End-to-End (E2E) solutions: an exploration of value conversion contingencies in a developing country

Author:
Riyadh, Al Nahian

Publication Date:
2011

DOI:
https://doi.org/10.26190/unsworks/15217

End-to-End (E2E) Solutions: An Exploration of Value Conversion Contingencies in a Developing Country

Al Nahian Riyadh

Submitted for the degree of Doctor of Philosophy

School of Information Systems, Technology and Management

Australian School of Business

The University of New South Wales

2011

Originality Statement

‘I hereby declare that this submission is my own work and to the best of my knowledge it contains no materials previously published or written by another person, or substantial proportions of material which have been accepted for the award of any other degree or diploma at UNSW or any other educational institution, except where due acknowledgement is made in the thesis. Any contribution made to the research by others, with whom I have worked at UNSW or elsewhere, is explicitly acknowledged in the thesis. I also declare that the intellectual content of this thesis is the product of my own work, except to the extent that assistance from others in the project's design and conception or in style, presentation and linguistic expression is acknowledged.’

Signed …….....

Date …….....

Copyright Statement

Signed …….....

Date …….....

Authenticity Statement

‘I certify that the Library deposit digital copy is a direct equivalent of the final officially approved version of my thesis. No emendation of content has occurred and if there are any minor variations in formatting, they are the result of the conversion to digital format.’

Signed …….....

Date …….....

Dedications

This thesis is dedicated to:

Late Abdul Halim Miah

(Father)

Mrs Rizia Begum

(Mother)

Saima Islam

(Wife)

Nysha Riyadh

(Daughter)

Acknowledgements

I would like to thank my supervisors, Professor Patrick Finnegan, Associate Professor Fethi Rabhi and Associate Professor Deborah Bunker, for guiding me through this research.

In particular, my greatest debt of gratitude is to Professor Patrick Finnegan for his insights and encouragement on this project over the years. Professor Finnegan, with whom I had the privilege to work, always had time for me and his frank but honest comments inspired me to work harder and harder.

I would like to thank my wife Saima for her love, encouragement, support and considerable patience throughout this project. I also thank the joy of my life, my daughter Nysha who has provided me with endless hours of entertainment. I would like to honour the loving memory of my late father, Abdul Halim Miah. His 'thirst' for knowledge is one of the major reasons for my becoming an academic. My mother, brothers, sisters-in-law, sisters, brothers-in-law, uncles, aunts, father-in-law, mother-in-law, nephews and nieces have always been proud of my academic achievements and encouraged me to do better. I would like to thank all my friends and students for wishing me luck towards this research project.

I owe Tricia Hartley and Margaret Lo each a huge debt of gratitude for their great administrative support. Dr Louise Fitzgerald of the Education Development Unit at the Australian School of Business (ASB) advised on the writing style and copy-edited the final version of the thesis; I appreciate her kind support.

I was fortunate to receive a Tuition Fee Remission and Faculty Stipend Scholarship and a Sasakawa Fellowship (SYLLF) which provided me with financial support at a particularly lean time. Thus, I would like to acknowledge the support of the Australian School of Business (ASB), UNSW Graduate Research School (GRS) and SYLLF authority.

Lastly, thanks to all the interviewees and their organisations as this thesis could not have been written without their very generous help.

Abstract

The business value of IT literature has a number of limitations: the IT productivity paradox is known to exist in developing countries but the literature on the factors that explain the causes of such IT productivity paradox (i.e. value conversion contingencies) is non-existent. In particular there is a scarcity of empirical research measuring the value of digital business capabilities, a limited number of research studies at the business process level, and a lack of exploratory research. In addition, a shift from stand-alone IT implementation to End-to-End (E2E) Solutions is apparent in organisations due to the extension of business process across organisational boundaries and the emergence of breakthrough technologies. However, extant literature on E2E Solutions focuses solely on the conceptual and implementation issues.

The objective of this research is to investigate the derivation of business value from E2E Solutions in developing countries. The study examined the E2E loan process in nine commercial banks in Bangladesh. The research focused on; how E2E Solutions deliver business value and how the derivation of business value from E2E Solutions is impacted by value conversion contingencies.

The study reveals that E2E Solutions are evident as Single Point Processing, Single Point Data Entry, Integrated Database, and Automated and Integrated Processes. The study revealed that E2E Solutions deliver value by improving nine aspects of core processes as well as the coordination and communication process; processing time, risk assessment, administrative task, processing cost, communication, coordination, document sharing, controlling and monitoring. The empirical evidence shows that E2E Solutions improve processes, which in turn improve organisational performance. However, not all process improvements have an impact on organisational performance. Furthermore, these process performance aspects are impeded by eight value conversion contingencies; Senior Management Ability, Complementary Resources, Software Misfits, Integration, Customer Readiness, Information Infrastructure, IT Infrastructure and Regulatory Environment.

Table of Contents

List of Tables

List of Figures

Chapter One

Introduction

1.0 Introduction of the Study

This chapter highlights the dearth of, and need for, research on E2E Solutions' value and value conversion contingencies in developing countries. It is revealed that as contemporary business processes are moving across functional and organisational boundaries, organisations are increasingly implementing E2E Solutions which are single or integrated solutions that facilitate the flow of a business process from the initiation of activities to fulfilment. It argues that it is necessary to understand how to derive business value from E2E Solutions in the context of developing countries. The paucity of extant research and the need to better understand value creation using E2E Solution lead to a need for research (section 1.1). Section 1.2 provides an overview of E2E Solutions. Section 1.3 presents the research objective and summarises the key contribution of this research. It addresses how this study seeks to contribute to existing literature and practice by documenting E2E Solutions' business value and the impact of conversion contingencies on business value of E2E Solutions. The plan of research is presented in the final section (section 1.4).

1.1 An Overview of the Research Motivation

The disagreement and debate among researchers on the three aspects of IT value research; IT productivity paradox (cf.Solow 1987); conceptualisation of IT (Kohli and Grover 2008); and level of IT value analysis (Davamanirajan *et al.* 2006) make this topic area rather interesting for further research. Furthermore, managers are also increasingly concerned about the poor returns of their IT investments (cf.Santos and Sussman 2000). Thus, continued research on IT value is required to reduce the disagreements among researchers in the aforesaid areas and to guide managers on how best to derive value from their IT investment (cf.Walsham and Sahay 2006) .

The IT productivity paradox (cf.Solow 1987) is the concept that increased IT investments have not been consistently associated with increased productivity (e.g., Brynjolfsson 1993). While, some researchers (cf.Hodgkinson *et al.* 2009; Kohli and Grover 2008) recently concluded that the early formulated IT productivity paradox is irrelevant, empirical evidence from developed[1] (e.g., Davamanirajan *et al.* 2006) and developing (e.g., Chowdhury 2006) countries reveal the

[1] In common practice, Japan, Hong Kong, Singapore, South Korea, and Taiwan in Asia, Canada and the United States in northern America, Australia and New Zealand in Oceania, and Europe, are considered "developed" regions or areas. Other countries are known as 'developing countries'. (United Nations Statistics Division, 2008).

opposing positions on the existence of the IT productivity paradox. The IT value literature on developing countries concludes that IT investment does not have any significant correlation with labour productivity (cf.Avgerou 2008; Heeks 2010). Hence, continued research is warranted on the causes of the IT productivity paradox in developing countries.

The factors that explain the gaps between potential and realised value of IT or the factors responsible for the existence of the IT productivity paradox are known in the literature as IT value conversion contingencies (cf.Davern and Kauffman 2000). Knowing the IT value conversion contingencies is important for managers to better manage the value conversion contingencies in order to make the IT investments profitable. However, IT value conversion contingencies are an area that is under-researched (cf.Goh and Kauffman 2009). All of the existing research is focused on the developed countries (e.g.,Davern and Kauffman 2000; Goh and Kauffman 2009; 2005), whereas the IT productivity paradox is an issue for developing countries (cf.Heeks 2010). Therefore, the scarcity of extant research on IT value conversion contingencies in developing countries begs to be addressed.

Despite the persistent nature of the IT productivity paradox in developing countries, a significant proportion of organisational budgets are spent on IT with expectations of deriving value from such an investment (Heeks 2010). For example, in an editorial note, Heeks (2010) reported that the IT implementation budgets of developing countries are found to be in excess of US$800 billion per year with the return from such investment always being less than the cost. This huge spending on IT by developing countries, organisations and governments needs to be justified because of the huge opportunity loss for making investment on IT in developing countries (cf.Avgerou 2008). But, "*the entire literature on IS and developing countries would struggle to fill a single bookshelf*" (cf.Heeks 2002,p. 102). The scarcity of published research on IS in developing countries is also reported in many recent meta-analysis papers (Avgerou 2008; Boateng *et al.* 2009; Walsham and Sahay 2006). While IT investments are made at the organisational level (cf.Kohli and Grover 2008) and IT value conversion contingencies take place at the business process level (cf.Davern and Kauffman 2000), existing IS research in developing countries focuses on the macro-aspects i.e., e-commerce, telecentres (cf.Avgerou 2008). Process level analysis of IT value and value conversion contingencies are absent in extant literature. This scarcity of research needs to be addressed as, at the business process level, IT value is actually realised and value conversion contingencies take place (cf. Davern and Kauffman 2000).

In addition, while traditional IT value research (e.g., Davern and Kauffman 2000; Melville *et al.* 2004) is focusing on IT investment and its link with capabilities and then on business value, Kohli and Grover (2008) suggest conducting future research on digital business capabilities (rather than IT alone). Indeed, Kohli and Grover (2008) theoretically observed that IT becomes an integral part of the processes and is not separable from the product (e.g. IT-Embeddedness). However, previous IT value research rarely conceptualises IT as a digital business capability and more research is needed to address this issue for better appreciation of the role of IT in delivering value (cf.Kohli and Grover 2008).

Furthermore, while researchers (Barua *et al.* 1995; Davamanirajan *et al.* 2006; Davern and Kauffman 2000; Fichman 2004) acknowledge that the business process is the appropriate level for measuring IT value, process level analysis of IT value research is in its infancy (cf.Radhakrishnan *et al.* 2008) and suffering from two sorts of problems. The first problem relates to the problem of aggregation of business processes. While measuring IT value, researchers (e.g., Karimi *et al.* 2007) combine all of the business processes together. But IT might create a different level of impact on the different business processes within an organisation and that may result in different levels of effectiveness. The other problem of the existing business value literature (e.g., Barua *et al.* 1995; Gattiker and Goodhue 2005) is the problem of vertical focus, that is to say, it focuses on business functions and business units. However, despite business processes cutting across functions and the organisational boundary (cf.Bubak *et al.* 2006), little is known about the business value of IT in an E2E business process context. Thus, the effectiveness of IT in the E2E business process context needs to be addressed.

1.2 E2E Solutions

An end-to-end business process is *"where a customer's request triggers the process and fulfilment of customer needs bringing closure to the process"* (Davamanirajan *et al.* 2006, p.96). This research refers to such system implementations and process reorientation as End-to-End (E2E) Solutions, defined as *'single or integrated solutions that help the business process to flow unimpeded across organizational boundaries from beginning to end'*. E2E Solutions are of interest to both domestic and overseas companies based in developing countries as they concurrently provide automation efficiencies, as well as process transformation benefits i.e., key aspects of IT value. Nevertheless, the value realisation from E2E Solutions is rather complex in comparison with value realisation from stand-alone IT as: (i) the realisation of value from E2E Solutions is dependent on the actions of multiple parties (including external parties) involved in

the business process; and (ii) unlike stand-alone systems (e.g., stand-alone ERP), E2E Solutions are subject to more stringent regulations (cf.Jain *et al.* 2010) as they bring customers, partners and suppliers into a single E2E process that is frequently dependent on public infrastructure, i.e., Internet, electricity and telecommunication.

Deriving value from E2E Solutions is complex and value realisation processes from E2E Solutions are not well documented in extant literature. The existing E2E Solutions literature focuses on conceptual issues (see for example, Frye and Gulledge 2007), integration (see for example, Jain *et al.* 2010), and implementation issues (see for example, Bubak *et al.* 2006). In the preceding example, the value conversion contingencies of E2E Solutions are not well addressed. Hence, the derivation of value from E2E Solutions is not well understood. This is particularly problematic in developing countries where the efficiency gains from the software and process redesign associated with E2E Solutions offer much potential.

1.3 Research Objective and Contribution

The research objective for the study is "to investigate the derivation of business value from E2E Solutions in developing countries". The following two research questions are posed:

Research Question 1: How do E2E Solutions deliver business value?

Research Question 2: How is the achievement of business value from E2E Solutions impacted by value conversion contingencies?

Prior to this study, less than 10 journal papers have been focused on IT value conversion contingencies and other similar topics, e.g., IT value latency and sources of shock of IT value. All of these studies focus on IT value conversion contingencies in developed countries. Furthermore, the shift from the stand-alone IT implementation to E2E Solutions is evident in organisations due to the extending nature of business process and emergence of breakthrough technologies. The existing E2E Solutions' literature focuses merely upon the conceptual and implementation issues instead of the business value analysis of E2E Solutions. By examining the E2E loan process in nine banks in Bangladesh, this study significantly extends the body of empirical evidence on the business value of IT and value conversion contingencies.

The conceptualisation of E2E Solutions is one of the key contributions of this research. Previous research mostly focuses on IT investment and relates IT to the business value; however, this has been criticised in the literature (cf.Kohli and Grover 2008) as IT alone cannot produce value due to its embedded nature. Indeed, Kohli and Grover (2008, p.30) mentioned that "*what business*

capability is needed should come first". This research is one of the early research studies to respond to this call. In this study, E2E Solutions are conceptualised in such a way so as to ensure the unimpeded flow of business processes across functional and organisational boundaries. This ensures business process reorientation and internal and external process integration. E2E Solutions therefore deliver more value than that of stand-alone IT. Thus, rather than IT as a tool to create value, E2E Solutions are evident as the 'Digital Business Capability'. In this study, E2E Solutions have four aspects: Single Point Processing, Single Point Data Entry, Integrated Databases, and Automated and Integrated Processes. Single Point Processing and Single Point Data Entry are enabled by Integrated Databases and Automated and Integrated Processes.

Another important contribution of this study is that it demonstrates both the value derivation from E2E Solutions and how business value of E2E Solutions is impeded by value conversion contingencies. This was largely absent in the previous IT value literature in developing countries. As E2E Solutions facilitate both internal and externally facing business processes, the business value of E2E Solutions and value conversion contingencies is complex. This study contributes to the existing body of literature by illustrating the complexity of value derivation from E2E Solutions, and how value conversion contingencies impact on the business value of E2E Solutions. This is done by identifying the constructs and indicators for constructs which are important for theory building in this study. This study helps fill the gaps in IT value literature. Additional process level performance aspects identified in this study were: accurate risk assessment, ease of administration, ease of document sharing, ease of controlling and ease of monitoring. This research also identifies a set of value conversion contingencies; senior management ability, complementary resources, software misfits, integration, customer readiness, information infrastructure, IT infrastructure and regulatory environment. Many of these contingencies were previously unreported in IT value literature. Additional value contingencies factors identified include complementary resources, software misfits, integration, information infrastructure and IT infrastructure.

This study also contributes to the IT value literature in developing countries, where the IT productivity paradox is found to exist but research on IT value conversion contingencies does not exist (cf.Avgerou 2008; Heeks 2010). By identifying the value conversion contingencies, this research allows managers and policy makers in developing countries to determine what needs to be done in order to derive value from IT investments.

A further contribution of this study is that it integrates two streams of research; business value of IT (e.g. stand-alone ERP) (e.g., Radhakrishnan *et al.* 2008) and supply chain management/net-enabled technologies/inter-organisational (e.g., Barua *et al.* 2004) into one model. As this research focuses on an end-to-end business process it captures both internal and externally facing business processes and connects customers, suppliers and other process participants.

1.4 Plan of Research

The plan of this research is as follows. Chapter 2 explores the phenomenon of E2E Solutions' value and value conversion contingencies. As E2E Solutions are a new area of research, the IT (stand-alone) value literature is explored, and key aspects of IT value; the IT productivity paradox, IT value conversion contingencies, conceptualisation of IT and level of IT value analysis are described. The chapter reveals that the IT productivity paradox exists in developing countries, but the value conversion contingencies, factors that apparently resolve such a paradox, have to date been studied in developed countries. It also reveals that contemporary business processes are moving across organisational boundaries and, consequently, rather than stand-alone IT, organisations are increasingly implementing E2E Solutions. However, there is a paucity of research on E2E Solutions. This chapter concludes that there is a need for research on deriving value from E2E Solutions in developing countries.

Chapter 3 uses extant literature to theorise E2E Solutions' value and value conversion contingencies and then develops a conceptual model of the business value of E2E Solutions. Having presented the justification for the study (chapter 2), this chapter draws on Absorptive Capacity Theory to theorise how E2E Solutions deliver value. It argues that E2E Solutions' value (e.g. organisational absorptive capacity outcome) is impacted by value conversion contingencies. However, IS absorptive capacity literature is not sufficient to fully explain such contingencies. Therefore, the Technology-Organisation-Environment (TOE) framework is used to identify the high level constructs that impact on E2E Solutions' value: (1) technology factors; (2) organisation factors; and (3) environment factors. This chapter concludes by presenting a conceptual model that guides empirical data gathering.

Chapter 4 details the research approach and strategy adopted for this study. This chapter starts by presenting the research objective and research questions. Due to the exploratory nature of the study, and as part of the theory development process, this research adopted a case study design. The chapter moves on by illustrating the research process for identifying the organisations, key

informants, data gathering and data analysis. In the process of theory development from empirical data, this chapter describes how open, axial and selective coding is used.

Chapter 5 answers the first research question by presenting the evidence from nine commercial banks in Bangladesh on how E2E Solutions deliver business value. Analysis revealed that four aspects of E2E Solutions; Single Point Processing, Single Point Data Entry, Integrated Databases, and Automated and Integrated Processes impact on different aspects of core process and coordination and communication process which in turn impact on organisational productivity. The impact of each aspect of E2E Solutions on each of the process level aspects is illustrated. The impact of core process and communication and coordination process on organisational productivity is examined. This chapter concludes by presenting the first part of the model on how E2E Solutions deliver business value.

Chapter 6 deals with the second research question, which is the central theme of this thesis. This chapter discusses how the achievement of business value using E2E Solutions is negatively impacted by value conversion contingencies. Analysis reveals that the value conversion contingencies occur at the business process level, and the factors which impact upon E2E Solutions' value are: senior management ability, complementary resources, software misfits, integration, customer readiness, information infrastructure, IT infrastructure and regulatory environment. Each of these E2E value conversion contingencies is explained and their impact upon core process aspects and coordination and communication aspects is detailed. This chapter concludes by extending the explanation of how business value is derived from E2E Solutions by integrating the value conversion contingencies into the model presented in chapter 5.

Chapter 7 presents the overall conclusions of the study. This chapter begins by articulating the rationale for the study and outlining the research strategy. The research findings are presented as a model of how business value is derived from E2E Solutions. These findings are discussed in the context of extant literature to reveal the contribution of the study. Finally, the limitations of the study are documented and recommendations for further development of this research are presented.

Chapter Two

Literature Review

2.0 Introduction

This chapter explores the phenomenon of E2E Solutions' value and value conversion contingencies introduced in the previous chapter (chapter 1). This chapter argues that because of the scarcity of literature on the business value of E2E Solutions, the literature on (stand-alone) IT business value is a good starting point to understanding the business value of E2E Solutions. The IT productivity paradox is described and the opposite findings from developed and developing countries are presented (section 2.1). The other key aspects of IT value; IT value conversion contingencies (section 2.2); and conceptualisation and level of IT value analysis (section 2.3) are analysed and corresponding gaps in the extant literature are illustrated. It is revealed that while contemporary business processes are moving across functional and organisational boundaries, existing IT value literature largely ignores the extending nature of business processes. It argues that a shift from stand-alone IT implementation to E2E Solutions in organisations is evident due to the extended nature of business processes and development of breakthrough technologies, but there is little research on E2E Solutions (section 2.4). This chapter concludes by arguing that there is a need for research on deriving value from E2E Solutions, particularly in relation to the factors that impede the derivation of such value in developing countries (section 2.5).

2.1 IT Productivity Paradox

IT value research deals with measuring and managing the impact of information technology (IT). This section presents the debate among researchers on the existence of the IT productivity paradox. It is revealed that the IT productivity paradox is an international phenomenon, but it exists largely in the developing countries.

The IT productivity paradox is an observation made by a Nobel Laureate, Solow (1987), that IT does not contribute to organisational productivity (Brynjolfsson Erik and Hitt 1998). Although the necessity of technology in organisations is unquestionable (cf. Wan *et al.* 2007), literature provided inconclusive findings on the relationship between IT and resulting payoffs. The IT productivity paradox was firstly formulated in USA because of the slowdown in labour productivity growth despite huge investment in IT during the period of 1965-1994 (e.g., Dewan and Kraemer 1998). Dewan and Kraemer (1998) reported that the annual labour productivity growth in USA in 1960 was 3% but the growth rate decreased to 1% in 1990; however, the

investment on IT had more than tripled during this period. Therefore, Robert Solow (1987) observed that, "*You can see the computer age everywhere these days, except in the productivity statistics*" (New York Times Book Review, July 12th). The research conducted during this time (pre-1995) also concluded that IT did not show a positive impact on productivity (e.g.,Loveman 1994; Roach 1987; 1989; 1991; Strassmann 1990).

After 1995, researchers (e.g., Brynjolfsson 1993; 1996; Brynjolfsson and Hitt 1996; 1995; Brynjolfsson Erik and Hitt 1998; Jorgenson 2001; Jorgenson and Stiroh 2000) refuted the existence of the IT productivity paradox as Brynjolfsson and Hitt (1996, p.557) claimed that *"the computer productivity paradox is a thing of the past"*. Few of these studies (Jorgenson 2001; Jorgenson and Stiroh 2000) found the linkage of the rise of US productivity growth during the 1990s with IT investment. Researchers (e.g., Brynjolfsson 1993; Brynjolfsson and Hitt 1996) have provided four alternative explanations for the existence of the IT productivity paradox: measurement error, time lag, level of analysis (e.g. redistribution of profit) and mismanagement of IT. But all this research has been conducted on developed countries. While the IS literature of developed countries refuted the IT productivity paradox, Dewan and Kraemer (2000) reported that the IT productivity paradox is an international phenomenon. They mentioned that return on IT investment is found to be positive and significant in developed countries, but not in developing countries. Furthermore, very recent individual research (e.g., Molla and Heeks 2007; Peguy *et al.* 2010) as well as meta-studies (e.g., Avgerou 2008; Heeks 2002; 2010) did not give rest to an IT productivity paradox in developing countries.

As mentioned, IS research in developed countries (Brynjolfsson 1993; Brynjolfsson and Hitt 1996) provided four explanations of the IT productivity paradox; measurement error, time lag, level of analysis (e.g. redistribution of profit) and mismanagement of IT. Measurement errors are linked with the data quality and specification of IT input and output measures. The complementary nature of IT value suggests that organisational structure, policies, rules, culture, etc. are important for generating IT value (e.g., Barney 1991), and research that finds no correlation between IT and productivity did not consider the complementary resources. Likewise, the output measure was also underestimated in the traditional research. IT provides many important benefits such as improved quality, services, communication, coordination, etc. and literature supporting the IT productivity paradox did not include the non-accounting benefits of IT (cf.Brynjolfsson and Hitt 1996). IT payoffs are not instant, thus measuring the IT value during implementation or soon after implementation would be inappropriate; a minimum period of learning, adjustment and restructuring might be required (cf.Wan *et al.* 2007). Thus,

studies conducted shortly after implementation might have arrived at wrong conclusions on IT productivity. The level of analysis suggests that IT might be beneficial to the business process, but might not find productivity at the organisational level, as not all process level benefits translate into organisational performance (Barua *et al.* 1995). By the same token, IT may be found productive at the firm level but not at the industry or national level (cf.Brynjolfsson 1993). Lastly, mismanagement of IT refers to IT not being properly managed to deliver value, or being implemented to pursue personal interest rather than enhancing organisational productivity (cf.Brynjolfsson 1993).

Table 2.1 shows the explanation of the IT productivity paradox. It is revealed that after accounting for mismeasurement errors, time lags, level of analysis and mismanagement of IT, most of the literature in developed countries (e.g., Chen *et al.* 2009; Lee 2001; Nicolaou 2004) finds a positive relationship between IT and productivity; some research still supports the IT productivity paradox (e.g., Lin 2009; Martínez *et al.* 2008). While a granular level of IT value analysis is missing, after accounting for mismeasurement error and time lags, the IT productivity paradox is found to exist in developing countries (e.g., Chowdhury 2006).

Table 2. 1: Explanations for the IT Productivity Paradox and Evidence from Developed and Developing Countries						
Causes of IT Productivity Paradox	Explanations of IT Productivity Paradox	Sources	Evidence from Developed Countries	Sources	Evidence from Developing Countries	Sources
Measurement Errors	Inputs: Research should include the complementary nature of resources while studying IT value, otherwise ended up with wrong conclusion of IT value. Output: Output measure should capture both financial and non-financial aspects of value; otherwise value may be underestimated.	Brynjolfsson (1993)	Produces mixed results although after ensuring appropriate inputs and outputs specifications in IT value research.	Bhatt and Grover (2005)	Inputs: Study included complementary resources and control measurement errors finds support of paradox. Output: Although process level studies are scarce, organisational level studies after including the non-financial aspects of value support IT productivity paradox.	Molla and Heeks (2007); Chowdhury (2006)
Time Lags	Studies concluded IT productivity paradox did not consider the time lag between IT investment and resulting benefits.	Brynjolfsson (1993)	Evidence suggests that IT produces significant value after few years of implementation.	Devaraj and Kohli (2002); Radhakrishnan *et al*. (2008)	Longitudinal studies in developing countries support the productivity paradox.	Dewan and Kraemer (2000); Peguy *et al*. (2010)
Level of Analysis (e.g. Redistribution of Profit)	IT may improve a task, but may not translate into organisational performance. More granular level of studies recommended to get the existing benefits of IT, otherwise conclusion would be wrong.	Brynjolfsson (1993); Brynjolfsson and Yang (1996)	Although studies conducted in the economy and industry level are mixed; studies at organisational and process level mostly refuted the productivity paradox.	Davamanirajan *et al*.(2006); Lin *et al.(2010)*; Radhakrishnan *et al.* (2008)	Studies conducted in the economy, industry and organisational level support productivity paradox; however, no process level studies are found.	Dewan and Kraemer(2000) ; Pohjola(2001); Chowdhury (2006)

Table 2. 1: Explanations for the IT Productivity Paradox and Evidence from Developed and Developing Countries						
Causes of IT Productivity Paradox	Explanations of IT Productivity Paradox	Sources	Evidence from Developed Countries	Sources	Evidence from Developing Countries	Sources
Mismanage-ment of IT	IT implementation was not done properly; not used and managed properly, and implemented for reasons other than increasing productivity.	Brynjolfsson (1993); Wan *el al*. (2007)	Software misfit; lack of top management support, organisational change and culture also reported as IT failure.	Grover *et al.* (1995); Papp(1999); Strong and Volkoff(2010)	Business-IT alignment; poor IT maintenance, lack of political commitment, organisational inertia appears to be main causes of productivity paradox.	Avgerou (2008); Heeks (2002); Soja (2008); Wu *et al*. (2007)

As the IT productivity paradox exists in developing countries (cf.Avgerou 2008), full or partial IT failure is the norm (cf.Heeks 2002), but research on the IT productivity paradox, especially revealing its causes in developing countries is scarce. A review of four meta-papers on IS literature in developing countries (Avgerou (2008) analyses 138 papers; Boateng *et al.* (2009) analyse 362 papers; Heeks (2002) analyses 64 papers; Walsham and Sahay (2006) analyse 50 papers) revealed that few articles have been found to focus on IT value at the national level (e.g., Avgerou 2003; Madon 2003; Ngwenyama *et al.* 2006); or IT value at the social service/industry level (e.g., Doern and Fey 2006; Harris *et al.* 2003; Madon 2004). However, no articles focused on IT value at the micro level (organisational and process) where IT investments are actually made, and value conversion contingencies take place. This is why Avgerou (2008, p.138) observed that *"the strategic potential of IS innovation in DCs (e.g., developing countries) tends to be discussed in macro-societal transformative terms"*. Therefore, a more granular level of analysis is required revealing the persistent nature of the IT productivity paradox for better management of such paradoxes and deriving value from IT investments. The huge IT investment made by organisations (for example, 5.93% of GDP was IT expenditure in developing countries in 2009 (World Bank 2010)), high opportunity cost of IT capital (cf.Avgerou 2008) and digital divide issue (cf.Corrocher and Ordanini 2002; Wong 2002) demand additional studies on IT value in developing countries for the proper use and assimilation of IT and to stop the wastage of the precious nature of capital.

2.2 IT Value Conversion Contingencies

This section covers the IT value conversion contingencies factors that explain the IT productivity paradox. It starts with describing the origin of the terminology of 'IT Value Conversion Contingencies' (section 2.2.1). It then analyses the existing IT value conversion contingencies' literature. It is revealed that most of the IT value conversion contingencies' literature is on developed countries (section 2.2.2). Thus, IT implementation literature in developing countries is discussed (section 2.2.3). This section concludes by arguing that a need for study on IT value conversion contingencies in developing countries is required due to the distinct differences between developing and developed countries (section 2.2.4).

2.2.1 IT Value Conversion Contingencies: An Overview

The factors that explain the gaps between potential and realised value or the factors responsible for the existence of the IT productivity paradox are known as IT value conversion contingencies (e.g., Davern and Kauffman 2000; Weill 1990; 1992). Weill (1990; 1992) firstly coined the

word 'conversion effectiveness' and defined it as an aspect of the firm's climate which influences IT. By 'conversion effectiveness', Weill (1992) only included the four internal organisational aspects: top management commitment to IT, previous firm experience with IT, user satisfaction with systems and the turbulence of the political environment within the firm, concluding that 'conversion effectiveness' is a significant moderator between strategic IT investment and firm performance. Later on, Weill's (1992) study was further developed by Davern and Kauffman (2000) who extended it in two directions. First, while Weill focused on the impact of the conversion contingencies at the firm level, by taking the notion of 'locus of value', Davern and Kauffman (2000) observed that IT value conversion contingencies occur at the business process level. Second, while Weill (1990; 1992) considered only the internal sources of value conversion contingencies, Davern and Kauffman (2000) mention that value conversion contingencies are both internal and external in nature. IT value conversion contingencies also appeared in the literature with other names including IT value latency (e.g.,Goh and Kauffman 2009), sources of shocks of IT value (e.g., Goh and Kauffman 2005) and sources of risk (e.g., Au *et al.* 2009). Although value conversion contingencies may create positive and negative impacts on IT value (cf.Davern and Kauffman 2000), these terminologies are usually used as negative impacts on IT value.

The literature (e.g., Davern and Kauffman 2000; Goh and Kauffman 2009; Weill 1990; 1992) reports that the gaps between the potential value and realised value exist in practice and are important to managers in order to understand the factors that impact on IT value. First, before committing funds for IT, if managers know the IT value conversion contingencies, they can discount the potential value on account of value conversion contingencies and make a meaningful IT investment decision. Second, once the managers commit the funds for IT, they can then take the corrective action for ensuring value from such investment. If conversion contingencies are internal, managers can put more resources, training and knowledge into making sure of the realisation of IT value. In the case of external value conversion contingencies, managers may either build their own capability that negates the external impact or negotiate with external parties for the removal of those barriers. Third, rather than invest on the basis of marketing hype, managers can take prudent decisions on IT investment (cf.Chircu *et al.* 2001). But managers in practice often fail to realise the pervasive nature of IT value conversion contingencies and their impact on value. As Davern and Kauffman (2000, p.125) mention, *"Many senior managers who invest in IT projects fail to appreciate the pervasive impacts of conversion contingencies within their organisations. A lot has to go 'right' for the*

potential value of an IT project to be achieved following implementation". This area is under researched, and the literature has not paid much attention to revealing the causes of such internal and external IT value conversion contingencies (cf.Goh and Kauffman 2009). Most importantly, most of the studies from this perspective are based on developed countries, while IT value productivity exists in developing countries.

2.2.2 IT Value Conversion Contingencies in Developed Countries

This section reviews the IT value conversion contingencies' literature in developed countries. It is revealed that the extant IT value conversion contingencies' literature can be characterised on the basis of the level of analysis, factors identified and research methodology adopted.

First, while Davern and Kauffman (2000) suggest conducting studies of conversion contingencies at the business process level for proper identification of value conversion contingencies, organisational (Li and Ye 1999; Rai *et al.* 1996) and industry level analyses (e.g., Goh and Kauffman 2009) are found to be common and dominant in the literature. Davern and Kauffman (2000, p.134) mention, *"In terms of measuring realised value, measurement below the business process level is inappropriate because value is realised in a business-process context. Measurement above the business process level is inappropriate because it becomes more difficult to isolate the critical user-level contingencies. Thus, it is at the business process level that the critical conversion contingencies often materialize"*.

Second, Davern and Kauffman (2000) and Melville *et al.* (2004) observe that business value of IT is impacted by both internal and external/environmental factors, but existing literature mostly reports the internal IT value conversion contingencies: the research on the impact of environmental factors on IT value is scarce. The internal IT value conversion contingencies identified in the literature include: top management support (e.g., Au *et al.* 2009; Dong *et al.* 2009; Weill 1990; 1992), facilitating conditions (e.g., Sabherwal *et al.* 2006), knowledge barriers (e.g., Chircu and Kauffman 2000), usage barriers (e.g., Chircu and Kauffman 2000; Weill 1992), technology standard (e.g.,Au *et al.* 2009), technology readiness (e.g., Zhu *et al.* 2004) and IT-business alignment (e.g., Wagner 2006).

Li and Ye (1999) studied the impact of information technology investment on firm performance, and found that firm strategy, CIO/CEO arrangement and environmental dynamism impacted on the creation of IT value at the firm level. Peppard and Ward (2003) emphasised the role of internal users and managers in realising the value from IT and mentioned that only business managers and users can unlock the value from IT investment. Drawing on Absorptive Capacity

Theory (cf.Cohen and Levinthal 1990), Armstrong and Sambamurthy (1999) mention that IT assimilation in firms depends upon senior leadership's IT and business knowledge. Weill and Olson (1989) mention that how effectively IT investment will be converted to useful output is determined by management skill and organisational culture. Sabherwal *et al*. (2006) studied the information system success factors and mention that context-related factors and user-related factors explain IT success in any organisation. By context-related factors they mean top management support and facilitating conditions, and user-related factors consist of user experience, user training, user attitude and user participation. As user participation is required for realising value, thus training in IT and change management is necessary. The importance of users in the business value derivation process is as described by Ashurst *et al*. (2008), *"the real benefits of IS are typically realised once users begin to appropriate the technology and adapt it to their own requirements and working contexts"*.

