MNF	MIX	SUR	OTH	OTH

Table B1 continue …..

Study	INN	STG ADP	SAM SIZ	CTY SDY	TYP INN	TYP ORG	SIZ ORG	DCM	DAM	THR
Pervan et al. (2005).	Collaboration Technologies (Email)	INI	82	Australia & New Zealand	PRD	MIX	LRG	SUR	COR	DOI, OTH
		ADP	82	Australia & New Zealand	PRD	MIX	LRG	SUR	COR	DOI, OTH
		IMP	82	Australia & New Zealand	PRD	MIX	LRG	SUR	COR	DOI, OTH
Plouffe et al. (2001).	Payment System	MIX	172	Canada	PRD	SRV	MIX	SUR	COR	PCI, TAM
Pollard (2003).	E-Service	IMP	30	Australia	PRD	MNF	SML	SUR	OTH	TAM, OTH
Premkumar (2003).	Communication Technologies	ADP	207	USA	PRD	MIX	SML	SUR	REG	OTH
Premkumar and Potter (1995).	Computer Aided Software Engineering (CASE)	ADP	90	USA	PRD	MIX	MIX	SUR	DIS	OTH
Premkumar and Ramamurthy (1995).	(Inter-organizational Systems) EDI	ADP	201	USA	PRD	MIX	MIX	SUR	COR	TOE
		IMP	201	USA	PRD	MIX	MIX	SUR	COR	TOE
Premkumar et al. (1994).	Electronic Data Interchange (EDI)	ADP	201	USA	PRD	MIX	MIX	SUR	REG	OTH
		IMP	201	USA	PRD	MIX	MIX	SUR	REG	OTH
		IMP	201	USA	PRD	MIX	MIX	SUR	REG	OTH
		IMP	201	USA	PRD	MIX	MIX	SUR	REG	OTH
Premkumar and Roberts (1999).	Email	ADP	78	USA	PRD	MIX	SML	SUR	DIS	DOI, TOE
	On-line Data Access	ADP	78	USA	PRD	MIX	SML	SUR	DIS	DOI, TOE
	Internet Access	ADP	78	USA	PRD	MIX	SML	SUR	DIS	DOI, TOE
	Electronic Data Interchange (EDI)	ADP	78	USA	PRD	MIX	SML	SUR	DIS	DOI, TOE

Table B1 continue …..

Study	INN	STG ADP	SAM SIZ	CTY SDY	TYP INN	TYP ORG	SIZ ORG	DCM	DAM	THR
Quaddus and Hofmeyer (2007).	E-Commerce	INI	211	Australia	PRD	MIX	SML	SUR	OTH	DOI, TAM, TPB, TRA, TOE
Rai and Bajwa (1997).	Executive Information System (Collaboration)	ADP	210	USA	PRD	MIX	MIX	SUR	COR	OTH
		IMP	210	USA	PRD	MIX	MIX	SUR	COR	OTH
	Executive Information System (Decision Support)	ADP	210	USA	PRD	MIX	MIX	SUR	COR	OTH
		IMP	210	USA	PRD	MIX	MIX	SUR	COR	OTH
Rai et al. (2009).	Electronic Procurement	ADP	166	USA	PRD	MIX	MIX	SUR	COR	OTH
Rai and Howard (1994).	CASE Technology	IMP	405	USA	PRD	MIX	LRG	SUR	REG	OTH
Rai and Patnayakuni (1996).	Computer Aided Software Engineering (CASE)	ADP	405	USA	PRD	MIX	MIX	SUR	OTH	OTH
Ramamurthy and Premkumar (1995).	Electronic Data Interchange (EDI)	IMP	201	USA	PRD	MIX	MIX	SUR	COR	OTH
Ramamurthy et al. (2008).	Data Warehouse	ADP	196	USA	PRD	MIX	MIX	SUR	REG	DOI, TriCore
Ravichandran (2000).	Total Quality Management (TQM) Adoption	ADP	123	USA	PRC	MIX	MIX	SUR	REG	OTH
Raymond (1990).	Information Systems	IMP	34	Canada	PRC	MNF	MIX	CSS	COR	OTH
	Information Systems (Off-line)	IMP	34	Canada	PRC	MNF	MIX	CSS	COR	OTH
	Information Systems (On-line)	IMP	34	Canada	PRC	MNF	MIX	CSS	COR	OTH
Ruppel and Howard (1998).	Telework	ADP	252	USA	PRD	MIX	MIX	SUR	COR	OTH
Scupola (2003).	E-Commerce	ADP	7	Italy	PRD	MIX	SML	CSS	DES	DOI, TOE
		IMP	7	Italy	PRD	MIX	SML	CSS	DES	DOI, TOE
Seyal et al. (2004).	E-Commerce	ADP	54	Pakistan	PRD	MIX	SML	SUR	COR	TOE, OTH

Table B1 continue …..

Study	INN	STG ADP	SAM SIZ	CTY SDY	TYP INN	TYP ORG	SIZ ORG	DCM	DAM	THR
Seyal and Rahman (2003).	E-Commerce	ADP	95	Brunei	PRD	MIX	SML	SUR	COR	DOI, OTH
Seyal et al. (2007).	Electronic Data Interchange (EDI)	ADP	50	Brunei	PRD	MIX	SML	SUR	COR	TOE, OTH
Sharma and Rai (2003).	CASE	ADP	350	USA	PRD	MIX	MIX	SUR	DIS	OTH
Subramanian and Nilakanta (1996).	Technical Innovation (Mean)	ADP	141	USA	PRC	SRV	LRG	SUR	COR	OTH
	Technical Innovation (Time)	ADP	141	USA	PRC	SRV	LRG	SUR	COR	OTH
	Technical Innovation (Consistency)	ADP	141	USA	PRC	SRV	LRG	SUR	COR	OTH
	Administrative Innovation (Mean)	ADP	141	USA	PRC	SRV	LRG	SUR	COR	OTH
	Administrative Innovation (Time)	ADP	141	USA	PRC	SRV	LRG	SUR	COR	OTH
	Administrative Innovation (Consistency)	ADP	141	USA	PRC	SRV	LRG	SUR	COR	OTH
Tan et al. (2007).	E-Commerce	ADP	134	China	PRD	MIX	MIX	SUR	DIS	OTH
		IMP	134	China	PRD	MIX	MIX	SUR	DIS	OTH
Tan et al. (2009).	Internet	ADP	406	Malaysia	PRD	MIX	SML	SUR	REG	DOI, TAM, TPB, TRA
Tang (2000).	Intranet	ADP	190	Taiwan	PRD	MIX	MIX	SUR	OTH	OTH
Teo et al. (2007).	Human Resources Information Systems (HRIS)	ADP	110	Singapore	PRC	MIX	MIX	SUR	REG	OTH
		IMP	110	Singapore	PRC	MIX	MIX	SUR	REG	OTH
Teo et al. (2009).	E-Procurement	ADP	141	Singapore	PRD	MIX	LRG	SUR	COR	DOI, TAM, TOE
Teo and Ranganathan (2004).	E-Commerce	ADP	108	Singapore	PRD	MIX	MIX	SUR	OTH	OTH
Teo and Tan (1998).	Internet	ADP	188	Singapore	PRD	MIX	MIX	SUR	OTH	OTH

Table B1 continue …..

Study	INN	STG ADP	SAM SIZ	CTY SDY	TYP INN	TYP ORG	SIZ ORG	DCM	DAM	THR
Thong (1999).	IT	ADP	294	Singapore	MIX	MIX	SML	SUR	COR	DOI, TOE, OTH
		IMP	294	Singapore	MIX	MIX	SML	SUR	COR	DOI, TOE, OTH
Thong (2001).	IT	IMP	114	Singapore	MIX	MIX	SML	SUR	OTH	OTH
Thong and Yap (1995).	IT	ADP	166	Singapore	MIX	MIX	SML	SUR	COR	OTH
Thong et al. (1996).	IT	IMP	114	Singapore	MIX	MIX	SML	SUR	OTH	OTH
To et al. (2008).	Instant Messaging	IMP	313	Taiwan	PRD	MIX	MIX	SUR	OTH	DOI, TPB
Tornatzky and Klein (1982).	IT	ADP			MIX	MIX	MIX	SDA	OTH	OTH
Troshani et al. (2011).	Human Resource Information Systems (HRIS)	ADP	11	Australia	PRC	SRV	MIX	CSS	DES	TOE
Truman et al. (2003).	Smart Card Technology (Consumer)	ADP	72	USA	PRC	SRV	MIX	SUR	COR	DOI, OTH
	Smart Card Technology (Merchant)	ADP	96	USA	PRD	SRV	MIX	SUR	COR	DOI, OTH
Tsao et al. (2004).	E-Commerce	ADP	72	Taiwan	PRD	MIX	SML	SUR	COR	OTH
Tung and Rieck (2005).	E-government Service	ADP	128	Singapore	PRD	MIX	MIX	SUR	COR	DOI
Wang and Cheung (2004).	E-Business	ADP	137	Taiwan	PRD	SRV	SML	SUR	COR	TOE, OTH
		IMP	137	Taiwan	PRD	SRV	SML	SUR	COR	TOE, OTH
Wang et al. (2004).	E-Business	MIX	121	Taiwan	PRD	MIX	MIX	SUR	COR	OTH
Wang et al. (2010).	Radio Frequency Identification (RFID)	ADP	133	Taiwan	PRD	MIX	MIX	SUR	REG	TOE
Wu and Chuang (2010).	Electronic Supply Chain Management	INI	184	Taiwan	PRC	MIX	MIX	SUR	REG	DOI
		ADP	184	Taiwan	PRC	MIX	MIX	SUR	REG	DOI
		IMP	184	Taiwan	PRC	MIX	MIX	SUR	REG	DOI
Zhu and Kraemer (2005).	E-Business	ADP	624	many	PRD	SRV	MIX	SUR	PLS	TOE
Zhu et al. (2003).	E-Business	ADP	3552	Germany	PRD	MIX	MIX	SUR	REG	OTH

Table B1 continue …..

Study	INN	STG ADP	SAM SIZ	CTY SDY	TYP INN	TYP ORG	SIZ ORG	DCM	DAM	THR
Zhu et al. (2006a).	E-Business	INI	1857	10 countries	PRD	MIX	MIX	SUR	COR	TOE, OTH
		ADP	1857	10 countries	PRD	MIX	MIX	SUR	COR	TOE, OTH
		IMP	1857	10 countries	PRD	MIX	MIX	SUR	COR	TOE, OTH
Zhu et al. (2006b).	E-Business	IMP	1415	Europe	PRC	MIX	MIX	SUR	PLS	DOI, TOE
Zmud (1982).	Software Development Practice (Technical)	INI	49	USA	PRD	MIX	MIX	SUR	OTH	OTH
		ADP	49	USA	PRD	MIX	MIX	SUR	OTH	OTH
		IMP	49	USA	PRD	MIX	MIX	SUR	OTH	OTH
	Software Development Practice (Administrative)	INI	49	USA	PRD	MIX	MIX	SUR	OTH	OTH
		ADP	49	USA	PRD	MIX	MIX	SUR	OTH	OTH
		IMP	49	USA	PRD	MIX	MIX	SUR	OTH	OTH

Innovation - INN,

Stage of Adoption - STG ADP: Initiation - INI, Adoption - ADP, Implementation - IMP, Mixed - MIX,

Sample Size - SAM SIZ,

Country of Study - CTY SDY,

Type of Innovation - TYP INN: Product - PRD, Process - PRC, Mixed - MIX,

Type of Organization - TYP ORG: Manufacturing - MNF, Service - SRV, Mixed - MIX,

Size of Organization - SIZ ORG: Large - LRG, Small - SML, Mixed - MIX,

Data Collection Methods - DCM: Survey - SUR, Case Study - CSS, Secondary Data - SDA, Other - OTH.

Data Analysis Methods - DAM: Correlation - COR, Regression - REG, Descriptive - DES, Discriminant - DIS, PLS - PLS, Other - OTH

Theories Used - THR: Diffusion of Innovation - DOI, Theory of Reasoned Action - TRA, Technology Acceptance Model - TAM, Theory of Planned Behaviour - TPB, Technology, Organization and Environment Model - TOE, Tricore model - Tricore, Unified Theory of Acceptance and Use of Technology - UTAUT..

Table B2: Relationships extracted from the innovation adoption studies (Individual level analysis)

Study	INN	STG ADP	SAM SIZ	CTY SDY	TYP INN	TYP ORG	SIZ ORG	DCM	DAM	THR
Adams et al. (1992).	Email	IMP	116	USA	PRD	MIX	MIX	SUR	COR	TAM
	Voice mail (Vmail)	IMP	68	USA	PRD	MIX	MIX	SUR	COR	TAM
Adamson and Shine (2003).	Information Systems	IMP	122	Europe	MIX	SRV	LRG	SUR	OTH	TAM
Agarwal and Prasad (1998b).	Information System Application (Configurator)	IMP	76	USA	PRD	MIX	MIX	SUR	REG	DOI, TAM
Agarwal and Prasad (1999).	IT	IMP	230	USA	MIX	SRV	LRG	SUR	OTH	TAM
Agarwal and Prasad (2000).	Software Process Innovations	IMP	71	USA	PRC	SRV	LRG	SUR	COR	DOI, TAM, TRA
Al-Gahtani and Shih (2009).	IT	IMP	400	Saudi Arabia	MIX	SRV	MIX	SUR	PLS	TPB
Al-Khaldi and Wallace (1999).	Personal Computer	IMP	151	Saudi Arabia	PRD	MIX	MIX	SUR	COR	TAM, TRA, OTH
Anandarajan et al. (2002).	IT	IMP	175	Nigeria	MIX	MIX	MIX	SUR	COR	TRA, OTH
Bhattacherjee et al. (2008).	Document Management System	IMP	81	Ukraine	PRC	SRV	LRG	SUR	PLS	TPB, TRA, OTH
Brown et al. (2002).	Computer Banking System	IMP	107	USA	MIX	SRV	LRG	SUR	PLS	TAM, TPB
Burton-Jones and Hubona (2005).	Computer Application (Email)	IMP	96	USA	PRD	MNF	LRG	SUR	COR	TAM, TRA, OTH
	Computer Application (Email)	IMP	96	USA	PRD	MNF	LRG	CSS	COR	TAM, TRA, OTH
	Computer Application (Word)	IMP	96	USA	PRD	MNF	LRG	SUR	COR	TAM, TRA, OTH
	Computer Application (Word)	IMP	96	USA	PRD	MNF	LRG	SUR	COR	TAM, TRA, OTH
Calantone et al. (2006).	IT Application	IMP	506	China	PRD	MIX	MIX	SUR	COR	TAM
Chau (1996).	Personal Computer	IMP	285	Hong Kong	PRD	SRV	LRG	SUR	OTH	TAM

Table B2 continue …..

Study	INN	STG ADP	SAM SIZ	CTY SDY	TYP INN	TYP ORG	SIZ ORG	DCM	DAM	THR
Chau and Hu (2001).	Telemedicine Technology	IMP	408	Hong Kong	PRD	MIX	MIX	SUR	OTH	TAM, TPB, OTH
Gumussoy and Calisir (2009).	Electronic-Reverse Auction	IMP	156	many	PRD	MIX	MIX	SUR	OTH	DOI, TAM, TPB
Guo and Zhang (2010).	Mobile Administrative System	IMP	134	China	PRC	SRV	LRG	SUR	PLS	OTH
Horton et al. (2001).	Intranet	IMP	386	UK	PRD	SRV	LRG	SUR	COR	TAM
	Intranet	IMP	65	UK	PRD	MNF	LRG	SUR	COR	TAM
Igbaria (1993).	Microcomputer Software Packages	IMP	519	USA	PRD	MIX	MIX	SUR	PLS	TAM, TRA
Igbaria and Iivari (1995).	IT	IMP	450	Finland	MIX	MIX	MIX	SUR	COR	TAM, TPB, TRA, OTH
Igbaria et al. (1995).	IT	IMP	450	Finland	MIX	MIX	MIX	SUR	COR	TAM, TPB, TRA, OTH
Igbaria et al. (1996).	Micro-Computer	IMP	471	North America	MIX	MIX	MIX	SUR	COR	TAM, TRA
Igbaria et al. (1997).	Personal Computer	IMP	358	New Zealand	PRD	MIX	MIX	SUR	COR	TAM, TRA
Jones et al. (2002).	Sale Force Automation System	IMP	249	USA	PRC	MIX	MIX	SUR	COR	TAM, TPB, TRA
Karahanna et al. (2006).	Consumer Relations Management System (CRMS)	IMP	216	USA	PRC	SRV	LRG	SUR	COR	TAM, TAM2
Kijsanayotina et al. (2009).	IT	IMP	1323	Thailand	MIX	SRV	MIX	SUR	COR	UTAUT
	IT for care and report	IMP	1323	Thailand	MIX	SRV	MIX	SUR	COR	UTAUT
	IT for Administrative	IMP	1323	Thailand	MIX	SRV	MIX	SUR	COR	UTAUT
	IT for Communication	IMP	1323	Thailand	MIX	SRV	MIX	SUR	COR	UTAUT

Table B2 continue …..

Study	INN	STG ADP	SAM SIZ	CTY SDY	TYP INN	TYP ORG	SIZ ORG	DCM	DAM	THR
Lawrence and Low (1993).	Information Systems	IMP	59	Australia	PRC	SRV	LRG	CSS	COR	OTH
Lin (2006).	Virtual Community	IMP	165	Taiwan	PRD	SRV	LRG	SUR	OTH	TPB
Money and Turner (2005).	Knowledge Management System	IMP	35	USA	PRC	MIX	MIX	SUR	COR	TAM, TRA
Patel et al. (2011).	Health Information Exchange	IMP	144	USA	PRD	SRV	LRG	SUR	DES	OTH
Riemenschneider et al. (2003).	Website	IMP	156	USA	PRD	MIX	MIX	SUR	COR	TAM, TPB
Roberts and Henderson (2000).	IT	IMP	108	Australia	MIX	MIX	MIX	SUR	COR	TAM, TRA
Sorebo and Eikebrokk (2008).	Personal Computer	IMP	161	Scandinavian	PRD	SRV	LRG	SUR	COR	TAM, OTH
Venkatesh (2000).	IT	IMP	70	USA	MIX	SRV	SML	SUR	COR	TAM, TPB, TRA
	IT	IMP	160	USA	MIX	SRV	LRG	SUR	COR	TAM, TPB, TRA
	IT	IMP	52	USA	MIX	SRV	SML	SUR	COR	TAM, TPB, TRA
Venkatesh and Davis (2000).	IT	IMP	468	USA	MIX	MIX	MIX	SUR	REG	TAM2
Zhang et al. (2011).	E-Government System	IMP	35	China	PRC	SRV	LRG	SUR	PLS	TAM, TTF
		IMP	62	China	PRC	SRV	LRG	SUR	PLS	TAM, TTF
Zhang and Gutierre (2007).	Management Information Systems	IMP	60	USA	PRC	SRV	MIX	SUR	REG	TPB, OTH

Innovation - INN,

Sample Size - SAM SIZ,

Type of Innovation - TYP INN: Product - PRD, Process - PRC, Mixed - MIX,

Size of Organization - SIZ ORG: Large - LRG, Small - SML, Mixed - MIX,

Data Analysis Methods - DAM: Correlation - COR, Regression - REG, Descriptive - DES, Discriminant - DIS, PLS - PLS, Other - OTH

Stage of Adoption - STG ADP: Initiation - INI, Adoption - ADP, Implementation - IMP, Mixed - MIX,

Country of Study - CTY SDY,

Type of Organization - TYP ORG: Manufacturing - MNF, Service - SRV, Mixed - MIX,

Data Collection Methods - DCM: Survey - SUR, Case Study - CSS, Secondary Data - SDA, Other - OTH.

Theories Used - THR: Diffusion of Innovation - DOI, Theory of Reasoned Action - TRA, Technology Acceptance Model - TAM, Theory of Planned Behaviour - TPB, Technology, Organization and Environment Model - TOE, Tricore model - Tricore, Unified Theory of Acceptance and Use of Technology - UTAUT.

Table B3: Determinants examined in the innovation adoption studies (Organizational level analysis)

Study	INN	STG ADP	Innovation	Organizational	Environmental	CEO	User Acceptance
Agarwal and Prasad (1997).	IT	ADP	I01, I04, I05, I06				
Alam (2009).	Internet	ADP	I01, I02	O03, O24		C03	
Al-Gahtani (2004).	IT	ADP	I01, I03, I04, I05, I06	O11, O12, O13		C03	
		IMP	I01, I03, I04, I05, I06	O11, O12, O13		C03	
Al-Qirim (2007).	Internet + Internal email	ADP	I01, I02, I04	O02, O11	E01, E02, E04	C01, C08	
	Internet + External email	ADP	I01, I02, I04	O02, O11	E01, E02, E04	C01, C08	
	Intranet	ADP	I01, I02, I04	O02, O11	E01, E02, E04	C01, C08	
	Extranet + VPN	ADP	I01, I02, I04	O02, O11	E01, E02, E04	C01, C08	
	Internet + EDI	ADP	I01, I02, I04	O02, O11	E01, E02, E04	C01, C08	
	Website	ADP	I01, I02, I04	O02, O11	E01, E02, E04	C01, C08	
Bajwa et al. (2005).	Collaboration Information Technologies	ADP		O02, O06, O08, O09, O41			
		IMP		O02, O06, O08, O09, O41			
		ADP		O02, O06, O08, O09, O41			
		IMP		O02, O06, O08, O09, O41			
		ADP		O02, O06, O08, O09, O41			
		IMP		O02, O06, O08, O09, O41			
Beatty et al. (2001).	Website	ADP	I01, I03, I04	O01			
Bradford and Florin (2003).	Enterprise Resource Planning (ERP)	IMP	I03, I04, I13	O01, O07, O13	E01		

Table B3 continue …..

Study	INN	STG ADP	Innovation	Organizational	Environmental	CEO	User Acceptance
Bruque and Moyano (2007).	IT	ADP		O01, O02, O05, O07, O13			
		IMP		O01, O13			
Chan and Ngai (2007).	Internet	ADP	I01	O02, O05, O09, O12	E02	C03	
Chau and Tam (1997).	Open System	ADP	I01	O07, O09, O26, O38			
Choe (1996).	Accounting Information Systems	ADP		O01, O02, O03, O07, O40			
		IMP		O01, O02, O03, O07, O40			
Chong (2004).	E-Commerce	ADP	I01, I03, I04, I05, I06	O01, O02, O04, O11	E01, E02, E03		
Chuang et al. (2009).	IT	ADP				C05, C06, C07	
Chwelos et al. (2001).	EDI	ADP	I01	O09, O10	E01, E02, E05, E06, E09		
Cragg and King (1993).	Computing	IMP	I01	O03	E01, E04	C01	
Damanpour (1991).	IT	ADP		O03, O06, O07, O11, O12, O17, O21, O22, O27,		C02, C04	
Damanpour and Schneider (2006).	IT	INI	I03	O02, O12, O15, O17		C02, C03, C04, C05, C06	
		ADP	I03	O02, O12, O15, O17		C02, C03, C04, C05, C06	
		IMP	I03	O02, O12, O15, O17		C02, C03, C04, C05, C06	
Damanpour and Schneider (2009).	IT	ADP	I02, I03	O02, O12		C02, C03, C04, C05, C06, C07	
DeLone (1981).	Personal Computer	IMP		O02, O03, O12	E04		
DeLone (1988).	Personal Computer	IMP		O12, O35	E04	C03, C08	A12

Table B3 continue …..

Study	INN	STG ADP	Innovation	Organizational	Environmental	CEO	User Acceptance
Eder and Igbaria (2001).	Intranet	ADP		O01, O02, O06, O07, O09, O14			
		IMP		O01, O02, O06, O07, O09, O14			
Fichman (2001).	OO Programming	ADP		O03, O08, O21			
	OO Programming	IMP		O03, O08, O21			
	OO Programming	MIX		O03, O08, O21			
	Relational DMS	MIX		O03, O08, O21			
	CASE	MIX		O03, O08, O21			
	Software Process	ADP		O03, O08, O21			
	Software Process	MIX		O03, O08, O21			
Fletcher et al. (1996).	Database	MIX	I03	O02, O06, O07, O11			
Gemino et al. (2006).	Website	ADP	I01	O09, O12, O30	E02		
Gengatharen and Standing (2005).	E-Market Place	IMP	I01, I04, I07	O01, O02, O03, O12, O13, O29	E03	C01	A01, A02
Grandon and Pearson (2004a).	E-Commerce	ADP	I04, I14, I17, I18	O04	E02	C02	A01, A02
Grandon and Pearson (2004b).	E-Commerce	ADP	I14, I17, I18	O04	E02	C02	A01, A02
Grover (1993).	Inter Organizational System	ADP	I01, I03, I04	O01, O02, O03, O05, O06, O07, O09, O11, O34, O35	E01, E02, E08		

Table B3 continue …..

Study	INN	STG ADP	Innovation	Organizational	Environmental	CEO	User Acceptance
Grover et al. (1997).	Out Sourcing	ADP		O02, O08, O10, O12, O21, O31, O35			
	CASE	ADP		O02, O08, O10, O12, O21, O31, O35			
	Object Oriented Programming System/ Design (OOPS)	ADP		O02, O08, O10, O12, O21, O31, O35			
	Large Scale Relational Database (DBMS)	ADP		O02, O08, O10, O12, O21, O31, O35			
	Executive Information System	ADP		O02, O08, O10, O12, O21, O31, O35			
	Teleconferencing	ADP		O02, O08, O10, O12, O21, O31, O35			
	Expert System	ADP		O02, O08, O10, O12, O21, O31, O35			
	Email	ADP		O02, O08, O10, O12, O21, O31, O35			
	CAD/CAM	ADP		O02, O08, O10, O12, O21, O31, O35			
	Electronic Data Interchange (EDI)	ADP		O02, O08, O10, O12, O21, O31, O35			

Table B3 continue …..

Study	INN	STG ADP	Innovation	Organizational	Environmental	CEO	User Acceptance
Grover and Goslar (1993).	Telecommunication Technologies	INI		O02, O03, O06, O07	E07		
		ADP		O02, O03, O06, O07	E07		
		IMP		O02, O03, O06, O07	E07		
Grover and Teng (1992).	DBMS	ADP		O01, O06, O09, O31, O36			
Hoffer and Alexander (1992).	Database Machine (DBM)	ADP	I01, I03, I04	O01, O05, O13, O35	E04	C03	
Hsiao et al. (2009).	Mobile Nursing Information Systems	ADP	I02, I04	O01, O03, O05, O30, O40, O41	E01, E03, E05		
Hu et al. (2002).	Telemedicine	ADP	I01, I07	O04	E02		A01
Iacovou et al. (1995).	Electronic Data Interchange (EDI)	ADP	I01	O04	E02		
		IMP	I01	O04	E02		
Ifinedo (2011).	Internet-E-Business Technologies	IMP	I01	O01, O02, O03, O12	E01, E02, E04		
Iskandar et al. (2001).	Electronic Data Interchange (EDI)	ADP		O02, O03, O11, O16, O37	E11		
		IMP		O02, O03, O11, O16, O37	E11		
Jeon et al. (2006).	E-Business	ADP	I01, I02, I03, I04	O02, O03	E01, E03, E15	C02, C03	
Jun and Kang (2009).	E-Commerce	IMP		O02, O10, O12, O35			
Karahanna et al. (1999).	IT	ADP	I04, I05, I06, I08	O01, O03, O09, O19			A01, A02, A03, A05
		IMP	I04, I05, I06, I08	O01, O03, O09, O19			A01, A02, A03, A05
Khalid and Brian (2004).	Inter-Organizational Information Systems	ADP	I02, I03, I07, I15	O01, O28	E01, E02, E14		

Table B3 continue .....

Study	INN	STG ADP	Innovation	Organizational	Environmental	CEO	User Acceptance
Khoumbati et al. (2006).	Enterprise Application Integration	ADP	I01, I02, I04	O02, O09, O13, O18, O21, O30	E02		
Kim and Garrison (2010).	Radio Frequency Identification (RFID)	INI	I01	O03, O12, O25, O38			
Kimberly and Evanisko (1981).	Administrative Innovation	ADP		O02, O06, O21, O22	E01	C01, C03, C04	
	Technological Innovation	ADP		O02, O06, O21, O22	E01	C01, C03, C04	
Kowtha and Choon (2001).	E-Commerce	ADP		O03	E01		
Kuan and Chau (2001).	Electronic Data Interchange (EDI)	ADP	I01, I02	O03	E02, E10		
Lai and Guynes (1994).	ISDN	ADP	I01, I03, I04	O03, O06, O08, O32, O33			
Lai and Guynes (1997).	ISDN	INI	I03	O02, O06, O07, O12, O20, O32, O33			
Larsen (1993).	IT	MIX				C03, C04, C05, C07	
Law and Ngai (2007).	Enterprise Resource Planning (ERP)	ADP		O01		C01	
Lean et al. (2009).	E-government	ADP	I01, I03				
Lee and Shim (2007).	Radio Frequency Identification (RFID)	ADP	I01	O03, O05, O12, O25	E04, E07		
Lee and Xia (2006).	IT	ADP		O02			
Lee and Cheung (2004).	Internet	ADP	I01	O03, O04	E06, E07		
Lee and Larsen (2009).	Anti-Malware Adoption	ADP	I02	O02, O10	E04		
		IMP		O02, O10	E04		
Lertwongsatien and Wongpinunwatana (2003).	E-Commerce	ADP	I01, I04	O01, O02, O03	E01		
Li et al. (2010).	E-Business	ADP	I01	O02, O03, O22	E07		

Table B3 continue …..