Technology factors also appear to impact on the business value of IT (e.g., Au *et al.* 2009; Goh and Kauffman 2009; Melville *et al.* 2004). Technology factors include technology standard, technology readiness and IT-business alignment. Technology standard is the adoption timing risk of technology; early adoption may incur higher costs, and late adoption may result in obsolescence of technology. The key challenge a manager faces is to figure out when a technology will become a standard in the market (cf.Au *et al.* 2009). Thus deriving business value of IT depends upon the technology standard (e.g., Dedrick *et al.* 2003). Use of packaged software (e.g. enterprise system) by organisations has dramatically increased in the last couple of years (Strong and Volkoff 2010). Therefore, IT-business alignment also appears to have an impact on technology performance (Wagner 2006). Papp (1999) conducted a longitudinal study on 500 US firms and concluded that alignment between business and IT is the key to achieving improved productivity from IT. Wagner (2006) also found that IT business alignment and business internal alignment are the keys to process level performance. Technology readiness is reported as significant in determining IT e-business value in developed countries (e.g., Zhu *et al.* 2004).

Competition appears to be one of the environmental IT value conversion contingencies in the literature of developed countries (e.g.,Au *et al.* 2009; Davern and Kauffman 2000; Dong *et al.* 2009; Oz 2005). Organisations invest in IT for delivering products and services, and those products and services are subject to competition in the marketplace. Dong *et al*. (2009) conclude that business value of IT is contingent on competition. Goh and Kauffman (2005) mention that, *"Existing competition, threats of new entrants and actions undertaken by competitors are known*

to skew the distribution of value among actors within an economy". Au *et al*. (2009) mention that a firm's technological move is subject to strategic entry risk by business competitors. Although environmental aspects are reported as important in IT value realisation (e.g., Davern and Kauffman 2000), three causes may be responsible for less research on the impact of environmental factors on IT value. First, modelling of environmental impact at the micro business process level may pose difficulty for the researchers (cf.Davern and Kauffman 2000). Second, existing research is conducted in developed country contexts where environmental impacts at the business process level may be negligible (e.g., Malhotra *et al.* 2005; Weill 1992). Third, existing research is conducted by setting boundaries on the firm and not incorporating external factors (e.g., Goh and Kauffman 2005).

Third, in terms of methodologies used, existing IT value conversion contingencies either focus on survey and secondary data (e.g., Goh and Kauffman 2009; Li and Ye 1999; Weill 1990; 1992) or single case study (e.g., Davern and Kauffman 2000), or firm and industry level analysis (e.g., Goh and Kauffman 2009; Li and Ye 1999). The mechanism through which IT value conversion contingencies impact on value is largely missing in the literature. Case study design, that allows for both literal and theoretical replication (cf.Eisenhardt 1989) is absent in the existing IT value contingencies' literature. Tables 2.2 and 2.3 present the review of some IT value conversion contingencies' literature in developed countries.

Table 2. 2: Value Conversion Contingencies in the Business Value of IT Research in Developed Countries					
Study	Measures				Findings
	Independent Variables	Moderating /Value Conversion Contingences	Process Level Outcome	Firm Level Outcome	
Weill (1992) Empirical, firm level.	IT Investment (Strategic, Informational, and Transactional)	Top management commitment, User satisfaction, Internal political turbulence and IT expertise	Nil	Firm performance	This study finds that conversion effectiveness (i.e. Top management commitment, User satisfaction, Internal political turbulence and IT expertise) significantly moderate the relationship between strategic IT investment and firm performance.
Davern and Kauffman (2000) Empirical; process oriented.	IT Project expenditure, IT management	Contingencies at the level of market, firm, work group, business process and users.	IT impacts at process level	Nil	The relationship between IT (investment and management) and IT impacts at the business process level is moderated by IT value conversion contingencies. IT value conversion contingencies may be both internal and external to firm.
Melville *et al*. (2004) Theoretical; process oriented.	IT resources: technology and human, Complementary organisational resources	Trading partner resources, and business process, Industry characteristics and country characteristics	Business process performance	Organisational performance	This study develops IT business value model through extant literature review and proposes that IT creates value through business process performance. However, the process level business value is moderated by trading partners' resources & business processes, industry characteristics and country characteristics.
Chircu *et al*. (2001) Empirical; process oriented.	Information Technology, Complementary resources	Valuation barriers (organisational and industry), conversion barriers (resources, knowledge and usage)	Realised Value	Nil	Firm cannot benefit from IT investment without acquiring co-specialised assets. However, valuation barriers and conversion barriers limit the value realisation capacity of firms.

Table 2. 3:Value Conversion Contingencies in the Business Value of IT Research in Developed Countries

Study	Measures				Findings
	Independent Variables	Moderating /Value Conversion Contingences	Process Level Outcome	Firm Level Outcome	
Albadvi *et al*. (2007) ; firm level.	IT Application	Interaction between organisation infrastructure and IT , Extent of BPR	Nil	Customer results, people results, operational results and growth	This study finds that organisational infrastructure and extent of business process reengineering intervene in the relationship between the use of IT and firm performance.
Malhotra *et al*. (2005); process orientated.	Integrative inter-organisational process mechanism, partner interface directed information systems	Breadth of information exchanged, quality of information exchanged, privileged information exchanged and coordination of information exchanged	Operational efficiency, partner enabled market knowledge creation	Nil	This study finds that enterprise absorptive capacity in supply chain context (i.e. assimilation, transformation, exploitation and acquisition) to produce operational and partner enabled market knowledge creation are moderated by breadth of information exchanged, quality of information exchanged, privileged information exchanged and coordination of information exchanged.
Li and Ye (1999) Empirical; firm level.	Information technology investment	Environmental dynamism, Firm strategy, CEO/CIO arrangement	Nil	Firm economic performance (e.g. ROA, ROS)	IT impacts at firm level but IT value is moderated by environmental context, strategic directions and top management team arrangement.

2.2.3 IT Value Conversion Contingencies in Developing Countries

As illustrated elsewhere in this chapter, the IT productivity paradox exists in developing countries (cf.Heeks 2010), but there is a paucity of research on IT value conversion contingencies in developing countries (see the meta analysis of Avgerou 2008; Boateng *et al.* 2009; Heeks 2002; Walsham and Sahay 2006). The existence of the IT productivity paradox and paucity of IT value research are reported in the editorial note of the Journal of International Development, where the editor Heeks (2010, p.635) mentions, *"ICTs in low-income countries and communities may represent an excess of cost over economic benefit (Mpogole et al. 2008), they may not sustain (Avgerou 2008) and they may fail to enhance capabilities (Zheng and Walsham 2008). While research on impact has been relatively limited, work on implementation issues has been less so"*. As micro level (e.g., organisational and process level) analysis of IT value in developing countries is scarce (cf.Avgerou 2008), this section thus reviews the national/economy level analysis of IT value and IT implementation/assimilation literature.

First, IT literature in developing countries has analysed potential benefits and implementation barriers, rather than how benefits are actually realised and value conversion contingencies. For example, Ranganathan and Dhaliwal (2001) studied a business process reengineering (BPR) implementation in Singapore and found that cost reduction, operational efficiency, customer service and profit are the key motives for the implementation of BPR. However, how far the benefits are realised is not discussed. Likewise, Sharma and Wickramasinghe (2004) studied the potential of e-commerce in SMEs as well as obstacles for SMEs to adopt e-commerce. But how far the potential benefits are realised and how the barriers impact upon the benefits are not reported. Xue *et al*. (2005) studied ERP implementation failures in China. A few papers discuss the realised benefits; however, rigorous analysis is missing. For example, Molla and Heeks (2007) studied the realised benefits of e-commerce in South Africa; however, no analysis was made about the barriers in realising the benefits and how they impact upon benefits.

Second, IT literature is described from either a national and industry/society context as opposed to an organisational level where actual investment takes place and a business process level where benefits are realised and conversion contingencies take place. National level IT value literature in developing countries (e.g., Chowdhury 2006; Indjikian and Siegel 2005; Wong 2002) has normally proved the IT productivity paradox without offering the causes of such productivity paradox. One the other hand, industry level IT value literature either measures the benefits (e.g., Molla and Heeks 2007) or barriers only (e.g., Dedrick and Kraemer 2001; Huang

and Palvia 2001; Kapurubandara 2009; Kshetri 2007; Mahdi and Dawson 2007; Rotchanakitumnuai and Speece 2003). For example, Dedrick and Kraemer (2001) studied e-commerce adoption barriers in China. The barriers that directly and indirectly inhibit e-commerce were limited diffusion of computers, high cost of Internet access and lack of online payment systems, inadequate transportation and delivery networks, limited availability of banking services and uncertain taxation rules. Mahdi and Dawson (2007) studied the introduction of IT in the commercial banking sector of Sudan and both internal and external factors were found to be problematic for implementation of IT. The implementation barriers reported in the paper are international sanctions, poor telecommunication infrastructure, absence of merit-based appointment, lack of technology awareness, lack of quality management, fear of security, inadequate IT budget or fund, poor salary structure, lack of qualified and experienced IT staff and resistance from older employees to IT change initiatives. Against the dominant trend of IT value research at the industry or national level, Molla and Bhalla (2006) conducted a single case study on the ERP and competitive advantage in an Asian developing country; however, process level analysis is missing in the analysis. Because of the national and industry focus of IS research in developed countries, Avgerou (2008, p. 138) reported that the literature in developing countries tends to be described in *"macro-societal transformative terms"*.

Third, developing countries' IS literature described the barriers (e.g., Kshetri 2007; Luken and van Rompaey 2008; Mukti 2000; Rajapakse and Seddon 2005), and some research goes beyond formulating policy (e.g., Kapurubandara 2009); however, all are described from macro aspects (e.g. society/industry) and little is known about 'micro' aspects (e.g. organisation and business process) or how 'macro' barriers impact upon benefits' realisation by organisations. For example, Kshetri (2007) studied e-commerce implementation barriers in Nepal and identified several barriers; economic factors (Internet penetration, availability of ICTs), socio-political factors (legal environment, Digital Signature Act) and cognitive factors (knowledge, skills of users, unreliable postal services). Kapurubandara (2009) identified barriers of e-commerce adoption by SMEs in Sri Lanka, and then formulated a set of policies for overcoming those barriers. However, description of organisational or process level barriers is missing in the literature. While the majority of research focuses on the macro level, few studies (e.g., Hawari and Heeks 2010; Xue *et al.* 2005) are carried out at an organisational level where ERP implementation failures are discussed. Hawari and Heeks (2010) studied the ERP implementation failure in Jordan and found the causes are design-actuality gaps (cf.Heeks 2002) in information, technology, processes, objectives and values, staffing and skills, management

systems and structures, and other resources. Besides total failure, there are some partially failed projects in developing countries (e.g., Heeks 2002; Kitiyadisai 2000) in which major goals are unattained, but projects are still running and the business value of those projects are contingent upon certain factors. This type of analysis is missing in the extant literature.

Fourth, the categorisation and ranking of implementation barriers (shown in tables 2.4, 2.5 and 2.6) in developing countries revealed that all the factors reported as IT implementation barriers can be categorised under technology, organisation and environment. A ranking of the implementation problems revealed that environmental factors are mostly reported in the literature as barriers to IT implementation. Environmental factors include lack of government rules and protection, IT infrastructure (e.g. Internet, telephone and electricity), banking infrastructure (e.g. payment system, credit card penetration, banking policy and guidelines), lack of security and trust, and economic factors of the country. Organisational factors include top management related problems (IT skills, competence, champion, resistance to implementation, risk averseness), financial resource problems, and staff's IT skills and resistance to change. Technology barriers appear less frequent in the literature and this could be because of a focus in the research on society and industry rather than on the organisation. Lack of adequate IT infrastructure in the firm and of suitable software standards fall into the technology context.

While this extant literature review has revealed that environmental factors appear to be most vital in developing countries, little IT value research at industry level (e.g., Cheng and Chiu 2008; Khong and Richardson 2003) is carried out by ignoring the environmental factors. Cheng and Chiu (2008) studied critical success factors of BPR in the banking industry in Hong Kong and identified four critical factors of BPR related to the firm's performance: management commitment, customer focus, use of IT and communication of change . Likewise, Khong and Richardson (2003) also did not include environmental factors as they studied BPR value in Malaysian banks and finance companies.

Table 2. 4: IT Implementation Barriers in Developing Countries

Ranking	Barriers	Sources	Technology Barriers	Organisation Barriers	Environment Barriers
1*	Weaknesses of Government regulations and protection	Huang and Palvia (2001); Daniel J. Pare (2002); Kshetri (2007); Sharma and Wickramasinghe (2004); Yang and Ahmed (2009); Mukti (2000); Rotchanakitumnuai and Speece (2003); Kapurubandara (2009)			√
2	Poor fixed phone and mobile telecommunication infrastructure	Huang and Palvia (2001); Pare (2002); Kshetri (2007); Sharma and Wickramasinghe (2004); Yang and Ahmed (2009); Mukti (2000); Rotchanakitumnuai and Speece (2003); Kapurubandara (2009)			√
3	Poor Internet and intranet infrastructure	Huang and Palvia (2001); Kshetri (2007); Sharma and Wickramasinghe (2004); Yang and Ahmed (2009); Dedrick and Kraemer (2001); Kapurubandara (2009)			√
3	Lack of qualified IT staff	Mahdi and Dawson (2007); Kshetri (2007); Moodley and Morris (2004); Yang and Ahmed (2009);Ranganathan and Dhaliwal (2001); Mukti (2000)		√	
5	Lack of security and trust in online transactions	Daniel J. Pare (2002); Moodley and Morris (2004); Mukti (2000); Rotchanakitumnuai and Speece (2003); Kapurubandara (2009)			√
6	Poor transportation and distribution networks	Huang and Palvia(2001); Pare (2002); Sharma and Wickramasinghe(2004); Dedrick and Kraemer (2001)			√
6	Lack of competence in senior management team	Mahdi and Dawson (2007); Moodley and Morris (2004); Rotchanakitumnuai and Speece (2003); Kapurubandara (2009))		√	
8	Preference for face-to-face meeting between buyers and sellers	Pare (2002); Kshetri (2007); Kapurubandara (2009)			√
8	Lack of financial resources	Mahdi and Dawson (2007); Moodley and Morris (2004); Rajapakse and Seddon (2005)		√	

*Note: Ranking based on the number of appearances in the literature

Table 2. 5: IT Implementation Barriers in Developing Countries

Ranking	Barriers	Sources	Technology Barriers	Organisation Barriers	Environment Barriers
8*	Lack of skilful human resources	Mahdi and Dawson (2007); Indjikian and Siegel (2005); Kapurubandara (2009)		√	
8	Lack of knowledge of the 'best practices' of IT usage	Indjikian and Siegel (2005); Rotchanakitumnuai and Speece (2003); Rajapakse and Seddon (2005)		√	
8	Poor electricity supply	Mahdi and Dawson (2007); Kshetri (2007); Kapurubandara (2009)			√
8	Low credit card penetration and online payment system	Kshetri (2007); Sharma and Wickramasinghe (2004); Dedrick and Kraemer (2001)			√
8	Lack of awareness and knowledge of e-commerce benefits	Kshetri (2007); Moodley and Morris (2004); Sharma and Wickramasinghe (2004)		√	
8	Lack of trust in service providers	Kshetri (2007); Sharma and Wickramasinghe (2004); Rotchanakitumnuai and Speece (2003)			√
8	Senior management reluctant to implement large ICT project	Moodley and Morris (2004); Ranganathan and Dhaliwal (2001); Rotchanakitumnuai and Speece (2003)		√	
17	Poor economic and political status	Huang and Palvia (2001); Kapurubandara (2009)			√
17	Lack of collaboration between IT and general staff	Mahdi and Dawson (2007); Ranganathan and Dhaliwal (2001)		√	
17	Lack of comprehensive banking system and policy	Mahdi and Dawson (2007); Kshetri (2007)			√
17	Poor salary of IT professionals	Mahdi and Dawson (2007); Kaynak *et al*. (2005)		√	

*Note: Ranking based on the number of appearances in the literature

Table 2. 6: IT Implementation Barriers in Developing Countries

Ranking	Barriers	Sources	Technology Barriers	Organisation Barriers	Environment Barriers
17*	Computer illiteracy and English language skills	Kshetri (2007); Xue *et al*. (2005)		√	
17	Lack of knowledge of consequence of greater transparency	Moodley and Morris (2004);Sharma and Wickramasinghe (2004)		√	
17	Lack of strategic vision, organisational structure	Brown (2002); Ranganathan and Dhaliwal (2001)		√	
17	Lack of adequate IT infrastructure in the firm	Ranganathan and Dhaliwal (2001); Rotchanakitumnuai and Speece (2003)	√		
17	Fear of leakage of personal information	Mukti (2000); Rotchanakitumnuai and Speece (2003)			√
17	Lack of suitable software standard	Kapurubandara (2009); Rajapakse and Seddon (2005)	√		
27	Lack of public database system	Huang and Palvia (2001)			√
27	Lack of IT champion	Ranganathan and Dhaliwal (2001)		√	
27	Lack of Electronic Signature Act	Kshetri (2007)			√
27	Risk aversion of service providers	Moodley and Morris (2004)		√	
27	Staff resistance to IT change initiative	Mahdi and Dawson (2007)		√	
27	Lack of purchasing power	Kshetri (2007)			√
27	Low level of training	Mahdi and Dawson (2007)		√	
*Note: Ranking based on the number of appearances in the literature					

2.2.4 Discussing the Divide: IT Value Conversion Contingencies in Developed and Developing Countries

A review of extant IT value literature in developed countries and its relationship with IT implementation and assimilation literature in developing countries reveal some patterns that are worth discussing here in this section.

Analysis reveals that environmental barriers (e.g. rules and regulations, infrastructure, etc.) are mostly unreported in the developed countries' IT value literature; whereas the environmental context appears to be the most vital in developing countries. Zhu *et al*. (2004) studied e-business value in both developed and developing countries, and found that government regulations (environmental factor) play a much more important role in e-business value creation in developing countries than in developed countries. Factors within the context might be different, as Zhu *et al*. (2004) reported that financial resources are an IT value contingency in developing countries, not developed countries. Furthermore, competition is found to be an important IT value contingency in developed countries (e.g., Goh and Kauffman 2009): this factor may not be significant in less competitive markets, as competition creates differential impact across competitive and less competitive industries, as found by Dong *et al*. (2009).

Thus, organisations in developing countries face an additional set of barriers to their developed countries' counterparts. But unfortunately, no prior research has been carried out in developing countries focusing on IT value contingencies at the business process level. Although very limited, all the research (e.g., Chircu *et al.* 2001; Davern and Kauffman 2000; Goh and Kauffman 2009; Weill 1990; 1992) on IT value contingencies focuses on developed countries. This research is a good starting point for finding out the IT value contingencies in developing countries; however, a separate stream of research is required for developing countries. This new research stream would guide managers in dealing with the value conversion contingencies and ensure the realisation of the business value of IT (cf.Avgerou 2008; Heeks 2010).

2.3 Conceptualisation of IT and Level of IT Value Analysis

This section argues that conceptualisation of IT and the level of analysis are important for accurate assessment of IT value and value conversion contingencies. It argues that due to 'IT-embeddedness', IT should be conceptualised as digital business compatibilities rather than separating IT from the business process. However, existing IT value literature hardly conceptualises IT as a digital business capability (section 2.3.1). It argues that while the

business process level is the appropriate level of analysis for measuring IT value and detecting value conversion contingencies, most of the IT value literature is conducted at the economy, national and organisational levels (section 2.3.2). This section concludes by arguing that existing IT value literature is not adequate to explain the business value of IT in an E2E process context and value conversion contingencies.

2.3.1 Conceptualisation of IT in IT Value Research

Conceptualisation of IT in the IT value research is very important. Proper conceptualisation is required for better appreciation of the role of IT in creating value, and better management and control of IT value to make sure of the realisation of such value (cf.Sein and Harindranath 2004). Furthermore, input mismeasurement is also one of the explanations for the IT productivity paradox (cf.Lin 2009). This literature review (e.g., Sein and Harindranath 2004) has revealed that four types of conceptualisations of IT artifact are used in IT value research: tool view, proxy view, ensemble view and nominal view. Although these four types have their own merits and justification, existing conceptualisations of IT in the IT value research are subject to criticism, especially for their failure to consider the complementary nature of IT (Melville *et al.* 2004) and 'IT embeddedness' (Kohli and Grover 2008).

Table 2.7 presents the IT artifact conceptualisations in IT value research. In tool view, IT is treated as hardware and software, and used to generate value through productivity enhancement, cost reduction, competitive advantage, improved supplier relationships, etc. In proxy view, IT is viewed as 'what IT presents'. IT may be viewed as 'knowledge enabler' or proxies as capital stock. In the ensemble view, IT is not confined to hardware and software. IT is conceptualised as an umbrella term and viewed as a production network and system alliances between disparate groups. Organisational structure and co-innovations such as workplace practices may be included as moderators or mediators of value. In the nominal view, IT is treated as an object without articulating any specific view.

From reviewing the conceptualisation of IT in the existing research, it is revealed that conceptualisation of IT as tool, proxy, ensemble or nominal creates problems. First, in the case of a tool view, IT is treated as a tool that generates value. However, this view does not consider the complementary nature of IT in the generation of IT value. Second, in the case of a proxy view, IT is presented as a monetary value, thus ignoring the use of IT and absorptive capacity of IT by organisations. Thirdly, an ensemble view of IT is mostly used in IS research. However, this view is criticised (e.g., Melville *et al.* 2004) on the grounds that this view does not consider

the role of IT management and technical expertise in generating IT value. IT brings many changes to the organisational process, culture and work practices; however, the literature relates IT spending to organisational performance without considering the impact of complementary resources (cf.Lee 2001; Melville *et al.* 2004).

Table 2. 7: IT Artifact Conceptualisations in IT Value Research

IT Conceptualisation	Reference
Tool IT is a tool (i.e. engineered artifact) intended to generate value. The value may be generated through productivity enhancement, cost reduction, competitive advantage, improved supplier relationships, etc. Studies of specific system and implementation contexts enable examination of tool view assumptions.	Sawyer and Tapia (2003)
Proxy IT is conceptualised in terms of a surrogate for some other concept. IT operationalised via proxies such as capital stock denominated in dollars. This view conceptualises as 'what IT represents'.	Andrew and Petkov (2003)
Ensemble Assessment of IT business value generation in rich contexts, often using case or field studies. IT is viewed as a production network and system alliances between disparate groups. Organisational structure and co-innovations such as workplace practices may be included as moderators or mediators of value.	Kraemer *et al*. (2002); Madon (1994); Williams and Frolick (2001)
Nominal IT is not conceptualised and appears in name but not in fact. Abstraction enables model precision at the expense of generality.	Belleflamme (2001)

Source: Adapted from Orlikowski and Iacono (2001), Melville *et al*. (2004) and Sein & Harindranath (2004)

While a lot of progress has been made in the IS literature in terms of an appropriate conceptualisation of IT, this advancement in conceptualising IT in IT value research gives more confidence in asserting the situation under which IT pays off. Conceptualisation is still an issue because of the evolving nature of technology (e.g. Internet) and business processes (cf.Kohli and Grover 2008; Melville *et al.* 2004). By analysing the progression of conceptualisations of IT in IT value research, it is evident that initially IT was viewed as inputs in the production process and measured through amounts spent and investment (e.g.,Kraemer and Dedrick 1994; Soh and Markus 1995). For example, the starting point of Soh and Markus' (1995) model is "IT Expenditure" and it shows that IT expenditure would give rise to business benefits. However, this trend was later modified when Devaraj and Kohli (2003) mentioned that the driver of IT impact is not investment in IT, but actual usage of IT. Later on, as successful implementation of IT is dependent on acquiring co-specialised assets including human resources, organisational structure, policies, IT management, workplace practices, etc., therefore, researchers (Bhatt and

Grover 2005; Davamanirajan *et al.* 2006; Melville *et al.* 2004) included both IT resources and complementary organisational resources (albeit separately) while studying the business value of IT in organisations. For example, Melville *et al*. (2004) criticise the existing conceptualisation of IT (e.g. tool view, proxy view, ensemble view, nominal view) in the IT value research and developed an IT value model where they disaggregate the IT components into subcomponents: technological IT resources, human IT resources and complementary organisational resources. This conceptualisation pattern, separating out IT investment from complementary resources, is dominant in the literature, but criticised recently because of 'IT-embeddedness' (e.g., Kohli and Grover 2008).

'IT-embeddedness' (cf.Kohli and Grover 2008) suggests that IT and business processes are intertwined, and thus rather than separating IT from co-specialised assets (e.g.,Melville *et al.* 2004), organisations should consider digital business capability. Kohli and Grover (2008) mention that IT can only serve as a magnifier or accelerator of digital business capabilities and includes complementary assets (e.g.,Davern and Kauffman 2000) as well. Kohli and Grover (2008) criticise the erstwhile IT value models that assume the sequence that IT investment creates the capabilities required which in turn deliver business value, and suggest that organisations should uncover the capabilities required and then organise resources to build them. Kohli and Grover (2008, p.30) mention that, *"The question of 'what business capability is needed' should come first. Then the resources required in building that capability comes next"*. They suggest that IT creates value while interacting with a variety of complementary resources such as business process redesign, training and incentives. Thus, separating IT from complementary resources or separating IT value from the value of complementary resources are of marginal utility. It is also a situation of an *'us vs. them'* relationship between IT and business managers in a state where decisions are made jointly by both IT and business managers. The conceptualisation of IT in terms of 'digital business capability' seems to be appropriate in the Internet era where business processes are extending across organisational boundaries. This is because of the uninterrupted flow of contemporary business processes (e.g. E2E process) across organisational boundaries: besides IT capability, business process reorientation, internal and external integration are required (cf.Bubak *et al.* 2006). Thus rather than IT and complementary resources, digital business capability is important to ensure business value (cf.Kohli and Grover 2008). But existing research rarely conceptualises IT in terms of digital business capability.

2.3.2 Level of Analysis of IT Value

This section describes IT value at different levels of analysis. It is revealed that in the 1980s and early 1990s, IT value studies were conducted at the economy level and industry level. However, there was a shift in the focus of studies to more granular organisational and business process levels afterwards with an expectation to provide more insights of IT value and to overcome the problems arising from aggregation of data at the economy and industry level. This section concludes by arguing that existing process level IT value literature did not pay enough attention to the extending nature of business processes (e.g. E2E business process).

2.3.2.1 Economy Level Analysis of IT Value

This section documents the IT value analysis at the economy level. The methodologies used and conclusion drawn on the IT productivity paradox in extant literature in developed and developing countries are documented. The justifications and limitations for conducting research at the economy level are also discussed.

Early studies (pre-1990s) of IT value were carried out at the national economy level (cf.Dedrick *et al.* 2003). The main purpose of this type of study was to measure the usefulness or productivity of IT and to confirm or disconfirm the existence of a productivity paradox (cf.Melville *et al.* 2004). Economists use various production and micro-economic theories for studying the impact of IT at the national level (cf.Hitt *et al.* 2002). Production theory postulates that a firm (country) utilises different resources for production of tangible goods and services (e.g., Lin 2009). IT is viewed as input in the production process just like labour and land, and it also has a substitution effect with other factors of production (e.g., Dewan and Min 1997). IT is treated as productive when IT capital or labour produces higher returns than ordinary capital and labour (Hu and Quan 2005). Researchers at this level are interested in measuring the marginal products, output elasticity, input/output ratio for IT, technical efficiency, etc. Economic theory, on the other hand, relates IT capital accumulation to economic growth (e.g., Jorgenson and Stiroh 1999). At the economy level, researchers use well-defined constructs via theoretical and mathematical specifications (cf.Melville *et al.* 2004). Researchers have employed Correlation Analysis (e.g., Dewan and Kraemer 1998); Cobb-Douglas Production Function (e.g., Pohjola 2001); Growth Accounting (e.g., Schreyer 2000); Malmquist Total Factor Productivity (TFP) Index (e.g., Shao and Shu 2004); Data Envelopment Analysis (DEA) (e.g.,Shao and Lin 2002); Stochastic Production Frontier Models (e.g., Lin 2009); and Partial Adjustment Approach (e.g., Lin *et al.* 2010).

This review of economy level studies shows disagreements among researchers on the existence of an IT productivity paradox. Early (mid-1980s to mid-1990s) research (e.g.,Jorgenson and Stiroh 1995; Roach 1987; 1989; 1991) supports the view of an IT productivity paradox, that IT fails to deliver its promised returns. A few researchers (e.g., Dedrick *et al.* 2003; Sichel 1997) went further and mentioned that one of the causes of the existence of such a paradox is that the IT portion of capital stock was too small to make an economic impact. Oliner and Sichel (1994) studied the IT impact for the period of 1970-1992 and concluded that IT contributed very insignificantly to economic growth (0.16-0.28%) of the USA. The IT productivity paradox that was formulated was refuted by later researchers (e.g., Brynjolfsson and Hitt 1996; Dedrick *et al.* 2003; Willcocks and Lester 1999). Brynjolfsson and Hitt (1996) claim that the productivity paradox disappeared by the mid-1990s. Kraemer and Dedrick (1994) have concluded that a significant positive correlation between IT investment, growth and GDP exists in Asia-Pacific countries, and thus refute the IT productivity paradox. Various reasons put forward for the rejection of an IT productivity paradox include mismeasurement of inputs and outputs (cf.Devaraj and Kohli 2003), time lag effects (cf.David 1990), lack of organisational change (cf. Brynjolfsson and Hitt 2000) and failure to invest in complementary resources (cf. Lin and Shao 2006).

At a national economy level of measuring IT impact, some researchers (e.g., Jorgenson 2001; Jorgenson and Stiroh 2000; Oliner and Sichel 2000; Roach 1987; 1989; 1991) focus on a single country (predominantly USA) and some (Chen and Lin 2009; Dewan and Kraemer 2000; 1998) have done cross-country analyses for greater validity of the research findings. Oliner and Sichel (2000) studied IT productivity in USA during the period of 1973-1995. They found a positive contribution of IT to economic growth (13% of the 3.04% economic growth) and labour productivity (27% of the 1.4% labour productivity). Cross-country studies focusing only on samples from developed counties have eventually refuted the IT productivity paradox. For example, Schreyer (2000) measured the impact of ICT capital goods in G7 countries and concluded that ICT capital goods have been important contributors to economic growth.

Table 2.8 presents economy level studies of IT value and demonstrates opposite findings on the IT productivity paradox in developed and developing countries. Dewan and Kraemer (2000) studied IT impact on productivity in 36 developed and developing countries. They conclude that returns from IT investment are significant and positive in developed countries but not in developing countries. Poor infrastructure, less productive human capital, poor business models and absence of appropriate government policies are hypothesised as reasons for the existence of

an IT productivity paradox. Against the developed and developing country categorisation, few studies (e.g., Lin 2009; Lin *et al.* 2010) report that an IT productivity paradox may exist regardless of whether a country is developed or developing. For example, Martinez *et al.* (2008) conducted research in Spain, a developed country, and found a negative relationship between IT and productivity for the period of 1995-2002.

Table 2. 8: Country Level IT Productivity Analysis in Developed and Developing Countries

Study	Methods	Countries Studies	Time	Key Findings
Kraemer and Dedrick (1994)	Correlation Analysis	12 Asia-Pacific Countries	1984-1990	Significant positive correlation exists between IT and GDP growth. Refuted the IT productivity paradox.
Tam (1998)	Cobb-Douglas Production Function	4 Asian Countries in Asia (industrialised)	1983-1991	Mixed support for IT productivity paradox across performance measures.
Dewan and Kraemer (1998)	Cobb-Douglas Production Function; Ordinary Least Square	17 Developed Countries	1985-1992	Countries received a positive and significant return from IT investments. IT productivity paradox does not exist.
Dewan and Kraemer (2000)	Cobb-Douglas Production Function	36 developed and developing countries	1985-1993	Returns from IT investment are significant and positive in developed countries but not in developing countries.
Schreyer (2000)	Growth Accounting Framework	G7 Countries	1985-1996	The findings show that ICT capital goods have been important contributors to economic growth.
Pohjola (2001)	Cobb-Douglas Production Function	39 Countries	1980-1995	IT productivity paradox does not exist in OECD countries; however, it exists in developing countries (DCs). IT contributes to 80% gross returns to OECD countries, and nothing significant for DCs.
Shao and Shu (2004)	Malmquist Total Factor Productivity (TFP) Index	14 OECD Countries	1978-1990	10 out of 14 countries witnessed productivity growth in ICT industries.
Lin (2009)	Stochastic Production Frontier Models	12 developed and 03 developing countries	1993-1999	IT productivity paradox exists regardless of whether a developed or developing country. IT spending does not improve technical efficiencies of individual countries.
Lin, Chuan and Choi (2010)	Partial Adjustment Approach	12 developed and developing countries (including G7)	1993-2006	IT productivity paradox exists in number of developed and developing countries. IT productivity paradox is an international phenomenon; may or may not exist in a country, regardless of whether it is developed or developing.

Researchers have offered various justifications for measuring IT value at the economy level but this research is subject to criticisms. The wide availability of country level data and external validity by country level empirical findings are the two justifications of country level analysis (e.g.,Chen and Lin 2009). Country economy level studies have also been helpful for multinational firms in taking decisions on the deployment of foreign direct investment (cf.Lin 2009). But at country level, IT is viewed from the lens of production and economic theory (cf.Markus and Robey 1988) thus providing little explanation of IT use and the value generation process (cf.Mooney *et al.* 1996; Soh and Markus 1995). Furthermore, country level studies normally viewed IT as proxy, and IT represented amounts spent, thus ignoring the absorptive capacity of the organisation (country) included in the study.

2.3.2.2 Industry Level Analysis of IT Value

This section describes IT value analysis at the industry level. It starts with characterising the industry level studies, then compares developed and developing country studies. This section concludes by presenting limitations of industry level IT value studies.

Industry-based research provides more insight than country level studies on the impact of IT across industries within a country. Thus, based on cross-industry analysis, it is possible to differentiate industries based on IT productivity (e.g. IT value) helping managers to identify IT productive industries. Like economy level research, industry-based IT value research uses production and economic theory and specifies input and output relationships via mathematical relationships (cf.Melville *et al.* 2004). In industry-based research, researchers are either interested in measuring the efficiency of IT in producing the outputs while comparing IT efficiency with other inputs (e.g.,Chowdhury 2003; Shao and Shu 2004) or the impact of IT (investment) towards cost efficiency and/or organisational growth (e.g., Kim *et al.* 2009). Although most industry-based research is conducted using secondary data, qualitative case studies and survey-based research are also common, thus, providing more insights than economy level studies on how IT delivers value.