Study	INN	STG ADP	Innovation	Organizational	Environmental	CEO	User Acceptance
Liang et al. (2007).	Enterprise Resource Planning (ERP)	IMP		O01		C01	
Looi (2005).	E-Commerce	ADP	I01, I07	O03	E01, E03		
Luo et al. (2010).	Instant Messaging	ADP	I04, I07, I20	O19			A01, A02, A09, A10
Mehrtens et al. (2001).	Internet	ADP	I01	O04	E02		
Meyer and Goes (1988).	Medical Innovation	ADP	I03	O02, O35		C04, C07	
Mirchandani and Motwani (2001).	E-Commerce	ADP	I01, I02, I04	O03, O11	E01	C01	
Nedovic-Budic and Godschalk (1996).	Geographic Information Systems (GIS)	ADP	I01, I03, I04, I05				
Nystrom et al. (2002).	Imaging Technology	ADP		O02, O12			
Pae et al. (2002).	DataBase Management System (DBMS)	ADP		O01			
Pervan et al. (2005).	Collaboration Technologies (Email)	INI		O02, O06, O08			
		ADP		O02, O06, O08			
		IMP		O02, O06, O08			
Plouffe et al. (2001).	Payment System	MIX	I01, I03, I04, I05, I06, I08	O19			A01, A02, A03
Pollard (2003).	E-Service	IMP	I01, I04	O03, O13			A01, A02, A05, A07, A08
Premkumar and Ramamurthy (1995).	(Inter-organizational Systems) EDI	ADP	I01, I04	O01, O05, O09	E01, E02		
		IMP	I01, I04	O01, O05, O09	E01, E02		
Premkumar (2003).	Communication Technologies	ADP	I01, I02, I04	O01, O02			
Premkumar, G. & Potter, M. (1995).	Computer Aided Software Engineering (CASE)	ADP	I01, I02, I03, I04	O01, O02, O05			

Table B3 continue …..

Study	INN	STG ADP	Innovation	Organizational	Environmental	CEO	User Acceptance
Premkumar et al. (1994).	Electronic Data Interchange (EDI)	ADP	I01, I02, I03, I04, I09				
		IMP	I01, I02, I03, I04, I09				
		IMP	I01, I02, I03, I04, I09				
		IMP	I01, I02, I03, I04, I09				
Premkumar and Roberts (1999).	Email	ADP	I01, I02, I03, I04	O01, O02, O03	E01, E02, E05, E08		
	On-line Data Access	ADP	I01, I02, I03, I04	O01, O02, O03	E01, E02, E05, E08		
	Internet Access	ADP	I01, I02, I03, I04	O01, O02, O03	E01, E02, E05, E08		
	Electronic Data Interchange (EDI)	ADP	I01, I02, I03, I04	O01, O02, O03	E01, E02, E05, E08		
Quaddus and Hofmeyer (2007).	E-commerce	INI	I01	O04	E01, E03, E04, E05	C02	
Rai and Bajwa (1997).	Executive Information System (Collaboration)	ADP		O02, O08	E07		
		IMP	I18	O01, O08	E07		
	Executive Information System (Decision Support)	ADP		O02, O08	E07		
		IMP	I18	O01, O08	E07		
Rai et al. (2009).	Electronic Procurement	ADP	I07	O01, O03, O12			
Rai and Howard (1994).	CASE Technology	IMP		O01, O02, O03, O05, O13, O39			
Rai and Patnayakuni (1996).	Computer Aided Software Engineering (CASE)	ADP		O01, O05, O08, O13, O38, O39	E07		

Table B3 continue …..

Study	INN	STG ADP	Innovation	Organizational	Environmental	CEO	User Acceptance
Ramamurthy and Premkumar (1995).	Electronic Data Interchange (EDI)	IMP	I01, I02, I03, I04	O01, O05, O09, O11			
Ramamurthy et al. (2008).	Data Warehouse	ADP	I01, I03	O02, O03, O04, O11, O12			
Ravichandran (2000).	Total Quality Management (TQM) Adoption	ADP		O01, O08, O17, O21, O34			
Raymond (1990).	Information Systems	IMP		O02, O03, O12			
	Information Systems (Off-line)	IMP		O02, O03, O12			
	Information Systems (On-line)	IMP		O02, O03, O12			
Ruppel and Howard (1998).	Telework	ADP	I07	O01, O05, O09, O13, O35			
Scupola (2003).	E-Commerce	ADP	I01	O02, O03, O05, O09, O12	E01, E02, E03		
		IMP	I01	O02, O03, O05, O09, O12	E01, E02, E03		
Seyal et al. (2004).	E-Commerce	ADP	I01, I16	O01, O24, O29	E03		
Seyal and Rahman (2003).	E-Commerce	ADP	I01, I03, I04, I05, I06	O01, O02		C02	
Seyal et al. (2007).	Electronic Data Interchange (EDI)	ADP	I01, I16	O01, O24, O29	E03		
Sharma and Rai (2003).	CASE	ADP		O08		C04	

Table B3 continue …..

Study	INN	STG ADP	Innovation	Organizational	Environmental	CEO	User Acceptance
Subramanian and Nilakanta (1996).	Technical Innovation (Mean)	ADP		O02, O06, O07, O12, O21			
	Technical Innovation (Time)	ADP		O02, O06, O07, O12, O21			
	Technical Innovation (Consistency)	ADP		O02, O06, O07, O12, O21			
	Administrative Innovation (Mean)	ADP		O02, O06, O07, O12, O21			
	Administrative Innovation (Time)	ADP		O02, O06, O07, O12, O21			
	Administrative Innovation (Consistency)	ADP		O02, O06, O07, O12, O21			
Tan et al. (2007).	E-Commerce	ADP		O04	E06		
		IMP		O04	E06		
Tan et al. (2009).	Internet	ADP	I01, I02, I03, I04, I05, I06, I07				
Tang (2000).	Intranet	ADP		O01, O13		C01	
Teo et al. (2007).	Human Resources Information Systems (HRIS)	ADP	I01, I03, I04	O01, O02, O03	E01		
		IMP	I01, I03, I04	O01, O02, O03	E01		
Teo et al. (2009).	E-Procurement	ADP	I01, I02	O01, O02, O27	E02		
Teo and Ranganathan (2004).	E-Commerce	ADP	I01	O01, O03, O05, O07			
Teo and Tan (1998).	Internet	ADP	I01	O02, O05, O34			
Thong (1999).	IT	ADP	I01, I03, I04	O02, O03, O11	E01	C01, C03	
		IMP	I01, I03, I04	O02, O03, O11	E01	C01, C03	
Thong (2001).	IT	IMP		O01, O03, O10, O35, O40	E04, E13		
Thong and Yap (1995).	IT	ADP		O02, O11	E01	C01, C02, C03	
Thong et al. (1996).	IT	IMP		O01	E04, E12, E13		

Table B3 continue …..

Study	INN	STG ADP	Innovation	Organizational	Environmental	CEO	User Acceptance
To et al. (2008).	Instant Messaging	IMP	I04, I07, I19				A01, A02, A05, A08
Tornatzky and Klein (1982).	IT	ADP	I01, I02, I03, I04, I05, I06, I09, I10, [illegible]				
Troshani et al. (2011).	Human Resource Information Systems (HRIS)	ADP	I01, I04	O01, O02, O03, O05, O06			
Truman et al. (2003).	Smart Card Technology (Consumer)	ADP	I01, I03, I04, I19				
	Smart Card Technology (Merchant)	ADP	I01, I03, I04, I19				
Tsao et al. (2004).	E-Commerce	ADP		O01, O04, O10	E03		
Tung and Rieck (2005).	E-Government Service	ADP	I01, I02		E02, E16		
Wang and Cheung (2004).	E-Business	ADP	I01	O02, O09, O12	E01, E02		
		IMP	I01	O02, O09, O12	E01, E02		
Wang et al. (2004).	E-Business	MIX	I01	O02, O04			
Wang et al. (2010).	Radio Frequency Identification (RFID)	ADP	I01, I03, I04	O01, O02, O03, O11	E01, E02		
Wu and Chuang (2010).	Electronic Supply Chain Management	INI	I01, I03, I07	O02	E07		
		ADP	I01, I03, I07	O02	E07		
		IMP	I01, I03, I07	O02	E07		
Zhu and Kraemer (2005).	E-Business	ADP		O02, O03, O12	E01, E03, E15		
Zhu et al. (2003).	E-Business	ADP		O02, O03	E01, E06		
Zhu et al. (2006a).	E-Business	INI		O02, O09, O23, O41	E01, E03		
		ADP		O02, O09, O23, O41	E01, E03		
		IMP		O02, O09, O23, O41	E01, E03		

Table B3 continue …..

Study	INN	STG ADP	Innovation	Organizational	Environmental	CEO	User Acceptance
Zhu et al. (2006b).	E-Business	IMP	I01, I02, I04, I07	O02, O03	E01, E06		
Zmud, R. W. (1982).	Software Development Practice (Technical)	INI		O06, O07			
		ADP		O06, O07			
		IMP		O06, O07			
	Software Development Practice (Administrative)	INI		O06, O07			
		ADP		O06, O07			
		IMP		O06, O07			

Innovation - INN,

Stage of Adoption - STG ADP: Initiation - INI, Adoption - ADP, Implementation - IMP, Mixed - MIX,

Relative advantage - I01, Cost - I02, Complexity - I03, Compatibility - I04, Trialability - I05, Observability - I06, Security - I07, Demonstrability - I08, Communicability - I09, Divisibility - I10, Profitability - I11, Social approval - I12, Business process re-engineering - I13, Strategic decision aid - I14, Scalability - I15, Task Variety - I16, Managerial productivity - I17, Organizational support - I18, Critical mass - I19, Perceived risk - I20.

Top management support - O01, Organization size - O02, IT expertise - O03, Organization readiness - O04, Product champion - O05, Centralization - O06, Formalization - O07, IS dept size - O08, IS infrastructure - O09, IS investment - O10, Information intensity - O11, Resources - O12, Training - O13, Earliness of adoption - O14, No. of. business lines - O15, No.of customers - O16, Organizational complexity - O17, Barrier to adoption - O18, Image - O19, Expansion - O20, Specialization - O21, External integration - O22, Managerial obstruction - O23, Culture - O24, Job relevance - O25, Perceived barrier - O26, Information sharing culture - O27, Trust - O28, Motivation - O29, Internal pressure - O30, Technology level - O31, Openness - O32, Norm encouraging change - O33, Role of IT - O34, Strategic planning - O35, Age of IS - O36, No of competitors - O37, Satisfaction with exisitng system - O38, Job rotation - O39, User involvement - O40, Degree of integration - O41, - , External Communication - O42.

Competitive pressure - E01, External pressure - E02, Government support - E03, Vendour support - E04, Partners support - E05, Partners readiness - E06, Environmental Uncertainity - E07, Vertical linkage - E08, Partners depence - E09, Government pressure - E10, No. of competitors - E11, External expertise - E12, Consultant effectiveness - E13, Trust with partners - E14, Globalization - E15, Social influence - E16.

CEO innovativeness - C01, CEO attitude - C02, CEO IT knowledge - C03, Managers tenure - C04, Managers age - C05, Managers gender - C06, Managers educational level - C07, CEO involvement - C08.

Perceived usefulness - A01, Perceived ease of use - A02, Perceived voluntariness - A03, Anxiety - A04, Attitude towards use - A05, Compatibility - A06, Behavioural intention - A07, Subjective norm - A08, Perceived enjoyment - A09, Perceived playfulness - A10, User experience - A11, User training - A12, User involvement - A13, Organizational support - A14, Organizational usage - A15, Educational level - A16, User age - A17, Self-efficacy - A18, Facilitating conditions - A19, Perceived behavioural control - A20, Financial incentives - A21, Technical assistance - A22.

Table B4: Determinants examined in the innovation adoption studies (Individual level analysis)

Study	INN	STG ADP	User Acceptance
Adams et al. (1992).	Email	IMP	A01, A02,
	Voice mail (Vmail)	IMP	A01, A02,
Adamson and Shine (2003).	Information Systems	IMP	A01, A02, A08, A18,
Agarwal and Prasad (1998b).	Information System Application (Configurator)	IMP	A01, A02, A06,
Agarwal and Prasad (1999).	IT	IMP	A01, A02,
Agarwal and Prasad (2000).	Software Process Innovations	IMP	A01, A02, A03, A05, A06,
Al-Gahtani and Shih (2009).	IT	IMP	A05, A08, A20,
Al-Khaldi and Wallace (1999).	Personal Computer	IMP	A01, A02, A08, A11, A12, A19,
Anandarajan et al. (2002).	IT	IMP	A01, A02, A08, A09, A11, A14, A15,
Bhattacherjee et al. (2008).	Document Management System	IMP	A18, A19,
Brown et al. (2002).	Computer Banking System	IMP	A01, A02, A05, A07, A08, A20,
Burton-Jones and Hubona (2005).	Computer Application (Email)	IMP	A01, A02, A16, A17,
	Computer Application (Email)	IMP	A01, A02, A16, A17,
	Computer Application (Word)	IMP	A01, A02, A16, A17,
	Computer Application (Word)	IMP	A01, A02, A16, A17,
Calantone et al. (2006).	IT Application	IMP	A01, A06,
Chau (1996).	Personal Computer	IMP	A01, A02,
Chau, P.Y.K & Hu, P.J. (2001).	Telemedicine Technology	IMP	A01, A02, A05, A06, A08,
Gumussoy and Calisir (2009).	Electronic-Reverse Auction	IMP	A01, A02, A06, A07, A08, A20,
Guo and Zhang (2010).	Mobile Administrative System	IMP	A05, A06, A11, A14,
Horton et al. (2001).	Intranet	IMP	A01, A02, A071,
	Intranet	IMP	A01, A02, A071,

Table B4 continue …..

Study	INN	STG ADP	User Acceptance
Igbaria (1993).	Microcomputer Software packages	IMP	A01, A04, A05, A071, A11, A12, A14, A22,
Igbaria and Iivari (1995).	IT	IMP	A01, A02, A04, A11, A14, A18,
Igbaria et al. (1995).	IT	IMP	A01, A02, A09, A16, A17,
Igbaria et al. (1996).	Micro-Computer	IMP	A01, A08, A09, A11, A14, A15,
Igbaria et al. (1997).	Personal Computer	IMP	A01, A02, A22,
Jones et al. (2002).	Sale Force Automation System	IMP	A01, A05, A08,
Karahanna et al. (2006).	Consumer Relations Management System (CRMS)	IMP	A01, A02, A06,
Kijsanayotina et al. (2009).	IT	IMP	A03, A07, A08, A11, A19,
	IT for care and report	IMP	A03, A07, A08, A11, A19,
	IT for Administrative	IMP	A03, A07, A08, A11, A19,
	IT for Comunication	IMP	A03, A07, A08, A11, A19,
Lawrence and Low (1993).	Information Systems	IMP	A11, A13, A14,
Lin (2006).	Virtual Community	IMP	A01, A02, A05, A08, A18, A19, A20,
Money and Turner (2005).	Knowledge Management System	IMP	A01, A02, A071,
Patel et al. (2011).	Health Information Exchange	IMP	A02, A21, A22,
Riemenschneider et al. (2003).	Website	IMP	A01, A02, A05, A08, A20,
Roberts and Henderson (2000).	IT	IMP	A01, A04, A05, A09, A18,
Sorebo and Eikebrokk (2008).	Personal Computer	IMP	A01, A02,
Venkatesh (2000).	IT	IMP	A01, A02, A04, A09, A10, A18,
	IT	IMP	A01, A02, A04, A09, A10, A18,
	IT	IMP	A01, A02, A04, A09, A10, A18,
Venkatesh and Davis (2000).	IT	IMP	A01, A02, A07, A08,

Table B4 continue …..

Study	INN	STG ADP	User Acceptance
Zhang et al. (2011).	E-government System	IMP	A01, A02, A05, A06, A07, A19,
		IMP	A01, A02, A05, A06, A07, A19,
Zhang and Gutierre (2007).	Management Information Systems	IMP	A05, A07, A08, A14, A18, A20, A21,

Innovation - INN,

Stage of Adoption - STG ADP: Initiation - INI, Adoption - ADP, Implementation - IMP, Mixed - MIX,

Perceived usefulness - A01, Perceived ease of use - A02, Perceived voluntariness - A03, Anxiety - A04, Attitude towards use - A05, Compatibility - A06, Behavioural intention - A07, Subjective norm - A08, Perceived enjoyment - A09, Perceived playfulness - A10, User experience - A11, User training - A12, User involvement - A13, Organizational support - A14, Organizational usage - A15, Educational level - A16, User age - A17, Self-efficacy - A18, Facilitating conditions - A19, Perceived behavioural control - A20, Financial incentives - A21, Technical assistance - A22.

Appendix C

Table C1: Studies considered for the analysis of innovation characteristics (Relative advantage, Cost, Complexity, Compatibility, Trialability and Observability)

Study	INN	STG ADP	SAM SIZ	TYP INN	TYP ORG	SIZ ORG	DAM	Relative Advantage		Cost		Complexity		Compatibility		Trailability		Observability	
								SIG	COR	SIG	COR	SIG	COR	SIG	COR	SIG	COR	SIG	COR
Agarwal and Prasad (1997).	IT	ADP	73	PRC	SRV	MIX	REG	N						P		P		P	
Alam (2009).	Internet	ADP	368	PRD	MIX	SML	COR	P	0.6830	P	0.6600								
Al-Gahtani (2004).	IT	ADP	1190	PRC	MIX	MIX	COR	P	0.2710			P	0.3050	P	0.3400	P	0.4310	P	0.3050
		IMP	1190	PRC	MIX	MIX	COR	P	0.4090			P	-0.5180	P	0.4210	P	0.2960	P	0.4880
Al-Qirim (2007).	Internet + Internal Email	ADP	129	PRD	MIX	SML	OTH	N		N				N					
	Internet + External Email	ADP	129	PRD	MIX	SML	OTH	N		N				N					
	Intranet	ADP	129	PRD	MIX	SML	OTH	N		N				N					
	Extranet + VPN	ADP	129	PRD	MIX	SML	OTH	P		N				N					
	Internet + EDI	ADP	129	PRD	MIX	SML	OTH	N		N				N					
	Website	ADP	129	PRD	MIX	SML	OTH	N		N				N					
Beatty et al. (2001).	Website	ADP	284	PRD	MIX	MIX	OTH	P				N		P					
Bradford and Florin (2003).	Enterprise Resource Planning (ERP)	IMP	51	PRC	MNF	LRG	COR					P	-0.6930	N	0.2900				
Chan and Ngai (2007).	Internet	ADP	10	PRD	MIX	MIX	DES	P											
Chau and Tam (1997).	Open System	ADP	89	PRD	MIX	MIX	REG	N											
Chong (2004).	E-Commerce	ADP	115	PRD	MIX	SML	REG	N				P		P		N		N	
Chwelos et al. (2001).	Electronic Data Interchange (EDI)	ADP	317	PRD	MIX	MIX	COR	P	0.2740										
Cragg and King (1993).	Computing	IMP	6	MIX	MNF	SML	DES	P											

Table C1 continue …..

Study	INN	STG ADP	SAM SIZ	TYP INN	TYP ORG	SIZ ORG	DAM	Relative Advantage		Cost		Complexity		Compatibility		Trailability		Observability	
								SIG	COR	SIG	COR	SIG	COR	SIG	COR	SIG	COR	SIG	COR
Damanpour and Schneider (2006).	IT	INI	1276	PRC	MIX	MIX	COR					P	0.1800						
		ADP	1276	PRC	MIX	MIX	COR					N	0.1700						
		IMP	1276	PRC	MIX	MIX	COR					N	0.1600						
Damanpour and Schneider (2009).	IT	ADP	725	MIX	SRV	MIX	COR			P	0.2700	N	-0.0500						
Fletcher et al. (1996).	Database	MIX	86	PRD	SRV	LRG	COR					N	0.1144						
Gemino et al. (2006).	Website	ADP	223	PRD	MIX	MIX	REG	P											
Gengatharen and Standing (2005).	E-Market Place	IMP	28	MIX	MIX	SML	DES	P						N					
Grandon and Pearson (2004a).	E-Commerce	ADP	83	PRD	MIX	SML	DIS							P					
Grover (1993).	Inter-Organizational System	ADP	214	PRC	MIX	MIX	DIS	N				P		P					
Hoffer and Alexander (1992).	Database Machine (DBM)	ADP	76	PRD	MIX	MIX	OTH	P				P		P					
Hsiao et al. (2009).	Mobile Nursing Information Systems	ADP	84	PRC	SRV	MIX	DIS			N				N					
Hu et al. (2002).	Telemedicine	ADP	113	PRD	SRV	MIX	REG	N											
Iacovou et al. (1995).	Electronic Data Interchange (EDI)	ADP	7	PRD	MIX	SML	DES	P											
		IMP	7	PRD	MIX	SML	DES	P											
Ifinedo (2011).	Internet E-Business Technologies	IMP	214	PRD	MIX	SML	OTH	P	0.3200										
Jeon et al. (2006).	E-Business	ADP	204	PRD	MIX	SML	COR	P	0.4100	P	0.2300	P	0.3800	P	0.3800				
Karahanna et al. (1999).	IT	ADP	77	MIX	MIX	MIX	PLS							N		P		P	
		IMP	153	MIX	MIX	MIX	PLS							N		N		N	
Khalid and Brian (2004).	Inter-Organizational Information Systems	ADP	87	PRC	MIX	MIX	OTH			P		P							
Khoumbati et al. (2006).	Enterprise Application Integration	ADP	65	PRC	SRV	MIX	DES	P		P				N					
Kim and Garrison (2010).	Radio Frequency Identification (RFID)	INI	78	PRD	MIX	MIX	COR	P											

Table C1 continue …..

Study	INN	STG ADP	SAM SIZ	TYP INN	TYP ORG	SIZ ORG	DAM	Relative Advantage		Cost		Complexity		Compatibility		Trailability		Observability	
								SIG	COR	SIG	COR	SIG	COR	SIG	COR	SIG	COR	SIG	COR
Kuan and Chau (2001).	Electronic Data Interchange (EDI)	ADP	525	PRD	MIX	SML	REG	P		P									
Lai and Guynes (1994).	ISDN	ADP	153	PRD	MIX	LRG	OTH	P				P		P					
Lai and Guynes (1997).	ISDN	INI	161	PRD	MIX	LRG	DIS					N							
Lean et al. (2009).	E-Government	ADP	150	PRD	MIX	MIX	COR	P	0.4900			P	-0.0900						
Lee and Shim (2007).	Radio Frequency Identification (RFID)	ADP	126	PRD	SRV	MIX	OTH	P											
Lee and Cheung (2004).	Internet	ADP	3	PRD	SRV	SML	DES	P											
Lee and Larsen (2009).	Anti-Malware Adoption	ADP	239	PRD	MIX	MIX	OTH			P									
		IMP	239	PRD	MIX	MIX	OTH												
Lertwongsatien and Wongpinunwatana (2003).	E-Commerce	ADP	386	PRD	MIX	SML	OTH	P						P					
Li et al. (2010).	E-Business	ADP	307	PRD	MIX	MIX	OTH	P											
Looi (2005).	E-Commerce	ADP	184	PRD	MIX	SML	COR	P	0.5630										
Luo et al. (2010).	Instant Messaging	ADP	140	PRD	MIX	MIX	OTH							P					
Mehrtens et al. (2001).	Internet	ADP	5	PRD	SRV	SML	DES	P											
Meyer and Goes (1988).	Medical Innovation	ADP	25	PRD	MIX	MIX	COR					P	0.2800						
Mirchandani and Motwani (2001).	E-Commerce	ADP	62	PRD	MIX	SML	COR	P	0.4200	N	0.0100			P	0.6090				
Nedovic-Budic and Godschalk (1996).	Geographic Information Systems (GIS)	ADP	4	PRD	SRV	LRG	DES	P				N		N		P			
Plouffe et al. (2001).	Payment System	MIX	172	PRD	SRV	MIX	COR	P	0.6000			P	0.3400	P	0.5800	P	0.3600	P	0.2600
Pollard (2003).	E-Service	IMP	30	PRD	MNF	SML	OTH	N						N					
Premkumar (2003).	Communication Technologies	ADP	207	PRD	MIX	SML	REG	P		N				P					
Premkumar and Potter (1995).	Computer Aided Software Engineering (CASE)	ADP	90	PRD	MIX	MIX	DIS	P		P		N		N					
Premkumar and Ramamurthy (1995).	(Inter-Organizational Systems) EDI	ADP	201	PRD	MIX	MIX	COR	P	0.3080					N	0.1120				
		IMP	201	PRD	MIX	MIX	COR	P	0.2150					N	0.0460				

Table C1 continue …..

Study	INN	STG ADP	SAM SIZ	TYP INN	TYP ORG	SIZ ORG	DAM	Relative Advantage		Cost		Complexity		Compatibility		Trailability		Observability	
								SIG	COR	SIG	COR	SIG	COR	SIG	COR	SIG	COR	SIG	COR
Premkumar et al. (1994).	Electronic Data Interchange (EDI)	ADP	201	PRD	MIX	MIX	REG	P		P		N		P					
		IMP	201	PRD	MIX	MIX	REG	P		N		N		N					
		IMP	201	PRD	MIX	MIX	REG	N		N		N		P					
		IMP	201	PRD	MIX	MIX	REG	N		P		N		P					
Premkumar and Roberts (1999).	Email	ADP	78	PRD	MIX	SML	DIS	P		N		P		P					
	On-line Data Access	ADP	78	PRD	MIX	SML	DIS	P		N		N		N					
	Internet Access	ADP	78	PRD	MIX	SML	DIS	P		N		N		N					
	Electronic Data Interchange (EDI)	ADP	78	PRD	MIX	SML	DIS	P		P		N		N					
Quaddus and Hofmeyer (2007).	E-Commerce	INI	211	PRD	MIX	SML	OTH	P											
Ramamurthy and Premkumar (1995).	Electronic Data Interchange (EDI)	IMP	201	PRD	MIX	MIX	COR	P	0.2320	N	0.1570	N	-0.0700	P	0.1630				
Ramamurthy et al. (2008).	Data Warehouse	ADP	196	PRD	MIX	MIX	REG	P				P							
Scupola (2003).	E-Commerce	ADP	7	PRD	MIX	SML	DES	P											
		IMP	7	PRD	MIX	SML	DES	P											
Seyal et al. (2004).	E-Commerce	ADP	54	PRD	MIX	SML	COR	P	0.4610										
Seyal and Rahman (2003).	E-Commerce	ADP	95	PRD	MIX	SML	COR	N	0.1100			N	0.1100	P	0.5200	P	0.4000	P	0.5000
Seyal et al. (2007).	Electronic Data Interchange (EDI)	ADP	50	PRD	MIX	SML	COR	P	0.3960										
Tan et al. (2009).	Internet	ADP	406	PRD	MIX	SML	REG	P		N		P		P		N		P	
Teo et al. (2007).	Human Resources Information Systems (HRIS)	ADP	110	PRC	MIX	MIX	REG	P				N		P					
		IMP	110	PRC	MIX	MIX	REG	N				N		N					
Teo et al. (2009).	E-Procurement	ADP	141	PRD	MIX	LRG	COR	P	0.3000	N	-0.2100								
Teo and Ranganathan (2004).	E-Commerce	ADP	108	PRD	MIX	MIX	OTH	P											
Teo and Tan (1998).	Internet	ADP	188	PRD	MIX	MIX	OTH	P											
Thong (1999).	IT	ADP	294	MIX	MIX	SML	COR	P	0.2990			P	0.2090	P	0.2990				
		IMP	294	MIX	MIX	SML	COR	N	0.0730			N	0.0760	N	0.0730				
To et al. (2008).	Instant Messaging	IMP	313	PRD	MIX	MIX	OTH							P					

Table C1 continue …..

Study	INN	STG ADP	SAM SIZ	TYP INN	TYP ORG	SIZ ORG	DAM	Relative Advantage		Cost		Complexity		Compatibility		Trailability		Observability	
								SIG	COR	SIG	COR	SIG	COR	SIG	COR	SIG	COR	SIG	COR
Tornatzky and Klein (1982).	IT	ADP		MIX	MIX	MIX	OTH	P		N		P		P		N		N	
Troshani et al. (2011).	Human Resource Information Systems (HRIS)	ADP	11	PRC	SRV	MIX	DES	P						P					
Truman et al. (2003).	Smart Card Technology (Consumer)	ADP	72	PRC	SRV	MIX	COR	P	0.2500			P	0.2700	N	0.1400				
	Smart Card Technology (Merchant)	ADP	96	PRD	SRV	MIX	COR	P	0.4100			N	0.2700	N	0.1100				
Tung and Rieck (2005).	E-Government Service	ADP	128	PRD	MIX	MIX	COR	P	0.4300	N	-0.1500								
Wang and Cheung (2004).	E-Business	ADP	137	PRD	SRV	SML	COR	P	0.3700										
		IMP	137	PRD	SRV	SML	COR	P	0.3000										
Wang et al. (2004).	E-Business	MIX	121	PRD	MIX	MIX	COR	P	0.4460										
Wang et al. (2010).	Radio Frequency Identification (RFID)	ADP	133	PRD	MIX	MIX	REG	N				P		P					
Wu and Chuang (2010).	Electronic Supply Chain Management	INI	184	PRC	MIX	MIX	REG	P				P							
		ADP	184	PRC	MIX	MIX	REG	P				N							
		IMP	184	PRC	MIX	MIX	REG	P				N							
Zhu et al. (2006b).	E-Business	IMP	1415	PRC	MIX	MIX	PLS	P		P				P					

Innovation - INN,

Stage of Adoption - STG ADP: Initiation - INI, Adoption - ADP, Implementation - IMP, Mixed - MIX,

Sample Size - SAM SIZ,

Type of Innovation - TYP INN: Product - PRD, Process - PRC, Mixed - MIX,

Type of Organization - TYP ORG: Manufacturing - MNF, Service - SRV, Mixed - MIX,

Size of Organization - SIZ ORG: Large - LRG, Small - SML, Mixed - MIX,

Data Analysis Methods - DAM: Correlation - COR, Regression - REG, Descriptive - DES, Discriminant - DIS, PLS - PLS, Other - OTH

Significance - SIG, Correlation - COR, Positive - P, Negative - N.