Industry-based IT value research can be characterised as based on input and output indicator specifications and with mixed findings on the existence of an IT productivity paradox. In industry-based research, IT investment (e.g., IT-capital, IT-labour) is typically measured in terms of amount spent (e.g., Badescu and Garcés-Ayerbe 2009). For example, Kim *et al*. (2009) measured IT investment (independent variable) in terms of IT budget as a percentage of sales. In the case of outcome variables, various measures are used including profitability and

productivity (measured by Return of Asset, Return of Equity, Profit Margin, marginal productivity of labour) (e.g., Kim *et al.* 2009); growth factors (sales growth, earning per share) (e.g., Lee and Kim 2006) and strategic factors (market access, customers/suppliers linkage) (e.g., Molla and Heeks 2007; Moodley and Morris 2004).

This review of extant literature of industry level studies has produced mixed findings on an IT value productivity paradox. Nevertheless, some patterns can be observed. Like country level studies, industry level studies are also conducted mostly from a developed countries' perspective. Although, economy level studies refute the existence of an IT productivity paradox in developed countries, industry level studies reveal that an IT productivity paradox is also an industry-wise phenomenon. It has been found that within a developed country, some industries are more productive in terms of IT usage than others (e.g., Shao and Shu 2004). It also claimed that the productivity growth of the US economy is a combination of technological progress in ICT industries and resultant IT investment (Jorgenson 2001; Stiroh 2001). In contrast, Ho and Mallick (2010) studied IT productivity in the US banking sector and found that at the individual bank level, profit can decline due to adoption and diffusion of IT because of negative network competition in the industry, and in the long run, profit will be in an equilibrium condition. Besides ICT sectors, hospitals and other private sectors are found to be producing returns from IT investment. Devaraj and Kohli (2000) studied the profitability of IT investment in the hospital industry in the US and found a positive relationship between IT investment and profitability. The same conclusion was drawn by Thouin, Hoffman, and Ford (2008).

With few exceptions (e.g., Kim *et al.* 2009), the existing literature (cf. Avgerou 2008; Kshetri 2007; Moodley and Morris 2004; Pare 2002) concludes that IT does not contribute to profitability and productivity at industry level in developing countries. Avgerou (2008, p. 137) mentions that, *"in developing countries, endemic problems hinder both the completion of IS innovation initiatives and the realisation of their expected benefits"*. It is revealed that in developing countries, IT initiatives (e.g. e-commerce and e-banking), where customer participation, rules and regulations, and public infrastructure are important, have failed totally or partially (Heeks 2002). This is because infrastructure, rules and regulations, and customers' readiness did not grow commensurately while organisations increased their IT spending. A review of the literature in developing countries (Molla and Heeks 2007; Moodley and Morris 2004; Pare 2002) reveals that e-commerce does not provide any strategic benefits such as cost reduction, or communication with customers and partners, but just improves lower level tasks (e.g. communication). Tables 2.9 and 2.10 present a summary of some industry level studies.

Table 2. 9: Industry Level IT Productivity Studies across Developed Countries				
Study	Research Method	Industry Studies	Time Period	Key Findings
Teo and Wong (1998)	Regression Analysis	Retail Industry (1455 Companies) in Singapore	1997	Mixed results; largely support an IT productivity paradox. IT investment has negligible relationships with information quality and improvement in work environment.
Devaraj and Kohli (2000)	Time Series Models	8 Hospitals in US	36 months' data	Investment in IT leads to organisational profitability.
Ho and Mallick (2010)	Regression Analysis	Banking Sector using bank-level data from a panel of 68 US banks over the period	1986-2005	The results suggest that bank profits can decline due to adoption and diffusion of IT investment, reflecting negative network competition effects in this industry.
Hu and Quan (2005)	Granger Causality Model	Mining, Construction, Manufacturing, Transport, Wholesale, Retail, Finance and Service Industry in US	1970-1999	Causal relationship exists between IT investment and productivity at the industry level. IT investment contributes to productivity growth in most industries included in the study.
Han *et al*.(2005)	Production Function	61 Private Sector Industries in US	1998-2003	IT outsourcing has made a positive and significant contribution to industry output growth.
Shu and Strassmann (2005)	Cobb–Douglas Production Function	12 US Banks	1989-1997	IT investment demonstrated the highest marginal products among the inputs of factors included in the study.
Thouin *et al.* (2008)	Regression Analysis	Integrated Healthcare Delivery Systems in US	2003	IT budgetary expenditure and IT outsourcing are associated with increase in profitability, whereas increases in IT personnel are not significantly associated with increased profitability.
Badescu and Garces-Ayerbe (2009)	Cobb-Douglas Production Function	341 Medium Sized and Large Firms from 12 Sectors in Spain	1994-1998	IT does not significantly contribute to labour productivity.

Table 2. 10: Industry Level IT Productivity Studies across Developing Countries				
Study	Research Method	Industry Studies	Time Period	Key Findings
Mendonca *et al.* (2008)	Cobb-Douglas Production Function	Manufacturing Sector in Brazil (26,776 Companies)	2003	The results suggest that IT adoption has a positive effect on labour productivity in Brazil.
Moodley and Morris (2004)	Semi-structured interview	28 Garment Firms in South Africa	January to April 2002	B2B e-commerce is not effective in reducing transaction costs or in opening up new global market opportunities.
Molla and Heeks (2007)	Survey	E-commerce in South Africa	2001-2002	E-commerce does not provide strategic benefits relating to market access, customer/supplier linkage or cost savings. E-commerce benefits limited to intra and inter-organisational communication.

Although industry level studies provide sector-wise IT productivity results, they suffer from the same problem as economy level studies. When aggregating firm level data, bias may occur in the proper classification of industries that may hamper the quality of datasets (cf. Wan *et al.* 2007). Moreover, as an industry level study (e.g., Mooney *et al.* 1996; Soh and Markus 1995) mostly takes IT investment as input, it provides less insight to managers on how effectively technology is used within the firm. In the case of industry level analysis, IT spending being used as a predictor is criticised by researchers. The conjecture that higher levels of IT spending, measured in monetary terms, will enhance organisational performance ignores the complexity and risks associated with the deployment of IT. Therefore, researchers suggested conducting IT value research at the 'micro' level, as managers are more interested to know the IT impact at a more granular level (cf. Devaraj and Kohli 2003).

2.3.2.3 Firm Level Analysis of IT Value

The impact of IT at an organisational level is known as the business value of IT. This includes intermediate business process level performance as well as aggregate organisational performance (cf. Melville *et al.* 2004). In studying the business value of IT, some researchers focus on measuring IT impact at an organisational aggregate level, and some take the 'process oriented view' of IT. This section describes the business value of IT at an aggregate firm level and the next section is devoted to IT value at the business process level. IT improves the

business process by reducing cycle times, cost reductions and faster communication, eventually enhancing profitability and giving a competitive advantage (e.g., Melville *et al.* 2004).

Measuring the IT impact at an aggregate firm level is often justified by researchers on several grounds. First, measuring IT value at the economy level or national level is fine, but as investment decisions are made at the firm level, managers are interested to know about IT productivity at the firm level (cf. Dedrick *et al.* 2003). IT value externalities may exist; IT projects may create social benefits and thus be productive at the national level, but may not create value at the firm level. Moreover, an industry may perform well, but that does not mean that all the firms belonging to that industry perform well. Some firms use IT more productively than others. Thus, measurement must be made at the point of investment. Second, as the IT productivity paradox is formulated based on the findings of the IT value research at the economy and industry level, researchers (cf. Brynjolfsson 1993; Brynjolfsson and Hitt 1996) claimed that the IT productivity paradox would have disappeared if measurement were done at the firm level. These research studies mentioned that IT alone does not create value; complementary resources must be procured and taken into consideration when studying IT. Kohli and Grover (2008, p.26) report that *"IT, as simply hardware and software tools, does not create value in isolation, but must be a part of a business value creating process with 'other' IS and organisational factors operating in a synergistic manner"*. Complementary resources may include business process reorientation, organisational structure, culture, human resources and training (e.g., Barney 1991; Melville *et al.* 2004). But research at the aggregate economy and industry level has largely ignored the 'complementary nature of IT'. Furthermore, input-output relationships had better be specified at the aggregate firm level, and mismeasurement errors would be fewer if IT value was measured at an organisational level (cf. Brynjolfsson and Hitt 1996).

Although researchers (cf. Brynjolfsson 1993; Brynjolfsson and Hitt 2000; Devaraj and Kohli 2003; Lin and Shao 2006) mention that the reasons for an IT productivity paradox are mismeasurement of inputs and outputs, and ignorance of the complementary nature of IT, and firm level study has tried to overcome these problems, evidence has emerged to support the IT productivity paradox. Table 2.11 presents the firm level studies.

Table 2. 11: Firm Level IT Value Studies in Developed and Developing Countries				
Study	Context Studied	Dependent Variables (s)	Performance Indicators	Key Findings
Sircar *et al*. (2000)	624 firms in USA	Staff, staff training, computer capital, non-IS labour, non-computer capital.	Sales, market share, assets, equity, outstanding shares.	Mixed results on IT productivity. IT and corporate investments have a strong positive relationship with sales, assets, and equity, but not with net income. Investment in complementary resources (IS staff and training) contribute more to firm performance than investment in IT assets.
Poston and Grabski (2001)	54 ERP implemented firms in USA; statistical test employed	Nil	Selling, general and administrative cost to revenue; cost of goods sold to revenue.	Time lags effect is evident. No significant impact of ERP on productivity and cost factors within 3 years of implementation. After 3 years, ERP system improves productivity and reduces costs.
Bhatt and Grover (2005)	202 Manufacturing firms in USA; statistical test employed	Intensity of organisational learning, IT infrastructure quality, IT business experience, relationship infrastructure	Competitive advantages	Mixed results. Quality of the IT infrastructure did not have any significant effect on competitive advantage. IT business expertise, relationship infrastructure has positive impact on competitive advantage.
Peguy *et al.* (2010)	47 firms in Cameroon	Employment, IT investment, non-IT investment	Sales	ICT has a negative and significant impact on firms' productivity.
Chowdhury (2006)	300 firms from Kenya and Tanzania (Nov 1999 to May 2000)	Total stock of capital, ICT capital, non-ICT capital, average years of schooling of mgt., total staff size, capital output ratio, ICT-capital to total capital stock, and non-ICT capital to total capital stock	Internal rate of return (IRR), labour intensity, market expansion index	IT has negative impact on labour productivity, internal rate of return. IT failed to determine the firm's exporter (non-exporter status).
Ramirez *et al*. (2010)	228 firms in USA (1996-1999)	BPR portfolio, IT portfolio	Production efficiency, market value	The interaction of IT and BPR portfolios is positively associated with firm productivity and market value.

The first group of studies (e.g., Bharadwaj 2000; Brynjolfsson and Yang 1996; Dewan and Min 1997; Kudyba and Diwan 2002; Sircar *et al.* 2000) mention that there is a significant positive relationship between IT spending and firm performance. Firm performance is measured by profitability (e.g., Hitt and Brynjolfsson 1996), productivity (Kudyba and Diwan 2002), cost saving (e.g.,Alpar and Kim 1990; Lucas *et al.* 1996) and market share (e.g.,Bharadwaj *et al.* 1999). For example, Bharadwaj (2000) performed a study of 34 leading IT firms in the USA and employed various statistical tests. Bharadwaj conceptualised IT in terms of IT infrastructure, human IT resources and IT-enabled intangibles, and found that firms with high IT capability tend to outperform on profit and cost-based performance measures. Ramirez *et al.* (2010) conducted a study of 228 firms in the USA between 1996 and 1999 and found that the interaction of IT and Business Process Reengineering (BPR) portfolios was positively associated with firms' productivity and market value. This finding supports the observations of researchers (Brynjolfsson and Hitt 2000; Lin and Shao 2006) that IT together with complementary resources produce value.

The second group of studies (Licht and Moch 1999; McKendrick 1992; Peguy *et al.* 2010) assert that IT investment could not improve firm performance and thus support the IT productivity paradox. For example, Licht and Moch (1999) examined IT productivity in banking firms in Germany during 1996, and found that IT does not contribute to labour productivity. Similarly, Rai *et al.* (1997) found that IT spending does not contribute to firm productivity. Firm level studies measuring IT impact in developing countries are rare, and few studies conclude that IT does not contribute to firm profitability and productivity in developing countries. For example, McKendrick (1992) studied IT productivity in banking firms in Indonesia for the period of 1980 to 1987 and found that banking automation did not improve financial performance. The same conclusions were drawn by some recent studies as well. Peguy *et al.* (2010) studied IT productivity of 47 firms in Cameroon for the period of 2003-2006 and found that ICT had a negative and significant impact on firm productivity.

The third group of studies (e.g., Bhatt and Grover 2005; Mahmood and Mann 1993; Sircar *et al.* 2000) produces mixed findings on IT performance. Mixed findings occur when either all the input indicators failed to show a positive impact, or not all performance indicators improve. For example, Bhatt and Grover (2005) studied the impact of IT on the competitive advantage of 202 US manufacturing firms. They conceptualised IT in terms of the intensity of organisational learning, IT infrastructure quality, IT business experience and relationship infrastructure. They found the quality of IT infrastructure did not have any significant effect on competitive

advantage. But IT business expertise and relationship infrastructure do have a positive impact on competitive advantage. On the other hand, Sircar *et al.* (2000) demonstrated that IT did not impact on all facets of performance indicators. They studied IT productivity in 624 US firms, and found that IT and corporate investment have a strong positive relationship with sales, assets, and equity, but not with net income. They also found that investment in complementary resources (IS staff and training) contributes more to firm performance than investment in IT assets.

Business value research (e.g., Bakos and Treacy 1986; Bhatt and Grover 2005) at an aggregate firm level has focused on competitive advantage derived from IT applications, and adopted various theoretical lenses (e.g., resource-based view of the firm, Absorptive Capacity Theory) in explaining how IT and complementary resources provide a competitive advantage to firms (cf.Melville *et al.* 2004; Ravichandran and Lertwongsatien 2005). Production theory is also used as a theoretical lens, as productivity issues are rooted in the theory of production (cf.Hitt and Brynjolfsson 1996). At an organisational level of analysis, it is possible to get an explanation of how various types of IT complementary resources (e.g. organisational structure, strategy, management practices, human resources, training, etc.) provide a competitive advantage across firms (Dedrick *et al.* 2003). At a country or industry level, it is very difficult to ascertain the cost of IT and IT-related investment with a high degree of precision; however, this can be done at firm level (cf.Brynjolfsson and Hitt 2000). Furthermore, firm level analysis of IT value (e.g. productivity, accounting and market measure) is suggested as it poses less measurement problems (cf.Dewan and Min 1997).

Although firm level analysis of IT value provides more insights of IT value and usage within a firm than economy and industry level, firm level analysis of IT value research is subject to criticism. First, researchers mention that IT value measurement needs to be done at a more granular level as the immediate effects of IT manifest in process improvements and may not translate into the firm's aggregate performance (e.g. profit) (cf.Ravichandran and Lertwongsatien 2005). For example, Dedrick *et al*. (2003, p.11) mention that, *"IT investment affects intermediate measures such as inventory turnover but found no evidence that the benefits extended to firm performance as measured by return on assets"*. Devaraj and Kohli (2003,p.275) mention that, *"the more detailed the level of analysis, the better the chance to detect the impact, if any, of a given technology"*. A firm is an aggregate of many processes (e.g., finance, production, sales) and business process should be the level of analysis for detecting the impact

of IT. Proper measurement of IT value is very important for managers in justifying investment in IT (cf.Davern and Kauffman 2000).

Second, as the IT productivity paradox still exists, at least in developing countries (cf.Heeks 2010), it is very important for managers to know value conversion contingencies. Aggregate firm level literature provides little insight on value conversion contingencies, as critical conversion contingencies occur at the business process level (cf.Davern and Kauffman 2000).

Third, the literature on aggregate firm level IT value treats IT as a source of competitive advantage (e.g., Bhatt and Grover 2005), and takes production theory (e.g., Brynjolfsson and Hitt 1996) and a resource-based view (e.g., Jarvenpaa and Leidner 1998) of the firm as a theoretical lens. Because of switching costs and possible copying of technology by competitors, technologies thus provide limited competitive positions and at the expense of increased cost (cf.Ravichandran and Lertwongsatien 2005). Productivity theory treats organisations as a 'black box' and does not provide any insight on the intermediate mapping of IT's contribution to outputs (e.g., Brynjolfsson and Hitt 1996; Mitra and Chaya 1996). In addition, a resource-based view of firms has also been criticised for its failure to establish causal linking between IT investment and competitive position (cf.Pavlou *et al.* 2005).

Fourth, the mixed evidence of IT value productivity at aggregate firm level is interpreted by researchers (cf.Dedrick *et al.* 2003) as a consequence of the link between IT capital and organisational level performance indicators (e.g., profit, market share) being less direct, and aggregate firm level measures of IT create output mismeasurement problems.

Fifth, aggregate measures are subject to changes in tax rates or accounting practices (cf.Bharadwaj *et al.* 1999). Factors such as time lags, the dilution effect and the intangible nature of returns also pose problems for the analysis of business value of IT at the aggregate firm level (cf.Scheepers and Scheepers 2008; Weill and Broadbent 1998).

2.3.2.4 Business Process Level Analysis of IT Value

This section describes IT value analysis at a business process level. It reveals that business process level is an appropriate level of analysis for assessing value, as well as identifying value conversion contingencies. It reveals that existing process level studies were conducted on developed countries, and an E2E process viewpoint is missing in the extant literature.

IT value research at the process level measures the impact of IT at an intermediate level (e.g. process level) and then relates process level performance to organisational performance. A

process is defined as *"a set of logically related tasks performed to achieve a defined business outcome"* (Davenport and Short 1990, p.12). The process level view argues that IT impacts at an organisational level (e.g. profitability, productivity, market share) via intermediate business processes (e.g., cycle time, efficiency, coordination, communication) (e.g., Melville *et al.* 2004; Radhakrishnan *et al.* 2008). Davenport and Short (1990) were the first to advocate IT value analysis at the business process level. Since then many researchers have put forward arguments justifying process level analysis of IT value. The literature mentions that the link between IT and firm level performance is not direct, therefore, IT's impact at intermediate level needs to be considered first before studying firm level impact. More conclusive results of IT value are expected when IT investments are related to process level. This is because the immediate effects of IT are manifest in process improvements (cf.Mukhopadhyay and Kekre 2002; Ravichandran and Lertwongsatien 2005; Segars and Grover 1998). The literature also concludes that one of the reasons for inconclusive findings of IT value productivity is the measurement of value at aggregate level (e.g., economy, industry and firm). Barua *et al.* (1995, p. 6-7) provide a detailed explanation of why the business value of IT should be studied at process level:

"Our basic thesis is that primary economic impacts or contributions (to performance) of information technologies (if any) can be measured at lower operational levels in an enterprise, at or near the site where the technology is implemented. To capture these impacts, measurements should be taken in the organisation where the potential for first-order effects exists. These effects may then be traced through a chain of relationships within the organisational hierarchy to reveal higher order impacts (if any) on enterprise performance.....We suspect that as the distance between a first-order effect and higher level increases, the ability to detect and measure an impact decreases (perhaps rapidly)".

The literature also suggests process level analysis of IT for several other reasons. First, isolation of direct tangible benefits is possible at the process level (Fichman 2004). Second, at the process level, critical value is actually realised and critical conversion contingencies materialise (cf.Davern and Kauffman 2000). Third, at the process level, managerial controls are in operation to ensure value realisation (cf.Davamanirajan *et al.* 2002). Fourth, investment decisions are made at the process level, thus the process level should be the focal point of analysis of value (cf.Davamanirajan *et al.* 2006). Fifth, process level analysis of IT value increases precision and focus (cf.Tallon *et al.* 2000). Thus a process-oriented view of IT value is justified for the proper measurement and management of IT value.

While researchers advocate conducting research on the business value of IT at the business process level (cf.Barua *et al.* 1995), only a modest amount of research (e.g.,Karimi *et al.* 2007), all of recent origin, has been conducted at the business process level (cf.Radhakrishnan *et al.* 2008; Wan *et al.* 2007). Although, measurement of IT value and understanding of the complexity of value realisation are a serious concern for management, there is a need for identifying IT effects on a systematic basis (cf.Davamanirajan *et al.* 2006). The paucity of literature at the process level may be because of practical problems for conducting research, despite having calls from researchers for more research at the process level to assess the true value of IT and solve the IT productivity paradox (e.g., Radhakrishnan *et al.* 2008). Process level data is confidential in nature; therefore, organisations do not want to share their data with other entities to avoid possible leakage (cf. Scheepers and Scheepers 2008; Uwizeyemungu and Raymond 2010). Furthermore, process level data is not accessible from secondary sources. Thus efforts to conduct research at the process level are greatly hampered because of data accessibility problems. Process level research is also challenging on the grounds of specifying the input-output relationships (cf. Pavlou *et al.* 2005; Tallon and Kraemer 2006).

It has been observed that findings on the existence of an IT productivity paradox are mixed at economy, industry and firm levels of analysis. There are clear differences between developed and developing countries as well as on the existence of such a paradox. However, while a clearer picture of the business value of IT has emerged at the process level, most of such studies are focused on developed country contexts, and thus little is known about process level IT impacts in developing countries. In developed countries, while most of the literature (e.g.,Davamanirajan *et al.* 2006; Radhakrishnan *et al.* 2008) clearly demonstrates that IT generates positive returns at process level (e.g. lower level impacts) and in turn affects organisational performance measures, few researchers produce mixed (e.g., Barua *et al.* 1995) and negative results (e.g., Wieder *et al.* 2006). This proves that researchers have yet to reach a consensus on the existence of an IT productivity paradox. Table 2.12 presents literature on the business value of IT at the process level in developed countries, as research on developing countries is found to be absent.

Davamanirajan *et al.* (2006) studied the business value of IT at the process level. They found that an increase in the electronic initiation of letters of credit (LC) by 1% can increase labour productivity by 9.6 transactions per employee per year and reduce cycle time by 0.29 hours on an average. Tallon *et al.* (2000) found that IT essentially enhanced communication and coordination which helps process planning and support and customer relationships. As a result,

the competitive position in the market is enhanced and economies of scales are attained. Lee (2001) discusses the business value of IT at the mortgage loan process level and shows that IT together with internal and external processes impact first on the lower or intermediate level variables and then on high level variables such as profit. This research also finds an indirect and complex causal relationship between IT and profit.

While most process level studies show the positive outcome of IT, few research studies show that IT does not deliver any value to the organisation. For example, Wieder *et al.*(2006) studied the impact of ERP and SCM systems in the Australian context. After conducting large scale sampling, they concluded that there is no significant performance difference between adopters and non-adopters at both process and organisational levels. Mixed results of IT impact at the process level are also evident. Barua *et al.* (1995) studied the IT impact of 60 Strategic Business Units in the USA and Western Europe. They found that IT has a positive contribution on some process level indicators (e.g., capacity utilisation, inventory turnover).

Table 2. 12:Process Level Analysis of IT Value in Developed Countries							
Study	Context	Types of Process	Input Variables	Process Level Performance	Firm Level Performance	Contingency Consideration	Findings
Davamanirajan *et al*, (2006)	11 US Banks; Survey	Letter of Credit	Process IT and non-IT Characteristics	Productivity and Quality	Profit	No	Two separate models proposed. In the first model, this paper found that system design characteristics positively affect process performance. The second model shows that process level variables significantly affect firm level variables.
Lee (2001)	7 US Mortgage Firms; Case Study	Mortgage	External, Internal, Use of IT and Marketing	Cycle Time, Officer Retention, Cost, Price and Customer Base	Profit	No	IT together with process changes variable impact first on the lower or intermediate level variables and then impact on the high level variable such as profit. Such relationship is an indirect and complex causal between IT and profit.
Radhakrishnan *et al*, (2008)	80 US Firms; Survey	Five Key Process	Information Technology	Operation Process and Mgt. Process	ROA, ROE, Z Score, Mkt Share, Profit	No	This study empirically finds that IT creates differential business value.
Wieder *et al*. (2006)	102 Australian Firms; Survey	ERP and Supply Chain Processes	ERP and Supply Chain	23 Process Indicators	ROI, Profits, Sales Growth, Cost, Cash	No	Supports the IT productivity paradox. No significant performance difference was found at the business process level, and aggregate firm level between adopted and non-adopters of ERP and

Table 2. 12:Process Level Analysis of IT Value in Developed Countries							
Study	Context	Types of Process	Input Variables	Process Level Performance	Firm Level Performance	Contingency Consideration	Findings
					Flow		SCM.
Karimi *et al*., (2007)	123 US Firms; Survey	Multiple Processes	IS Resources, ERP	Efficiency, Effectiveness and Flexibility in Processes	Nil	Yes	ERP implementation influences business process outcome and both ERP radicalness and delivery system play moderating roles.
Gattiker and Goodhue (2005)	111 US Firms; Survey	Plant (Function)	Interdependence, Differentiation, Customisation, Lag Time	Task Efficiency, Coordination Improvements	Overall (Local) Level Benefits	Yes	ERP contributes positively to organisational performance. Effects of ERP vary considerably from company to company.
Uwizeye-mungu and Raymond (2010)	Multiple Firms in US and Canada; Case Study	Production	Characteristics of ERP, Processes affected by ERP	Processes and Sub-Processes Performance Indicators	Financial, Customer, Innovation, Learning, Internal Process	No	The study results support that ERP system delivers value to the organisations through process level indicators (e.g. automational, informational, transactional effects).
Barua *et al*. (1995)	60 Business Units in USA and Europe	Business Unit	IT Capital, Non-IT Capital, IT Purchase, Non-IT Purchase, Cost	Capacity Utilisation, Inventory Turnover, Product Price and Quality	Market Share, ROA	Yes	Mixed findings. IT has positive indicators on some process level indicators (e.g., capacity utilisation, inventory turnover). Process level indicators have little impact on overall organisational performance.

A review of extant literature on IT value research at the process level indicates that most literature (Davamanirajan *et al.* 2006; Lee 2001; Scheepers and Scheepers 2008; Tallon *et al.* 2000; Uwizeyemungu and Raymond 2009) has tried to develop models to measure IT value at the process level. A few researchers (Devaraj and Kohli 2003; Hitt *et al.* 2002; Soh and Markus 1995) have acknowledged the role of value conversion contingencies in the business value of IT and very few and of recent origin (Davern and Kauffman 2000; Goh and Kauffman 2009; 2005) go to the further depth of trying to uncover IT value conversion contingencies. IT value conversion contingencies are used to explain the gaps between the expected and realised IT value (e.g.,Davern and Kauffman 2000). Although researchers have made sufficient progress in measuring IT value, more research is warranted at process level (cf.Davamanirajan *et al.* 2006; Kohli and Grover 2008). This is because of the problem of incorrect specification of measurement units of IT value (cf.Kohli and Grover 2008), the evolving nature of business processes (e.g. E2E processes) (cf.Bubak *et al.* 2006) and the lack of focus on IT value conversion contingencies (cf.Goh and Kauffman 2009).

Table 2.13 shows the findings of a citation analysis (for the period of 1996-2006) conducted by Wan *et al*.(2007) of a seminal paper on the IT productivity paradox by Brynjolfsson and Hitt (1996) . The table illustrates that out of 96 papers analysed, only two papers were conducted at the business process level. This demonstrates the dearth of research carried out at the business process level. Although limited in number, a review of the extant IT value literature at this level reveals two sorts of problems. The first problem relates to the aggregation of business processes. While some literature (Barua *et al.* 1995; Devaraj and Kohli 2003) suggests conducting research on business value at the 'micro level', existing process level research (Karimi *et al.* 2007; Radhakrishnan *et al.* 2008; Scheepers and Scheepers 2008; Wieder *et al.* 2006) is not 'micro' by design. Existing process level IT value research mostly measures IT value at the process level by aggregating all processes within an organisation. However, IT might create different levels of impact on different business processes within an organisation that may result in different levels of effectiveness. For example, Karimi *et al*. (2007) studied the impact of ERP capabilities at the aggregate business process level. Such capabilities included all the ERP modules (e.g. finance, human resources, sales, inventory, etc.). They measured business process outcomes through operational efficiency, effectiveness and flexibility. But a firm is composed of many processes. For example, leading organisations such as IBM, Xerox and British Telecom may have 14 to 18 key processes (Davenport 1993). Proper assessment of IT may not be done by measuring all processes as a whole as IT may bring different levels of efficiency, effectiveness

and flexibility to different business processes. Likewise, Radhakrishnan *et al*. (2008) studied the business value of information technologies across many organisations by summing five key business processes (i.e. production and operation, sales and marketing, product/service enhancements, supplier relations and customer relations processes) within an organisation.

Another problem in the existing business value literature (e.g.,Barua *et al.* 1995; Gattiker and Goodhue 2005) is vertical focus. By designing the study as 'micro', existing research focuses on business functions and business units and ignores the nature of business processes that cut across functional units. For example, serving a patient in a hospital involves a joint effort from the customer service department, billing department, pathology and X-ray department, etc. Thus focusing on a single department and ignoring the extended nature of business processes provides partial results of IT value and this is the case in most of the process level literature. For example, Gattiker and Goodhue (2005) studied the business value of IT at the business function level of organisations. Barua *et al*. (1995) studied business value of IT at the strategic business unit level in an organisation and then related it to the aggregate level performance. However, since many processes cut across the strategic business units, little is known about the impact on the individual process and process optimisation, and this is what managers are interested to know about in order to justify IT investment. More importantly, besides extending functional territory, a business process extends across organisational boundaries and includes customers and suppliers (cf.Bubak *et al.* 2006). Because of the E2E nature of business processes, collaboration with partners and customers is a necessary perquisite for organisational effectiveness (cf.Chan 2000), process issues, interactions with customers, suppliers and human resources, and needs to be evaluated for an evaluation of organisational long-term performance. But research on the extending nature of business processes (e.g. E2E) is very scarce.

Table 2. 13: Meta-analysis on IT Value Research

Section 1: The Paradox Results by Level Analysis

IS outcome measures (e.g. productivity, profit, business value	Level of Analysis						
	Individual	Process	Firm	Industry	Country	Multi -level	Total
Positive		1	47	6	1	1	56
Negative			2	0	0	0	2
No effect			1	1	1	1	4
Contingent	1	1	23	5	3	1	34
Total	1	2	73	12	5	3	96

Section 2: The Paradox Results by Research Methods

What effect does IS have on outcome measure	Research Methods					
	Secondary Data	Survey	Case Study	Others	Multi-Method	Total
Positive	35	12	3	4	2	56
Negative	0	1	0	1	0	2
No effect	3	1	0	0	0	4
Contingent	10	18	3	3	0	34
Total	48	32	6	8	2	96

Section 3: Variable Included in the Literature

IS Inputs (#)	Complementary Factors (#)	Process (#)	Intermediate Outputs (#)	Outcomes(#)
IS investments (29) IS capital (10) IS expenditure (3) IS labour (2) IS resources (1) ATM (1) Computerization (1) EA software (1) EC initiatives (1) EC technology (1) Information system (1) IS managerial skill (1) IS skill (1) IS personnel role	Strategic orientation (1) IS governance strategy (1) IS sophistication (1) IS substitution (1) Tech compatibility (1) Top management support (1)	IS adoption (3) IS Implementation (6) IS plan (2) IS use (17) IS integration (1) Technical progress	Supply chain performance (1) Capacity utilisation (1) Cost of coordination (2) Flexibility (1) Inventory performance (1) Job performance (1) Lead time (2) Operational quality(1) Process quality (1) Service performance (1) Satisfaction (1) Efficiency (2)	Competitive advantage (1) Productivity (26) Cost advantage (1) Financial performance (10) GDP (3) Market value (2) Operational cost (1) Sales (1) Shareholder value (3)

(Source: Wan, Fang, and Wade (2007)

The dearth of research on the measurement of IT value in the extending business process context is also evident in section 3 of table 2.13. The meta-analysis of the business value of IT conducted by Wan *et al.* (2007) showed that process level indicators chosen in the existing literature are indicators that fall into organisational territory. For example, capacity utilisation, cost of coordination, inventory performance, operational and process quality, lead time, etc., all are within organisation process-related indicators (e.g. inside process indicators). However, the development of Internet and net-enabled technologies help organisations to communicate and coordinate processes that move beyond the organisation. Thus the existing IT value model needs to be adjusted and refined in the context of extended enterprises, otherwise managers would not be able to appreciate the business value of IT and this may be one of the reasons for current inconclusive findings on IT value. In case of organisational aggregate performance, the meta-analysis shows that productivity is most used to measure the organisational performance; various financial measures, competitive advantage and market value are also common.

Another striking feature of the business value of IT literature is the heavy reliance on secondary and survey data as opposed to in-depth case studies. Thus, how IT delivers business value is largely missing in the extant literature. Although the meta-analysis (Wan *et al.* 2007, see tabe 2.11) is conducted on the business value of IT overall (e.g. economy, industry, organisation, process), it shows that out of 96 papers analysed, only six employed case study research design as opposed to secondary (48) and survey-based research (32). As researchers (cf. Lee 2001) have mentioned, the relationships between IT and aggregate level performance are indirect and complex, thus an in-depth case study is required to understand the complex phenomenon. Nonetheless, quantitative survey (e.g., Davamanirajan *et al.* 2006; Karimi *et al.* 2007; Radhakrishnan *et al.* 2008; Wieder *et al.* 2006)-based research as opposed to few case study designs (e.g., Lee 2001; Uwizeyemungu and Raymond 2009) are prevalent, as was found in the meta-analysis of Wan *et al.*(2007). Other researchers (cf. Hitt and Brynjolfsson 1996) also suggested opening the organisational 'black box' of IT use by conducting research at a 'micro level'. Thus for analysing and understanding the complex nature of the business value of IT, researchers are moving down the hierarchy, from economy level to industry, industry to organisation, organisation to process level, but still, a dearth remains of exploratory in-depth research at all levels including the business process level.

Although researchers have taken opposite stands on the existence of an IT productivity paradox, they are in agreement that the potential value of IT is hardly realised in practice (cf. Davern and Kauffman 2000). The reasons for the gaps are known as IT conversion contingencies (cf.