Appendix D

Table D1: Studies considered for the analysis of Organizational characteristics (Top management support, Organizational size, IT expertise, Product champion, Centralization and Formalization)

Study	INN	STG ADP	SAM SIZ	TYP INN	TYP ORG	SIZ ORG	DAM	Top Management		Organization Size		IT expertise		Product Champion		Centralization		Formalization	
								SIG	COR	SIG	COR	SIG	COR	SIG	COR	SIG	COR	SIG	COR
Alam (2009).	Internet	ADP	368	PRD	MIX	SML	COR					P	0.7410						
Al-Gahtani (2004).	IT	ADP	1190	PRC	MIX	MIX	COR												
		IMP	1190	PRC	MIX	MIX	COR												
Al-Qirim (2007).	Internet + Internal Email	ADP	129	PRD	MIX	SML	OTH			N									
	Internet + External Email	ADP	129	PRD	MIX	SML	OTH			N									
	Intranet	ADP	129	PRD	MIX	SML	OTH			N									
	Extranet + VPN	ADP	129	PRD	MIX	SML	OTH			N									
	Internet + EDI	ADP	129	PRD	MIX	SML	OTH			P									
	Website	ADP	129	PRD	MIX	SML	OTH			N									
Bajwa et al. (2005).	Collaboration Information Technologies	ADP	119	MIX	MIX	MIX	REG			P						N			
		IMP	119	MIX	MIX	MIX	REG			P						N			
		ADP	140	MIX	MIX	MIX	REG			N						N			
		IMP	140	MIX	MIX	MIX	REG			N						N			
		ADP	85	MIX	MIX	MIX	REG			N						N			
		IMP	85	MIX	MIX	MIX	REG			N						N			
Beatty et al. (2001).	Website	ADP	284	PRD	MIX	MIX	OTH	P											
Bradford and Florin (2003).	Enterprise Resource Planning (ERP)	IMP	51	PRC	MNF	LRG	COR	P	0.4710									P	0.4770

Table D1 continue …..

Study	INN	STG ADP	SAM SIZ	TYP INN	TYP ORG	SIZ ORG	DAM	Top Management		Organization Size		IT expertise		Product Champion		Centralization		Formalization	
								SIG	COR	SIG	COR	SIG	COR	SIG	COR	SIG	COR	SIG	COR
Bruque and Moyano (2007).	IT	ADP	15	MIX	MIX	SML	DES	P		P				P				P	
		IMP	15	MIX	MIX	SML	DES	P											
Chan and Ngai (2007).	Internet	ADP	10	PRD	MIX	MIX	DES			N				P					
Chau and Tam (1997).	Open System	ADP	89	PRD	MIX	MIX	REG											N	
Choe (1996).	Accounting Information Systems	ADP	78	PRC	MIX	MIX	COR	N	0.0080	N	0.2680	P	0.0440					P	0.0240
		IMP	78	PRC	MIX	MIX	COR	N	0.0460	P	0.0740	N	0.1250					P	0.0330
Chong (2004).	E-Commerce	ADP	115	PRD	MIX	SML	REG	N		N									
Chwelos et al. (2001).	Electronic Data Interchange (EDI)	ADP	317	PRD	MIX	MIX	COR												
Cragg and King (1993).	Computing	IMP	6	MIX	MNF	SML	DES					P							
Damanpour (1991).	IT	ADP		MIX	MIX	MIX	OTH					P				P		N	
Damanpour and Schneider (2006).	IT	INI	1276	PRC	MIX	MIX	COR			P	0.2700								
		ADP	1276	PRC	MIX	MIX	COR			P	0.2600								
		IMP	1276	PRC	MIX	MIX	COR			P	0.2500								
Damanpour and Schneider (2009).	IT	ADP	725	MIX	SRV	MIX	COR			P	0.2700								
DeLone (1981).	Personal Computer	IMP	84	PRD	MNF	SML	COR			P	0.2460	P	0.1430						
DeLone (1988).	Personal Computer	IMP	93	PRD	MNF	SML	OTH												
Eder and Igbaria (2001).	Intranet	ADP	281	PRD	MIX	LRG	COR	P	0.2600	P	0.0300					N	0.0900	N	0.1000
		IMP	281	PRD	MIX	LRG	COR	P	0.3700	N	0.0700					N	0.0800	N	0.1500
Fichman (2001).	OO Programming	ADP	608	PRD	MIX	MIX	COR					P	0.2700						
	OO Programming	IMP	608	PRD	MIX	MIX	COR					P	0.3400						
	OO Programming	MIX	608	PRD	MIX	MIX	COR					P	0.3300						
	Relational DMS	MIX	608	PRD	MIX	MIX	COR					N	0.0300						
	CASE	MIX	608	PRD	MIX	MIX	COR					N	-0.0100						
	Software Process	ADP	608	PRD	MIX	MIX	COR					P	0.1400						
	Software Process	MIX	608	PRD	MIX	MIX	COR					P	0.1700						

Table D1 continue …..

Study	INN	STG ADP	SAM SIZ	TYP INN	TYP ORG	SIZ ORG	DAM	Top Management		Organization Size		IT expertise		Product Champion		Centralization		Formalization	
								SIG	COR	SIG	COR	SIG	COR	SIG	COR	SIG	COR	SIG	COR
Fletcher et al. (1996).	Database	MIX	86	PRD	SRV	LRG	COR			P	-0.0600					N	-0.1400	N	0.1470
Gemino et al. (2006).	Website	ADP	223	PRD	MIX	MIX	REG												
Gengatharen and Standing (2005).	E-Market Place	IMP	28	MIX	MIX	SML	DES	P		P		P							
Grover (1993).	Inter-Organizational System	ADP	214	PRC	MIX	MIX	DIS	P		P		N		P		P		N	
Grover et al. (1997).	Out Sourcing	ADP	313	PRD	MIX	LRG	REG			N									
	CASE	ADP	313	PRD	MIX	LRG	REG			P									
	Object Oriented Programming System/ Design (OOPS)	ADP	313	PRD	MIX	LRG	REG			P									
	Large Scale Relational Database (DBMS)	ADP	313	PRD	MIX	LRG	REG			P									
	Executive Information System	ADP	313	PRC	MIX	LRG	REG			P									
	Teleconferencing	ADP	313	PRD	MIX	LRG	REG			P									
	Expert System	ADP	313	PRD	MIX	LRG	REG			P									
	Email	ADP	313	PRD	MIX	LRG	REG			P									
	CAD/CAM	ADP	313	PRD	MIX	LRG	REG			N									
	Electronic Data Interchange (EDI)	ADP	313	PRD	MIX	LRG	REG			P									
Grover and Goslar (1993).	Telecommunication Technologies	INI	154	PRD	MIX	MIX	REG			N		N				P		N	
		ADP	154	PRD	MIX	MIX	REG			N		N				P		N	
		IMP	154	PRD	MIX	MIX	REG			N		N				P		N	
Grover and Teng (1992).	DBMS	ADP	171	PRD	MIX	MIX	OTH	P								P			
Hoffer and Alexander (1992).	Database Machine (DBM)	ADP	76	PRD	MIX	MIX	OTH	P						P					
Hsiao et al. (2009).	Mobile Nursing Information Systems	ADP	84	PRC	SRV	MIX	DIS	N				N		N					
Ifinedo (2011).	Internet-E-Business Technologies	IMP	214	PRD	MIX	SML	OTH	P		N		N							
Iskandar et al. (2001).	Electronic Data Interchange (EDI)	ADP	111	PRD	MNF	MIX	COR			N	0.2170	N	0.1550						
		IMP	111	PRD	MNF	MIX	COR			P	0.3940	N	0.1890						

Table D1 continue …..

Study	INN	STG ADP	SAM SIZ	TYP INN	TYP ORG	SIZ ORG	DAM	Top Management		Organization Size		IT expertise		Product Champion		Centralization		Formalization	
								SIG	COR	SIG	COR	SIG	COR	SIG	COR	SIG	COR	SIG	COR
Jeon et al. (2006).	E-Business	ADP	204	PRD	MIX	SML	COR			N	0.0500	P	0.4200						
Jun and Kang (2009).	E-Commerce	IMP	171	PRD	MIX	MIX	OTH			P									
Karahanna et al. (1999).	IT	ADP	77	MIX	MIX	MIX	PLS	P				P							
		IMP	153	MIX	MIX	MIX	PLS	P				P							
Khalid and Brian (2004).	Inter-Organizational Information Systems	ADP	87	PRC	MIX	MIX	OTH	P											
Khoumbati et al. (2006).	Enterprise Application Integration	ADP	65	PRC	SRV	MIX	DES			P									
Kim and Garrison (2010).	Radio Frequency Identification (RFID)	INI	78	PRD	MIX	MIX	COR					P	0.2000						
Kimberly and Evanisko (1981).	Administrative Innovation	ADP	210	PRD	SRV	LRG	COR			P	0.6900					N	-0.3800		
	Technological Innovation	ADP	210	PRD	SRV	LRG	COR			P	0.5200					P	-0.1300		
Kowtha and Choon (2001).	E-Commerce	ADP	135	PRD	SRV	MIX	COR					P	0.5300						
Kuan and Chau (2001).	Electronic Data Interchange (EDI)	ADP	525	PRD	MIX	SML	REG					P							
Lai and Guynes (1994).	ISDN	ADP	153	PRD	MIX	LRG	OTH					P				P			
Lai and Guynes (1997).	ISDN	INI	161	PRD	MIX	LRG	DIS			P						N		N	
Law and Ngai (2007).	Enterprise Resource Planning (ERP)	ADP	96	PRC	MIX	MIX	OTH	N											
Lee and Shim (2007).	Radio Frequency Identification (RFID)	ADP	126	PRD	SRV	MIX	OTH					P		P					
Lee and Xia (2006).	IT	ADP		MIX	MIX	MIX	OTH			P									
Lee and Cheung (2004).	Internet	ADP	3	PRD	SRV	SML	DES					P							
Lee and Larsen (2009).	Anti-Malware Adoption	ADP	239	PRD	MIX	MIX	OTH			N									
		IMP	239	PRD	MIX	MIX	OTH			N									
Lertwongsatien and Wongpinunwatana (2003).	E-Commerce	ADP	386	PRD	MIX	SML	OTH	P		N		P							
Li et al. (2010).	E-Business	ADP	307	PRD	MIX	MIX	OTH			P		P							

Table D1 continue …..

Study	INN	STG ADP	SAM SIZ	TYP INN	TYP ORG	SIZ ORG	DAM	Top Management		Organization Size		IT expertise		Product Champion		Centralization		Formalization	
								SIG	COR	SIG	COR	SIG	COR	SIG	COR	SIG	COR	SIG	COR
Liang et al. (2007).	Enterprise Resource Planning (ERP)	IMP	77	PRC	MIX	MIX	COR	P	0.4030										
Looi (2005).	E-Commerce	ADP	184	PRD	MIX	SML	COR					P	0.5560						
Meyer and Goes (1988).	Medical Innovation	ADP	25	PRD	MIX	MIX	COR			P	0.3200								
Mirchandani and Motwani (2001).	E-Commerce	ADP	62	PRD	MIX	SML	COR					P	0.7150						
Nystrom et al. (2002).	Imaging Technology	ADP	70	PRD	SRV	LRG	COR			P	0.5700								
Pae et al. (2002).	DataBase Management System (DBMS)	ADP	163	PRD	MNF	MIX	OTH	P											
Pervan et al. (2005).	Collaboration Technologies (Email)	INI	82	PRD	MIX	LRG	COR			N						P			
		ADP	82	PRD	MIX	LRG	COR			N						N			
		IMP	82	PRD	MIX	LRG	COR			N						N			
Pollard (2003).	E-Service	IMP	30	PRD	MNF	SML	OTH					P							
Premkumar (2003).	Communication Technologies	ADP	207	PRD	MIX	SML	REG	P		P									
Premkumar and Potter (1995).	Computer Aided Software Engineering (CASE)	ADP	90	PRD	MIX	MIX	DIS	P		P				P					
Premkumar and Ramamurthy (1995).	(Inter-Organizational Systems) EDI	ADP	201	PRD	MIX	MIX	COR	P	0.2750					N	0.0740				
		IMP	201	PRD	MIX	MIX	COR	N	0.1780					N	-0.0360				
Premkumar and Roberts (1999).	Email	ADP	78	PRD	MIX	SML	DIS	P		P		N							
	On-line Data Access	ADP	78	PRD	MIX	SML	DIS	P		P		P							
	Internet Access	ADP	78	PRD	MIX	SML	DIS	N		P		N							
	Electronic Data Interchange (EDI)	ADP	78	PRD	MIX	SML	DIS	P		N		N							
Rai and Bajwa (1997).	Executive Information System (Collaboration)	ADP	210	PRD	MIX	MIX	COR			N	0.2800								
		IMP	210	PRD	MIX	MIX	COR	P	0.2900										
	Executive Information System (Decision Support)	ADP	210	PRD	MIX	MIX	COR			P									
		IMP	210	PRD	MIX	MIX	COR	P	0.2200										

Table D1 continue …..

Study	INN	STG ADP	SAM SIZ	TYP INN	TYP ORG	SIZ ORG	DAM	Top Management		Organization Size		IT expertise		Product Champion		Centralization		Formalization	
								SIG	COR	SIG	COR	SIG	COR	SIG	COR	SIG	COR	SIG	COR
Rai et al. (2009).	Electronic Procurement	ADP	166	PRD	MIX	MIX	COR	P	0.3900			P	0.2400						
Rai and Howard (1994).	CASE Technology	IMP	405	PRD	MIX	LRG	REG	P		P		P		P					
Rai and Patnayakuni (1996).	Computer Aided Software Engineering (CASE)	ADP	405	PRD	MIX	MIX	OTH	N						P					
Ramamurthy and Premkumar (1995).	Electronic Data Interchange (EDI)	IMP	201	PRD	MIX	MIX	COR	N	0.2410					P	0.1620				
Ramamurthy et al. (2008).	Data warehouse	ADP	196	PRD	MIX	MIX	REG			P		P							
Ravichandran (2000).	Total Quality Management (TQM) Adoption	ADP	123	PRC	MIX	MIX	REG	P											
Raymond (1990).	Information Systems	IMP	34	PRC	MNF	MIX	COR			P	0.3100	P	0.5000						
	Information Systems (Off-line)	IMP	34	PRC	MNF	MIX	COR			N	-0.0200	P	0.3700						
	Information Systems (On-line)	IMP	34	PRC	MNF	MIX	COR			P	0.3100	P	0.1900						
Ruppel and Howard (1998).	Telework	ADP	252	PRD	MIX	MIX	COR	P	0.3890					P	0.3325				
Scupola (2003).	E-Commerce	ADP	7	PRD	MIX	SML	DES			N		P		P					
		IMP	7	PRD	MIX	SML	DES			N		P		P					
Seyal et al. (2004).	E-Commerce	ADP	54	PRD	MIX	SML	COR	N	0.0760										
Seyal and Rahman (2003).	E-Commerce	ADP	95	PRD	MIX	SML	COR	P	0.3500	N	-0.1900								
Seyal et al. (2007).	Electronic Data Interchange (EDI)	ADP	50	PRD	MIX	SML	COR	P	0.3110										
Sharma and Rai (2003).	CASE	ADP	350	PRD	MIX	MIX	DIS												

Table D1 continue …..