Davern and Kauffman 2000). It is very important for the managers to understand the causes of such gaps or the IT productivity paradox, so they can act accordingly. Davern and Kauffman (2000) observe that the business process level is appropriate for looking at value conversion contingencies. Very few researchers have discussed the IT value conversion contingencies (cf. Davern and Kauffman 2000; Goh and Kauffman 2009) although many (e.g., Lucas 1993; Soh and Markus 1995) have acknowledged the existence of value conversion contingencies. For example, Lucas (1993) reported that well-designed IT leads to appropriate IT use which in turn leads to organisational performance improvement, but subject to the intervention of other external factors. Lucas (1993) observed that appropriate IT use does not always occur even when the IT is well designed. However, Lucas does not refer to any such conversion contingencies. Likewise, Soh and Markus (1995) propose that IT expenditure needs to be converted into IT assets such as IT management and conversion activities. IT assets then need to be put into appropriate IT use processes to create at first the intermediate value and then aggregate business value.

This section concludes by arguing that business process is the appropriate level for analysing IT value and value conversion contingencies. It also reveals that business processes are extending across functional and organisational territories, but existing process level literature has not paid much attention to the E2E business process. The next section is thus devoted to a discussion of E2E Solutions that capture the whole E2E business process.

2.4 E2E Solutions

This section explores the phenomenon of E2E Solutions. It highlights the paucity of, and need for, research on the performance and value conversion contingencies of E2E Solutions. It reveals that organisations are increasingly implementing E2E Solutions as part of business process orientation and unimpeded flow of business process. But value realisation of E2E Solutions is not well documented, and the traditional (e.g. stand-alone) IT value literature is unsuitable in the E2E scenario. It argues that the value derivation from E2E Solutions is complex and difficult because of the involvement of many internal and external parties, dependence on public infrastructure and impact from regulatory environments. This section starts with defining and characterising E2E Solutions (section 2.4.1). As E2E Solutions differ from ERP and Web technologies, the pervasive nature of the value of E2E Solutions (section 2.4.2) and value conversion contingencies (section 2.4.3) are explored, and research gaps are identified.

2.4.1 Characterising E2E Solutions

The development of enterprise solutions and related technologies (e.g. Internet) help organisations to implement solutions that are aligned with the E2E business process (cf. Bubak *et al.* 2006). An E2E business process is *"where a customer's request triggers the process and fulfilment of customer needs bringing closure to the process"* (Davamanirajan *et al.* 2006, p.69). E2E Solutions are defined in this thesis as *'single or integrated solutions that help the business process to flow unimpeded across organizational boundaries from beginning to end'*. E2E Solutions have the potential to optimise the business process across diverse solutions (cf. Bubak *et al.* 2006) and provide automational and transformational benefits. Such process reorientation and process automation enable firms to reduce the cycle time, improve decision-making capability, enhance customer services and improve coordination, which may eventually lead to productivity and profitability. Despite the potential for supporting E2E business process and improved firm performance through E2E Solutions, there is a lack of systematic research documenting the process through which value is created and how value is impacted by value conversion contingencies.

E2E Solutions ensure the business process reorientation, internal and external process integration, and unimpeded flow of business processes across functional and organisational boundaries (e.g., Bubak *et al.* 2006). E2E Solutions thus help organisations to develop digital business capabilities, improve internal core business processes and help in effective communication and coordination among business process participants, which then lead to improved productivity. E2E Solutions address the E2E nature of business processes, which are known as 'real world' (cf. Bubak *et al.* 2006) business processes that the stand-alone IT (e.g. stand-alone ERP) failed to carry out. In the case of stand-alone IT, business processes are optimised relative to one system while ignoring the others, and thus E2E processes may be sub-optimised (cf. Bubak *et al.* 2006). While stand-alone solutions focus on processes that either flow inside (e.g., Okrent and Vokurka 2004) or outside (e.g., Barua *et al.* 2004), E2E Solutions focus on E2E processes. An E2E Solution is not bounded by functional and organisational territory. An E2E process scenario helps business managers control the process and measure process level performance. Managers can easily identify where to put resources and energy to get the desired outcome. The E2E viewpoint allows an organisation to build stronger relationships with business process participants. It has been argued that to become competitive in the market, focusing on internal efficiency and effectiveness is not enough: partnerships with

customers, suppliers and other parties are also required (cf. Chen *et al.* 2007) and an E2E process-oriented view can ensure all of these (cf. Bubak *et al.* 2006).

It is argued that not all firms have the absorptive capacity to develop the digital business capability by implementing E2E Solutions, even though after having access to the same IT assets. A digital business capability cannot be copied or imitated by competitors easily and thus results in providing superior business value to the firm (cf. Amit and Schoemaker 1993) Melville *et al.* (2004) have argued that implementation of IT together with business process redesign is a source of value; however, the business value may be impacted by the focal firm, competitive and macro-environmental factors. Thus the business value of digital business capability at the intermediate level (e.g. process level) may be impacted by a set of value conversion contingencies factors. While the literature (Bubak *et al.* 2006; Frye and Gulledge 2007; Kohli and Grover 2008) reports that the traditional nature of the organisation is 'blurring' and organisations are increasingly implementing E2E Solutions, systematic research on the value realisation process and value conversion contingencies of E2E Solutions are in short supply. Existing research on E2E Solutions focuses on conceptual issues (see for example, Frye and Gulledge 2007), integration (see for example, Jain *et al.* 2010) and implementation issues (see for example, Bubak *et al.* 2006).

E2E Solutions are evident as two types: (i) a single solution supplied by a single vendor; and (ii) 'heterogeneous' yet 'integrated' systems supplied by many vendors. Although, enterprise systems providers (e.g. Oracle, SAP) claim their solutions can support the complete product life cycle by linking multiple channels and vendors, organisations generally use multiple systems for such purposes (cf. Bubak *et al.* 2006), and sometimes rely on manual intervention (e.g. human judgment, manual document gathering and information search) (cf. Dayal *et al.* 2001). Bubak *et al.* (2006) provide an example of fully supported E2E Solutions for order execution where sales inquiry and quotation creation are supported by CRM, accepting orders and creating shipping lists are supported by ERP and writing invoices and checking payments are supported by legacy systems (shown in figure 2.1). Another example, eSagu (http://agriculture.iiit.ac.in) is a personalised agro-advisory E2E Solution for augmenting the livelihoods of farmers in India. Here, a coordinator visits a fixed number of rural farms and collects data and takes photographs of farms. A CD is prepared and couriers manually deliver the CD to a central site having a pool of agricultural experts with diverse backgrounds who examine each case and email their advice to the firms which is downloaded at local kiosks and distributed among the farmers.

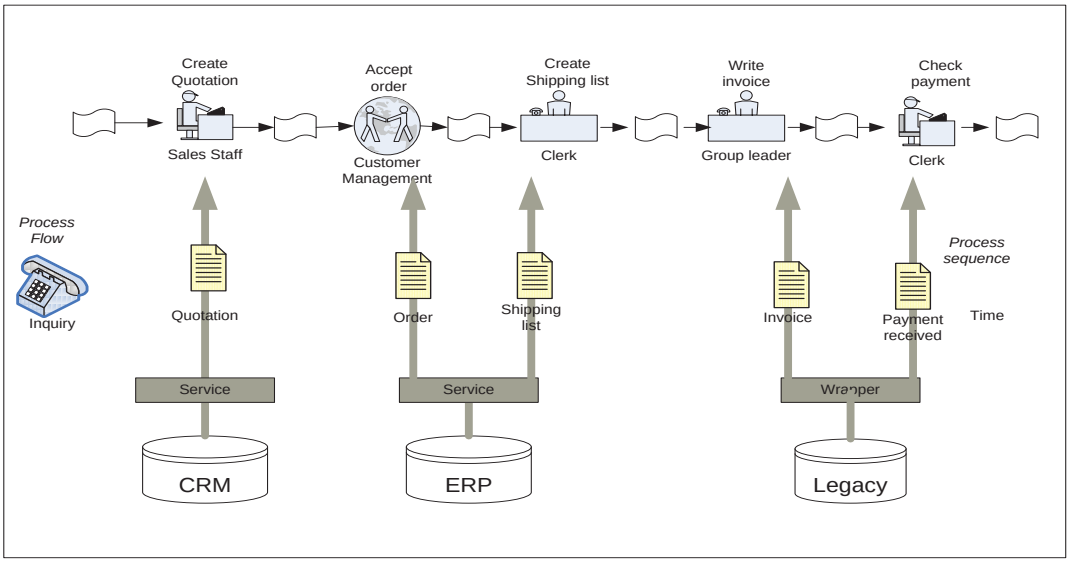


Figure 2. 1: End-to-End Business Process Scenario (Source: Bubak *et al.* (2006, p. 423))

Table 2.14 characterises E2E Solutions and compares such systems with stand-alone ERP and web technologies. While characterising E2E Solutions and differentiating them from stand-alone ERP and web technologies, it reveals that realisation of value from E2E Solutions is complex and depends upon the collaboration of business process participants. E2E Solutions integrate customers, suppliers and other parties as well as dispersed offices and thus rely heavily on public infrastructure as an E2E Solution, and are impacted by regulations. The next two subsections address the complexity of value realisation of E2E Solutions and E2E Solutions' value conversion contingencies.

Table 2. 14: Characterisation of End-to-End (E2E) Solutions			
	E2E Solutions	ERP	Web Technology
Definition and Concepts	A single or 'integrated' enterprise solution architecture that supports an end-to-end business process.	A packaged software solution seeking to integrate the complete range of a business's processes and functions.	Interactive websites allow for information sharing, interoperability, user-centred design and collaboration. Non-interactive websites allow viewing, downloading or uploading application, documents.
Computing Solutions	Integration of client and access devices (i.e., PCs, cell phones; website), and delivery fabric (i.e. cable, satellite, Internet, phone) and enterprise backbone (e.g. data base, infrastructure; DSS, ERP).	Integrated software packages utilising single information architecture.	Clients and access device (i.e. website).
Approach and Focus	Holistic approach; End-to-end process; intra and inter-enterprise process integration; focuses on process rather than functions.	Partial approach to process; focuses on functions - HR, Finance, Marketing; inter-enterprise process integration technology view dominated. Less decision-making capability.	Partial approach to process; interacting with customers, suppliers, B2C solution; technology view dominated.
Interdependency on customer, partner, supplier	Multiple (cross organisational boundary) parties are involved: customers, suppliers and partners.	Few (may or may not cross organisational boundary) parties are involved.	Few (connecting external parties); mostly B2C.
Extent of reliance on public infrastructure and affected by regulations	Extremely high; use of Internet to connect suppliers and customers, further, use of public infrastructure to connect dispersed offices; greatly affected by regulations.	Medium; use of public infrastructure to connect geographically dispersed offices; solid organisational infrastructure is required; less affected by regulations.	High; use Internet to access website; highly affected and governed by existing regulations.

2.4.2 Business Value of E2E Solutions

An E2E Solution covers the processes flowing both inside and outside the firm and from beginning to end. Thus, the business value of an E2E Solution is more pervasive in nature than that of stand-alone IT. The business value of an E2E Solution is contingent upon the participation and collaboration of all parties participating in the business process. Business process participants could be internal organisational staff or external parties (e.g., customers, suppliers, competitors, support services and regulators). The participation of external parties is again determined by a set of factors. For example, Setia *et al.* (2008) mention that value co-creation in supply chain contexts depends on technology, organisational and relational factors, and the focal organisation may have little control over those factors. Technology factors include relative advantage, complexity, reliability, compatibility and observability (e.g., Rogers 1995). Organisational characteristics deal with the size, capacity and resources of the adopting organisation (e.g., Tornatzky and Fleischer 1990). Relational characteristics for adoption decisions of the supply chain network include trust and power relations of participating organisations (e.g., Hart and Saunders 1997; Iacovou *et al.* 1995). The value co-creation in the supply chain context may be applicable for E2E Solutions, but it goes further as it encompasses customers, regulators and competitors, besides trading partners as included in the supply chain context. Besides factors (e.g. technology, organisation and relation) that determine value creation in a supply chain context, 'capacity' and 'willingness' of other E2E process participants to partake in the value creation process is also important. Thus it can be said that the business value of E2E Solutions is not only pervasive (as opposed to stand-alone ERP, SCM), the realisation of value is also a complex process. While value realisation of E2E Solutions is complex, and the focal firm may not appropriate all the value generated from E2E Solutions because of IT value externalities, the realised value of any IT should be considered from an organisational viewpoint (cf. Davern and Kauffman 2000).

Whereas the benefits of an E2E Solution are pervasive, traditional IT (e.g. stand-alone ERP) that streamlines and integrates internal business process enhances efficiency and effectiveness only within the organisational boundary (McAfee 2002; Radhakrishnan *et al.* 2008). Few studies have gone beyond and measured value in the inter-organisational system context (e.g., Gebauer and Buxmann 2000), outsourcing context (e.g., Santos *et al.* 1993), supply chain context (e.g., Setia *et al.* 2008) and net-enabled business context (e.g., Barua *et al.* 2004) and hence they suffer from discontinuity problems. They either focus on customers and/or suppliers and/or intra or inter-organisational processes: an E2E viewpoint is missing.

As E2E Solutions cover processes that flow both inside and outside (cf. Bubak *et al.* 2006), the business value literature on IT (e.g. stand-alone) and inter-organisational supply chain context provide valuable insight on the business value of E2E Solutions. ERP-related literature documents numerous benefits of the ERP system to organisations. Shang and Seddon (2002) report five dimensions of ERP system benefits: operational, managerial, strategic, IT infrastructural and organisational. Operational benefits include automated faster decision making, etc. Managerial benefits arise from ERP-enabled planning and management of organisational resources. Strategic benefits provide a competitive position in the market. Organisational benefits are organisational learning and staff empowerment. Barua *et al.* (2004) studied the net-enabled business value and found that digitisation of both customer service processes (e.g., sales, customer service, new customers' acquisition) and supplier service processes (e.g. procurement) have a strong impact on financial performance. The literature related to supply chain context shows that by reducing forecasting and planning errors that arise in managing a supply chain network, SCM avoids business value destruction. The benefits of a supply chain management (SCM) system include increased profitability, productivity, better coordination, lower inventory and lower costs (e.g., Cachon and Fisher 2000; Cheung and Lee 2002; Hendricks and Singhal 2003; Hendricks *et al.* 2007). The literature related to Electronic Data Interchange (EDI) reports that EDI facilitates information sharing with trading partners and has a positive impact on operational (e.g. reduced cycle time, improved product quality) as well as organisational level performance (e.g., Lee and Kim 2005; Mukhopadhyay *et al.* 1995). The business value literature focused on Customer Relationship Management (CRM) reports that by reducing duplication in data entry and proper maintenance of customer-related data, CRM systems help organisations to serve customers in better and more accurate ways that enhance the competitive position of the firm in the market (e.g., Katz 2002; Suresh 2004).

Based on the above discussion, it can be concluded that E2E Solutions have the potential to improve inside organisational processes (e.g. cycle time, better decisions) and outside coordination and communication process performance that leads to better organisational performance. It can also be concluded that deriving the value of E2E Solutions is a complex process. Business managers thus need to understand this complex value realisation process for better appreciation of the role of E2E Solutions and to manage the value chain networks along the E2E business process. Thus knowledge building in this particular area is imperative.

2.4.3 E2E Solutions Value Conversion Contingencies

E2E Solutions' value conversion contingencies are factors that impact upon E2E value chain networks and distort the value. As the potential value of IT can hardly be realised in practice (cf. Kohli and Grover 2008; Melville *et al.* 2004) and managers are worried about the productivity of their IT investment (cf. Peppard and Ward 2003), knowing the E2E Solutions' value conversion contingencies is important for managers during various phases of implementation. The ultimate outcome of an E2E Solution may vary in a scale of complete success to complete failure. The successful implementation of an E2E Solution is not the end of the journey; a company must ensure the effective assimilation and remove the barriers that may arise afterwards. There is also the possibility that initial failure or partial failure of an IT project may turn into success if value conversion contingencies are better handled and managed (cf. Jasperson *et al.* 2005). Therefore, if managers know all the sources of risk to E2E Solutions' business value, maybe internal or external, managers can pursue policies to remove these to realise the full potential of E2E Solutions. Furthermore, the high failure rate of IT projects reported in the literature (Trkman 2010; Yu 2005) also indicates that knowledge of E2E Solutions' value conversion contingencies is important at the stage of adoption decision. If managers know in advance of the value conversion contingencies, they can discount the potential value of E2E Solutions and weigh this with the cost of implementation. But research on E2E Solutions' value conversion contingencies is not advanced enough to shed light for managers to take appropriate action to handle such contingencies.

As is evident in table 2.14, E2E Solutions are highly dependent on the public infrastructure for connecting customers, suppliers, support services and dispersed offices (Jain *et al.* 2010). E2E Solutions are also impacted by the regulatory environment. The value realisation of E2E Solutions depends on the actions of the E2E process participants and process participants are then guided by technology, organisation, relational, capacity and willingness factors to participate in E2E value chain networks. Thus value realisation of E2E Solutions is more complex than value realisation from ERP and web technologies. It can therefore be said that the value conversion contingencies of E2E Solutions might be different from those of ERP and web technologies. The knowledge of value conversion contingencies of ERP and web technologies is a good starting point to explain contingencies for E2E Solutions, but a separate set of research studies is required for E2E Solutions.

E2E Solutions connect customers, suppliers and other process participants, and thus readiness of those process participants to partake in the value creation process is important. Barua *et al.* (2004) studied net-enabled business value and found that customer and supplier readiness is very important for deriving value and suggested including customer and supplier resources and incentives in the firm's transformation-related decisions. Before connecting customers and suppliers, E2E Solutions cut across organisational functional units, and thus organisational IT and management capabilities are needed for an unimpeded flow of business processes. Stand-alone ERP-related literature offers various critical success/conversion contingencies factors. Top management support is identified as a most critical factor for ensuring the proper assimilation of technologies in the organisation (e.g., Davern and Kauffman 2000; Peppard and Ward 2003; Weill 1990; 1992). The role of complementary resources (human resources, training, IT skills and management) is also reported in the literature (e.g., Melville *et al.* 2004; Park *et al.* 2007) as critical for ensuring the business value of IT and failure of which resources would diminish IT value. Technological strengths such as integration and IT-business alignment are reported as most important factors for deriving value from technologies. A lack of integration may result in a lack of knowledge sharing among E2E process participants causing potential value to be unrealised (e.g., Davern and Kauffman 2000). The literature reports that the greater the use of internal and external communication channels, the more likely is successful IT implementation and vice versa (e.g., Hamel and Prahalad 1989; Harrington and Guimaraes 2005). The IT-business alignment determines the success of the project (e.g., Wagner 2006).

An E2E Solution relies on the public infrastructure (cf. Jain *et al.* 2010) (e.g. Internet, electricity) which could be sources of value contingencies, at least in developing countries where it is in short supply. Poor Internet, intranet, telephone, IT infrastructure, electricity, public database and distribution channels are reported as the topmost problems in developing countries (e.g., Dedrick and Kraemer 2001; Huang and Palvia 2001; Kapurubandara 2009; Kshetri 2007). E2E Solutions connect customers, suppliers, support services and regulatory bodies; their value could be impacted by the regulatory environment of the country. A technology-friendly regulatory environment is required for ensuring proper assimilation and use of E2E Solutions. Zhu *et al.* (2004) report that the impact of the regulatory environment on e-business value is greater in developing countries than in developed countries. Inadequate regulatory environments, no legal protection for online transactions and the absence of Digital Signatures Acts are also

reported as problematic for IT implementation in developing countries (e.g., Kapurubandara 2009; Kshetri 2007; Moodley and Morris 2004; Mukti 2000; Pare 2002).

Despite some progress in the area of studying critical factors impacting on IT value in an extended enterprise context (e.g., Barua *et al.* 2004), the need to examine the E2E Solutions' value conversion contingencies exists for several reasons. First, although many studies have provided hints that technology, organisation and environmental factors may affect E2E Solutions' value, the underlying mechanism by which those factors impact on E2E Solutions' value remain unexamined in both IS and management literature. Past studies (e.g., Davern and Kauffman 2000; Weill 1992) of IT value conversion contingencies focused on processes that flow only inside an organisation and all are in developed country contexts.

Second, Barua *et al.* (2004) studied net-enabled value, and found that customer and supplier readiness is important for deriving value, although (stand-alone) IT-related literature could not identify this. Likewise, factors identified as IT (stand-alone) value conversion contingencies factors (e.g., top management support) may be applicable to an E2E Solution context, but as E2E Solutions cover the whole E2E process, new factors may emerge which may be unreported in the previous literature. Identifying them helps managers manage and control the sources of risk to E2E Solutions' value.

Third, as most research on value conversion contingencies has taken place in developed country contexts (e.g., Davern and Kauffman 2000; Goh and Kauffman 2009; 2005; Weill 1990; 1992), separate studies on developing countries are required as there is ample evidence (e.g., Dewan and Kraemer 2000; Huang and Palvia 2001; Zhu *et al.* 2004) that organisations in such countries face additional challenges to organisations in developed countries. Furthermore, existence of an 'IT productivity paradox', the precious nature of capital in developing countries (cf. Avgerou 2008) and increasing IT investment by organisations and government (e.g., Heeks 2010) highlight an urgent need for research on value conversion contingencies.

Overall, E2E Solutions' value conversion contingencies' literature is very scarce. Thus, it is problematic to find a complete set of factors from the extant literature that may impact on E2E Solutions' value.

2.5 Conclusion

This review of extant literature has revealed that the IT productivity paradox exists in developing countries. While determining the causes of the paradox is necessary for better

utilisation of scarce resources, the existing IT value conversion contingencies' literature focuses on developed countries. Thus, it is difficult to identify IT value conversion contingencies for developing countries from the extant literature. There is urgency for managers to know the IT value conversion contingencies in order to make IT investments profitable.

It is also revealed that while the business process level (e.g. granular level) is appropriate for measuring IT value, process level IT value research is in its infancy; existing literature has not considered the E2E nature of business processes. It is revealed that business processes move across functional and organisational boundaries and the development of enterprise solutions and related technologies help organisations to implement solutions that are aligned with E2E business processes. Thus, business value needs to be studied in an E2E Solutions' context. While the literature reports that the traditional nature of organisations is 'blurring' and they are increasingly implementing E2E Solutions, systematic research on value realisation of E2E Solutions and E2E Solutions' value conversion contingencies is scarce. The existing E2E Solutions' literature focuses only on conceptual and implementation issues.

Furthermore, this literature review has revealed some shortcomings in the existing IT value research that require further investigation. First, it reveals that four conceptualisations of IT artifact are used in IT value research; tool view, proxy view, ensemble view and nominal view. However, recent literature criticises the traditional conceptualisation of IT and suggests conceptualising IT as 'digital business capability'. This is because of the embedded nature of IT, but existing research hardly conceptualises IT as digital business capability, and new research should overcome this problem.

Second, researchers suggest opening the organisational 'black box' of IT use by conducting research at granular level. Thus, for analysing and understanding the complex nature of IT value, researchers have moved down the hierarchy, from economy to industry, industry to organisation, and organisation to process in an effort to open the 'black box' of IT use. But the 'black box' remains 'black' due to the dearth of exploratory in-depth research at all levels of inquiry, including the business process level. The IT value research is dominated by secondary data and quantitative survey-based studies. The mechanism through which IT creates value and conversion contingencies take place is largely missing in the literature.

In response to the research gaps identified in this chapter, chapter 3 theorises E2E Solutions and develops a conceptual model of E2E Solutions' value in developing countries.

Chapter Three

Conceptual Framework

3.0 Introduction

As revealed in chapter 2 (literature review), there is a need to study how E2E Solutions deliver business value, and how business value of E2E Solutions is impacted by value conversion contingencies in developing countries. This chapter begins to theorise E2E Solutions' value and value conversion contingencies from the extant literature and draws on the Absorptive Capacity Theory to theorise how E2E Solutions deliver value. It argues that E2E Solutions are a dynamic capability and enhance organisations' absorptive capacity to utilise internal and external knowledge bases, ensure business process reorientation and essentially improve organisational performance. It also argues that E2E Solutions' value (e.g. organisational absorptive capacity outcome) is impacted by value conversion contingencies. But the IS absorptive capacity literature is not adequate to explain value conversion contingencies. Thus, the Technology-Organisation-Environment (TOE) framework is adopted and related literature is reviewed to delineate constructs (e.g. value conversion contingencies) and relationships among these constructs with E2E Solutions' value, with the aim of investigating the derivation of business value from E2E Solutions in developing countries.

Section 3.1 provides an overview of Absorptive Capacity Theory, including its core proposition. Special consideration is paid to the theorisation of E2E Solutions and how business value is enabled by E2E Solutions. Section 3.2 draws on a Technology-Organisation-Environment framework to identify high level constructs that impact on E2E Solutions' value: (1) technology factors; (2) organisation factors; and (3) environment factors. This chapter concludes by presenting a conceptual model that guides empirical data gathering.

3.1 Theorising E2E Solutions Using Absorptive Capacity Theory

This section presents Absorptive Capacity Theory for theorising E2E Solutions and how E2E Solutions create value. It argues that E2E Solutions enhance organisational ability to store the knowledge base, utilise internal and external knowledge bases, ensure the business process re-orientation and thus form a digital business capability. It also argues that E2E Solutions improve both internal and externally facing organisational business processes which in turn yield superior organisational performance and competitive advantage. It is revealed that organisational absorptive capacity outcome (e.g. E2E Solutions' value) is impacted by a set of internal and external factors. This section begins by describing the Absorptive Capacity Theory

(section 3.1.1). It then presents the key tenets of the Absorptive Capacity Theory (section 3.1.2). E2E Solutions (section 3.1.3), E2E Solutions' value (section 3.1.4) and E2E Solutions' value conversion contingencies (section 3.1.5) are theorised using Absorptive Capacity Theory and presented in the rest of this section. This section concludes that in addition to Absorptive Capacity Theory it is necessary to consider factors that impede value creation.

3.1.1 Absorptive Capacity Theory

Absorptive capacity (Cohen and Levinthal 1990; Zahra and George 2002) refers to the ability to locate new ideas and information from both internal and external sources, and this is widely accepted as critical for organisational growth and performance. Absorptive Capacity Theory (Cohen and Levinthal 1990; Zahra and George 2002) is rooted in the strategic management and organisational behaviour literature; however, it is also popular in IS and Economics disciplines and used in firm, group and inter-organisational dyad level analyses (cf. Volberda *et al.* 2010). Although Kedia and Bhagat (1988) first coined the term 'absorptive capacity' for studying cultural constraints on the transfer of technology across nations, Cohen and Levinthal (1990) are accepted as the founding authors of Absorptive Capacity Theory. Their seminal paper has received more than 12,000 citations up to 2011. Absorptive Capacity is defined by Cohen and Levinthal (1990, p.128) as the *'ability of a firm to recognize the value of new, external information, assimilate it, and apply it to commercial ends'*. Zahra and George (2002, p. 198) further conceptualise absorptive capacity as *'a set of organizational routines and processes by which firms acquire, assimilate, transform, and exploit knowledge to produce a dynamic organizational capability'*. Table 3.1 shows the theoretical underpinning of Absorptive Capacity Theory.

Table 3. 1: Absorptive Capacity Theory: Intellectual Foundations and Seminal Paper
• *Absorptive Capacity: A New Perspective of Learning and Innovation (Cohen and Levinthal, 1990)* ✓ The ability of a firm to recognise the value of new, external information, assimilate it and apply it to commercial ends is dependent on to its innovative capabilities. ✓ Ability to exploit external knowledge is critical for organisations. ✓ Absorptive capacity is largely a function of firm's level of prior related knowledge (e.g. skills, shared language and knowledge on scientific innovation). ✓ The firm's ability to assimilate information is a function of richness of the pre-existing knowledge structure. ✓ Organisation's absorptive capability depends on its employees' absorptive capacity at large. A diverse background provides a more robust basis for learning. ✓ Structure of communication with external environment, among subunits of the organisation also determines the absorptive capacity. Specialised set of 'actor'(s) is required for transmission of knowledge among parties. Inward looking and outwards looking absorptive capacity differs. • *Absorptive Capacity: A review, re-conceptualization and extension (Zahra and George, 2002)* ✓ Absorptive capacity is a dynamic capability that shapes competitive advantage. ✓ Firms' realised capacity (e.g. transformation, exploitation) differs from potential capacity (acquisition and assimilation). Realised capability shapes organisational performance as well as competitive advantage. ✓ Social integration mechanism reduces the gap between potential adsorptive capacity and realised absorptive capacity. ✓ Firms acquire knowledge from different sources in their environment; however, exposure to diverse sources does not necessarily lead to absorptive capacity development, especially if these sources have low knowledge base. Thus, organisational routine, process and internal knowledge base is important. • *Absorptive Capacity Configurations in Supply Chains (Malhotra et al. 2005)* ✓ Absorptive Capacity as 'set of organizational routines and processes by which organizations acquire, assimilate, transform, and exploit knowledge to produce dynamic organizational capabilities' (p.145). ✓ Complement the individual firm's internal capability with the relational view of the firm (e.g. in an inter-organisational relationship). ✓ Integrative inter-organisational process mechanisms between firms and external parties also determine the firm's absorptive capacity to acquire and assimilate knowledge. ✓ Competitive advantage is derived from knowledge resources embedded in social relationship with other enterprises. ✓ Absorptive capacity outcome is impacted by breadth, quality, privilege and coordination of information exchanged.

Absorptive Capacity Theory posits that the knowledge base lies in organisational routines and processes. It argues that both internal and external knowledge is important for sustained organisational performance, competitive advantage and organisational routine and process,

which allow firms to analyse, process, interpret and understand the internal and external sources of information (cf. Zahra and George 2002). Firms build their innovation capacity by tapping external sources of knowledge. As Cohen and Levinthal (1990, p. 128) point out, *"Outside sources of knowledge are often critical to the innovation process, whatever the organisational level at which the innovating unit is defined"*. While external knowledge is important, organisations must also create and preserve knowledge internally (cf. Nonaka 1994) and disseminate knowledge across departments, functions and individuals (cf. Schmidt 2010). Therefore, it is important to enhance the absorption capacity of the knowledge receiver and this essentially depends on the receiver's prior expertise, training and background characteristics (e.g., Reagans and McEvily 2003). While absorptive capacity of knowledge receivers is important for higher level organisational capacity, a firm's aggregate absorptive capacity is not necessarily the sum of the absorptive capacity of all individual staff and therefore, a firm should not only develop its staff's absorptive capacity (Cohen and Levinthal 1990; Srivardhana and Pawlowski 2007) but also concurrently develop organisational routines and processes to acquire, assimilate, transfer and exploit both internal and external knowledge (Cohen and Levinthal 1990; Srivardhana and Pawlowski 2007). An organisational culture and communication system are important on the level of organisational absorptive capacity. An organisational culture determines the close networks and relationships of task participants and stimulates the transfer of knowledge base (e.g., Gradwell 2003). A higher absorptive capacity is evident when information flows from one point to another within an organisation without any transitional loss. Thus, besides individual staff absorptive capacity (e.g. training, skills), organisational routine, culture and communication system determine the absorptive capacity as they allow for direct contact among staff from different units and departments. Furthermore, a firm should build organisational absorptive capacity to pre-empt changes in the environment (Cohen and Levinthal 1994).

A review of extant literature (e.g., Volberda *et al*. 2010) reveals that firms' deficiencies in absorptive capacity are key barriers to their innovation and growth. A lack of absorptive capacity may emanate from inability of the firms to value, assimilate and apply the internal and external knowledge base (cf. Zahra and George 2002), or it may be a cause of difficulty in acquiring external knowledge bases because of its embedded nature (e.g., Szulanski 1996). Srivardhana and Pawlowski (2007) observe that technology contexts (integration, technology alignment) negatively impact on possible relationships between business process absorptive capacity and sustained business process innovation. Malhotra *et al*. (2005) report the nature of

information exchanged between firms and their supply chain partners impacts on absorptive capacity outcomes. The analysis revealed that prior IS absorptive capacity literature focuses on organisational in-house determinants of absorptive capacity, for example, organisational internal users' absorptive capacity (e.g., Park *et al.* 2007), technological absorptive capacity (e.g., Pennings and Harianto 1992), absorptive capacity in inter-organisational settings (e.g., Lane and Lubatkin 1998), absorptive capacity in a supply chain context (e.g., Malhotra *et al.* 2005), and absorptive capability in an IT-enabled business process and IT-business alignment context (e.g., Schwarz *et al.* 2010).

3.1.2 Key Tenets of Absorptive Capacity Theory

Twenty years after publication of the Absorptive Capacity Theory (cf. Cohen and Levinthal 1990), this theory has been extended and empirically examined by researchers in various disciplines. Absorptive capacity is a multi-level construct (cf. Volberda *et al.* 2010) and is used in various levels of analysis: individual, groups, firms and intra-organisational dyads. Although absorptive capacity is a multi-level construct, the majority of empirical studies are conducted either at the business unit level (cf. Tsai 2001) or subsidiary level (cf. Gupta and Govindarajan 2000); however, business process level analysis is missing in the extant literature (cf. Volberda *et al.* 2010). An organisational process, routine and system serve as an organisational memory to store past information and are considered important for creating a new knowledge base (e.g., Lyles and Charles 1992). In a citation analysis on Absorptive Capacity Theory, Volberda *et al.* (2010, p.937) mentioned, *"It is clear that most empirical studies do not carefully address important processes that influence the viability of AC (e.g., Absorptive Capacity) constructs"*. The key beliefs that underpin the theory are described below:

Prior related knowledge and knowledge storage: Absorptive Capacity Theory (Cohen and Levinthal 1990) posits that absorptive capacity is path dependent, and prior related knowledge and experiences form new knowledge. It is revealed that staff's prior related knowledge and experience essentially affects a firm's capability for acquisition of future knowledge and acts upon knowledge for better performance (Srivardhana and Pawlowski 2007; Zahra and George 2002). Although Cohen and Levinthal (1990) and Zahra and George (2002) did not explicitly mention how to store and retrieve prior knowledge, computer database and organisational routine are found to be two mechanisms for storing such prior related knowledge (e.g., Nonaka and Krogh 2009). Besides computer and organisational routines, Volberda *et al.* (2010) mention that stories, norms, etc., are more effective for storing and retrieving prior knowledge. This

knowledge base needs to be available to all departmental and functional staff in such a way that there is no knowledge gap. This wide availability of knowledge base increases the organisational future absorptive capacity (cf. Lenox and King 2004).

Acquiring of external sources of knowledge and dissemination to the end-users: Acquiring knowledge from external sources and learning from trading partners, suppliers and customers is critical and essentially forms the absorptive capacity of firms (cf. Volberda *et al.* 2010). For acquiring external knowledge, it is very rewarding to establish inter-organisational networking, alliances and supply chain relationships as these essentially facilitate the learning process, foster knowledge creation and enhance organisational absorptive capacity (e.g., Malhotra *et al.* 2005; Van Wijk *et al.* 2003). The information absorbed from external sources should reach the right person at the right time. Therefore, an organisation's gatekeeper (e.g. senior management) role is important for acquiring information from external sources and distributing information among users (e.g., Vinding 2000).