Study	INN	STG ADP	SAM SIZ	TYP INN	TYP ORG	SIZ ORG	DAM	Top Management		Organization Size		IT expertise		Product Champion		Centralization		Formalization	
								SIG	COR	SIG	COR	SIG	COR	SIG	COR	SIG	COR	SIG	COR
Subramanian and Nilakanta (1996).	Technical Innovation (Mean)	ADP	141	PRC	SRV	LRG	COR			N	-0.0900					P	-0.2900	N	0.1400
	Technical Innovation (Time)	ADP	141	PRC	SRV	LRG	COR			P	0.3400					P	-0.3200	N	-0.0100
	Technical Innovation (Consistency)	ADP	141	PRC	SRV	LRG	COR			N	0.0200					N	0.1300	N	0.0600
	Administrative Innovation (Mean)	ADP	141	PRC	SRV	LRG	COR			P	0.2300					N	-0.1000	P	0.3300
	Administrative Innovation (Time)	ADP	141	PRC	SRV	LRG	COR			P	0.1700					P	0.3900	N	0.0900
	Administrative Innovation (Consistency)	ADP	141	PRC	SRV	LRG	COR			N	0.0400					P	-0.3700	P	-0.3500
Tang (2000).	Intranet	ADP	190	PRD	MIX	MIX	OTH	P											
Teo et al. (2007).	Human Resources Information Systems (HRIS)	ADP	110	PRC	MIX	MIX	REG	P		P		P							
		IMP	110	PRC	MIX	MIX	REG	P		P		N							
Teo et al. (2009).	E-Procurement	ADP	141	PRD	MIX	LRG	COR	P	0.3400	P	0.3100								
Teo and Ranganathan (2004).	E-Commerce	ADP	108	PRD	MIX	MIX	OTH	P				P		P				P	
Teo and Tan (1998).	Internet	ADP	188	PRD	MIX	MIX	OTH			P				P					
Thong (1999).	IT	ADP	294	MIX	MIX	SML	COR			P	0.3640	P	0.2860						
		IMP	294	MIX	MIX	SML	COR			P	0.4720	P	0.3980						
Thong (2001).	IT	IMP	114	MIX	MIX	SML	OTH	P				P							
Thong and Yap (1995).	IT	ADP	166	MIX	MIX	SML	COR			P	0.2720								
Thong et al. (1996).	IT	IMP	114	MIX	MIX	SML	OTH	N											
Troshani et al. (2011).	Human Resource Information Systems (HRIS)	ADP	11	PRC	SRV	MIX	DES	P		P		P		P		P			
Tsao et al. (2004).	E-Commerce	ADP	72	PRD	MIX	SML	COR	P	0.6590										
Wang and Cheung (2004).	E-Business	ADP	137	PRD	SRV	SML	COR			P	0.3100								
		IMP	137	PRD	SRV	SML	COR			P	0.2300								

Table D1 continue …..

Study	INN	STG ADP	SAM SIZ	TYP INN	TYP ORG	SIZ ORG	DAM	Top Management		Organization Size		IT expertise		Product Champion		Centralization		Formalization	
								SIG	COR	SIG	COR	SIG	COR	SIG	COR	SIG	COR	SIG	COR
Wang et al. (2004).	E-business	MIX	121	PRD	MIX	MIX	COR			P	0.4500								
Wang et al. (2010).	Radio Frequency Identification (RFID)	ADP	133	PRD	MIX	MIX	REG	N		P		N							
Wu and Chuang (2010).	Electronic Supply Chain Management	INI	184	PRC	MIX	MIX	REG			P									
		ADP	184	PRC	MIX	MIX	REG			P									
		IMP	184	PRC	MIX	MIX	REG			P									
Zhu and Kraemer (2005).	E-Business	ADP	624	PRD	SRV	MIX	PLS			N		P							
Zhu et al. (2003).	E-Business	ADP	3552	PRD	MIX	MIX	REG			P		P							
Zhu et al. (2006a).	E-Business	INI	1857	PRD	MIX	MIX	COR			N	0.1100								
		ADP	1857	PRD	MIX	MIX	COR			P	0.1200								
		IMP	1857	PRD	MIX	MIX	COR			P	0.0500								
Zhu et al. (2006b).	E-Business	IMP	1415	PRC	MIX	MIX	PLS			P		P							
Zmud (1982).	Software Development Practice (Technical)	INI	49	PRD	MIX	MIX	OTH									N		P	
		ADP	49	PRD	MIX	MIX	OTH									N		P	
		IMP	49	PRD	MIX	MIX	OTH									P		P	
	Software Development Practice (Administrative)	INI	49	PRD	MIX	MIX	OTH									P		N	
		ADP	49	PRD	MIX	MIX	OTH									N		N	
		IMP	49	PRD	MIX	MIX	OTH									N		N	

Innovation - INN,
Stage of Adoption - STG ADP: Initiation - INI, Adoption - ADP, Implementation - IMP, Mixed - MIX,
Sample Size - SAM SIZ,
Type of Innovation - TYP INN: Product - PRD, Process - PRC, Mixed - MIX,
Type of Organization - TYP ORG: Manufacturing - MNF, Service - SRV, Mixed - MIX,
Size of Organization - SIZ ORG: Large - LRG, Small - SML, Mixed - MIX,
Data Analysis Methods - DAM: Correlation - COR, Regression - REG, Descriptive - DES, Discriminant - DIS, PLS - PLS, Other - OTH
Significance - SIG, Correlation - COR, Positive - P, Negative - N.

Table D2: Studies considered for the analysis of Organizational characteristics (IS department size, IS infrastructure, Information intensity, Resources and Specialization)

Study	INN	STG ADP	SAM SIZ	TYP INN	TYP ORG	SIZ ORG	DAM	IS Department Size		IS Infrastructure		Information Intensity		Resources		Specialization	
								SIG	COR	SIG	COR	SIG	COR	SIG	COR	SIG	COR
Alam (2009).	Internet	ADP	368	PRD	MIX	SML	COR										
Al-Gahtani (2004).	IT	ADP	1190	PRC	MIX	MIX	COR					P		P	0.3260		
		IMP	1190	PRC	MIX	MIX	COR					P		P	0.4840		
Al-Qirim (2007).	Internet + Internal Email	ADP	129	PRD	MIX	SML	OTH					N					
	Internet + External Email	ADP	129	PRD	MIX	SML	OTH					N					
	Intranet	ADP	129	PRD	MIX	SML	OTH					N					
	Extranet + VPN	ADP	129	PRD	MIX	SML	OTH					N					
	Internet + EDI	ADP	129	PRD	MIX	SML	OTH					N					
	Website	ADP	129	PRD	MIX	SML	OTH					P					
Bajwa et al. (2005).	Collaboration Information Technologies	ADP	119	MIX	MIX	MIX	REG	P		N							
		IMP	119	MIX	MIX	MIX	REG	P		P							
		ADP	140	MIX	MIX	MIX	REG	N		P							
		IMP	140	MIX	MIX	MIX	REG	N		P							
		ADP	85	MIX	MIX	MIX	REG	N		N							
		IMP	85	MIX	MIX	MIX	REG	N		N							
Beatty et al. (2001).	Website	ADP	284	PRD	MIX	MIX	OTH										
Bradford and Florin (2003).	Enterprise Resource Planning (ERP)	IMP	51	PRC	MNF	LRG	COR										
Bruque and Moyano (2007).	IT	ADP	15	MIX	MIX	SML	DES										
		IMP	15	MIX	MIX	SML	DES										
Chan and Ngai (2007).	Internet	ADP	10	PRD	MIX	MIX	DES			P				N			
Chau and Tam (1997).	Open System	ADP	89	PRD	MIX	MIX	REG			N							
Choe (1996).	Accounting Information Systems	ADP	78	PRC	MIX	MIX	COR										
		IMP	78	PRC	MIX	MIX	COR										

Table D2 continue …..

Study	INN	STG ADP	SAM SIZ	TYP INN	TYP ORG	SIZ ORG	DAM	IS Department Size		IS Infrastructure		Information Intensity		Resources		Specialization	
								SIG	COR	SIG	COR	SIG	COR	SIG	COR	SIG	COR
Chong (2004).	E-Commerce	ADP	115	PRD	MIX	SML	REG					P					
Chwelos et al. (2001).	Electronic Data Interchange (EDI)	ADP	317	PRD	MIX	MIX	COR			P	0.3080						
Cragg and King (1993).	Computing	IMP	6	MIX	MNF	SML	DES										
Damanpour (1991).	IT	ADP		MIX	MIX	MIX	OTH					P		P		P	
Damanpour and Schneider (2006).	IT	INI	1276	PRC	MIX	MIX	COR							P	0.1100		
		ADP	1276	PRC	MIX	MIX	COR							P	0.1700		
		IMP	1276	PRC	MIX	MIX	COR							P	0.1400		
Damanpour and Schneider (2009).	IT	ADP	725	MIX	SRV	MIX	COR							P	0.1300		
DeLone (1981).	Personal Computer	IMP	84	PRD	MNF	SML	COR							P			
DeLone (1988).	Personal Computer	IMP	93	PRD	MNF	SML	OTH							P			
Eder and Igbaria (2001).	Intranet	ADP	281	PRD	MIX	LRG	COR			N	-0.0500						
		IMP	281	PRD	MIX	LRG	COR			P	-0.0100						
Fichman (2001).	OO Programming	ADP	608	PRD	MIX	MIX	COR	P	0.2800							P	0.1300
	OO Programming	IMP	608	PRD	MIX	MIX	COR	P	0.3300							P	0.2600
	OO Programming	MIX	608	PRD	MIX	MIX	COR	P	0.3600							P	0.2700
	Relational DMS	MIX	608	PRD	MIX	MIX	COR	P	0.3900							P	0.2500
	CASE	MIX	608	PRD	MIX	MIX	COR	P	0.4400							P	0.2900
	Software Process	ADP	608	PRD	MIX	MIX	COR	P	0.5500							P	0.3900
	Software Process	MIX	608	PRD	MIX	MIX	COR	P	0.5700							P	0.3700
Fletcher et al. (1996).	Database	MIX	86	PRD	SRV	LRG	COR					P					
Gemino et al. (2006).	Website	ADP	223	PRD	MIX	MIX	REG			P				N			
Gengatharen and Standing (2005).	E-Market Place	IMP	28	MIX	MIX	SML	DES							P			
Grover (1993).	Inter-Organizational System	ADP	214	PRC	MIX	MIX	DIS			P		P					

Table D2 continue …..

Study	INN	STG ADP	SAM SIZ	TYP INN	TYP ORG	SIZ ORG	DAM	IS Department Size		IS Infrastructure		Information Intensity		Resources		Specialization	
								SIG	COR	SIG	COR	SIG	COR	SIG	COR	SIG	COR
Grover et al. (1997).	Out Sourcing	ADP	313	PRD	MIX	LRG	REG	N						N		P	
	CASE	ADP	313	PRD	MIX	LRG	REG	P						N		P	
	Object Oriented Programming System/ Design (OOPS)	ADP	313	PRD	MIX	LRG	REG	P						N		P	
	Large Scale Relational Database (DBMS)	ADP	313	PRD	MIX	LRG	REG	P						N		N	
	Executive Information System	ADP	313	PRC	MIX	LRG	REG	N						N		N	
	Teleconferencing	ADP	313	PRD	MIX	LRG	REG	N						N		P	
	Expert System	ADP	313	PRD	MIX	LRG	REG	P						P		P	
	Email	ADP	313	PRD	MIX	LRG	REG	N						N		N	
	CAD/CAM	ADP	313	PRD	MIX	LRG	REG	N						N		N	
	Electronic Data Interchange (EDI)	ADP	313	PRD	MIX	LRG	REG	N						N		N	
Grover and Goslar (1993).	Telecommunication Technologies	INI	154	PRD	MIX	MIX	REG										
		ADP	154	PRD	MIX	MIX	REG										
		IMP	154	PRD	MIX	MIX	REG										
Grover and Teng (1992).	DBMS	ADP	171	PRD	MIX	MIX	OTH			P							
Hoffer and Alexander (1992).	Database Machine (DBM)	ADP	76	PRD	MIX	MIX	OTH										
Hsiao et al. (2009).	Mobile Nursing Information Systems	ADP	84	PRC	SRV	MIX	DIS										
Ifinedo (2011).	Internet-E-Business Technologies	IMP	214	PRD	MIX	SML	OTH							P			
Iskandar et al. (2001).	Electronic Data Interchange (EDI)	ADP	111	PRD	MNF	MIX	COR					P	0.5570				
		IMP	111	PRD	MNF	MIX	COR					N	0.0690				
Jeon et al. (2006).	E-Business	ADP	204	PRD	MIX	SML	COR										
Jun and Kang (2009).	E-Commerce	IMP	171	PRD	MIX	MIX	OTH							P			
Karahanna et al. (1999).	IT	ADP	77	MIX	MIX	MIX	PLS			P							
		IMP	153	MIX	MIX	MIX	PLS			N							
Khalid and Brian (2004).	Inter-Organizational Information Systems	ADP	87	PRC	MIX	MIX	OTH										

Table D2 continue …..

Study	INN	STG ADP	SAM SIZ	TYP INN	TYP ORG	SIZ ORG	DAM	IS Department Size		IS Infrastructure		Information Intensity		Resources		Specialization	
								SIG	COR	SIG	COR	SIG	COR	SIG	COR	SIG	COR
Khoumbati et al. (2006).	Enterprise Application Integration	ADP	65	PRC	SRV	MIX	DES			P						P	
Kim and Garrison (2010).	Radio Frequency Identification (RFID)	INI	78	PRD	MIX	MIX	COR							P	0.1800		
Kimberly and Evanisko (1981).	Administrative Innovation	ADP	210	PRD	SRV	LRG	COR									P	0.7000
	Technological Innovation	ADP	210	PRD	SRV	LRG	COR									P	0.4700
Kowtha and Choon (2001).	E-Commerce	ADP	135	PRD	SRV	MIX	COR										
Kuan and Chau (2001).	Electronic Data Interchange (EDI)	ADP	525	PRD	MIX	SML	REG										
Lai and Guynes (1994).	ISDN	ADP	153	PRD	MIX	LRG	OTH	P									
Lai and Guynes (1997).	ISDN	INI	161	PRD	MIX	LRG	DIS							P			
Law and Ngai (2007).	Enterprise Resource Planning (ERP)	ADP	96	PRC	MIX	MIX	OTH										
Lee and Shim (2007).	Radio Frequency Identification (RFID)	ADP	126	PRD	SRV	MIX	OTH							N			
Lee and Xia (2006).	IT	ADP		MIX	MIX	MIX	OTH										
Lee and Cheung (2004).	Internet	ADP	3	PRD	SRV	SML	DES										
Lee and Larsen (2009).	Anti-Malware Adoption	ADP	239	PRD	MIX	MIX	OTH										
		IMP	239	PRD	MIX	MIX	OTH										
Lertwongsatien and Wongpinunwatana (2003).	E-Commerce	ADP	386	PRD	MIX	SML	OTH										
Li et al. (2010).	E-Business	ADP	307	PRD	MIX	MIX	OTH										
Liang et al. (2007).	Enterprise Resource Planning (ERP)	IMP	77	PRC	MIX	MIX	COR										
Looi (2005).	E-Commerce	ADP	184	PRD	MIX	SML	COR										
Meyer and Goes (1988).	Medical Innovation	ADP	25	PRD	MIX	MIX	COR										
Mirchandani and Motwani (2001).	E-Commerce	ADP	62	PRD	MIX	SML	COR					N	0.2940				
Nystrom et al. (2002).	Imaging Technology	ADP	70	PRD	SRV	LRG	COR							P	0.3100		
Pae et al. (2002).	DataBase Management System (DBMS)	ADP	163	PRD	MNF	MIX	OTH										

Table D2 continue …..