Knowledge base lies in the organisational routine and processes: As mentioned before, an organisation's absorptive capacity is not the sum of its staff's abilities. Absorptive capacity of an organisation essentially depends upon its ability to stimulate and facilitate the transfer of knowledge inside and outside an organisation (e.g., Schmidt 2010). Therefore, organisational routine and processes, histories and stories, documentation, heuristics and know-how are important in creating a shared understanding of the knowledge which essentially increases the organisational absorptive capacity (e.g., Grant 1996; Matusik and Heeley 2005). Malhotra *et al.* (2005) complement the Absorptive Capacity Theory (cf. Zahra and George 2002) with a relational view of the firm (Dyer and Singh 1998) and describe routine and process as important units of the analysis for understanding the competitive advantage of an organisation.

Knowledge building capability is an IT-driven capability: It is revealed that the knowledge building capacity of a firm is an IT-driven capability (cf. Zahra and George 2002). Along with an organisational routine and process, information systems determine the quality of the organisational configuration (cf. Malhotra *et al.* 2005; Miller 1993) and are determinants of absorptive capacity. Information technology helps an organisation to build a knowledge repository and provides access to the repository to users across the organisation (Goodman and Darr 1998; Walsh and Ungson 1991). Malhotra *et al.* (2005) focus on organisational routine, structure and supply chain-enabled inter-organisational relationships to study the differences in absorptive capacity in organisations and resulting differences in outcome. Similarly,

Srivardhana and Pawlowski (2007) developed a theoretical framework specifying the relationship between ERP-enabled knowledge and its impact on potential/realised absorptive capacity for business process innovation.

Knowledge gathered while implementing 'Best Practice' embedded in IT: As knowledge building is an IT-driven mechanism (cf. Zahra and George 2002), organisations' knowledge base (e.g. absorptive capacity) can be enhanced while implementing various types of IT. Furthermore, while implementing IT from external vendors, organisations are exposed to new sources of knowledge. First, the IT system (e.g., ERP) is embedded best practice reference of business process and industries (cf. Lee and Lee 2000). Shang and Seddon (2000, p. 272) mention that ERP systems *"contain deep knowledge of business practices accumulated from vendor implementations in a wide range of client organisations"*. Therefore, while implementing IT, knowledge also transfers to the implementing organisation in the form of best practice processes embedded in the IT (cf. Lee and Lee 2000; Srivardhana and Pawlowski 2007). Furthermore, updates of the software also *'provide a continuing conduit for external knowledge'* (Srivardhana and Pawlowski 2007, p.57). Second, knowledge also transfers from the IT vendors and consultants to the implementing organisation's staff during implementation and in other social interactions (e.g., Baskerville *et al.* 2000; Newell *et al.* 2004; Robey *et al.* 2002).

Absorptive capacity outcome: Absorptive capacity refers to the recognition, assimilation and utilisation of internal and external knowledge that directly links with an organisation's performance and competitive advantage (e.g., Cohen and Levinthal 1990; Lane *et al.* 2001). Researchers argue that an absorptive capacity is a dynamic capability that provides superior business performance (cf. Teece 2007; Teece *et al.* 1997). Volberda *et al*. (2010, p. 942) mention that, *"the higher the level of AC (e.g., Absorptive Capacity), the more likely it is that a firm will be proactive in exploiting opportunities present in the environment, independent of current performance"*. This literature review reveals that absorptive capacity contributes to both tangible and intangible outcomes. Absorptive capacity is found to be a major contributor to organisational learning (Cohen and Levinthal 1990; Lane *et al.* 2001), innovation (Easterby-Smith *et al.* 2008; Stock *et al.* 2001; Zahra and George 2002), inter-organisational knowledge transfer (Gupta and Govindarajan 2000; Malhotra *et al.* 2005), knowledge search (Shenkar and Li 1999), competitive advantage (Cohen and Levinthal 1990) and performance (Lane *et al.* 2001).

Impact on absorptive capacity outcome: It is revealed that organisational absorptive capacity depends on an individual staff member's absorptive capacity (e.g., Park *et al.* 2007) and there are antecedents to absorptive capacity that are placed at the individual level (cf. Volberda *et al.* 2010). As such, the absorption of knowledge by individuals and its use for commercial ends depends upon his/her expertise, training and background (e.g., Reagans and McEvily 2003). Thus, if staff lack expertise and training, the knowledge base may not be used effectively for value creation purposes. The absorptive capacity literature also emphasises the role of managers (as gatekeepers) who collect information from external sources and distribute the knowledge among the users (Volberda 1996). Absorptive capacity literature also mentions that gatekeepers' or boundary spanners' ability to extract and distribute the knowledge base may be influenced by the cognitions and dominant logic (cf. Augier and Teece 2009). Therefore, dynamic managerial capability is required for ensuring the proper transfer of the knowledge base to the right people at the right time (cf. Adner and Helfat 2003). Malhotra *et al.* (2005) studied organisational absorptive capacity in supply chain contexts and introduced the role of information exchanged between an organisation and supply chain partners in shaping absorptive capacity outcome. They reported that breadth, quality, confidentiality and coordination of information moderate the absorptive capacity outcome in a supply chain context. The literature (Zahra and George 2002) also mentions that an organisation may suffer from acquiring too much information as acquisition costs may outweigh the benefits from exploitation of such a knowledge base.

Furthermore, as knowledge building is an IT-driven process (cf. Malhotra *et al.* 2005; Zahra and George 2002), a potential shock of organisational absorptive capacity may emerge from IT implementation. Srivardhana and Pawlowski (2007) propose two such negative moderators of organisational ability to adapt/change in the ERP context: (i) business process and system integration; and (ii) IT business alignment and system configuration. An organisation's innovation and learning processes are embedded in an environmental context (e.g., Jansen *et al.* 2006; Lichtenthaler 2009). Although research on external factors on organisational absorptive capacity is limited (cf.Lichtenthaler 2009; Volberda *et al.* 2010), the few external factors which appear in the literature as moderators of absorptive capacity are competitiveness and characteristics of the knowledge environment (e.g., Van den Bosch *et al.* 1999; Volberda *et al.* 2010).

3.1.3 Theorising E2E Solutions Using Absorptive Capacity Theory

Absorptive Capacity Theory (Cohen and Levinthal 1990; Zahra and George 2002) is considered a useful theoretical lens to represent E2E Solutions. The system (Malhotra *et al.* 2005; Zahra and George 2002) and process (Schmidt 2010) dimensions of E2E Solutions are captured in Absorptive Capacity Theory. Absorptive Capacity Theory posits that organisational knowledge building and creation is an IT-driven initiative (cf. Malhotra *et al.* 2005; Zahra and George 2002) and implementation of IT in an organisation also means the implementation of 'best practice reference business process' (cf. Lee and Lee 2000). Absorptive capacity literature reports that prior related knowledge and memory are important and this forms the basis for creation of future knowledge (Cohen and Levinthal 1990; Zahra and George 2002). E2E Solutions provide a platform for knowledge stock and make the knowledge available to users. Individuals' memory (e.g., Srivardhana and Pawlowski 2007) also creates an organisational absorptive capacity, and implementation of E2E Solutions ensures the maintenance and retention of individuals' knowledge for future use. Although knowledge building is IT driven, organisational routine, processes, stories, documentation and know how are also found to be important in creating knowledge that enhances organisational absorptive capacity (e.g., Grant 1996; Matusik and Heeley 2005). Implementation of E2E Solutions ensures that the business process re-orientation for E2E business processes flows from beginning to end without any hurdle (cf. Bubak *et al.* 2006). Besides an organisation's own knowledge, knowledge from customers, suppliers and trading partners are important for enhancing organisational absorptive capacity (Malhotra *et al.* 2005; Volberda *et al.* 2010). Van den Bosch *et al.* (1999) mentioned that a broad and active network of internal and external relationships and cross-functional interfaces influence the level of absorptive capacity of an organisation. E2E Solutions ensure both internal and external integration for the unimpeded flow of business process and thus enhance organisational absorptive capacity (cf. Bubak *et al.* 2006).

From the above discussion, this research argues that E2E Solutions are a dynamic capability enhancing organisational ability to utilise internal and external knowledge bases, creating new routine and processes to significantly increase organisational absorptive capacity related to organisation performance. Implementation of E2E Solutions ensures the 'storage' of prior related information and makes external knowledge available to the organisation. E2E Solutions also ensure the implementation of 'best practice' business process embedded into the E2E Solutions that essentially help to flow both internal and external knowledge bases uninterruptedly. This thesis posits that the derivation of business value from E2E Solutions will be determined by the

degree to which organisational routines and processes for acquiring assimilating, transforming and exploiting knowledge to produce a dynamic organisational capability (i.e. absorptive capacity) are embedded in the E2E Solutions.

A review of extant literature reveals that previous absorptive capacity literature (Lane and Lubatkin 1998; Malhotra *et al.* 2005; Park *et al.* 2007; Pennings and Harianto 1992; Schwarz *et al.* 2010) focuses on absorptive capacity of business units, organisational (e.g. users or technological), inter-organisational and supply chain contexts. However, contemporary business processes are routinely extended across functional and organisational boundaries and recent developments in breakthrough technologies (e.g. ERP, SCM) support E2E processes (cf. Bubak *et al.* 2006; Jain *et al.* 2010). Therefore, it is imperative to see how absorptive capacity of an organisation is determined by E2E Solutions. This research thus builds on and extends Absorptive Capacity Theory and applies the theory in an 'extended' enterprise context.

3.1.4 Theorising Business Value of E2E Solutions Using Absorptive Capacity Theory

In the Absorptive Capacity Theory, business value of IT is created when there is a synergetic relationship between IT capability and complementary organisational resources (e.g., Melville *et al.* 2004; Roberts *et al.* 2011). E2E Solutions are conceptualised as digital business capability that encompasses both IT capability and complementary resources (e.g. business process re-orientation), and therefore, E2E Solutions deliver business value. From the absorptive capacity perspective (e.g., Zahra and George 2002), a business process can be an appropriate place for analysing and assessing the business value of IT. Karimi *et al.* (2007, p. 229) mentioned that *"business process is a vehicle to build and materialize organizational capability"*. The business process view posits that IT impacts at the business process level (e.g. intermediary level) which in turn impacts on the organisational bottom line (e.g. profit, productivity) (Karimi *et al.* 2007; Melville *et al.* 2004).

Wade and Hulland (2004) conceptualise IT capabilities as outside-in, inside-out and spanning. An outside-in IT capability allows firms to develop and manage external relationships, gather and coordinate external knowledge whereas inside-out IT capabilities consider internal capabilities. They transform the 'raw' data extracted from outside into a new form of knowledge, and use the knowledge base for organisational needs. Spanning IT capabilities integrate both outside-in and inside-out IT capabilities. Roberts *et al.* (2011) propose that these three types of IT capabilities together with complementary organisational resources facilitate the

organisational absorptive capacity process. ERP (stand-alone) capabilities can be considered as inside-out capabilities. Shang and Seddon (2002) report that implementation of ERP results in operational, managerial, strategic, IT infrastructural and organisational benefits. Karimi *et al.* (2007) report that ERP implementation is expected to reduce cost and cycle time, and increase quality and customer service. Lee (2001) finds that IT together with business process change favourably impact on cycle time, officer retention, origination cost, price and customer base. The author also finds a higher level impact (e.g., profit) of all these process indicators. Gattiker and Goodhue (2005) identify post-implementation of ERP outcomes, and mention that ERP produces intermediate benefits at the process level (in terms of task efficiency and task improvements), and then process level benefits translate into the overall firm's performance.

EDI, supply chain management, net-enabled technologies, etc., can be considered as outside-in IT capabilities as these technologies connect organisations with external parties (e.g., customers, suppliers) and help in gathering external knowledge. For example, Barua *et al.* (2004) find that net-enabled technologies improve coordination tasks of both customer and supplier service processes and both process improvements are having an impact on organisational profit. Malhotra *et al.* (2005) mention that building an absorptive capacity in the supply chain context enhances firms' ability to acquire, assimilate, transform and exploit market knowledge to achieve superior performance. Chircu and Kauffman (2000) suggest that at market level, IT creates benefits through positive network externalities, and supporting and enhancing relationships with business partners. EDI-related literature (Lee and Kim 2005) also reports that EDI facilitates firms to seamless transfer data and information, thus improving communication and coordination tasks resulting in improved organisational performance.

In line with the forgoing discussion, it can be proposed that E2E Solutions are digital business capabilities and include IT capabilities (e.g., outside-in, inside-out and spanning) and business capabilities. E2E Solutions help organisations in knowledge formation and knowledge exploitation thus affecting a firm's ability to achieve competitive advantage and yield superior performance. It is argued that E2E Solutions improve both internal and externally facing business processes which in turn impacts on organisational level performance aspects. Thus, this study presents two propositions and high-level conceptualisations of how E2E Solutions deliver value (figure 3.1).

Proposition 1: *The process performance is positively affected by E2E Solutions.*

Proposition 2: *The organisational performance is positively affected by process performance.*

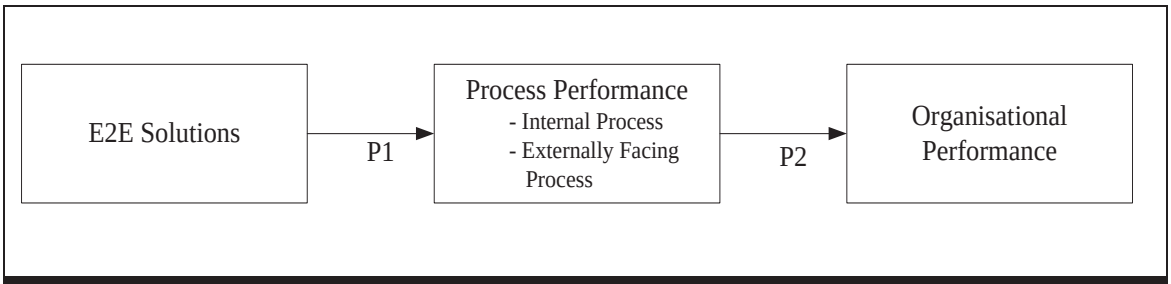


Figure 3. 1: High Level Research Framework 1 - E2E Solutions

3.1.5 Theorising E2E Solutions' Value Conversion Contingencies Using Absorptive Capacity Theory

Absorptive capacity is found to be a major contributor of organisational learning, innovation, inter-organisational knowledge transfer, knowledge search, competitive advantage and performance (e.g., Cohen and Levinthal 1990; Malhotra *et al.* 2005). A review of extant literature on absorptive capacity (e.g., Andersen and Foss 2005; Cohen and Levinthal 1990; Jansen *et al.* 2006; Lane *et al.* 2001; Van den Bosch *et al.* 1999; Zahra and George 2002) in the field of strategic management and organisation reveals that organisational absorptive capacity processes as well as outcomes are impacted by managerial, intra and inter-organisational antecedents and environmental conditions.

IT together with complementary assets improves the firm's absorptive capacity. Roberts *et al.* (2011, p.3) mention that, *"By recognizing information technology (IT) as a strategic resource (Wade and Hulland 2004), managers are combining their IT investments (e.g. infrastructural technologies, enterprise systems, common data repositories, and open architectures) with complementary assets to create digital capabilities that improve the firm's absorptive capacity"*. But having implemented a successful IT solution does not guarantee IT value to organisations (cf. Avgerou 2008) as not all firms possess equal capability to use IT to the fullest extent even though having the same IT assets (cf. Barua *et al.* 2004). Thus, organisational absorptive capacity outcomes resulting from E2E Solutions' implementation is dependent on value conversion contingencies. But to date, IS absorptive capacity literature does not pay much attention to how value conversion contingencies diminish organisational absorptive capacity. Malhotra *et al.* (2005) studied organisational absorptive capacity in supply chain context and found that breadth, quality, confidentiality and coordination of information moderate the absorptive capacity outcome. Srivardhana and Pawlowski (2007) developed a conceptual model of ERP-enabled absorptive capacity and propose that business process and system integration,

and system configuration may negatively impact on the absorptive capacity outcome. While absorptive capacity literature did not identify the stage where IT value conversion contingencies take place, process-oriented literature (cf. Davern and Kauffman 2000) suggests that value conversion contingencies occur at business process level. As E2E Solutions capture process and system, this section proposes that value conversion contingencies of E2E Solutions take place at business process level.

Based on the forgoing discussion, this section argues that a firm's ability to assimilate and use E2E Solutions is limited by its lack of absorptive capacity which is called, in this study, value conversion contingencies. But, due to the paucity of IS absorptive capacity literature on value conversion contingencies, this section only presents a high-level conceptual model (figure 3.2) without developing a theoretical proposition.

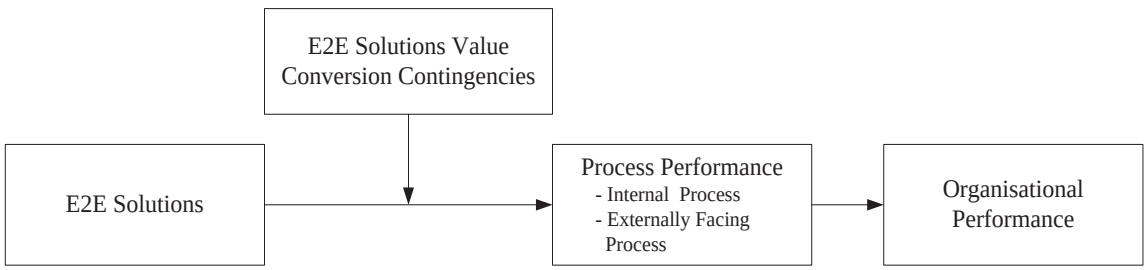


Figure 3. 2: High Level Research Framework 2 - E2E Solutions

3.2 Theorising E2E Solutions Using a Technology-Organisation-Environment (TOE) Framework

As revealed in section 3.1, E2E Solutions' value (e.g., absorptive capacity outcome) is impacted by value conversion contingencies, but IS absorptive capacity literature has not explained them explicitly. It is argued that understanding IT value conversion contingencies for developing countries involves an examination of technology, organisation and environmental issues. Thus, this research employs a Technology-Organisation-Environment (TOE) framework as a molar theory to identify high level constructs that impede E2E Solutions' value and this is presented in this section. While the research on E2E Solutions' value conversion contingencies is in an early stage (chapter 2), there is research on IT (stand-alone) value conversion contingencies, assimilation and implementation barriers. This section thus reviews this related literature, and

factors that are believed to affect E2E Solutions' value in the Technology-Organisation-Environment context are presented.

This section starts with presenting an overview of the TOE framework (section 3.2.1). It then discusses its use in the IS research (section 3.2.2). It is revealed that the TOE framework is an appropriate theoretical lens for theorising value conversion contingencies of E2E Solutions' value (section 3.2.3). Therefore, by drawing on this framework, this section identifies high level constructs that may impact on the E2E Solutions' value: (1) technology factors; (2) organisation factors; and (3) environmental factors.

3.2.1 TOE Framework

The TOE framework was developed by Tornatzky and Fleischer (1990, p. 152-154) and identifies how three contextual aspects: technology, organisation and environment influence innovation adoption and implementation by organisations (see figure 3.3).

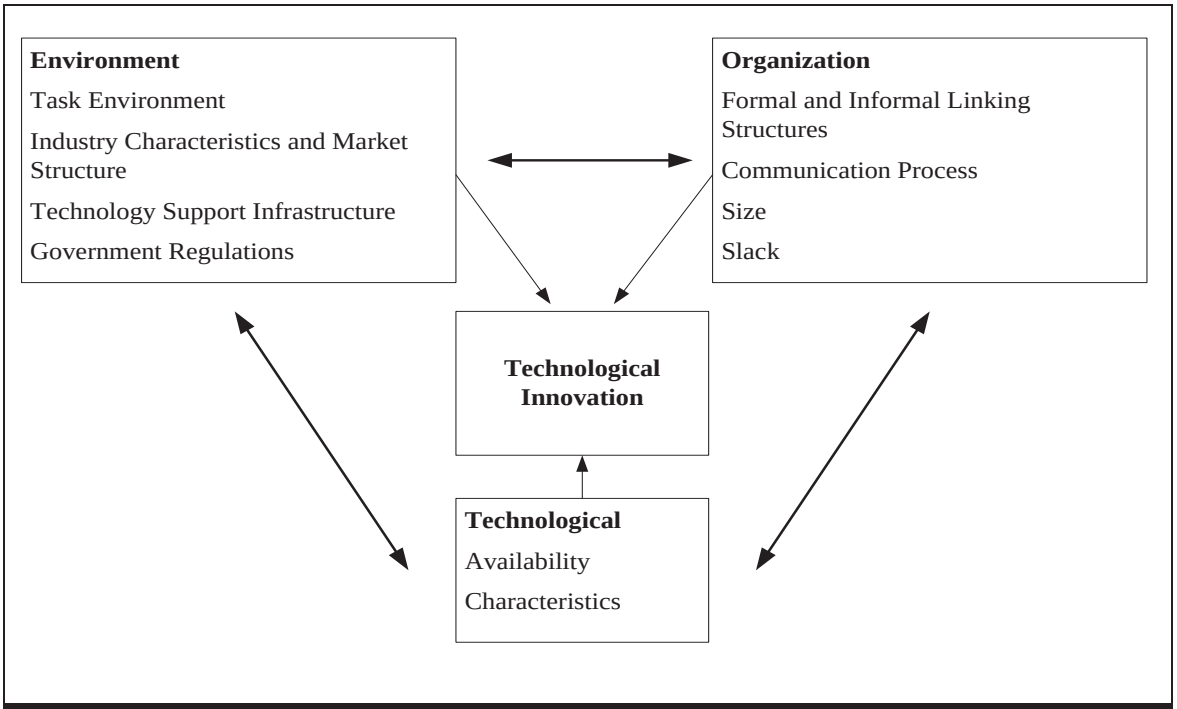


Figure 3. 3: TOE Framework (Tornatzky and Fleischer, 1990, p. 152-154)

Technological Context: Technological context includes both internal and external technologies relevant to the context in which a firm operates that play a critical role in determining technology adoption. This includes current practices and equipment internally available for use

(Starbuck 1976) as well as technological resources outside the firm (Hage 1980; Khadwalla 1970; Thompson 1967).

Organisational Context: Organisational context is described through several descriptive measures like firm size; the centralisation, formalisation and complexity of its managerial structure; the quality of its human resources; and the amount of slack resources available internally. Tornatzky and Fleischer (1990) also include formal linkages between employees, decision making and internal communication.

Environmental Context: Environmental context presents both constraints and opportunities for an organisation to adopt technological innovation. This includes: the industry in which the firm operates, its competitors, access to resources supplied by others, and rules and regulations enacted by competent authorities (Tornatzky and Fleischer 1990; Zhu and Kraemer 2005; Zhu *et al.* 2006; Zhu *et al.* 2004).

3.2.2 Use of TOE Framework in IS Literature

As a generic theory of technology diffusion, the TOE framework can be used for studying any kind of information systems' innovation adoption studies (cf. Zhu *et al.* 2003). A review of the extant literature shows that the framework has been used in various stages (e.g. adoption, implementation, post-adoption variation) and for different types of IS (e.g. e-commerce, EDI) studies. The TOE framework also has wide appeal in both developed and developing countries' IS research (see for example, Zhu and Kraemer 2005; Zhu *et al.* 2006; Zhu *et al.* 2004).

A review of extant literature also reveals that in the early stage of TOE framework-related studies, researchers were interested in the adoption/implementation of various types of IS. For example, Grover (1993) was probably the first researcher to use this framework in the adoption of customer-based inter-organisational systems. Then Chau and Tam (1997) used the TOE framework for studying the factors affecting the adoption of open systems. Both papers appear in top-ranked MIS journals. Although the TOE framework was mostly used in adoption studies, in recent times, it has also been used in post-implementation diffusion (Lin and Lin 2008) and implementation success (e.g., Lee and Kim 2007), as well as in post-adoption usage and business value creation studies (e.g., Zhu and Kraemer 2005; Zhu *et al.* 2004).

As mentioned earlier, the TOE framework (Tornatzky and Fleischer 1990) has been used in various kinds of IS research studies ranging from generic IT to IT artifacts. It has been used in the adoption of open systems (e.g., Chau and Tam 1997), information systems (e.g., Thong

1999), EDI (e.g., Kuan and Chau 2001; Xu *et al.* 2004), RFID (e.g., Lee and Shim 2007), Internet adoption (e.g., Lin 2008), open source software adoption (Glynn *et al.* 2005); e-business diffusion (e.g., Lin and Lin 2008), implementation success of IS (e.g., Lee and Kim 2007), online insurance adoption (e.g., Cata and Lee 2006) and e-business value creation (Zhu *et al.* 2003; Zhu and Kraemer 2005; Zhu *et al.* 2006; Zhu *et al.* 2004).

The TOE framework has been used as a theoretical lens in IS studies in both developed and developing countries. Damanpour and Schneiderw (2006) studied the impact of environmental, organisational and top managers' characteristics on the initiation, adoption decision and implementation of innovation in the USA. They concluded that each dimension accounts for unique variance in the adoption of innovation but organisational characteristics and top managers' attitudes towards innovation have a stronger influence on the adoption of innovations. Cata and Lee (2006) studied the adoption of web-based applications in the insurance sector in the USA. The relevant factors identified were infrastructure flexibility, website availability, the degree of business integration and company age. Hackney *et al.* (2006) used the TOE framework coupled with emergent context for evaluating web services within the UK. They found that emergent context together with TOE factors affect the adoption of web services.

In a developing country context, Lin (2008) studied the adoption of technological innovation in China in 583 logistic service providers. She developed four hypotheses based on the TOE framework and concluded that adoption of technological innovations is greatly influenced by technological, organisational and environmental characteristics. Lin and Lin (2008) gathered data from 163 IS executives in large Taiwanese firms to justify the TOE model on e-business diffusion. They used structural equation modelling (SEM) for data analysis and among the TOE factors, IS infrastructure, IS expertise, expected benefits of e-business and competitive pressure are found to be important factors affecting e-businesses diffusion. Lee and Kim (2007) tested the TOE framework for studying implementation success of internet-based IS in Korea. They empirically studied the model using multivariate regression analysis and found that compatibility and IS infrastructure (environmental context) are key determinants in IS implementation success. The TOE model has also been used in the adoption of online financial services. Likewise, Riyadh *et al.(*2009) use the TOE framework for studying e-banking in SMEs in Bangladesh.

Besides the separate use of the TOE framework, only a few research studies (Zhu and Kraemer 2005; Zhu *et al.* 2004) have been carried out using datasets from both developed and developing

countries. These studies claim that environmental aspects play a much more important role in developing countries than in developed countries. For example, Zhu *et al.* (2004) studied information technology payoffs in the e-business environment in both developed and developing countries. They concluded that government regulations were more important in creating e-business value in developing countries in comparison with developed countries represented in the sample. It has also been found that the TOE framework has been equally applied in both qualitative (Chau and Tam 1997; Hackney *et al.* 2006) and quantitative (e.g., Lee and Kim 2007; Zhu and Kraemer 2005) research. In conclusion, the specific factors identified in the literature within TOE contexts vary and results may differ in developed and developing countries. Nonetheless, the TOE framework has received strong empirical support (Zhu *et al.* 2003; Zhu *et al.* 2004) in extant IS literature.

3.2.3 Appropriateness of TOE Framework for Theorising E2E Solutions' Value Conversion Contingencies

The TOE (Tornatzky and Fleischer 1990) framework provides a useful theoretical lens to represent value conversion contingencies. This is because it captures the TOE factors believed to have influence on IT value. This thesis intends to identify the value conversion contingencies and the TOE framework is consistent with that, as Tornatzky and Fleischer (1990, p.154) mention that TOE factors act as *'both constraints and opportunities for technological innovation'*.

IT value conversion contingencies' literature (Davern and Kauffman 2000) reports that value conversion contingencies are both internal and external. In addition, an analysis of value conversion contingencies/IT implementation barriers (chapter 2) reveals that factors reported in the extant literature can be categorised as technology, organisation and environment factors, and therefore, the TOE framework (Tornatzky and Fleischer 1990) is suited for analysing value conversion contingencies for E2E Solutions' value.

As is evident (see chapter 2) from the factors that differentiate developed and developing countries, understanding value conversion contingencies for developing countries involves an examination of TOE issues. An E2E Solution itself relies on public infrastructure at large and is impacted by the legal environment (Jain *et al.* 2010) besides organisational capabilities (i.e., IT, human and resources). Furthermore, the embedded nature of IT value in developing countries (cf. Avgerou 2008) also suggests that the TOE framework (Tornatzky and Fleischer 1990)

would better explain the conversion contingencies for E2E Solutions' value in developing countries.

As is evident in table 3.2, a few studies (Zhu and Kraemer 2005; Zhu *et al.* 2006; Zhu *et al.* 2004) have adopted the TOE framework (Tornatzky and Fleischer 1990) in the business value of IT context. For example, Zhu *et al.* (2004) studied value creation of e-business in the financial services industry and found tempirical support for the TOE framework. While all previous IT value literature (Zhu and Kraemer 2005; Zhu *et al.* 2006; Zhu *et al.* 2004) adopting the TOE framework was carried out at industry level (e.g. e-business value), this research intends to extend the TOE literature by using the framework for studying the business value of E2E Solutions at the business process level.

Table 3. 2: Use of TOE Framework in Previous IS Research					
Author(s)	Technology Factors	Organisation Factors	Environment Factors	Process Level View	IT Value Context
Zhu and Kraemer (2005) E-Business Adoption	Technology Competence	Size, International Scope, Financial Commitment, Front-End Functionality, Back-end Integration	Competitive Pressure, Regulatory Support	No	No
Pearson and Grandon (2006) E-Commerce Adoption	Compatibility, Perceived Ease of Use, Perceived Usefulness	Organisational Readiness, Organisational Support, Managerial Productivity, Strategic Decision Aids	External Pressure	No	No
Lin and Lin (2008) E-Business Diffusion in Taiwan	IS Infrastructure, IS Expertise	Organisational Compatibility, Expected Benefits of E-Business	Competitive Pressure, Trading Partners Readiness	No	No
Premkumar *et al.* (1997) EDI in Transportation Industry	Relative Advantage, Compatibility, Complexity, Cost	Top Management Support, Product Champion, Size	Climate, Net-dependence, Competitive Pressure, Customer Support	No	No
Kuan and Chau (2001) EDI Adoption	Perceived Direct Benefits, Perceived Indirect Benefits	Perceived Financial Cost, Perceived Technical Competence	Perceived Industry Pressure, Perceived Government Pressure	No	No
Teo *et al.* (2009) E-Procurement Adoption in Singapore	Perceived Direct and Indirect Benefits, Costs	Firm Size, Top Mgt. Support, Information Sharing Culture	Business Partner Influence	No	No
Seyal *et al*. (2007) EDI Adoption in Brunei	Perceived Benefits, Task Variety	Organisational Culture, Top Mgt Support, Motivation to Use EDI	Government Support	No	No
Sayel and Rahim (2006) EDI Adoption in Brunei	Perceived Direct Benefits, Perceived Indirect Benefits, Perceived Cost	IT Knowledge, Top Management Support	Government Support, Trading Partner Influence	No	No

Table 3. 2: Use of TOE Framework in Previous IS Research					
Author(s)	Technology Factors	Organisation Factors	Environment Factors	Process Level View	IT Value Context
Zhu, Kraemer and Xu (2006) Diffusion of E-Commerce	Technology Readiness, Technology Integration	Firm Size, Global Scope, Managerial Obstacles	Competition Intensity, Regulatory Environment	No	No
Grandon and Pearson (2004) E-Commerce Adoption	Perceived Ease of Use, Perceived Usefulness	Organisational Readiness	External Pressure	No	No
Chen (2005) Web Service Adoption	Perceived Benefits (Technical, Business, Operational, Strategic)	Firms' Technical Factors (Web services standards, application architecture, infrastructure tools, development tools)	Stakeholders of Web service standards (Vendors, System integrators, customers, web service providers)	No	No
Chwelos, Benbasat and Dexter (2001) EDI Adoption	Perceived Benefits	Financial Resources, IT Sophistication, Trading Partner Readiness	Competitive Pressure, Dependency on Trading Partner, Enacted Trading Partner Power , Industry Pressure	No	No
Chong and Pervan (2007) E-Commerce Adoption in Australia	Perceived Relative Advantages, Trailability, Observability	Communication Factors (Information Sources, Communication Amount)	Competitive Pressure, Non-Trading Institutions' Influence	No	No
Zhu,Kraemer, Xu and Dedrick (2004) E-Business in Fin. Services Industry	Technology Readiness	Firm Size, Global Scope, Financial Resources	Competition Intensity, Regulatory Environment	No	Yes
Zhu and Kraemer (2005) E-Business Value	Technology Competence	Size, International Scope, Financial Commitment	Competitive Pressure, Regulatory Support	No	Yes

3.2.4 Theorising E2E Solutions' Value Conversion Contingencies by Using the TOE Framework

Having established (in section 3.2.3) that the TOE framework is an appropriate lens to identify value conversion contingencies for E2E Solutions, the purpose of this section is to delineate value conversion contingencies as well as the relationships between these contingencies in the form of theoretical propositions. As revealed, the business value of IT is impacted by technology, organisation and environment factors (see chapter 2). This section theorises value conversion contingencies using extant literature. As the literature on E2E Solutions is in its infancy, this section thus reviews IT value literature as a starting point to determine how TOE factors impact on E2E Solutions' value. Section 3.2.4.1 reviews how technology factors impact on E2E Solutions' value. Section 3.2.4.2 examines how organisation factors impact on E2E Solutions' value. Section 3.2.4.3 considers how environmental factors impact on the organisational value realisation effort from E2E Solutions.

3.2.4.1 Effect of Technology Factors on E2E Solutions' Value

Technology factors include both internal and external technologies relevant to the firm (Tornatzky and Fleischer 1990). Technology factors are considered central to IT implementation success and factors identified are integration, IT-business alignment, technology readiness and system quality (e.g.,Au *et al.* 2009; Goh and Kauffman 2009; Srivardhana and Pawlowski 2007; Wagner 2006; Zhu *et al.* 2004).

Integration is the 'degree to which the internal and external business processes are integrated' (Bubak *et al.* 2006; Davenport *et al.* 2004). Absorptive Capacity Theory proposes that the greater the use of internal and external communication channels, the more likely is the successful implementation of IT and vice versa (e.g., Hamel and Prahalad 1989; Harrington and Guimaraes 2005). Without such integration, enterprise systems become an 'island of automation' and managers cannot achieve the 'single source of truth' for which they are looking (Bubak *et al.* 2006). Lack of integration may result in lack of knowledge sharing among business process participants causing potential value to be unrealised (cf. Davern and Kauffman 2000). Srivardhana and Pawlowski (2007) propose that integration/tight coupling of the system and processes could be a major moderator of ERP performance. Wagner (2006) finds that business internal alignment is a significant determinant of process performance of enterprise systems. In developing countries, both internal and external integration are frequently problematic and result in non-sharing of both internal and external knowledge (e.g., Riyadh *et al.* 2009).

IT-business alignment is the fit between strategic and/or structural aspects of the business and IT domain (e.g., Palmer and Markus 2000; Wagner 2006). A positive influence of IT-business alignment on IS effectiveness is evident in most of the literature (e.g., Tallon and Kraemer 2003; Tallon *et al.* 2000; Wagner 2006). Strategic alignment refers to organisation-wide IT support, culture and social dimensions (Henderson and Venkatraman 1993; Reich and Benbasat 1996). Structural alignment refers to the operational business domain, and includes business process matching with IT (Wagner 2006). Wagner (2006) concludes that a higher level IT-business alignment perspective directly influences ERP performance, while Palmer and Markus (2000) find no impact of IT-business alignment with performance in the retailing industry. Li and Ye (1999) represent strategic alignment as firm strategy and find that IT produces value when the firm's strategy is more proactive.

A number of research studies (Zhu and Kraemer 2005; Zhu *et al.* 2006; Zhu *et al.* 2004) report that technology competence is one of the important factors in IT use. Technology competence is measured by IT infrastructure in use, front-end and back-end integration, and IT human resources (e.g., Zhu and Kraemer 2005; Zhu *et al.* 2006; Zhu *et al.* 2004). Zhu *et al.* (2004) find that technology competence is the strongest factor for e-business value especially in developed countries. Zhu and Kramer (2005) studied e-business value in the retail industry, and found that technology competence is the strongest factor in the TOE framework in shaping business value.

The quality of the system in terms of reliability, ease of use and response time is found to be important for system usage in organisations (Rai *et al.* 2002; Sabherwal *et al.* 2006; Seddon 1997). Sabherwal *et al.* (2006) studied the impact of system quality on information system success in organisations. They measured the information system in terms of usage and found that system quality is one of the determinants of system usage. While system quality was found to be important for deriving business value, lack of suitable software standards was found to be a vital problem for ERP implementation in developing countries (Kapurubandara 2009; Rajapakse and Seddon 2005).

Therefore, this thesis presents the following proposition:

Proposition 3: *The impact of E2E Solutions on process performance is negatively affected by technology factors.*

3.2.4.2 Effect of Organisation Factors on E2E Solutions' Value

The TOE framework (Tornatzky and Fleischer 1990) states that, "*organizational context is described through several descriptive measures like firm size; the centralization, formalization, and complexity of its managerial structure; the quality of its human resources; the amount of slack resources available internally*". As literature on E2E Solutions is rare, this subsection reviews the extant IT value conversion contingencies/IT assimilation literature and finds that top management support (e.g., Au *et al.* 2009; Dong *et al.* 2009; Li and Ye 1999; Weill 1990; 1992), CEO and CIO relationship (Li and Ye 1999), facilitating conditions (e.g., Sabherwal *et al.* 2006), knowledge barriers (e.g., Chircu and Kauffman 2000) and usage barriers (e.g., Chircu and Kauffman 2000; Weill 1992) impact on the IT value realisation/IT assimilation in organisations.

Top management is defined as the 'organisational collective consisting of all the management committee members (CEO, CIO, COO and other top officials) and board members (e.g., Armstrong and Sambamurthy 1999; Molla and Licker 2005; Wiersema and Bantel 1992). Top management is the highest decision-making body within an organisation (cf. Rapp *et al.* 2008). Top management support is found to be important for technology adoption and implementation (e.g., Molla and Licker 2005) and the resulting IT assimilation (e.g.,Chatterjee *et al.* 2002) and value creation (e.g., Davern and Kauffman 2000; Peppard and Ward 2003). Top management support is considered complementary to unlocking business value from IT (Davern and Kauffman 2000; Peppard and Ward 2003). This is because IT usage is important, rather than IT spending (Devaraj and Kohli 2003) and top management involvement can ensure the proper usage of IT (Peppard and Ward 2003) and thus may affect value realisation. The top management's perception and attitude towards IT eventually determine organisational norms and values to use IT (Chatterjee *et al.* 2002). If senior management use IT at their end, it eventually spreads within the organisation (Chatterjee *et al.* 2002). Absorptive capacity literature (Cohen and Levinthal 1990) also reports that the roles of 'gatekeeper' and 'boundary spanner' are important for organisational learning and performance. Top management ability is important in creating IT value; lack of top management ability is also reported as a reason for the failure of IT implementation (e.g., Grover *et al.* 1995; Ranganathan and Dhaliwal 2001). Avgerou (2008) mentioned that lack of organisational change and commitment is the reason for IT failure in developing countries.

While the top management role is found to be important for IT assimilation and value realisation, Li and Ye (1999) studied the moderating role of CEO/CIO ties on the IT-

performance relationship. They found that the closer the ties between CEO and CIO, the stronger the impact of IT on performance.

Facilitating conditions for assimilation and the use of IT are regarded as important for IS implementation success (Sabherwal *et al.* 2006; Thompson *et al.* 1991). Facilitating conditions include human resources, skills, training, presence of help desk and technical support teams (Sabherwal *et al.* 2006). Both IT implementation success and absorptive capacity literature report that support services are critical for IT implementation success. Absorptive Capacity Theory (cf. Cohen and Levinthal 1990; Reagans and McEvily 2003) posits that human resource management practices and policies are one of the determinants of organisational absorptive capacity. Absence of facilitating conditions may cause IT failure. Kshetri (2007) mentions that that lack of organisational resources (financial, human, lack of awareness of benefits) are the most important barriers for e-business implementation success in developing countries. Besides human resources and training, financial resources are also important. Avgerou (2008, p. 137) observes in developing countries that *'IS projects are often starved of resources or lose political commitment, they are poorly maintained, and consequently, they are technologically as well as functionally degraded'*.

Implementation of new solutions and work practices in an organisation may create user knowledge barriers (Chircu and Kauffman 2000) and therefore, proper training is required to remove such barriers and nurture the absorptive capacity of employees. Park *et al.* (2007) hypothesise that users' absorptive capacity for assimilating ERP systems is positively related to their ERP usage. Besides end-user knowledge, knowledge of IT implementation team members is required for ensuring proper implementation by customisation of the software. Absorptive Capacity Theory mentions that IT vendors are one of the major sources of external knowledge (Srivardhana and Pawlowski 2007), and internal implementation teamwork is a 'gatekeeper' for acquiring knowledge from external IT vendors (Volberda *et al.* 2010). However, there is a lack of qualified IT staff in developing countries (Kshetri 2007; Mahdi and Dawson 2007) because of the poor salaries of IT professionals (Kaynak *et al.* 2005; Mahdi and Dawson 2007) and a 'brain drain' (Kundi and Shah 2009).

Usage barriers relate to the users' perceptions regarding technology and eventual acceptance and rejection of a system (Chircu and Kauffman 2000). Change management literature mentions that there is a human tendency to resist any changes (Joshi 1991). Staff resist changes because of the lack of information on the positive aspects of change, and power conflicts (Markus and Pfeffer

1983) that ultimately lead to project failure (Al-Mashari 2000; Kwahk and Ahn 2010). This is very much prevalent in developing countries. Mahdi and Dawson (2007) report that staff resistance to IT change initiatives is one of the reasons for IT implementation failure in banking in Sudan.

The study presents the following proposition:

Proposition 4: *The impact of E2E Solutions on process performance is negatively affected by organisation factors.*

3.2.4.3 Effect of Environment Factors on E2E Solutions' Value

The environment is the totality of outside factors considered by top managers in their decision-making (Li and Ye 1999, p. 45). The TOE framework (Tornatzky and Fleischer 1990) posits that the environmental context presents both constraints and opportunities for an organisation to adopt technological innovation. However, the literature based on the TOE framework studied the facilitating role of the environmental context in post-adoption innovation diffusion (Zhu *et al.* 2006) and e-business value (Zhu and Kraemer 2005; Zhu *et al.* 2004) and found that competitive pressure, partner readiness and the regulatory environment shape business value (Zhu and Kraemer 2005; Zhu *et al.* 2006). Besides, Melville *et al*. (2004) develop a conceptual model of the business value of IT and propose that national IT infrastructure might impact on IT value. Barua *et al.* (2004) empirically found that customer readiness has an impact on net-enabled business value creation.

Competitive pressure, the degree that the company is affected by competitors in the market (Zhu *et al.* 2004), is found to be associated with e-business value (Dong *et al.* 2009; Zhu and Kraemer 2005). Porter and Millar (1985) studied strategic causes for the relationship between competitive pressure and IT innovations. They observed that IT alters the rules of competition, affects industry structure and provides avenues to outperform competitors. Dong *et al.* (2009) found that e-business value is contingent upon competition. Zhu and Kraemer (2005) also conclude that competition positively impacts on e-business usage and e-business value. However, *Zhu et al.* (2004) found that competitive pressure has no impact on e-business value creation in the financial industry.

Partner readiness is defined as the degree to which a firm's suppliers are willing and ready to participate and conduct business activities electronically (Barua *et al.* 2004). Information technology is extending beyond organisational boundaries and increasingly connects trading

partners (Melville *et al.* 2004; Straub and Watson 2001). Therefore, focal firms' business value realisation may be impacted by trading partner readiness (Bakos and Nault 1997; Chatfield and Yetton 2000). Barua *et al.* (2004) found that higher levels of supplier e-business readiness are associated with greater levels of business process services digitisation (e.g. automated procurement). Melville *et al.* (2004) observed that inefficient business processes and outdated/lack of technologies of supplier firms negatively impact on a focal firm's business value realisation efforts in an inter-organisational system. While supplier readiness is an external factor (Melville *et al.* 2004; Zhu *et al.* 2006), focal firms may encourage suppliers to conduct business electronically by providing subsidies, business guarantees and training (e.g., Crook and Kumar 1998; Riggins and Mukhopadhyay 1993).

The regulatory environment shapes IT application and IT business value (Zhu *et al.* 2003; Zhu *et al.* 2006; Zhu *et al.* 2004). Regulation includes endorsement of the e-Signature Act, acceptability of soft copy as legal documents, enforcement of cyber law and e-banking rules (Molla and Licker 2005; Zhu *et al.* 2003; Zhu *et al.* 2006; Zhu *et al.* 2004). Williamson (1983, p.126) summarises in two ways how government regulatory environments could affect innovation diffusion, *'One is to take specific action to increase or decrease payoffs - by taking tax or other measures...The second way of influencing innovations is by altering the climate in which they are received'*. Zhu *et al.*(2006) provide a detailed list of regulatory actions through which government can influence organisational IS adoption and resulting value creation: (i) developing supportive e-business legislation in the areas of digital signatures, electronic transactions and intellectual property; (ii) making the Internet a trustworthy business platform by establishing privacy and consumer protection laws, dealing with fraud and credit card misuse; (iii) providing incentives for using e-business in government procurements and contracts, and offering support, training and funding. Government support for customers and firms varies between developed and developing countries. Government rules and regulations are more technology-friendly in developed countries than in developing countries. This is why, Zhu *et al.*(2006) conclude that the regulatory environment plays a more important role in developing countries than in developed countries. While the regulatory environment is important for developing countries (Zhu *et al.* 2006; Zhu *et al.* 2004), a review of extant IS adoption/implementation literature reveals that facilitating the regulatory environment for electronic transactions and electronic processing is either absent or weak in developing countries (e.g.,Doern and Fey 2006; Efendioglu and Yip 2004; Giannakoudi 1999; Gibbs *et al.* 2003; Kshetri 2007).

IT infrastructure includes the Internet, electricity and communication networks (Molla and Licker 2005). Melville *et al.* (2004) observe that if a firm adopted and co-specialised their own IT to the national IT, the possibility of business value from IT would increase. Although basic IT infrastructure is not a conventional asset specific to a particular firm, the differential business value of IT across developed and developing countries may be a manifestation of IT infrastructure across countries (cf. Dewan and Kraemer 2000). A solid ICT infrastructure, a good bandwidth Internet and a reliable telecommunication infrastructure are required for an organisation to implement an online platform and for customers to use the system. However, a reliable IT infrastructure is absent in developing countries (Kapurubandara 2006; Molla and Licker 2005; Sharma and Wickramasinghe 2004). Kapurubandara and Lawson (2007) found that e-commerce adoption in Sri Lanka is greatly hampered by high costs and unreliable ICT infrastructure (e.g., electricity and telecommunication).

Customer readiness refers to their capacity to engage in online transactions and communication with organisations (Barua *et al.* 2004; Molla and Licker 2005). The success of an IS implementation largely depends on customers' acceptance of the systems (Jaruwachirathanakul and Fink 2005; Mols 2000; Pikkarainen *et al.* 2004). This may be applicable for business value realisation of IT as Kohli and Grover (2008) observe that value realisation is a collaborative task. Barua *et al.* (2004) found customer readiness significant in deriving value from net-enabled technologies. Customers can engage in dialogue with suppliers during each stage of the product design and delivery process (cf. Ballantyne 2004; Payne *et al.* 2008). Customer readiness largely depends on customers' level of education, training, availability of resources, awareness and buying culture (Avgerou 2008; Datta 2011; Hawk 2004; Kundi and Shah 2009). The level of customer e-readiness has been found to be different in developed and developing countries, and customers in the latter group are not ready to adopt technology (Datta 2011; Hawk 2004). Avgerou (2008) observes that chronic poverty in developing countries is the main cause of failure of telecentre initiatives. Hawk (2004) relates low average income to low internet penetration and lower purchases over the web. Riyadh *et al.* (2009) report that cultural barriers are a reason for non-acceptance of ATMs in Bangladesh. This is why Datta (2011, p. 14) observes that in developing countries, *'even best technology remain[s] alien in the society'*.

This research thesis thus presents its final proposition:

Proposition 5: *The impact of E2E Solutions on process performance is negatively affected by environment factors.*

3.3 Presentation of Conceptual Model

This study utilised a theory building process proposed by Dublin (1969) and Whetten (1989) and consistent with the work of Wheeler (2002), Beaudry and Pinsonneault (2005) and O'Reilly and Finnegan (2010). This chapter develops constructs as well as relationships between these constructs in the form of propositions. The constructs and relationships are represented diagrammatically in the form of a conceptual model in figure 3.4.

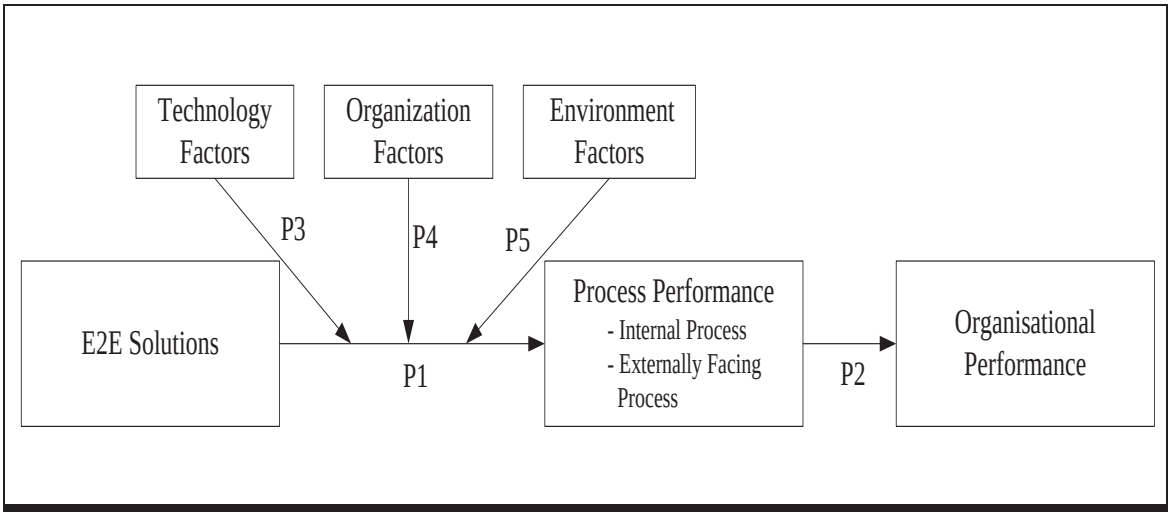


Figure 3. 4: Conceptual Model - Business Value of E2E Solutions

The research model is based on the premise that (i) E2E Solutions improve process level performance of organisations; (ii) business value of E2E Solutions (e.g. absorptive capacity of the organisation) is impacted by the technology, organisation and environment factors; (iii) E2E Solutions' value conversion contingencies occur at the process level; and (iv) E2E Solutions impact on the organisational level via process level performance. This model is consistent with other previous IT value models (see for example, Melville *et al.* 2004; Radhakrishnan *et al.* 2008) but has been modified and extended for capturing E2E Solutions' value and value conversion contingencies in developing countries. Existing research has neither considered the E2E nature of business process (see for example,Melville *et al.* 2004) nor conceptualised IT as a digital business capability (cf. Kohli and Grover 2008). Furthermore, it has ignored the environmental aspects of IT value contingencies (see for example, Radhakrishnan *et al.* 2008) despite the environment context being vital in developing countries (cf. Avgerou 2008). This high level conceptual model will guide empirical data gathering to achieve the research objective.

3.4 Summary

Drawing on Absorptive Capacity Theory, this chapter theorises E2E Solutions' value and finds that E2E Solutions deliver value to the organisation by improving both internal and externally facing processes. As the business value of E2E Solutions is impacted by value conversion contingencies, the TOE framework concurrently uses and identifies the high level value conversion contingencies: (i) technology factors; (ii) organisation factors; and (iii) environment factors. A conceptual research framework that integrates both Absorptive Capacity Theory and the Technology-Organisation-Environment (TOE) framework is developed to guide empirical data gathering. The next chapter (chapter 4) presents the research methodology of this study.

Chapter Four
Research Methodology

4.0 Introduction

The previous three chapters (chapters 1, 2 and 3) laid out the major points that inform the research and justification of this research in terms of the topic. Chapter 2 identified the need to study the derivation of value from E2E Solutions. Chapter 3 theorises E2E Solutions and value conversion contingencies and developed a conceptual research model for empirical data gathering. This chapter details the research approach and strategy adopted for the study. It argues that research design is a critical part of conducting research as it provides the blueprint of a research project and explains the details of how the research project has been carried out. This chapter starts with presenting the research objective and research questions (section 4.1) in response to the conclusion drawn in chapter 3. In order to best achieve the research objective and answer the research questions, alternative research paradigms and approaches are described (section 4.2). Due to the exploratory nature of the study and as part of the theory development process, a case study design was considered most appropriate for studying the E2E Solutions' performance. The operationalisation of the research approach is presented in section 4.3. Section 4.4 describes how the open, axial and selection coding were used to analyse the data. Finally, a summary of the research approach is presented in section 4.5.

4.1 Research Objective and Research Questions

Formulation of clear, concise, accurate and unambiguous research objectives is considered to be an important step for any empirical study (cf. Benbasat *et al.* 1987; Dube and Pare 2003). The objective helps in defining the research questions and research approach to be selected for the study. The research objective identified for the study is:

"to investigate the derivation of business value from E2E Solutions in developing countries".

As a logical next step to the identification of the research objective (cf. Nissen 1985), research questions were formulated to achieve it. The research questions identified for this thesis are:

Research Question 1: How do E2E Solutions deliver business value?

The purpose of this research question is to demonstrate how E2E Solutions deliver value. A review of the extant literature revealed that organisations are increasingly implementing E2E Solutions as part of business process reorientation and unimpeded flow of business process across the organisation and system boundary. But there is a lack of empirical evidence

demonstrating how E2E Solutions deliver business value. This reveals that the realisation of value from E2E Solution is rather difficult and complex in relation to stand-alone IT. First, the realisation of value from E2E Solutions is dependent on the actions of the multiple parties (including external parties) involved in the business process. Second, unlike other stand-alone systems (e.g., stand-alone ERP), E2E Solutions are subject to compliance with more stringent regulations as they bring customers, partners and suppliers into a single process, as well as being dependent on the public infrastructure at large (e.g. Internet). Thus, this research question was developed to illustrate the pervasive nature of E2E Solutions' value.

Research Question 2: How is the achievement of business value from E2E Solutions impacted by value conversion contingencies?

This question is exploratory in nature, and aims to demonstrate the mechanism by which business value of E2E Solutions is impacted by value conversion contingencies. The review of the literature (chapter 2) reveals that how the business value of E2E Solutions is impacted by value conversion contingencies is not well documented. This research question is formulated to demonstrate how the business value of E2E Solutions is impacted by value conversion contingencies. This research question essentially helps in explaining the sustained 'IT productivity paradox' in developing countries.

The two research questions posed are expected to ensure that the research objective is met. Because of their exploratory (cf. Yin 1994) and theory-driven (cf. Eisenhardt and Graebner 2007) nature, both research questions start with 'how'. As Eisenhardt and Graebner (2007, p.26) mention, *"theory building research using cases typically answers research questions that address 'how' and 'why' in unexplored research areas particularly well'*. A similar conclusion was drawn by Dennis and Valacich (2001, p. 14) who mention that *"Theory is the why of the phenomenon, not the what"*.

4.2 Epistemology

This section argues that four dominant research paradigms underpin IS research: positivism, interpretivism, critical theory and post-positivism, and presents the position (post-positivism) adopted for this study. Section 4.2.1 presents the research philosophies adopted by IS researchers and introduces research paradigms. Four dominant research paradigms: positivism (section 4.2.2), interpretivism (section 4.2.3), critical theory (section 4.2.4) and post-positivism (section 4.2.5) are discussed. This section concludes that any one epistemology or a combination of epistemologies can readily be applied to IS studies subject to being able to

conduct that study while satisfying the conditions associated with methodologies employing the particular epistemology.

4.2.1 Research Philosophies

All research is based on underlying philosophical assumptions of what constitutes 'valid' research and selecting the best method that goes well with the philosophical assumptions (cf. Guba and Lincoln 1994; Orlikowski and Baroudi 1991). Philosophical assumptions relate to underlying epistemological assumptions about knowledge and how it can be acquired, and essentially guide the appropriate methodology (e.g., Hirschheim 1992). The philosophical stance influences the selection of approaches to data interpretation (cf. Easterby-Smith *et al.* 1991). Therefore, researchers should be aware of the ontological and epistemological assumptions they subscribe to as well as their weaknesses (cf. Remenyi *et al.* 1998).

Guba and Lincoln (1994) defined a research paradigm as "... *a set of basic beliefs (or metaphysics) that deal with ultimates or first principles. It represents a world view that defines, for its holder, the nature of the 'world', the individual's place in it, and the range of possible relationships to that world and its parts*" (p. 107). All past research paradigms can be characterised by the way researchers respond to three key questions: ontological assumptions, epistemological assumptions and methodology (cf. Guba 1990). Ontological questions deal with the nature of the 'knowable' or nature of 'reality' (Guba 1990). Epistemological assumptions determine the nature and form of relationship between the researcher (the inquirer) and the subject(s) (cf. Guba and Lincoln 1994; Orlikowski and Baroudi 1991). Epistemological beliefs determine what constitutes knowledge, i.e. something that can be 'acquired' or that needs to be 'experienced' (e.g., Burrell and Morgan 1979). The methodological dimension guides data gathering and analysis about the subject matter under investigation. The research paradigm can be classified in four types: positivistic, interpretive, critical and post-positivist (Orlikowski and Baroudi 1991). The philosophical aspects of research paradigms are presented in table 4.1 and described in the next few subsections.

Table 4. 1: Philosophical Perspective of Four Research Perspectives

Items	Positivism	Interpretivism	Critical Theory	Post-positivism
Ontological Assumptions	Naive realism-'real' reality but apprehendable	Relativism-the social world is produced and reinforced by humans through their actions and interaction	Historical realism-social reality is historically constituted; human beings, organisations and societies are not confined to existing in a particular state	Critical realism-'real' reality but only imperfectly and probabilistically apprehendable
Epistemological Assumptions	Dualist/ objectivist; findings true	Subjectivist/ transactional; created findings	Subjectivist/ transactional; value mediated findings	Modified dualist/objectivist; critical tradition/community; findings probably true
Methodology	Experimental/ manipulative; verification of hypothesis; chiefly quantitative methods	Hermeneutical /dialectical	Dialogic/ dialectical	Modified experimental/ manipulative; critical multiplism; falsification of hypothesis; qualitative methods

Source: Developed from Benbasat and Zmud (2003); Guba and Lincoln (1994); Orlikowski and Baroudi (1991).

4.2.2 Positivism

The philosophy underpinnings to positivism are that the goal of knowledge is to describe a phenomenon as it is manifested and does not question whether it exists or not. Positivism is the approach of the natural sciences (Hirschheim 1992; Lee 1991). Positivist research is considered as value-free; it studies cause-effect relationships; and employs scientific methodologies to do research; results are valid, reliable and replicable (cf. Checkland 1981). The objectives of positivist researchers are to do rigorous, exact measures and ‘objective’ research and tests of hypotheses (Orlikowski and Baroudi 1991). Burrell and Morgan (1979) define positivist epistemology as that, "*which seek[s] to explain and predict what happens in the social world by searching for regularities and causal relationships between its constituent elements*". Positivism enables researchers to build knowledge through an iterative cycle:

a) Formulate a theory about some observed aspect of the world;
b) Derive hypothesis;

c) Test hypothesis objectively;
d) Observe results;
e) Confirm or refute hypothesis; and
f) Accept, modify or reject theory.

Positivism can best be described in terms of three assumptions (e.g., Chen and Hirschheim 2004). *Ontologically*, positivists believe that reality exists objectively and independently from human experience. *Epistemologically*, positivists are concerned with hypothesis testing through establishing causal relationships. *Methodologically*, positivist researchers take value-free positions and use objective measurement for collecting research evidence. Different research paradigms rely on different research methods and techniques for collecting and analysing data. For example, quantitative methods such as laboratory experiments, field experiments, surveys and case studies are typical positivist instruments. Positivists seek large amounts of empirical data that they can analyse statistically to detect underlying regularities (cf. Weber 2004).

The positivist approach has great applicability in practical research and many applied researchers therefore use it. This is clearly evidenced by any review of the IS journals, especially those that are based in the USA (cf. Alavi and Carlson 1992). Positivist researchers believe in the absolute supremacy of the methods of the natural sciences. Hirschheim (1985, p. 33) thus mentioned, *"Positivism has a long and rich historical tradition. It is so embedded in our society that knowledge claims not grounded in positivist thought are simply dismissed as a scientific and therefore invalid'*. Unlike other research methods, it is an advantage of positivist research that both quantitative and qualitative methods can be used.

Although the positivist approach has been widely adopted in IS and other social science research, it is also subject to criticism (e.g., Allison 1993; Baroudij *et al.* 1986). Positivist research is criticised on the grounds of failing to deal with the meaning of real people and their capacity to feel and think; ignoring social context; being anti-humanist; and believing in the status quo (e.g., Neuman 2000). The value-free approach adopted by positivists often leads researchers to become detached from the phenomenon of interest (cf. Allison 1993). Allison (1993) mentioned that time and culture are two important aspects of studying information systems in organisations; however, the positivist approach ignores these aspects. The positivist approach has largely used quantitative survey methods for data collection, and therefore, generalisation does not allow for in-depth studies. Quantitative approaches are often superficial and limited, as numerical descriptions are produced which make it *"difficult to get the real*

meaning of an issue" (Krueger 2003). In the IS research, the appropriateness of the positivist approach is questioned by many researchers (e.g., Galliers and Land 1987; Hirschheim 1992) as IS is considered a social system (e.g., Galliers 1991; Galliers and Land 1987). Furthermore, the positivist approach is used to test theory, thus requiring the existence of a prior model and relationship within the constructs (cf. Klein and Myers. 1999) which may not be possible in many areas of IS as it is an emerging field.

4.2.3 Interpretivism

Interpretivism is another dominant paradigm in studying IS (cf. Braa and Vidgen 1999; Orlikowski and Iacono 2001). The assumption of interpretative philosophy is that a researcher can never assume a value-neutral stance, and is always implicated in the phenomena being studied, because researchers' prior assumptions, beliefs, values and interests will always intervene to shape and interpret their investigations (cf. Orlikowski and Baroudi 1991). Therefore, interpretive studies refute the positivist's 'value-free' stance. Interpretivism believes that human interaction with an object inevitably involves understanding and meaning (e.g., Chua 1986). Interpretive research does not configure dependent and independent variables and establish a relationship among them, rather it takes a holistic view to understanding the complexity of 'human sense making' (cf. Kaplan and Maxwell 1994) as it views the world as 'an emergent social process' (cf. Burrell and Morgan 1979). Orlikowski and Baroudi (1991) describe the suitability and intent of interpretive approaches to research:

a) for gaining an understanding of the phenomenon within cultural and natural settings;
b) for gaining a deeper understanding of a phenomenon of interest; and
c) for conducting the research from the perspective of the participants; without imposing the researcher's own understanding on the situation.

Interpretivism can best be described in terms of three assumptions (cf. Orlikowski and Baroudi 1991). *Ontologically*, interpretivists look for meaning in the social context. Interpretation is subjective and depends on the observer. *Epistemologically*, interpretivists do not assume the existence of fixed relationships. Thus this approach is better used in theory development. *Methodologically*, interpretivists do not take a value-free position and use subjective measurements for collecting research evidence. Qualitative methodology is dominantly used in interpretivist studies.

Despite its growing application in studying IS in organisations (cf. Klein and Myers. 1999), interpretivism is also subject to criticism (e.g., Kaplan and Duchon 1988; Neuman 2000; Orlikowski and Baroudi 1991), as presented below:

a) Statistical generalisation is not possible.
b) Defends status quo.
c) Too subjective and relativist.
d) People's ideas treated as more important than actual conditions.
e) Focused on localised, micro level and short-term settings
f) Interpretive studies are amoral and passive.
g) Interpretive research neglects to explain historical changes.

As this research develops a conceptual research model from extant literature, an interpretivism approach may not be suitable.

4.2.4 Critical Theory

The purpose of critical social research is *'to explain a social order in such a way that it becomes itself the catalyst which leads to the transformation of this social order'* (Fay 1987). A critical philosophical stance (Hirschheim and Klein 1989) aims to critique the status quo and to transform social relations by revealing the underlying source of social relations and to empower people (cf. Lyytinen and Klein 1985; Orlikowski and Baroudi 1991). Cecez-Kecmanovic (2010, p. 3) thus described critical research as *"socially critical research, which challenges established social conditions and institutions and oppressive forms of control, often enabled and supported by IS, which prevent the realization of humane, just and free organizations and society"*.

Critical Theory can best be described in terms of three underlying assumptions (Guba and Lincoln 1994). *Ontologically*, critical theorists believe that reality exists. Social reality is historically constituted; human beings, organisations, and societies are not confined to existing in a particular state. *Epistemologically*, critical theorists believe in subjectivism, in the sense that values mediate inquiry. Knowledge is grounded in social and historical practices. A critical evaluation of social systems is required to acquire and justify knowledge (e.g., Benbasat and Zmud 2003). *Methodologically*, critical theorists take a transformative position, and initiate changes in social relations and practices. Critical theorists try to eliminate false consciousness and enable and facilitate transformation (e.g., Cecez-Kecmanovic 2010).

Few researchers (e.g., Alvesson and Deetz 2000; Myers and Klein Forthcoming) have tried to provide practical guidelines to conducting critical research. For example, Alvesson and Deetz (2000) suggest three steps in critical research: insight, critique and transformative redefinition (pp. 139–153). Alternatively, Myers & Klein (Forthcoming) (Appears in Cecez-Kecmanovic 2010) suggested six principles to be followed while conducting critical IS research, including:

a) using core concepts from critical social theories.
b) taking a value position.
c) revealing and challenging prevailing beliefs and social practices.
d) improvements in society.
e) improvements in social theories.

Although Critical Theory has a long tradition and can be traced back to the enlightenment ideal and Kant's view of the human potential and responsibility to achieve enlightenment and emancipation (e.g., Brocklesby and Cummings 1996; Cecez-Kecmanovic 2010), very few full-time researchers adopt the critical research approach. This may be because as Chua (1986 p.626) reports, *'Critical theorists don't share common philosophical standards for evaluation of theories. What is acceptable theory or explanation is still debatable'*. Guba and Lincoln (1994) and Cecez-Kecmanovic (2010) provide a detailed list of early philosophers who have contributed to the development of Critical Theory. They mention that Weber's theory of bureaucracy, neo-Marxism, materialism, feminism, moral philosophy, Freireism and participatory inquiry were considered as early critical theory (e.g., Cecez-Kecmanovic 2010; Guba and Lincoln 1994). Because of the diversity of theories under Critical Theory, Guba and Lincoln (1994, p.23) mention that *"The level critical theory is no doubt inadequate to encompass all the alternatives that can be swept into this category of paradigm. A more appropriate label would be 'ideologically oriented inquiry'"*. Critical researchers ask critical questions and hurt others; however, they are not critical enough of themselves. Critical Theory also suffers from not having its own distinct methodological identity, while some researchers adopt experiments, surveys and structural equation modelling (e.g. positivist methods), others use field study, ethnography and action research (e.g. interpretivist methods) (cf. Cecez-Kecmanovic 2010).

4.2.5 Post-Positivism

Post-positivists share many assumptions of positivism; however, they try to overcome the criticisms of positivism. This is why Guba (1990) mentions that post-positivism is the modified

version of positivism. Guba (1990) and Guba and Lincoln (1994) mention that the criticisms that positivism faces, i.e., relevance, richness, theory building ability, etc., are overcome by post-positivism as it takes the middle position between positivist and interpretivist research. Guba (1990) explains how post-positivist research overcomes the criticisms of positivist research:

a) *The imbalance between rigor and relevance*: Trade-offs exist between internal and external validity ensuring rigorous internal validity hampers the generalisability of the findings. Post-positivist research, as carried on in a more 'natural setting', tries to make a balance between rigor and relevance.
b) *The imbalance between precision and richness*: While precision is very important, to achieve it, positivists heavily rely on statistical and mathematical methodology and ignore the richness of the data. The post-positivist research tries to tackle both precision and richness by including more qualitative methods (e.g. case study).
c) *The imbalance between elegance and applicability*: While achieving generalisability, positivist researchers ignore the locality and specificity and thus lose the scope of theory building. Grounding theory fits with post-positivism approaches where research is carried out in such a way that theory is the product rather than the precursor of the research.
d) *The imbalance between discovery and verification*: The positivist approach focuses on the verification (falsification) of the hypothesis rather than the discovery of theories and developing of the hypothesis. Post-positivism takes the middle position of a continuum where 'pure' discovery lies at one end and 'pure' verification lies at the other end.