Study	INN	STG ADP	SAM SIZ	TYP INN	TYP ORG	SIZ ORG	DAM	IS Department Size		IS Infrastructure		Information Intensity		Resources		Specialization	
								SIG	COR	SIG	COR	SIG	COR	SIG	COR	SIG	COR
Pervan et al. (2005).	Collaboration Technologies (Email)	INI	82	PRD	MIX	LRG	COR	P	0.3000								
		ADP	82	PRD	MIX	LRG	COR	P	0.2200								
		IMP	82	PRD	MIX	LRG	COR	P	0.2400								
Pollard (2003).	E-Service	IMP	30	PRD	MNF	SML	OTH										
Premkumar (2003).	Communication Technologies	ADP	207	PRD	MIX	SML	REG										
Premkumar and Potter (1995).	Computer Aided Software Engineering (CASE)	ADP	90	PRD	MIX	MIX	DIS										
Premkumar and Ramamurthy (1995).	(Inter-Organizational Systems) EDI	ADP	201	PRD	MIX	MIX	COR			N	0.1230						
		IMP	201	PRD	MIX	MIX	COR			P	0.2100						
Premkumar and Roberts (1999).	Email	ADP	78	PRD	MIX	SML	DIS										
	On-line Data Access	ADP	78	PRD	MIX	SML	DIS										
	Internet Access	ADP	78	PRD	MIX	SML	DIS										
	Electronic Data Interchange (EDI)	ADP	78	PRD	MIX	SML	DIS										
Rai and Bajwa (1997).	Executive Information System (Collaboration)	ADP	210	PRD	MIX	MIX	COR	N									
		IMP	210	PRD	MIX	MIX	COR	P									
	Executive Information System (Decision Support)	ADP	210	PRD	MIX	MIX	COR	P	0.3300								
		IMP	210	PRD	MIX	MIX	COR	P	0.3300								
Rai et al. (2009).	Electronic Procurement	ADP	166	PRD	MIX	MIX	COR							P	0.1800		
Rai and Howard (1994).	CASE Technology	IMP	405	PRD	MIX	LRG	REG										
Rai and Patnayakuni (1996).	Computer Aided Software Engineering (CASE)	ADP	405	PRD	MIX	MIX	OTH	P									
Ramamurthy and Premkumar (1995).	Electronic Data Interchange (EDI)	IMP	201	PRD	MIX	MIX	COR			N	0.2283	P	0.2220				
Ramamurthy et al. (2008).	Data warehouse	ADP	196	PRD	MIX	MIX	REG					N		N			
Ravichandran (2000).	Total Quality Management (TQM) Adoption	ADP	123	PRC	MIX	MIX	REG	N								P	
Raymond (1990).	Information Systems	IMP	34	PRC	MNF	MIX	COR							N	0.0000		
	Information Systems (Off-line)	IMP	34	PRC	MNF	MIX	COR							N	0.1800		
	Information Systems (On-line)	IMP	34	PRC	MNF	MIX	COR							N	-0.1100		

Table D2 continue …..

Study	INN	STG ADP	SAM SIZ	TYP INN	TYP ORG	SIZ ORG	DAM	IS Department Size		IS Infrastructure		Information Intensity		Resources		Specialization	
								SIG	COR	SIG	COR	SIG	COR	SIG	COR	SIG	COR
Ruppel and Howard (1998).	Telework	ADP	252	PRD	MIX	MIX	COR			N	0.0321						
Scupola (2003).	E-Commerce	ADP	7	PRD	MIX	SML	DES			P				N			
		IMP	7	PRD	MIX	SML	DES			P				N			
Seyal et al. (2004).	E-Commerce	ADP	54	PRD	MIX	SML	COR										
Seyal and Rahman (2003).	E-Commerce	ADP	95	PRD	MIX	SML	COR										
Seyal et al. (2007).	Electronic Data Interchange (EDI)	ADP	50	PRD	MIX	SML	COR										
Sharma and Rai (2003).	CASE	ADP	350	PRD	MIX	MIX	DIS	P									
Subramanian and Nilakanta (1996).	Technical Innovation (Mean)	ADP	141	PRC	SRV	LRG	COR							P	0.3100	P	0.2500
	Technical Innovation (Time)	ADP	141	PRC	SRV	LRG	COR							P	0.4000	P	0.3900
	Technical Innovation (Consistency)	ADP	141	PRC	SRV	LRG	COR							P	-0.2800	P	-0.3000
	Administrative Innovation (Mean)	ADP	141	PRC	SRV	LRG	COR							P	-0.1700	N	-0.0900
	Administrative Innovation (Time)	ADP	141	PRC	SRV	LRG	COR							N	-0.0400	P	-0.2300
	Administrative Innovation (Consistency)	ADP	141	PRC	SRV	LRG	COR							N	-0.0200	P	0.3500
Tang (2000).	Intranet	ADP	190	PRD	MIX	MIX	OTH										
Teo et al. (2007).	Human Resources Information Systems (HRIS)	ADP	110	PRC	MIX	MIX	REG										
		IMP	110	PRC	MIX	MIX	REG										
Teo et al. (2009).	E-Procurement	ADP	141	PRD	MIX	LRG	COR										
Teo and Ranganathan (2004).	E-Commerce	ADP	108	PRD	MIX	MIX	OTH										
Teo and Tan (1998).	Internet	ADP	188	PRD	MIX	MIX	OTH										
Thong (1999).	IT	ADP	294	MIX	MIX	SML	COR					N	0.1340				
		IMP	294	MIX	MIX	SML	COR					P	0.2730				
Thong (2001).	IT	IMP	114	MIX	MIX	SML	OTH										
Thong and Yap (1995).	IT	ADP	166	MIX	MIX	SML	COR					N	0.1140				
Thong et al. (1996).	IT	IMP	114	MIX	MIX	SML	OTH										
Troshani et al. (2011).	Human Resource Information Systems (HRIS)	ADP	11	PRC	SRV	MIX	DES										

Table D2 continue …..

Study	INN	STG ADP	SAM SIZ	TYP INN	TYP ORG	SIZ ORG	DAM	IS Department Size		IS Infrastructure		Information Intensity		Resources		Specialization	
								SIG	COR	SIG	COR	SIG	COR	SIG	COR	SIG	COR
Tsao et al. (2004).	E-Commerce	ADP	72	PRD	MIX	SML	COR										
Wang and Cheung (2004).	E-Business	ADP	137	PRD	SRV	SML	COR			P	0.4500			N	0.1200		
		IMP	137	PRD	SRV	SML	COR			P	0.4600			P	0.3300		
Wang et al. (2004).	E-business	MIX	121	PRD	MIX	MIX	COR										
Wang et al. (2010).	Radio Frequency Identification (RFID)	ADP	133	PRD	MIX	MIX	REG					P					
Wu and Chuang (2010).	Electronic Supply Chain Management	INI	184	PRC	MIX	MIX	REG										
		ADP	184	PRC	MIX	MIX	REG										
		IMP	184	PRC	MIX	MIX	REG										
Zhu and Kraemer (2005).	E-Business	ADP	624	PRD	SRV	MIX	PLS							P			
Zhu et al. (2003).	E-Business	ADP	3552	PRD	MIX	MIX	REG										
Zhu et al. (2006a).	E-Business	INI	1857	PRD	MIX	MIX	COR			P	0.2200						
		ADP	1857	PRD	MIX	MIX	COR			P	0.3200						
		IMP	1857	PRD	MIX	MIX	COR			P	0.4000						
Zhu et al. (2006b).	E-Business	IMP	1415	PRC	MIX	MIX	PLS										
Zmud (1982).	Software Development Practice (Technical)	INI	49	PRD	MIX	MIX	OTH										
		ADP	49	PRD	MIX	MIX	OTH										
		IMP	49	PRD	MIX	MIX	OTH										
	Software Development Practice (Administrative)	INI	49	PRD	MIX	MIX	OTH										
		ADP	49	PRD	MIX	MIX	OTH										
		IMP	49	PRD	MIX	MIX	OTH										

Innovation - INN,
Stage of Adoption - STG ADP: Initiation - INI, Adoption - ADP, Implementation - IMP, Mixed - MIX,
Sample Size - SAM SIZ,
Type of Innovation - TYP INN: Product - PRD, Process - PRC, Mixed - MIX,
Type of Organization - TYP ORG: Manufacturing - MNF, Service - SRV, Mixed - MIX,
Size of Organization - SIZ ORG: Large - LRG, Small - SML, Mixed - MIX,
Data Analysis Methods - DAM: Correlation - COR, Regression - REG, Descriptive - DES, Discriminant - DIS, PLS - PLS, Other - OTH
Significance - SIG, Correlation - COR, Positive - P, Negative - N.

Appendix E

Table E1: Studies considered for the analysis of environmental characteristics (Competitive pressure, External pressure and Government support)

Study	INN	STG ADP	SAM SIZ	TYP INN	TYP ORG	SIZ ORG	DAM	Competitive Pressure		External Pressure		Government Support	
								SIG	COR	SIG	COR	SIG	COR
Al-Qirim (2007).	Internet + Internal Email	ADP	129	PRD	MIX	SML	OTH	N		N			
	Internet + External Email	ADP	129	PRD	MIX	SML	OTH	N		N			
	Intranet	ADP	129	PRD	MIX	SML	OTH	N		N			
	Extranet + VPN	ADP	129	PRD	MIX	SML	OTH	P		N			
	Internet + EDI	ADP	129	PRD	MIX	SML	OTH	N		P			
	Website	ADP	129	PRD	MIX	SML	OTH	P		P			
Bradford and Florin (2003).	ERP	IMP	51	PRC	MNF	LRG	COR	P	-0.1190				
Chan and Ngai (2007).	Internet	ADP	10	PRD	MIX	MIX	DES			P			
Chong (2004).	E-Commerce	ADP	115	PRD	MIX	SML	REG	P		P		P	
Chwelos et al. (2001).	Electronic Data Interchange (EDI)	ADP	317	PRD	MIX	MIX	COR	P	0.4570	P	0.3410		
Cragg and King (1993).	Computing	IMP	6	MIX	MNF	SML	DES	N					
Gemino et al. (2006).	Website	ADP	223	PRD	MIX	MIX	REG			N			
Gengatharen and Standing (2005).	E-Market Place	IMP	28	MIX	MIX	SML	DES					P	

Table E1 continue …..

Study	INN	STG ADP	SAM SIZ	TYP INN	TYP ORG	SIZ ORG	DAM	Competitive Pressure		External Pressure		Government Support	
								SIG	COR	SIG	COR	SIG	COR
Grandon and Pearson (2004a).	E-Commerce	ADP	83	PRD	MIX	SML	DIS			P			
Grandon and Pearson (2004b).	E-Commerce	ADP	100	PRD	MIX	SML	OTH			P			
Grover (1993).	Inter Organizational System	ADP	214	PRC	MIX	MIX	DIS	P		P			
Hsiao et al. (2009).	Mobile Nursing Information Systems	ADP	84	PRC	SRV	MIX	DIS	P				N	
Hu et al. (2002).	Telemedicine	ADP	113	PRD	SRV	MIX	REG			N			
Iacovou et al. (1995).	Electronic Data Interchange (EDI)	ADP	7	PRD	MIX	SML	DES			P			
		IMP	7	PRD	MIX	SML	DES			N			
Ifinedo (2011).	Internet-E-Business Technologies	IMP	214	PRD	MIX	SML	OTH	N		P			
Jeon et al. (2006).	E-Business	ADP	204	PRD	MIX	SML	COR	N	0.1000			P	0.3100
Khalid and Brian (2004).	Inter-Organizational Information Systems	ADP	87	PRC	MIX	MIX	OTH	P		P			
Khoumbati et al. (2006).	Enterprise Application Integration	ADP	65	PRC	SRV	MIX	DES			P			
Kimberly and Evanisko (1981).	Administrative Innovation	ADP	210	PRD	SRV	LRG	COR	P	0.2500				
	Technological Innovation	ADP	210	PRD	SRV	LRG	COR	P	0.4100				
Kowtha and Choon (2001).	E-Commerce	ADP	135	PRD	SRV	MIX	COR	P	0.5600				
Kuan and Chau (2001).	Electronic Data Interchange (EDI)	ADP	525	PRD	MIX	SML	REG			N			
Lertwongsatien and Wongpinunwatana (2003).	E-Commerce	ADP	386	PRD	MIX	SML	OTH	P					
Looi (2005).	E-Commerce	ADP	184	PRD	MIX	SML	COR	P	0.6200			P	0.2440
Mehrtens et al. (2001).	Internet	ADP	5	PRD	SRV	SML	DES			P			
Mirchandani and Motwani (2001).	E-Commerce	ADP	62	PRD	MIX	SML	COR	N	0.0480				
Premkumar and Ramamurthy (1995).	(Inter-Organizational Systems) EDI	ADP	201	PRD	MIX	MIX	COR	P	0.0230	P	0.2050		
		IMP	201	PRD	MIX	MIX	COR	N	0.1100	N	0.0880		

Table E1 continue …..

Study	INN	STG ADP	SAM SIZ	TYP INN	TYP ORG	SIZ ORG	DAM	Competitive Pressure		External Pressure		Government Support	
								SIG	COR	SIG	COR	SIG	COR
Premkumar and Roberts (1999).	Email	ADP	78	PRD	MIX	SML	DIS	P		P			
	On-line Data Access	ADP	78	PRD	MIX	SML	DIS	P		N			
	Internet Access	ADP	78	PRD	MIX	SML	DIS	N		P			
	Electronic Data Interchange (EDI)	ADP	78	PRD	MIX	SML	DIS	P		N			
Quaddus and Hofmeyer (2007).	E-Commerce	INI	211	PRD	MIX	SML	OTH	N				N	
Scupola (2003).	E-Commerce	ADP	7	PRD	MIX	SML	DES	P		P		P	
		IMP	7	PRD	MIX	SML	DES	P		P		P	
Seyal et al. (2004).	E-Commerce	ADP	54	PRD	MIX	SML	COR					P	0.3050
Seyal et al. (2007).	Electronic Data Interchange (EDI)	ADP	50	PRD	MIX	SML	COR					P	0.3010
Teo et al. (2007).	Human Resources Information Systems (HRIS)	ADP	110	PRC	MIX	MIX	REG	N					
		IMP	110	PRC	MIX	MIX	REG	P					
Teo et al. (2009).	E-Procurement	ADP	141	PRD	MIX	LRG	COR			P	0.3000		
Thong (1999).	IT	ADP	294	MIX	MIX	SML	COR	N	-0.0910				
		IMP	294	MIX	MIX	SML	COR	N	-0.0560				
Thong and Yap (1995).	IT	ADP	166	MIX	MIX	SML	COR	N	-0.0940				
Tsao et al. (2004).	E-Commerce	ADP	72	PRD	MIX	SML	COR					N	
Tung and Rieck (2005).	E-Government Service	ADP	128	PRD	MIX	MIX	COR			P	0.4700		
Wang and Cheung (2004).	E-Business	ADP	137	PRD	SRV	SML	COR	N	0.2700	N	0.1800		
		IMP	137	PRD	SRV	SML	COR	P	0.3100	N	0.2600		
Wang et al. (2010).	Radio Frequency Identification (RFID)	ADP	133	PRD	MIX	MIX	REG	P		P			

Table E1 continue …..