Post-positivism can be characterised in terms of three assumptions (e.g., Guba 1990; Guba and Lincoln 1994). *Ontologically*, post-positivism is labelled as critical realism (Cook and Campbell 1979). It assumes that reality exists but can never be fully apprehended by researchers because of their imperfect sensory and flawed intellectual mechanisms. *Epistemologically*, post-positivists believe in modified subjectivism. They say that 'objectivity' is a regulatory ideal, but can only be approximated by a human being. External guardians (e.g. critical tradition, critical community) are important. *Methodologically*, post-positivist researchers emphasise 'critical multiplism'. Post-positivist research contributes much to 'grounded theory' (cf. Glaser and Strauss 1967; Strauss and Corbin 1990) by conducting research in natural settings, collecting situational data and placing importance on the discovery of knowledge.

Epistemologically, this study takes a 'post-positivist' or 'soft positivist' approach as the researcher seeks to 'approximate reality' (cf. Guba 1990), meaning that the process is designed to reveal pre-existing phenomena and relationships among them as well as being open to new data emerging from the field. This assumes that the phenomena under investigation are relatively stable and objectively exist, which is consistent with a positivist view. However, the approach is not limited to examining pre-identified constructs, but is designed to surface other constructs as well, in the manner of interpretivists or grounded theorists. This research paradigm is deemed suitable for studying an E2E Solution as this study utilises the building block of theory development by delineating constructs as well as the relationships between these constructs in the form of theoretical propositions. The approach is proposed by Dublin (1969) and Whetten (1989) and consistent with Eisenhardt's (1989) method and the Madill *et al.* (2000) arguments and is further enriched by IS researchers such as Feller *et al.* (2008), Kirsch (2004), and Leidner *et al.*(2009*)*.

4.3 Research Strategy: Operationalising the Research Approach

This section argues that an exploratory research approach is deemed appropriate for this study as the paucity of literature on E2E Solutions' value prevents the researcher from identifying detail constructs, relationships and indicators from the extant literature. This section documents the research strategy adopted, starting with an overview of research methods (section 4.3.1). The justifications for choosing an exploratory approach and the methods for conducting exploratory IS research (field study (section 4.3.2) and case study (section 4.3.3)) are discussed. It argues that case study design best suits the needs of this research, given the exploratory nature of the study. The justification for adopting case study, procedure for selection of organisations for data gathering, validity and reliability of case study design, and unit of analysis are also explored in the case study section. Section 4.3.4 discusses the data collection techniques used in case study design; interview and document gathering, and illustrates the data gathering process. Lastly, this section concludes by presenting the limitations of the chosen strategy (section 4.3.5).

4.3.1 Research Methods

A research design is a logical sequence that connects empirical data to research questions and conclusion (e.g., Yin 1994). Each type of empirical research has either an explicit or implicit research design. A research design helps to operationalise the research in order to collect data, analyse and answer the research question (cf. Yin 1994). Thus, the selection of research method is important to ensure the right alignment among research questions, data collection and analysis

techniques. A researcher needs to be aware of the strengths and weaknesses of the chosen research strategy so they can ensure the best chosen approach. Dennis and Valacich (2001, p. 17) mention that, *"The best research designs, regardless of method, are those that openly accept their flaws and aggressively play to their strengths"*.

The literature (e.g., Marshall and Rossman 1995; Miles and Huberman 1994; Yin 1994) offers various taxonomies of research approaches that help researchers to select the most appropriate strategy in order to ensure the right alignment between purpose of the study, research questions, research method and data collection techniques. Table 4.2 presents a research framework that is deemed to be appropriate for this research project. As the field study and case study are widely used research methods for conducting exploratory research, they are covered in the next two sections.

Table 4. 2: Approaches to Research

Purpose of Research	Research Questions	Research Method	Sample Data Collection Technique
Exploratory (to investigate little-understood phenomena; to identify/discover important variables; to generate hypotheses for future research)	What are the salient themes, patterns, and categories in respondent's answer? How are the patterns linked?	Field study; case study	Participant observation; in-depth interviewing; elite interviewing
Exploratory (to explain causes of phenomena; to identify plausible causal networks shaping phenomena)	What events, beliefs, attitudes and policies are shaping this phenomenon? How do forces interact?	Multi-site case study; history; field study; ethnography	Participant observation; in-depth interviewing; survey questionnaire; document analysis
Descriptive (to document the phenomenon of interest)	What are salient behaviours, events, beliefs, attitudes and process?	Field study; case study; ethnography	Participant observation; in-depth interviewing; document analysis; unobtrusive methods; survey questionnaire
Predictive (to predict outcome of the phenomenon; to forecast events and behaviours resulting from phenomenon)	What will occur as a result of this phenomenon? Who will be affected? How?	Experiment; quasi-experiment	Large sample survey; content analysis

Source: Marshall and Rossman (1995, p.41)

4.3.2 Field Studies

Field study is *"an extension of laboratory experiments into an organizational context"* (Braa and Vidgen 1999, p. 31). A field study is suitable for exploratory research and offers many benefits. First, in field study as data is collected from large populations, the study results are found to be generalisable to other fields (cf. Jenkins 1985). Second, a field study is carried out in natural settings and therefore, field research is known to be pragmatic (cf. Braa and Vidgen 1999; Hirschheim 1992). Third, field study (known as field experiments) ensures precision (cf. Braa and Vidgen 1999). Fourth, field study aligns towards the continuum of prediction like positivist research (cf. Braa and Vidgen 1999) and 'predictive ability' is the goal of any 'scientific enquiry' (cf. Dennis and Valacich 2001).

Despite several advantages of field study research, this method is not appropriate for this particular research. First, field study requires a 'prior' research model specifying the relationship among the indicators (cf. Benbasat *et al.* 1987; Braa and Vidgen 1999) which is not possible in the present research, because of the paucity of literature on E2E Solutions. As Braa and Vidgen (1999, p.31) mention, *"One feature of the laboratory experiment that is applicable to field experiments is the identification of precise relationships between chosen variables using quantitative analytical techniques"*. Second, understanding a phenomenon rather than prediction is the goal of this research.

4.3.3 Case Studies

The case study is "*an empirical inquiry that investigates a contemporary phenomenon within its real-life context, especially when the boundaries between phenomenon and context are not clearly evident*" (Yin 1994, p. 13). Case study research is the most commonly used qualitative IS research method in organisational contexts (cf. Darke *et al.* 1998; Orlikowski and Baroudi 1991). Case study research can be positivist (Benbasat *et al.* 1987; Yin 2002) and interpretive (Myers 1995; Walsham 1995; Walsham 1993). A positivist case study is conducted in a natural setting (cf.Benbasat *et al.* 1987) having predefined phenomenon but does not control or manipulate variables (Darke *et al.* 1998). Therefore, case study research provides in-depth understanding of the phenomenon of interest (cf.Eisenhardt 1989). An interpretive case study rejects the notion of value-free research and focuses on the cultural and historical setting of the researchers, often requiring frequent visits to the field over an extended period of time (cf.Walsham 1995).

Case study research can focus on single or multiple sites. A single case study is appropriate when it is a revelatory case, an extreme or unique case, or when it represents a critical case for testing a well-formulated theory (Yin, 1994). A single case study design allows the investigator to examine phenomenon in depth to provide a rich account (Walsham, 1995). Alternatively, multiple case study designs facilitate cross-case analysis and evaluation, and are appropriate for the examination of a phenomenon in diverse settings. Nevertheless, both types of study designs are suitable for exploratory research and theory-building research (Eisenhardt 1989; Yin 1989).

Case study research is suitable in situations where research questions posed start with 'how' or 'why' and the focus is on current as opposed to historical phenomenon (cf.Leidner and Jarvenpaa 1993; Yin 1994). Undertaking a case study research design does not mean that the researcher is constrained by a single method for data collection. As Yin (1994 p.13) mentions, a case study "*relies on multiple sources of evidence*". This is the major strength of case study research. Multiple data sources of evidence provide a richer picture of the phenomenon (cf.Benbasat *et al.* 1987; Dube and Pare 2003). Another major strength of case study research is its ability for theory development. Case study research and theory development are becoming synonymous as the former can be used to describe a phenomenon, to develop and test a theory (cf.Darke *et al.* 1998) and theory can be developed using other methods as well (cf.Eisenhardt and Graebner 2007). Although case study research is treated as 'empirical scientific research' (Galliers 1992), it has some disadvantages. The controllability, deductibility and repeatability are three main weaknesses of case study design (e.g.,Gable 1994). In this regard, it is worth noting Dennis and Valacich's (2001 p.4) comment that, "*Each scientific method has its strengths; unfortunately, all methods of science are flawed*".

Based on the forgoing discussion, a case study approach is deemed fit for undertaking the present research. This research is more inclined towards a positivist case study (e.g.,Feller *et al.* 2008) as it utilises a theory building process by delineating constructs as well as relationships between these constructs in the form of theoretical propositions. The next section provides a detailed justification for selecting a case study approach.

4.3.3.1 Justification of the Case Study

This study employs a case study as the research approach. Case study research has gained considerable attention in the IS research community in the last couple of years (cf. Darke *et al.* 1998; Dube and Pare 2003). The case study approach is the chosen research method on several grounds.

First, case study research allows for engaging in exploratory theory building (cf. Dube and Pare 2003; Eisenhardt 1989), first by exploring how E2E Solutions deliver business value, and then describing how the business value of E2E Solutions is impacted by value conversion contingencies. The literature (e.g., Dube and Pare 2003; Eisenhardt and Graebner 2007; Eisenhardt 1989) describes the suitability of the case study for theory building research. The reasons cited are case study research can be conducted in natural settings without manipulation of data. Case study research also allows an understanding of the complex nature of phenomenon and provides in-depth understanding. In this case, Eisenhardt and Graebner (2007, p.25, 26) report, *"theory-building approach is deeply embedded in rich empirical data, building theory from cases is like[ly] to produce theory that is accurate, interesting and testable"*. The process of theory building from the case study adopted in this study is presented in table 4.3.

Second, the case study method is also adopted because of the research objectives identified and the research questions posed. This research has two research questions: (i) how do E2E Solutions deliver business value? and (ii) how is the achievement of business value from E2E Solutions impacted by value conversion contingencies? These two research questions invite answers that are exploratory in nature. The appropriate method suggested for answering question(s) starting with 'how', as this research does, is a case study (cf. Miles and Huberman 1994; Yin 1994).

Third, the topic of E2E Solutions has not received enough research attention (chapter 2) and the case study method is suggested when little is known about the phenomenon and theory is at an early stage (cf.Benbasat *et al.* 1987). Benbasat *et al.* (1987 p.369) argue that the case study is suitable for researching *"certain types of problems; those in which research and theory are at their early, formative stages; sticky practice based problems, whether the experiences of the actors are important and the context of action is critical"*. The realisation of value from E2E Solutions is a complex phenomenon, where multiple parties within and outside the firm are involved. Therefore, the study needs to be conducted in natural settings and a case study is thus deemed suitable.

Table 4. 3: Process of Building Theory from Case Study Research		
Step	Activity	Reason
Getting Started	Definition of research question Possibly *a priori* constructs Neither theory nor hypothesis	Focuses efforts. Provides better grounding of construct measures. Retains theoretical flexibility
Selecting Cases	Specified population. Theoretical, not random, sample.	Constrains extraneous variation and sharpens external validity Focuses efforts on theoretically useful cases- i.e., those that replicate or extend theory by filling conceptual categories.
Crafting Instruments and Protocols	Multiple data collection methods. Qualitative and quantitative data combined. Multiple investigators.	Strengthens grounding of theory by triangulation of evidence. Synergistic view of evidence. Fosters divergent perspectives and strengthens grounding.
Entering the Field	Overlap data collection and analysis, including field notes. Flexible and opportunistic data collection methods.	Speeds analyses and reveals helpful adjustments to data collection. Allows investigators to take advantage of emergent themes and unique case features.
Analysing Data	Within-case analysis. Cross-case pattern search using divergent techniques.	Gains familiarity with data and preliminary theory generation. Forces investigators to look beyond initial impressions and see evidence through multiple lenses.
Shaping Hypotheses	Iterative tabulation of evidence for each construct. Replication, not sampling, of logic across cases. Search evidence for 'why' behind relationships.	Sharpens construct definition, validity and measurability. Confirms, extends and sharpens theory. Builds internal validity.
Enfolding Literature	Comparison with conflicting literature. Comparison with similar literature.	Builds internal validity, raises theoretical level and sharpens construct definitions. Sharpens generalisability, improves construct definition and raises theoretical level.
Reaching Closure	Theoretical saturation when possible.	Ends process when marginal improvement becomes small.

Source: Eisenhardt (1989 p.533)

Fourth, a case study is justified for this research as it investigates the use of E2E Solutions in the organisational context. Researchers (cf. Benbasat *et al.* 1987; Dube and Pare 2003) suggest using case study while studying IS phenomenon in organisations. As Darke *et al.* (1998, p. 278)

mention, *"Case study research is particularly appropriate for the study of information systems development, implementation and use within organisations"*. It argues that IS use in the organisation is a complex phenomenon; people with different organisational hierarchies have different perspectives about a phenomenon (cf. Kathuria *et al.* 1999; Lincoln and Zeitz 1980). A case study serves better when a single source of information is not considered adequate to draw conclusions about an organisation (cf.Phillips 1981) and this is the case in the present research.

4.3.3.2 Selection of Sample Organisations

A careful selection of organisations for data collection is very important as theory development potential and richness of data largely depend upon the right selection of organisations. Two practical problems researchers face in selecting sample organisations are firstly, determining the appropriate sample size and secondly, selecting a representative sample from the population. Although there are no hard and fast rules of appropriate sample size in case study design, the literature (Eisenhardt 1989; Yin 2003) suggests that it should not be too little (may miss some aspect) or too many (managing data would be problematic) and any number in between four to ten is considered adequate for theory development. The selection of a meaningful sample could be based on a literature review, or expert opinion or market performance (e.g.,Amelinckx *et al.* 2008; O'Reilly and Finnegan 2010).

This research selects nine theoretically useful organisations for an in-depth study. This research is based on banks in Bangladesh. At the first stage, all 48 banks were contacted to participate in the study; however, 30 out of 48 banks agreed. The researcher himself conducted a single interview with all 30 banks. After conducting the first round of interviews, the researcher realised that banks are at three stages in terms of E2E Solutions' implementation and use: high end, mid end and low end. The researcher then selected nine organisations from 30, but selected representative banks from each of three groups for both literal (homogenous case selected to predict similar results) as well as theoretical (heterogeneous sample selected to predict contrasting results) replication logic. The selection process of sample organisations is presented in table 4.4.

Table 4. 4: Selection of Sample Organisations				
Banks invited to participate in this study (48 banks)	Banks participated in the study in the pilot stage (30 banks)	Banks participated in the final study (09 banks)	Literal Replication Logic	Theoretical Replication Logic
1. HSBC*	-	-	Six banks (e.g., BA, BRAC, CBL, DBL, DBBL, EBL) belong to High End E2E Solutions Deployed Banks (Homogenous organisation)	Heterogeneous Analysis
2. BA	1. BA	1. BA		
3. SCB	2. SCB	-		
4. BRAC	3. BRAC	2. BRAC		
5. Ceylon	4. Ceylon	-		
6. BASIC	-	-		
7. IBBL	-	-		
8. AB	5. AB	-		
9. Standard	6. Standard	-		
10. Trust	7. Trust			
11. Rupali	8. Rupali	-		
12. CBL	9. CBL	3. CBL		
13. UCBL	10. UCBL	-		
14. NCCBL	11. NCCBL	-		
15. UBL	12. UBL	-		
16. DBL	13. DBL	4. DBL		
17. DBBL	14. DBBL	5. DBBL		
18. EBL	15. EBL	6. EBL		
19. Pubali	16. Pubali	-		
20. Sonali	17. Sonali	-		
21. Agrani	18. Agrani	-		
22. PBL	19. PBL	-		
23. MBL	20. MBL	7. MBL	Two banks (MBL, UCBL) belong to Mid-End E2E Solutions Deployed Banks (Homogenous organisation)	
24. One	21. One	-		
25. UCBL	22. IFIC	-		
26. AL-Arafa	23. AL-Arafa	-		
27. SBL	24. SBL	-		
28. SE	25. SE	-		
29. NBL	26. NBL	-		
30. IFIC	27. UCBL	8. UCBL		
31. JAMUNA	28. JAMUNA	-		
32. BCB	-	-		
33. BSRS	-	-		
34. BKB	-	-		
35. BSB	-	-		
36. CITI NA	-	-		
37. FSB	-	-		
38. HABIB	-	-		
39. ICB ISLAMI	-	-		
40. PREMIER	-	-	JB belongs to	

Table 4. 4: Selection of Sample Organisations				
Banks invited to participate in this study (48 banks)	Banks participated in the study in the pilot stage (30 banks)	Banks participated in the final study (09 banks)	Literal Replication Logic	Theoretical Replication Logic
41. RAKUB	-	-	Low-End E2E Solutions Deployed Banks	
42. JB	29. JB	9. JB		
43. SIBL	-	-		
44. EXIM	30. EXIM	-		
45. WOORI	-	-		
46. DBBL	-	-		
47. AL-FALAH	-	-		
48. Mutual Trust	-	-		

Note: * Banks' acronyms

4.3.3.3 Rigor in Case Study

Proper precaution needs to be taken in case study research because of the high level of subjectivity and concern about generalisability (cf.Yin 1994). The literature (Miles and Huberman 1994; Stuart *et al.* 2002; Yin 1994) has prescribed various procedures to ensure rigor in case study design. Table 4.5 summarises how this study satisfies four aspects of rigor: construct validity, internal validity, external validity and reliability as prescribed by case study researchers.

The first rigor check ensures construct validity. Construct validity means the 'theoretical sufficiency' (Dey 1999 p.117) or the 'theoretical saturation' (Glaser and Strauss 1967 p.61). Construct validity deals with tackling the problem of operationalisation of the correct set of measures (cf.Yin 2003) and suggests tactics adopted in this study including the use of multiple sources of evidence (triangulation or corroboration), establishing a chain of evidence, and reviewing the draft of case findings with the key informants of the study. Besides the interview data, supporting documents are collected for this study. The key concepts are made clear to all informants to make sure that they have a common understanding. At the end of data analysis, the findings were shared with key informants of each bank: telephonic discussions took place between the researcher and key informants and disagreements were addressed to make sure informants' opinions were accurately reflected in the study.

The second rigor check ensures internal validity. Pattern matching, explanation building, addressing rival theories and use of logic models are suggested tactics for addressing internal

validity (Miles and Huberman 1994). In pattern matching, the observed pattern from data is compared with the predicted one. This research follows the guidelines of Miles and Huberman (1994) to ensure internal validity, however, making sure that new and emerging data are sufficiently captured and reported for theory building.

Table 4. 5: Rigor in Case Study Design

Test	Criteria	Whether/how this study followed the guidelines	Phases where rigor check takes place
Construct validity	Use multiple sources of evidence (Lee 1989) Establish a chain of evidence (Yin 1994) Key informants review the results (Phillips 1981)	Interviews, documents, charts were used. Multiple individuals were interviewed within an organisation. Evidence was coded and analysed using NVivo. Key informants reviewed the transcribed interview documents.	Data Collection Data Collection Transcription
Internal validity	Do pattern matching (Miles and Huberman 1994) Use natural controls (Lee 1989)	Pattern matching was used within and among cases as recommended by Miles and Huberman (1994) Multiple homogenous and heterogeneous organisational settings were used.	Data Analysis Research Design
External validity	Increase degrees of freedom Apply replication logic (Eisenhardt 1989; Yin 1994)	Evidence is based on multiple observations; multiple organisations analysed. Competing theories were tested. The patterns within and between cases were thoroughly analysed to generate theory. The resulting theory was assessed across organisational settings.	Research Design Research Design
Reliability	Use of case study protocol (Yin 1994) Develop case study database (Yin 1994)	An interview protocol was developed and pre-tested All data are stored in NVivo library. Case study transcripts, summary table, construct table, relationship table have been used	Data Collection Data Analysis

The third rigor check ensures external validity. This refers to the extent to which the findings of one organisation can be generalised with other and existing theory. External validity in a case study does not mean statistical generalisability, it means *"going from particular instances to general notions"* (Lee and Baskerville 2003 p.232). Tactics suggested for better external validity are to increase the degrees of freedom and apply replication logic. By collecting data from multiple organisations (e.g., nine banks), this research ensures multiple sources of observations

and tests alternative theories. This research also adopted 'replication logic' in the process of hypotheses development.

The fourth rigor check ensures reliability. It connotes different meanings to positivist and interpretive researchers. While for the positivist, reliable research is replicable in different samples with the same results obtained, for interpretivists, reliability means trusted, meaningful and interesting findings (Trauth 1997). Whatever the meaning conveyed by 'reliability', this is very important for any research. Yin (1994) suggests using case study protocol and developing a case study database to increase reliability. This study followed Yin's suggestions. An interview protocol was developed and placed in the appendices (see appendix 1). The evidence that supports conclusion drawing is kept in the NVivo library. The reliability of this research will be discussed in full in the data analysis section.

4.3.3.4 Unit of Analysis

The unit of analysis identifies what constitutes a case (cf.Yin 1994), and *"a clear definition of the unit of analysis helps define the boundaries of a theory, which in turn set the limitations in applying a theory"* (Dube and Pare 2003 p.610). Therefore, it is very important to define the proper unit of analysis. However, only eight percent of all case study articles reviewed by Dube and Pare (2003) clearly specify the unit of analysis. Specifying the unit of analysis seems to be challenging as it may be individual, group, organisation, technology, event or some other phenomenon (cf.Darke *et al.* 1998; Yin 1994).

The study is a case study of the banking sector in Bangladesh, with the E2E loan processes in the consumer and business lending sections of commercial banks the embedded unit of analysis. Benbasat *et al.* (1987) mentioned that research objectives to be pursued determine the unit of analysis. Furthermore, research generalisations that researchers want to achieve through the research are also important. In this regards, Benbasat *et al*. (1987, p.372) mentioned, "*the researcher should consider what generalisations are hoped for at the end project completion. Does the researcher hope to generalise to other organisations, individuals, or decisions, for instance?*" The objective of this study is to investigate the derivation of business value from E2E Solutions in developing countries. Bangladesh is chosen as exemplary of developing countries. Therefore, the unit of analysis of this study is at the sectoral level. An ‘E2E loan process’ is defined as the 'sequence of activities starting with customers' loan application, and including loan origination, loan analysis & syndication, documentation & closing, booking, servicing, and monitoring' (e.g.,Kidder 2004). Loan processes are deemed appropriate for the

study for several reasons. First, loan processing is an E2E process, having customer contact and joint production, which is separable from the other major processes of a bank (Davamanirajan *et al.* 2006). Second, loan processing is a good example of E2E Solutions where processes flow across organisational and system boundaries (cf.Bubak *et al.* 2006). Third, bank lending is critical for business, especially for developing countries that lack an efficient stock market, and is directly linked to national GDP (Valverde *et al.* 2007). Thus, loan processing is a relevant area of study for E2E Solutions in developing countries.

4.3.4 Data Collection Strategy

The objective of this study is to investigate the derivation of business value from E2E Solutions in developing countries. Because of the exploratory research objective and consequent selection of a case study approach, this section argues that interview and document gathering are most suitable techniques for data gathering. This study thus relies on interview and document gathering for data collection which is documented in this section.

The selection of best data collection techniques and reporting the data gathering procedure are two important elements of research; however, most of the case study research failed to do so (cf.Benbasat *et al.* 1987; Dube and Pare 2003). Data collection techniques need to be selected based on the nature of the research. As this research is exploratory in nature and theory development is one of the exercises, this research employed interviews and document gathering (internal and published) as data gathering techniques.

As this research has practical importance, out of 48 banks in Bangladesh, 30 banks agreed to participate. The organisations agreeing to participate in the study were struggling to use and assimilate IT in loan processing, therefore, bank management showed great interest in sharing their experiences. That ensured the rich quality of data for the researcher. The highest levels of institutional support were received by the researcher during the data collection process. In some instances, the human resource division of banks formed 'teams' and allocated official time for meeting with the researcher. The interviews were conducted in three phases. All the data were collected in a 12 month period from April 2009 to March 2010. Data were collected in three (3) distinct phases. Interview data were collected through face-to-face meetings in phase I and phase II. In the third (III) phase, interviews were conducted via conference calls. The third phase (III) was the following-up stage. All interview data were tape recorded. The researcher personally visited the entire site for data collection. Internal organisational documents were

collected. The researcher also reviewed publicly available documents. Table 4.6 summarises the techniques employed in this research for data collection.

Table 4. 6: Data Collection Techniques used in this Research

Techniques used in Data Collection	How Technique Was Used	Supporting Literature
Interview with key informants - tape recording - notes - informal discussion	Primary sources Evaluated as per the adopted exploratory post-positivist approach	Miles and Huberman (1994);Yin (1994)
Document analyses - internal documents - public access documents	Secondary sources Collecting and analysis of the dataset Empirical material collected and analysed	Eisenhardt (1989); Yin (1994)

As data were collected through interview and document gathering, the data collection process using both techniques is presented in the next two subsections.

4.3.4.1 Interviews

An interview is defined as *"face to face verbal exchange, in which one person, the interviewer, attempts to elicit information or expressions of opinion or belief from another person or persons"* (Maccoby and Maccoby 1954, p.450). The interview is one of the most employed data collection techniques in case study research (cf.Yin 2003). This is because of the strengths of interview as a data collection technique. The major advantage is its ability to generate large volumes of data. Interviews can be open-ended, focused and semi-structured (Yin 2003). This research adopted a semi-structured interview where an interview protocol was developed consisting of a set of questions based on the conceptual framework; however, there were open-ended, discovery-oriented questions focusing on respondents' perceptions of E2E Solutions' value and value conversion contingencies. A semi-structured interview is also considered suitable for the exploratory nature of the study (cf.Yin 1989) and is applied by many IS researchers (O'Reilly and Finnegan 2010; Pan *et al.* 2007). Face-to-face and telephonic interviews were conducted for this research. The key informant method (cf.Phillips 1981) was adopted in this thesis for data collection. A semi-structured interview guide was developed by the researcher and pre-tested with researcher supervisors and other colleagues internally at the Australian School of Business at University of New South Wales, Australia. Interviews conducted in each stage were tape recorded and appropriately transcribed and analysed in order

to get full pictures of the interviews (Amelinckx *et al.* 2008). However, confidentiality and anonymity were offered to interviewees to overcome the fear of speaking, in case of possible recording of sensitive information (cf.Walsham 1995). Proper notes were also taken for further questions and future reference (cf.Yin 1994). At least one interviewee from each bank was asked to provide details of their organisational and technological status (in terms of aspects of E2E Solutions' deployment and with the specific month and year of implementation); however, all interviewees were asked to describe but were not limited to:

- the sequences of activities in loan processing;
- use of technologies in each process;
- the reliance of external parties in loan processing and extent of integration;
- the regulatory guidelines in loan processing and its impact on automation;
- benefits of E2E Solutions at process level and organisational level;
- obstacles in implementation and value realisation of E2E Solutions in organisational, technological and environmental context;
- how E2E value conversion contingencies impacted on value and how they responded to these obstacles.

While being asked about the benefits of technologies and obstacles that banks are facing in the proper use and assimilation of E2E Solutions, some interviewees became very active and vividly described the benefits and barriers of E2E Solutions' value. Some interviewees were very fed up and expressed their anger towards government and regulators over country-specific barriers they face in the realisation of value. All interviewees duly signed the interview participation sheet and most of them were interested in the aggregate findings of the research. They also exchanged their visiting cards and mobile numbers and invited calls in case of further clarification being needed. Most importantly, interviewees earnestly requested the research findings be forwarded to government and the central bank to let them become aware of the value conversion contingencies of E2E Solutions.

4.3.4.1.1 Interviews Process

Because of the paucity of literature on E2E Solutions (chapter 2), the researcher placed more emphasis on field level data for preparing this dissertation. Besides pre-testing the interview protocol, the main data collection was held in three distinct phases. The phase I and II interviews were carried out from April to July 2009. However, the third (III) phase of data collection took place in March 2010.

1. **Pilot Stage (Phase I)**: At the initial stage of data collection, all banks (48) operating in Bangladesh were contacted to participate in this study. But, out of 48, 30 banks agreed to participate in this project. In the first stage, 30 in-depth face-to-face interviews were conducted with 30 banks. At this stage, data was collected from the Head of IT (CIO) or Deputy Head of IT (in case of non-availability of CIO). As the CIO is considered the key spokesman for any IT implementation and use in organisations, the CIO was chosen for the first round data collection. The duration of total interviews in this phase was approximately 30 hours. All interviews were tape recorded and then fully transcribed and analysed. At this stage, the conceptual research model was further refined. Furthermore, the interview guide was re-shaped as existing literature was not sufficient to develop an interview guide close to approximate reality. At this stage, all 30 banks interviewed could be categorised in three distinct groups based on E2E Solutions' implementation: (i) high-end E2E Solutions deployed banks; (ii) mid-end E2E Solutions deployed banks; and (iii) low-end E2E Solutions deployed banks and more interviews were conducted from these three groups of banks for replication logic (cf.Dube and Pare 2003).
2. **Main Data Collection (Stage II)**: At this stage of research, further interviews were conducted with nine organisations; six from high-end, two from mid-end, and one from low-end E2E Solutions deployed banks to achieve variance and greater understanding of the phenomenon (cf.Eisenhardt 1989). More organisations (i.e. six) were selected from high-end E2E Solutions deployed groups, as the research interest was to learn the E2E Solutions' value and value conversion contingencies, and high-end groups are better positioned for sharing their E2E Solutions' experiences. The researcher personally visited the research site and conducted face-to-face interviews at this stage. At this stage, interviewees were identified on the basis of their direct hands-on experience of E2E Solutions' implementation and use from the list of experts provided by the CIO/deputy CIO of the banks. This ensures the rich quality of data gathering. Interviews were conducted with 51 key respondents in nine organisations. A total of 70 hours of interviews took place at this stage of data collection. All interviews were tape recorded after seeking permission from the respondents. Besides this, four group interviews also took place. The information collected for the study is exhaustive, and data saturation was obtained with the 70 hours of interviews as the researcher was getting repeated answers to the same research questions and incremental value to additional data gathering seemed to be zero or minimum. At this point, the researcher did not feel that more interviews would add new information or provide richness

of data as additional data gathering did not provide any further light on the research questions under investigation (cf.Bernard 2000). All 70 hours of interviews were transcribed and analysed and afterwards a few contrary findings emerged that required further clarification. Therefore, the researcher decided to go for another follow-up interview with key informants in each of nine banks.

3. **Follow-up Data Collection (Stage III)**: In the third follow-up stage, further interviews were conducted via conference call with key informants in nine banks for clarification of the issues which arose in phase II. A total of 13 interviews were conducted in nine banks with key informants. The total duration of the interviews was 15 hours. All the interviews were tape recorded and transcribed.

Thus, the overall case study design for this research evolved from a single initial study from each of 30 banks, followed by in-depth interviews and a follow-up study with nine theoretically useful organisations (cf. Gable, 1994). Table 4.7 presents the profile of the respondents, revealing that out of 72 bank executives interviewed, 50 belonged to top management level, and 19 to middle level management positions. The average banking experience of interviewees (14 years) and average number of training sessions on IT received per interviewee (nine training sessions per person) demonstrate the competence of the interviewees participating in the research. Of the nine training sessions received by interviewees on an average, three were being conducted in overseas countries. Interviewees thus had the chance to see and experience how IT was being used by banks in other countries. Therefore, respondents seemed to be appropriate as key informants who have adequate job experiences and relevant training both at home and abroad to report on the investigated issues (Walter *et al.* 2001).