Study	INN	STG ADP	SAM SIZ	TYP INN	TYP ORG	SIZ ORG	DAM	Competitive Pressure		External Pressure		Government Support	
								SIG	COR	SIG	COR	SIG	COR
Zhu and Kraemer (2005).	E-Business	ADP	624	PRD	SRV	MIX	PLS	P				P	
Zhu et al. (2003).	E-Business	ADP	3552	PRD	MIX	MIX	REG	P					
Zhu et al. (2006a).	E-Business	INI	1857	PRD	MIX	MIX	COR	P	0.1900			P	0.4200
		ADP	1857	PRD	MIX	MIX	COR	P	0.0300			N	0.0900
		IMP	1857	PRD	MIX	MIX	COR	P	0.0100			P	0.1500
Zhu et al. (2006b).	E-Business	IMP	1415	PRC	MIX	MIX	PLS	P					

Innovation - INN,
Stage of Adoption - STG ADP: Initiation - INI, Adoption - ADP, Implementation - IMP, Mixed - MIX,
Sample Size - SAM SIZ,
Type of Innovation - TYP INN: Product - PRD, Process - PRC, Mixed - MIX,
Type of Organization - TYP ORG: Manufacturing - MNF, Service - SRV, Mixed - MIX,
Size of Organization - SIZ ORG: Large - LRG, Small - SML, Mixed - MIX,
Data Analysis Methods - DAM: Correlation - COR, Regression - REG, Descriptive - DES, Discriminant - DIS, PLS - PLS, Other - OTH
Significance - SIG, Correlation - COR, Positive - P, Negative - N.

Appendix F

Table F1: Studies considered for the analysis of CEO characteristics (Competitive pressure, External pressure and Government support).

Study	INN	STG ADP	SAM SIZ	TYP INN	TYP ORG	SIZ ORG	DAM	CEO Innovativeness		CEO attitude		CEO IT Knowledge		Managers Tenure		Managers Age		Managers Gender		Managers Educational Level	
								SIG	COR	SIG	COR	SIG	COR	SIG	COR	SIG	COR	SIG	COR	SIG	COR
Alam (2009).	Internet	ADP	368	PRD	MIX	SML	COR					P	0.4460								
Al-Gahtani (2004).	IT	ADP	1190	PRC	MIX	MIX	COR					P	0.2420								
		IMP	1190	PRC	MIX	MIX	COR					N	-0.0380								
Al-Qirim (2007).	Internet + Internal Email	ADP	129	PRD	MIX	SML	OTH	N													
	Internet + External Email	ADP	129	PRD	MIX	SML	OTH	P													
	Intranet	ADP	129	PRD	MIX	SML	OTH	N													
	Extranet + VPN	ADP	129	PRD	MIX	SML	OTH	N													
	Internet + EDI	ADP	129	PRD	MIX	SML	OTH	N													
	Website	ADP	129	PRD	MIX	SML	OTH	P													
Chan and Ngai (2007).	Internet	ADP	10	PRD	MIX	MIX	DES					P									
Chuang et al. (2009).	IT	ADP	97	MIX	SRV	SML	COR									P	-0.3930	P	0.4870	P	-0.3020
Cragg and King (1993).	Computing	IMP	6	MIX	MNF	SML	DES	P													
Damanpour (1991).	IT	ADP		MIX	MIX	MIX	OTH			P				N							

Table F1 continue …..

Study	INN	STG ADP	SAM SIZ	TYP INN	TYP ORG	SIZ ORG	DAM	CEO Innovativeness		CEO attitude		CEO IT Knowledge		Managers Tenure		Managers Age		Managers Gender		Managers Educational Level	
								SIG	COR	SIG	COR	SIG	COR	SIG	COR	SIG	COR	SIG	COR	SIG	COR
Damanpour and Schneider (2006).	IT	INI	1276	PRC	MIX	MIX	COR			P	0.2000	N	0.1400	P	0.0700	N	0.0300	N	0.0900		
		ADP	1276	PRC	MIX	MIX	COR			P	0.1700	N	0.1100	P	0.1300	N	0.0500	N	0.0600		
		IMP	1276	PRC	MIX	MIX	COR			P	0.1700	N	0.1100	P	0.0900	N	0.0100	N	0.0700		
Damanpour and Schneider (2009).	IT	ADP	725	MIX	SRV	MIX	COR			P	0.2900	P	0.1300	P	0.1300	N	-0.0100	N	0.0300	P	0.0130
DeLone (1988).	Personal Computer	IMP	93	PRD	MNF	SML	OTH					P									
Gengatharen and Standing (2005).	E-Market Place	IMP	28	MIX	MIX	SML	DES	P													
Grandon and Pearson (2004a).	E-Commerce	ADP	83	PRD	MIX	SML	DIS			P											
Grandon and Pearson (2004b).	E-commerce	ADP	100	PRD	MIX	SML	OTH			P											
Hoffer and Alexander (1992).	Database Machine (DBM)	ADP	76	PRD	MIX	MIX	OTH					P									
Jeon et al. (2006).	E-business	ADP	204	PRD	MIX	SML	COR			P	0.4200	P	0.5100								
Kimberly and Evanisko (1981).	Administrative Innovation	ADP	210	PRD	SRV	LRG	COR	P	-0.0200			P	0.1400	N	-0.0300						
	Technological Innovation	ADP	210	PRD	SRV	LRG	COR	P	0.1100			P	0.0600	P	0.0100						
Larsen (1993).	IT	MIX	99	MIX	MNF	LRG	COR					N	0.2100	N	-0.1698	N	-0.0392			N	0.2197
Law and Ngai (2007).	Enterprise Resource Planning (ERP)	ADP	96	PRC	MIX	MIX	OTH	N													
Liang et al. (2007).	Enterprise Resource Planning (ERP)	IMP	77	PRC	MIX	MIX	COR	P	0.5650												
Meyer and Goes (1988).	Medical Innovation	ADP	25	PRD	MIX	MIX	COR							N	-0.0700					N	0.1400

Table F1 continue …..

Study	INN	STG ADP	SAM SIZ	TYP INN	TYP ORG	SIZ ORG	DAM	CEO Innovativeness		CEO attitude		CEO IT Knowledge		Managers Tenure		Managers Age		Managers Gender		Managers Educational Level	
								SIG	COR	SIG	COR	SIG	COR	SIG	COR	SIG	COR	SIG	COR	SIG	COR
Mirchandani and Motwani (2001).	E-Commerce	ADP	62	PRD	MIX	SML	COR	P	0.5700												
Quaddus and Hofmeyer (2007).	E-commerce	INI	211	PRD	MIX	SML	OTH			N											
Seyal and Rahman (2003).	E-Commerce	ADP	95	PRD	MIX	SML	COR			P	0.3500										
Sharma and Rai (2003).	CASE	ADP	350	PRD	MIX	MIX	DIS							N							
Tang (2000).	Intranet	ADP	190	PRD	MIX	MIX	OTH	P													
Thong (1999).	IT	ADP	294	MIX	MIX	SML	COR	P	0.2120			P	0.2950								
		IMP	294	MIX	MIX	SML	COR	N	0.1670			N	0.0410								
Thong and Yap (1995).	IT	ADP	166	MIX	MIX	SML	COR	P	0.1730	P	0.3110	P	0.3000								

Innovation - INN,

Stage of Adoption - STG ADP: Initiation - INI, Adoption - ADP, Implementation - IMP, Mixed - MIX,

Sample Size - SAM SIZ,

Type of Innovation - TYP INN: Product - PRD, Process - PRC, Mixed - MIX,

Type of Organization - TYP ORG: Manufacturing - MNF, Service - SRV, Mixed - MIX,

Size of Organization - SIZ ORG: Large - LRG, Small - SML, Mixed - MIX,

Data Analysis Methods - DAM: Correlation - COR, Regression - REG, Descriptive - DES, Discriminant - DIS, PLS - PLS, Other - OTH

Significance - SIG, Correlation - COR, Positive - P, Negative - N.

Appendix G

Table F1: Studies considered for the analysis of user acceptance characteristics (Competitive pressure, External pressure and Government support).

Study	INN	STG ADP	SAM SIZ	TYP INN	TYP ORG	SIZ ORG	DAM	Perceived Usefulness		Perceived Ease of Use		Subjective Norm		Facilitating Conditions	
								SIG	COR	SIG	COR	SIG	COR	SIG	COR
Adams et al. (1992).	Email	IMP	116	PRD	MIX	MIX	COR	P	0.3470	P	0.2950				
	Voice mail (Vmail)	IMP	68	PRD	MIX	MIX	COR	P	0.4450	P	0.3460				
Adamson and Shine (2003).	Information Systems	IMP	122	MIX	SRV	LRG	OTH	P		P		P			
Agarwal and Prasad (1998b).	Information System Application (Configurator)	IMP	76	PRD	MIX	MIX	REG	P		N					
Agarwal and Prasad (1999).	IT	IMP	230	MIX	SRV	LRG	OTH	P		P					
Agarwal and Prasad (2000).	Software Process Innovations	IMP	71	PRC	SRV	LRG	COR	P		P					
Al-Gahtani and Shih (2009).	IT	IMP	400	MIX	SRV	MIX	PLS					N			
Al-Khaldi and Wallace (1999).	Personal Computer	IMP	151	PRD	MIX	MIX	COR	P		P		P	0.7630	P	0.2533
Anandarajan et al. (2002).	IT	IMP	175	MIX	MIX	MIX	COR	N	0.6700	P	0.5400	P	0.3300		
Bhattacherjee et al. (2008).	Document Management System	IMP	81	PRC	SRV	LRG	PLS							P	
Brown et al. (2005).	Computer Banking System	IMP	107	MIX	SRV	LRG	PLS	P		P		P			

Table G1 continue …..

Study	INN	STG ADP	SAM SIZ	TYP INN	TYP ORG	SIZ ORG	DAM	Perceived Usefulness		Perceived Ease of Use		Subjective Norm		Facilitating Conditions	
								SIG	COR	SIG	COR	SIG	COR	SIG	COR
Burton-Jones and Hubona (2005).	Computer Application (Email)	IMP	96	PRD	MNF	LRG	COR	P	0.5210	N	0.3560				
	Computer Application (Email)	IMP	96	PRD	MNF	LRG	COR	N	0.2960	N	0.2490				
	Computer Application (Word)	IMP	96	PRD	MNF	LRG	COR	N	0.2910	P	0.4130				
	Computer Application (Word)	IMP	96	PRD	MNF	LRG	COR	N	0.1710	P	0.2070				
Calantone et al. (2006).	IT Application	IMP	506	PRD	MIX	MIX	COR	P							
Chau (1996).	Personal Computer	IMP	285	PRD	SRV	LRG	OTH	P		N					
Chau and Hu (2001).	Telemedicine Technology	IMP	408	PRD	MIX	MIX	OTH	P		N		N			
Gumussoy and Calisir (2009).	Electronic-Reverse Auction	IMP	156	PRD	MIX	MIX	OTH	P		N		P			
Guo and Zhang (2010).	Mobile Administrative System	IMP	134	PRC	SRV	LRG	PLS								
Horton et al. (2001).	Intranet	IMP	386	PRD	SRV	LRG	COR	P	0.2340	P	0.4130				
	Intranet	IMP	65	PRD	MNF	LRG	COR	P	0.1490	P	0.4660				
Igbaria (1993).	Microcomputer Software packages	IMP	519	PRD	MIX	MIX	PLS	P							
Igbaria and Iivari (1995).	IT	IMP	450	MIX	MIX	MIX	COR	P	0.4500	P	0.2700				
Igbaria et al. (1995).	IT	IMP	450	MIX	MIX	MIX	COR	P	0.4300	P	0.2500				
Igbaria et al. (1996).	Micro-Computer	IMP	471	MIX	MIX	MIX	COR	P	0.4000			P	0.2700		
Igbaria et al. (1997).	Personal Computer	IMP	358	PRD	MIX	MIX	COR	P	0.4200	P	0.4400				
Jones et al. (2002).	Sale Force Automation System	IMP	249	PRC	MIX	MIX	COR	P				P			
Karahanna et al. (2006).	Consumer Relations Management System (CRMS)	IMP	216	PRC	SRV	LRG	COR	P	0.4500	P	0.3400				
Kijsanayotina et al. (2009).	IT	IMP	1323	MIX	SRV	MIX	COR					N	0.0700	N	0.1500
	IT for care and report	IMP	1323	MIX	SRV	MIX	COR					N	0.1900	P	0.3200
	IT for Administrative	IMP	1323	MIX	SRV	MIX	COR					N	0.1700	P	0.2900
	IT for Comunication	IMP	1323	MIX	SRV	MIX	COR					N	0.1300	P	0.3000
Lawrence and Low (1993).	Information Systems	IMP	59	PRC	SRV	LRG	COR								

Table G1 continue …..

Study	INN	STG ADP	SAM SIZ	TYP INN	TYP ORG	SIZ ORG	DAM	Perceived Usefulness		Perceived Ease of Use		Subjective Norm		Facilitating Conditions	
								SIG	COR	SIG	COR	SIG	COR	SIG	COR
Lin (2006).	Virtual Community	IMP	165	PRD	SRV	LRG	OTH	P		P		N		P	
Money and Turner (2005).	Knowledge Management System	IMP	35	PRC	MIX	MIX	COR	P	0.5730	P	0.4630				
Patel et al. (2011).	Health Information Exchange	IMP	144	PRD	SRV	LRG	DES			P					
Riemenschneider et al. (2003).	Website	IMP	156	PRD	MIX	MIX	COR	P		P		P			
Roberts and Henderson (2000).	IT	IMP	108	MIX	MIX	MIX	COR	P	0.3300						
Sorebo and Eikebrokk (2008).	Personal Computer	IMP	161	PRD	SRV	LRG	COR	P		P					
Venkatesh (2000).	IT	IMP	70	MIX	SRV	SML	COR	P		P					
	IT	IMP	160	MIX	SRV	LRG	COR	P		P					
	IT	IMP	52	MIX	SRV	SML	COR	P		P					
Venkatesh and Davis (2000).	IT	IMP	468	MIX	MIX	MIX	REG	P		P		P			
Zhang et al. (2011).	E-government System	IMP	35	PRC	SRV	LRG	PLS	P		P				P	
		IMP	62	PRC	SRV	LRG	PLS	P		N				P	
Zhang and Gutierre (2007).	Management Information Systems	IMP	60	PRC	SRV	MIX	REG					N			

Innovation - INN,

Stage of Adoption - STG ADP: Initiation - INI, Adoption - ADP, Implementation - IMP, Mixed - MIX,

Sample Size - SAM SIZ,

Type of Innovation - TYP INN: Product - PRD, Process - PRC, Mixed - MIX,

Type of Organization - TYP ORG: Manufacturing - MNF, Service - SRV, Mixed - MIX,

Size of Organization - SIZ ORG: Large - LRG, Small - SML, Mixed - MIX,

Data Analysis Methods - DAM: Correlation - COR, Regression - REG, Descriptive - DES, Discriminant - DIS, PLS - PLS, Other - OTH

Significance - SIG, Correlation - COR, Positive - P, Negative - N.