Table 4. 7: Profile of the Respondents

SL No	Bank	Respondents' Designation	Respond-ents' Position	Job Experi-ence	Training		Duration of Interview (Minutes)		
					Home	Abroad	Stage I (Pilot)	Stage II (Main)	Stage III (Follow-up)
1	EBL	Head of IT Security & SAVP	Top	12	15	10	60	95	
2		Head of Credit Risk Management & EVP	Top	34	15	3		80	
3		Head of Operations & SEVP	Top	25	25	15		80	
4		Head of Application Support & SVP	Top	24	20	15		90	
5		Head of Credit Administration & EVP	Top	19	8	4		70+30	
6		Manager, Trade Products, FCC & MIS & SAVP	Mid	11	3	0		90	75
7	DBL	Head of IT & FAVP	Top	10	2	2	50	90	70
8		Head of Credit & Re-engineering & SEVP	Top	6	20	11		85	
9		Manager & AVP, Branch Operation	Top	13	0	0		90	
10		VP of Credit & Change Management	Top	23	20	20		80	
11		Manager of Branch & SAVP	Top	14	1	0		90	
12		Senior Officer	Mid	3	1	0		70	
13		Head of Retail Banking & SME & EVP	Top	20	0	6		100	
14	DBBL	Senior Officer, System & Network	Mid	5	2	2	60	80	60
15		Deputy Manager of Branch & FAVP	Top	15	5	11		70+40	
16		In charge of Data Centre, IT Division	Top	6	10	1		70	
17		Manager of Branch & SAVP	Top	19	0	1		75	
18		Head of Credit Administration & SEVP	Top	23	20	2		80	
19		Head of IT & Vice President	Top	10	3	1		70	
20	CBL	Head of IT & Senior Vice President	Top	19	6	4		80	
21		Head of Branch Operations	Top	11	14	1	65	90	75
22		Senior Manager, Trade Service, CPC	Top	10	2	0		80	80
23		Manager & SAVP, SME Centre	Mid	10	3	0		80	60
24		Deputy Head, Corporate Wings	Mid	10	4	1		70	60

Table 4. 7: Profile of the Respondents

SL No	Bank	Respondents' Designation	Respond-ents' Position	Job Experi-ence	Training		Duration of Interview (Minutes)		
					Home	Abroad	Stage I (Pilot)	Stage II (Main)	Stage III (Follow-up)
25		AVP of Credit Risk Management Department	Mid	10	0	0		30+60	
26	BRAC	Head of IT & Executive Vice President	Top	5	0	1		90	
27		Senior Manager of Enterprise Application	Mid	8	1	0		90	
28		Head of Business Systems Management & VP	Top	8	4	2		80	70
29		Manager of Core Banking Solution	Mid	3.5	10	10	60	90	
30		Deputy Head of Loan Operations & FAVP	Top	16	0	1		75	
31		Team Manager-Loan Transaction Processing	Mid	10	2	2		90	
32	BA	Head of IT & First Vice President	Top	10	15	2		90	
33		Software Developer & SEO	Mid	6	3	1	50	65	40+40
34		AVP of Credit Risk Management Division	Mid	11	2	0		90	
35		AVP of Syndicated Loan Division	Mid	10	2	0		90	65
36	MBL	Head of Credit Risk Management & SEVP	Top	26	40	15		90	
37		Head of IT & Senior Vice President	Top	13	1	2	90	35+60	
38		Head of Main Branch Credit & SVP	Top	19	2	0		60	
39		AVP of Credit Risk Management Division	Mid	10	0	0		80	
40		AVP of IT Division	Mid	7.5	0	0		80	75
41	UCBL	Network Manager & AVP	Mid	7	7	1		60	
42		Manager ATM & AVP	Mid	9	3	1		70	
43		Head of Networking & SAVP	Top	4	10	3		80	
44		Head of Credit Administration & EVP	Top	29	3	1		90	
45		SPO of IT Division	Mid	7	0	0	50	80	70
46	JB	Senior Consultant & GM (IT)	Top	2	2	1	60	120	60
47		Senior Consultant & GM (Credit Admin)	Top	32	0	0		70	
48		Deputy General Manager of IT Division	Top	29	0	0		60	

Table 4. 7: Profile of the Respondents

SL No	Bank	Respondents' Designation	Respond-ents' Position	Job Experi-ence	Training		Duration of Interview (Minutes)		
					Home	Abroad	Stage I (Pilot)	Stage II (Main)	Stage III (Follow-up)
49		Senior Principal Officer of IT Division	Mid	28	1	0		60	
50		Senior Principal Officer of Industrial Credit	Mid	29	0	0		80	
51		Manager and DGM of Corporate Branches	Mid	30	1	0		60	
52	Other 21 Banks	Head of IT or Deputy Head of IT	Top	-	-	-	1255		
Total							115 Hours		

4.3.4.2 Documentation Gathering

Document gathering is considered useful in case study research (cf.Yin 1994; 2002). This study thus follows Yin's (2002) recommendation to utilise multiple sources of evidence, conduct multiple interviews in each organisation and collect data through documentation gathering. This essentially helps reduce the common biases in qualitative research, i.e. the holistic fallacy, the elite bias and going native (cf.Miles and Huberman 1984). This research gathered published and unpublished organisational documents, annual reports, loan application forms, lists of charge documents, etc. with the aim of obtaining a rich quality of data (e.g.,Benbasat and Weber 1996). Publicly available documents were collected and reviewed prior to conducting interviews, and interview questions reflected the outcomes of document analysis. A few banks also provided their confidential loan proposal reports and system architecture and drawings. Table 4.8 shows the documents and plans accessed. Section 4.4 describes the interview and document analysis procedure.

Table 4. 8: Documents Accessed

Bank	Bank Related		Industry Related
	Internal Documents	Public Documents	(1) Banking Company Act; (2) Bangladesh Bank (Central Bank) Ordinance; (3) Guidelines on Information and Communication Technology for Scheduled Banks and Financial Institutions; (4) Money Laundering Act; (5) Guidelines on IT Security for Scheduled Banks and Financial Institutions; and (6) Various Banking Policies and Circulars.
BA	Account opening form, loan proposal, loan application format	Press release, annual financial reports	
BRAC	Loan proposal, guidelines for loan proposal, organisational hierarchy, technology documents	Press release, annual financial reports, brochure	
CBL	Loan agreement, loan sanctioning guidelines, financial appraisal format	Press release, financial and interim audited reports	
DBBL	Credit Information Bureau format, architectural design of software, IT investment reports	Press release, financial and interim audited reports	
DBL	Loan processing architecture and drawings, management structure and experience reports	Press release, financial and interim audited reports	
EBL	Loan processing format, instructions for loan processing	Press release, financial and interim audited reports	
MBL	Loan application form, and assessment criteria documents, IT vendors related documents, training reports and guidelines	Press release, financial and interim audited reports	
UCBL	Loan proposal, guidelines for loan proposal, organisational hierarchy, technology documents	Press release, financial and interim audited reports	
JB	Training module, application format	Press release, financial and interim audited reports	

4.3.5 Limitations of the Chosen Research Method

This research overcomes some of the practical problems associated with administering case study research including getting access to the case site, selection of meaningful organisations, the tedious nature of data transcription and analysis (Cavaye 1996; Darke *et al.* 1998; Yin 1994), and following systematic data analysis by utilising open, axial and selective coding. However, some limitations of the chosen research approach that may be present are worth mentioning. The case study approach is harshly criticised because of lack of generalisibility and rigor (Darke *et al.* 1998; Yin 2003).

The shortcomings of the chosen approach are:

- Lack of generalisibility of the case study results. However, theoretical generalisation can be drawn from case study research;
- Lack of control over different variables;
- Lack of rigor; and
- Difficulty in establishing cause and effect relationship.

Second, limitations of the semi-structured approach to interviews are also applicable for this research (Galliers 1992).

4.4 Data Analysis

Data analysis is the final component of research design. In this research, the data analysis process started right after the first interview and ran in parallel with the data collection. It is argued that concurrent data collection and analysis ensures the proper documentation of data. This section starts with providing an overview of the data analysis and coding process (section 4.4.1). This section then demonstrates the in-depth coding techniques used in the research; open coding (section 4.4.2), axial coding (section 4.4.3) and selective coding (section 4.4.4). As the unit of analysis of this study is at sectoral level and not at individual bank level, matched pair analysis techniques are not used for data analysis. As data were collected from multiple organisations, therefore, how coding was used in within organisation and cross-organisation analysis is also demonstrated. Lastly, this research concludes that appropriate coding techniques help reduce the personal bias, ensure the reliability of the study and facilitate theory building.

4.4.1 Data Analysis and Coding Process: An Overview

In the data analysis process, this research mostly relies on the guidelines of Straus and Corbin (1990), and then on Miles and Huberman (1994). This research also relies on Nvivo software for data analysis, and that essentially helps in establishing the easy reference database as suggested by Yin (1989).

Data analysis represents an important part of the research procedure; however, this is a very difficult part of any qualitative research. Good theory building largely depends upon the quality of data analysis. Eisenhardt (1989 , p.539) mentioned that *"analysing data is the heart of building theory from case studies, but it is both most difficult and least codified part of the process"*. As data analysis is important for building theory, reporting the same in the text is also important for external observers and readers for better understanding of the findings. As Dube and Pare (2003 p.616) mention, *"whether or not the results are the fruit of a systematic and rigorous process"*. However, adequate reporting of the data analysis is mostly missing in qualitative case study research (cf.Eisenhardt 1989) and *"this presents another serious shortcoming"* (Dube and Pare 2003 p.616) of IS case study research. Data analysis consists of three current flows of activities: data reduction, data display and conclusion drawing/verification (e.g.,Miles and Huberman 1994) and all the works should occur concurrently so that the researcher remains open to new ideas or thoughts that might emerge from data. Miles and Huberman's (1994) suggestions are criticised by others (Myers 1998) who report that concurrent data collection and analysis is problematic; however, they acknowledge that both affect each other in a significant way.

Coding is one of the useful techniques in the data analysis and reduction process (cf.Dube and Pare 2003). Coding is the process of defining and categorising the dataset and getting meaning from the dataset (cf.Ezzy 2002). Coding allows the researcher to analyse qualitative data in a systematic way and build theory from it. Researchers (e.g.,Miles and Huberman 1994) emphasise the role of coding in the theory building process. For example, Douglass Ezzy (2002) mentions that coding establishes linkage from the data to an emerging theory. Whereas Strauss and Corbin (1990 p.57) mention, *"Coding represents the operations by which data are broken down, conceptualized, and put back together in new ways. It is the central process by which theories are built from data"*. Dube and Pare (2003) suggest documenting the coding procedure in the text as it helps the future researcher with replication and extension of a given study. Systematic coding is also important to avoid bias and validate the data analysis.

Coding can be created in deductive (Miles and Huberman 1994) and inductive ways (Strauss and Corbin 1990). In a deductive way of creating codes, Miles and Huberman (1994) suggest creating a 'provisional list of codes' prior to fieldwork. These codes will be based on prior models, research questions, hypothesis and research areas. However, as the research unfolds the provisional list of codes will be amended, as some do not work and some decay. Subsequently, pattern coding and memoing (i.e., making notes) will be used to identify patterns or repeatable regularities in the dataset to build a conceptually coherent explanation of the research phenomenon (Darke *et al.* 1998; Miles and Huberman 1994). The inductive way of creating codes was firstly suggested by Glaser and Strauss (1967) and later appears in Strauss (1987) and Strauss and Corbin (1990). Inductive coding is best suited to the 'Grounded Theory' approach, where rather than creating a predefined list of codes, the literature suggests writing up the interview data, reviewing and reading line by line, and categories, or labels, will be generated from the dataset. In between the deductive and inductive ways of creating codes, there are some mid-range accounting schemes developed by Lofland (1971) and Bogdan and Biklen (1992).

This thesis adopted the inductive coding scheme suggested by Strauss and Corbin (1990); open, axial and selective coding. This is because as mentioned in chapter 2, the literature on E2E Solutions is not sufficient to come up with an *a priori* list of coding. Furthermore, these coding systems facilitate emergent theory.

4.4.2 Open Coding

Open coding is defined as *"the process of breaking down, examining, comparing, conceptualising, and categorising data"* (Strauss and Corbin 1990 p.61). Open coding essentially helps to identify and uncover concepts and themes of the dataset. Miles and Huberman (1994) mention that open coding is reading and reviewing the interview dataset and categorising it into meaningful pieces by maintaining the relationships between the parts intact. Strauss and Corbin (1990) however, suggest doing open coding with an open mind.

As mentioned before, this research used Nvivo software; all the interview recordings are transcribed and translated (as interviews took place in the native language rather than English) and transcripts and audio file recordings were uploaded into the Nvivo software. The researcher read the transcripts line by line and listened to the audio recoding to create open coding based on both verbal and non-verbal expressions of interviewees. As suggested by Strauss and Corbin (1990), two-step procedures for creating open code were followed: labelling the phenomenon and then discovering the categories. Assigning of coding was done in a three-step process. In

step 1, the researcher read line by line and listened to the text several times and then assigned codes. In step 2, based on the open codes, meta-codes were developed and in step 3, themes were assigned that sufficiently captured and represented meta-codes. Table 4.9 demonstrates how open coding was done in this research by giving an example of the development of Software Misfit in an organisation (e.g., DBL). In the first step, three codes were assigned based on the interview text; functionality of software (SM-GP: FU), requirements of the software (SM-GP: RE), and customisation, localisation and costing of the software (SM-CS: CL). In the second stage, two meta-codes were generated from descriptive codes; gaps in software (SM-GP), and after sales cost and services (SM-CS). Finally, a theme, Software Misfits (SM) was assigned to represent meta-codes. The same procedure was followed for other organisations.

Table 4. 9: Development of Software Misfits (SM) Constructs for DBL

Text	Descriptive Codes	Meta-Codes	Theme
"...it [software] has huge functionality...but what I observed that the bank is using only 30-40% of the software".	SM-GP:FU: Functionality of the Software (FU)	SM-GP: Gaps in Software(GP)	Software Misfits (SM)
"....we have problem is setting up central bank's guidelines into the software...as per Bangladesh Bank's circular if loan becomes irregular (substandard, doubtful and bad and loss) and the question of adjustment of that loan comes, we face various problems...we could not match operational and provisioning procedure with the existing system. For example, in case of realisation of instalment in irregular loan, existing rules say that at first interest income needs to be adjusted and then principal amount; however, global practice is opposite-adjust the principal amount and then adjust of interest as income".	SM-GP:RE: Requirements of the Software (RE)		
"...pre-disbursement work processing part was into our CORE system...but if we want to customise the system...it requires huge amount of money"	SM-CS:CL: Customisation, Localisation Costing (CL)	SM-CS: After Sales Cost & Service (CS)	
Step 1: Text to Descriptive Codes	**Step 2: Coding to Concepts**	**Step 3: Concepts toThemes**	

4.4.3 Axial Coding

Axial coding is defined as *"A set of procedures whereby data are put back together in new ways after open coding, by making connections between categories"* (Strauss and Corbin 1990, p.96). Axial coding follows the open coding. The aim of axial coding is to integrate themes, linking categories and this is a most important aspect of theory building (cf.Strauss and Corbin 1990). Axial coding has two important components as mentioned by Strauss and Corbin (1990). First, each code has to be examined in terms of conditions which cause it, the context of its occurrence and consequences that may arise from the code. Second, it was suggested to move back to the data to search for additional properties of each category.

This research followed the suggestions made by Strauss and Corbin (1990), and the relationships among the constructs, and the impact of the value conversion contingencies on E2E Solutions' value was established. This was done firstly within an organisation and once all were done, the researcher moved beyond the organisation and did the cross-organisation analysis for theory building. In this circumstance, it is worth mentioning, *"Proposed relationships have to be supported over and over again in the data"* (Strauss and Corbin 1990p.138). How axial coding was performed is explained in figure 4.1 and figure 4.2.

Figure 4.1 represents the text provided below. It illustrates that Single Point Processing enables faster loan processing in banks.

"After implementing Single Point Processing, we are using 50% less staff than other banks; however, we are providing our clients faster services" (Interview text in an organisation).

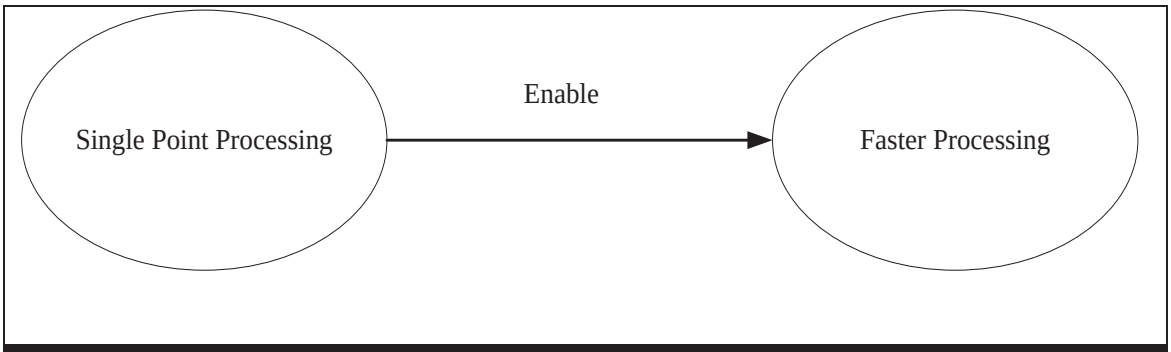


Figure 4. 1: Diagram illustrating the Relationship between Single Point Processing & Faster Processing

An interview text is provided below. Analysing the text revealed that Single Point Processing helps in quick loan processing; however, as there is a lack of integration with the Credit Information Bureau (CIB), therefore, the communication process is manual and slow and the

bank's ability to carry out quick processing is hampered. Figure 4.2 was prepared based on the following text.

"We need to allow some extra days for loan processing for getting reports from CIB....as in many cases or in relevant cases this report in must...without CIB's approval we cannot disburse the loan....in that scenario what we do, we process all the loan within two/three as all of our loans are processed from a single location, and then we wait for CIB clearance....as soon as we get CIB clearance we disburse the loan" (Interview text in an organisation).

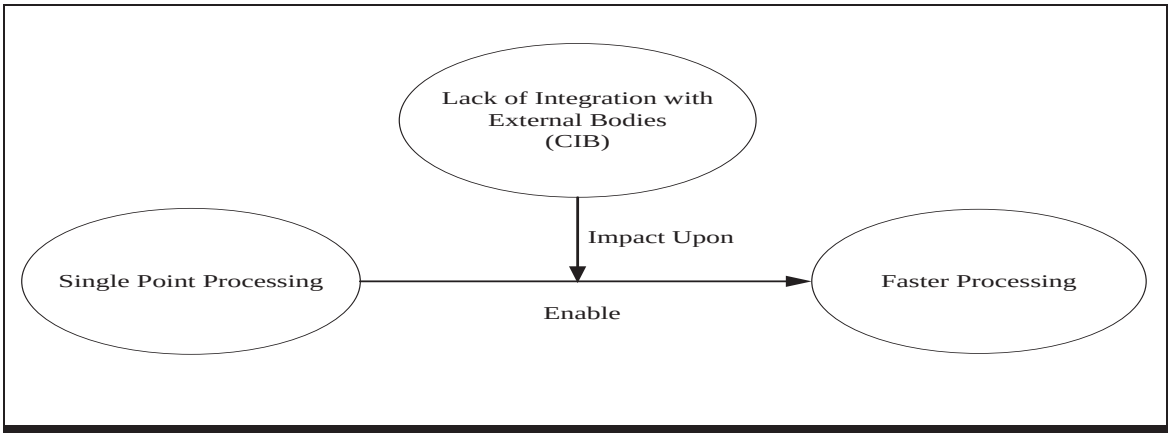


Figure 4. 2: Integrative Diagram illustrating the Impact of Lack of Integration on Relationship between Single Point Processing & Faster Processing

4.4.4 Selective Coding

Selective coding follows axial coding. Selective coding is defined as the *"identification of the core category or story around which the analysis focuses"* (Ezzy 2002p.92). Selective coding (e.g.,Strauss and Corbin 1990) is also known as theoretical coding (Glaser 1978). Selective coding is important for theory building as it helps in developing conditional propositions (cf. Creswell, 1994). In multi-case design, selective coding helps in distinguishing common themes and causal processes (cf.Miles and Huberman 1994).

In this research, selective coding was performed by selecting a central category (e.g. value conversion contingencies) and identifying groups of organisations (e.g. high-end E2E Solutions deployed banks, mid-end E2E Solutions deployed banks, and low-end E2E Solutions deployed banks). At this point of coding, the researcher asked questions such as, is there any common E2E Solutions' value conversion contingency among the groups? Chapters 5 and 6 present the relationship between all categories and E2E Solutions' performance.

4.5 Summary

This chapter outlines the research approach for the research, justifies the selection of research method, data collection and analysis strategies. Because of the exploratory nature of the research, a case study was selected as most appropriate, and data were gathered from nine organisations using interviews and document gathering. In order to analyse data and build theory from it, an inductive coding scheme, involving open, axial and selective coding techniques was utilised. The next chapter, chapter 5, presents the findings resulting from the case analysis describing the first research question: how E2E solutions deliver business value.

Chapter Five

The Business Value of E2E Solutions

5.0 Introduction

This chapter deals with the first research question by presenting the evidence from nine commercial banks on how E2E Solutions deliver business value. This chapter starts with recapping the research objective and research questions (section 5.1). The description of the case study environment is provided (section 5.2). Before moving onto a discussion of how E2E Solutions deliver value, the implementation status of E2E Solutions in nine commercial banks is presented (section 5.3). It is revealed that E2E Solutions are evident as Single Point Processing, Single Point Data Entry, Integrated Databases, and Automated and Integrated Processes. It is also revealed that E2E Solutions impact on process level aspects which in turn impact on organisational level performance. Analysis shows that all process level aspects impacted upon by E2E Solutions fall into two groups: core process aspects and coordination and communication aspects. Thus details on how E2E Solutions impact upon different aspects of core process (section 5.4), and coordination and communication process (section 5.5) are documented. The impact of core process and coordination and communication process on organisational productivity (section 5.6) is evidenced and described in full length with reference to nine commercial banks. This chapter concludes by presenting a preliminary model of E2E Solutions' business value (section 5.7).

The following chapter is devoted to the second research question and presents the value conversion contingencies that impact upon E2E Solutions' value. The final chapter (chapter 7) concludes the thesis by comparing and contrasting the findings presented in chapters 5 and 6 with the findings of the literature review presented in chapters 2 and 3 along with the contribution and limitations of and future directions for research.

5.1 Research Objective and Research Questions

The objective of the research as mentioned in detail at the outset of the thesis is to investigate the derivation of business value from E2E Solutions in developing countries. To attain the research objective, two research questions were formulated. This chapter deals with the first research question and is presented below.

Research Question 1: How do E2E Solutions deliver business value?

5.2 Case Study Environment

This research was carried out in Bangladesh, one of the largest deltas in the world with a total area of 147,570 square kilometres and a shared border with India and Myanmar. The latest census shows that the total population of Bangladesh was 162 million in 2009 and that it was the world's seventh most populated country (World Bank 2010). It is one of the most densely populated countries in the world. Bangladesh emerged as an independent country in 1971, and after that, followed a mixed economic policy, both market economy and socialism. But in 1990, Bangladesh adopted financial sector reforms, and gradually moved towards a market economy system and the government has withdrawn most of its financial stakes in businesses which has resulted in private sector dominance of the economy. Bangladesh's political system is a democratic, multi-party system with general elections held every five years. Bengali is the official language; however, English is widely used and practised as the official business language.

Bangladesh has been chosen for the study because it is a representative developing country in regards to GDP, the role of the banking sector in the economy and socio-economic conditions. In Bangladesh, domestic credit provided by the banking sector as a percentage of GDP was 59.4% in 2008 (World Bank 2010). However, ICT expenditure as a percentage of GDP in 2007 was 8.0% in comparison with an average 5.7% in the rest of South Asia. This is perhaps why Bangladesh is considered one of the most promising countries in the group of 'Next Eleven' (Goldman 2007), with a GDP growth rate of 5.7% in 2009 as opposed to an average of 0.6% in the rest of the world (World Bank 2010). Bangladesh's government with the help of international donor agencies and local businesses has undertaken several steps for ICT development; this has involved including enacting rules and regulations, and developing infrastructure. The electoral slogan of the present government in power (2009) was 'Digital Bangladesh'. To implement 'Digital Bangladesh', the government has taken various steps in terms of budgetary allocation and implementation of a regulatory framework. The ICT sector is the thrust sector of Bangladesh and is receiving the highest budgetary allocation from the government. The government has pledged to implement IT and automation in government offices and ministries.

The financial sector of Bangladesh, like most developing countries, is dominated by banking institutions. However, as of 2009, only 0.9% of total adult individuals and firms are listed in a public credit registry with current information on repayment history, unpaid debts or credit outstanding (World Bank 2010). The Bangladesh banking sector is found to be comparatively larger than any other economies with similar levels of development and per capita income. The

banking industry of Bangladesh consists of 48 scheduled (i.e. central bank enlisted) banks with 6686 rural and urban branches. Among the 48 are four nationalised commercial banks (NCBs), five state-owned specialised banks (SBs), 30 domestic private commercial banks (PCBs) and nine foreign commercial banks (FCBs). The banking sector in Bangladesh is very competitive, earning modest and consistent returns and is dominated by private commercial banks (PCBs) and foreign banks (FCBs). In June 2010, foreign and private commercial banks controlled 66.22% of the total banking assets (Bangladesh Bank 2011). Non-performing loans as a percent of gross loans were 14.5% in 2007 (World Bank 2010). Table 5.1 shows a brief sketch of the banking industry in Bangladesh.

Table 5. 1: Banking Structure of Bangladesh

Bank Type	2007						2008					
	No of Banks	No of Branch	Total Asset	% of total asset	Deposit	% of deposit	No of Banks	No of Branch	Total Asset	% of total asset	Deposit	% of deposit
NCBs***	4	3383	917.9	33.1	699.7	32.6	4	3386	1030.9	31.1	758.8	29.7
SBs	5	1359	201.7	7.3	115.6	5.4	5	1362	222.3	6.7	137.8	5.4
PCBs	30	1922	1426.6	51.4	1150.2	53.5	30	2082	1794.5	54.2	1450.7	56.6
FCBs	09	53	227.7	8.2	183.4	8.5	09	56	265.8	8	214.2	8.4
Total	48	6717	2773.9	100.0	2148.9	100.0	48	6686	3313.5	100.0	2561.4	100.0

Source: Bangladesh Bank (2009)

Note: * As per Bangladesh Bank's BRPD Circular letter no 11, dated 2nd December 2007 out of four (04) NCBs, three (03) of them namely Sonali Bank, Janata Bank and Agrani Bank have been denationalised; however, still all those three (03) banks are reported as NCBs.

** As per Bangladesh Bank's BRPD Circular letter no 01,dated 3rd January 2010, two (02) SBs have been merged and formed Bangladesh Development Bank Limited (BDBL), a fully government-owned commercial bank)

*** NCB (Nationalized Commercial Bank), SB (Specialized Bank), PCB (Private Commercial Bank), and FCB (Foreign Commercial Bank)

****Figure in Billions (TK)

Over the last few years, banks in Bangladesh have been facing huge business competition and this has resulted in lower profit margins, and therefore, they have invested a huge amount of resources in breakthrough technologies for process improvement and to operate in cost-effective ways. Basel II[2] requirements also forced banks to automate their business processes.

Banks provide many services; however, loan provision is the primary function of a bank. Loans can be categorised differently based on the amount and purpose. As per the central bank of Bangladesh (i.e. Bangladesh Bank), classification loans are of four types - agricultural short-term loans, continuous loans, demand loans and term loans. However, for practical working

[2] Basel II is the second of the Basel Accords, which are recommendations, issued in June 2004, on banking laws and regulations issued by the Basel Committee on Banking Supervision. The purpose of Basel II is to create an international standard that banking regulators can use when creating regulations about how much capital banks need to put aside to guard against the types of credit, market and operational risks banks face. Bangladesh entered the Basel II regime in January 2010.

purposes, banks categorise loans into three main categories - SME loans, retail loans and corporate loans. This study focuses on all three types of loans. The justifications for choosing loan processing as a relevant area of study for E2E Solutions in developing countries are provided in section 4.3.3.4 of chapter 4.

As described in chapter 4, at the outset of the research, all banks operating in Bangladesh were contacted to participate in the study; 30 out of 48 banks agreed. The 30 consisted of five government, 23 private domestic and two foreign banks. After finishing the first stage of data collection (e.g. one interview per bank), the analysis revealed that eight banks (six private commercial and two foreign banks) could be classified as 'high end', sixteen as 'mid end' and seven as 'low end' with respect to the implementation of E2E Solutions. The details of the classification criteria are shown in section 5.3. The researcher conducted further study on six 'high-end', two 'mid-end' and one 'low-end' banks. The following part of the section gives a brief description of the nine organisations (see table 5.2).

Table 5. 2: Description of the Organisations

SL NO	Bank Name	Year of Establis-hment/ Owner-ship Type	Bra-nch Size	Total Empl-oyees	Total Asset (in million TK)	IT Backbone(with vendors and implementation year)								
						Core Bank Solutions	Workflo w Solutions	Phone Banking Solutions	SMS Bank Solutions	Internet Banking Solutions	Cards Solutions	ATM Solutions	EFT Solutions	POS Solutions
Type 1: High-End E2E Solutions Deployed Banks														
1	BA	1999/ Private	30	720	44046	Stelar (2002) (ERA Info Tech, Joint Venture, Dubai)	N/A	Stelar (2009) (ERA Info Tech, Joint Venture, Dubai)	Stelar (2008) (ERA Info Tech, Joint Venture, Dubai)	MyBank (ERA Info Tech, Joint Venture, Dubai) (2002)	BA's Proprietary Debit Card (ERA Info Tech, Joint Venture, Dubai) (2004)	Stelar (2004) (ERA Info Tech, Joint Venture, Dubai)	Feature Available in Internet and SMS Banking	N/A
2	BRAC	200/ Private	71	8644	60083	Infosys (Asia Infosys, India, USA) (2006)	Engine: Kastle ULS(3i Infotech, Dubai) (2006)	Phonex Soft Access(Int ernational Acumen) (2006)	Webservice, Windows Service(In-house Developed) (2001)	Phonex Soft Access(Inter national Acumen) (2001)	CardPro (SunGard System, Malaysia) (2001)	CardPro (Sun Gard); Phoenix Soft, Internatio nal Acumen (2001)	IVR (Data edge); ATM (Phoenix Soft), Internet and Mobile Banking (BRAC) (2001)	TNMS (Aamra Technolog ies); STIS (Internatio nal Acumen) (2001)
3	CBL	1983/ Private	83	1993	48,649	Core Banking: Finacle (Infosys, India) (2003)	Workflow Engine: N/A	Phone Banking: N/A	SMS Banking: O/S WAP(M/S S.S.L) (2009)	Internet Banking: Finacle (Infosys, India) (2009)	Cards: Finacle and Connect24 (2003)	ATM: Tranzware Compass Plus, CardPro (Sun Gard) (2003)	EFT: N/A	POS: Tranzware Compass Plus (IT Consultant Ltd) (2003)

Table 5. 2: Description of the Organisations

SL NO	Bank Name	Year of Establis-hment/ Owner-ship Type	Bra-nch Size	Total Empl-oyees	Total Asset (in million TK)	IT Backbone(with vendors and implementation year)								
						Core Bank Solutions	Workflo w Solutions	Phone Banking Solutions	SMS Bank Solutions	Internet Banking Solutions	Cards Solutions	ATM Solutions	EFT Solutions	POS Solutions
4	DBBL	1996/ Private	49	898	59715	Flexcube (Oracle India) (2004)	N/A	CISCO System (2008)	Flexcube (Oracle India) (2006)	Flexcube (Oracle India) (2004)	Card Suite (AIX, Oracle) Tleto Enator, Latvia (2004)	IST (AIX, Oracle), FIS(USA) (2004)	N/A	Ingenico (ATCL, France) (2004)
5	DBL	1995 /Private	44	925	62215	Flexcube (Oracle India) (2005)	RBS (Oracle) and OCAS (in-house) 2009	N/A	Flexcube (Oracle India) (2005)	Flexcube (Oracle India) (2005)	CardPro (BEPS) (2001)	ITM, Euronet, Switzerlan d (2001)	Eldorado, Inter-blocks, SriLanka (2006)	N/A
6	EBL	1992/ Private	30	730	50,313	Flexcube (Oracle India) (2003)	LAPS (IBM, USA) (2006)	N/A	N/A	Flexcube (Oracle India)(2004)	Trans Master for Prepaid Credit and Debit Card(Tieton ator) (2004)	Wincor Nixdorf Protopas, ITCL (2004)	N/A	N/A
Type 2: Mid-End E2E Solutions Deployed Banks														
7	MBL	1999/ Private	41	1030	54200	PC Bank 2000(Leads Corp. Bangladesh) (2001)	N/A	N/A	Win2000 (Leads Crop. Bangladesh) (2007)	N/A	Win+SQL Server (Leads Crop. Bangladesh) (2005)	ITCL, Q-Cash (Singapor e) (2005)	N/A	Q-Cash (Singapore) (2005)
8	UCBL	1983/ Private	100	2260	57871	Core Banking: PC Bank 2000	Workflow Engine:	Phone Banking:	SMS Banking:	Internet Banking:	Cards: N/A	ATM: Iswitch,	EFT: N/A	POS: N/A

Table 5. 2: Description of the Organisations

SL NO	Bank Name	Year of Establis-hment/ Owner-ship Type	Bra-nch Size	Total Empl-oyees	Total Asset (in million TK)	IT Backbone(with vendors and implementation year)								
						Core Bank Solutions	Workflo w Solutions	Phone Banking Solutions	SMS Bank Solutions	Internet Banking Solutions	Cards Solutions	ATM Solutions	EFT Solutions	POS Solutions
						(Leads Corp. Bangladesh) (2008)	N/A	N/A	SMS Banking (Leads Crop. Bangladesh) (2009)	N/A		Inter-blocks, Srilanka (2009)		
Type 3: Low-End E2E Solutions Deployed Banks														
9	JB	1972/ Govern-ment	848	13234	240258	JBSoft Banking Application(In-house), Easy Banking (Desktop), Flora Bank (Flora Ltd.), BexiBank (Beximco Computers, BD); Infinity Banking System (Infinity Tech. Bangladesh) (2000)	N/A	N/A	N/A	Win+SQL Server (Desktop Ltd. Bangladesh) (2008)	Debit Card+ Credit Card (ITCL, Bangladesh) (2000)	N/A	Ease Limited BD and Desktop Ltd. Bangladesh) (2000)	N/A

5.2.1 Bank Asia

Bank Asia (BA) was established in 1999 by a group of successful entrepreneurs in Bangladesh. As of July 2009, Bank Asia had 30 branches with a total of 720 staff. The total assets of Bank Asia as of July 2009 were Bangladesh Taka (BDT) 50,313 million. Bank Asia started operations with locally produced software that provided online banking from its inception. However in 2003, Bank Asia implemented a world class CORE (Centralized Online Real-time Exchange) banking solution. Bank Asia has partnered with ERA Info Tech, Dubai and formed a joint venture company to develop core banking software solely for the use of Bank Asia. Bank Asia is serving the people with modern technologies such as online banking, ATMs, tele-banking, SMS banking, net banking and POS. Bank Asia is also known in Bangladesh for its strategic decisions, including the acquisition of the operations of two foreign banks. This bank has acquired the Bank of Nova Scotia's Dhaka Office, and the Bangladesh operations of Muslim Commercial Bank of Pakistan. In 2003, this bank issued Initial Public Offering (IPO), and received 55 times oversubscription, which is a record in Bangladesh’s financial history. This bank is the pioneer for providing syndicated loans in Bangladesh. Bank Asia's area of priority is the corporate sector.

5.2.2 BRAC Bank

BRAC Bank started its operations in 2001 with a vision to work as a catalyst for the vibrant yet unbanked SME sector of Bangladesh. BRAC Bank, a private sector bank, is one of the fastest growing innovative banks, established by the world's largest micro-credit institution, Bangladesh Rural Advancement Committee (BRAC). As of 2009, the bank operated 71 branches, 180 ATMs, 30 cash deposit machines, 951 POS, 17 utility payment booths and 1900 remittance delivery points. In 2009, the bank served 878,837 clients with the help of 3635 customer touch points. In 2009, the total assets of the bank were BDT 60,083 million. BRAC Bank has implemented core banking solutions, Finacle of Infosys India in 2006. In 2010, BRAC launched the Enterprise Resource Planning (ERP) system, one of the biggest deployments of this kind of automation of management systems in Bangladesh. BRAC Bank was awarded as the 'Emerging Markets’ Sustainable Bank’ of the Year in the Asian region of the FT Sustainable Banking Awards 2010. Among private banks, BRAC Bank is a pioneer in implementing centralised banking operations in 2003.

5.2.3 The City Bank

The City Bank Limited (CBL) is one of the oldest private commercial banks in Bangladesh which started its operations in 1983. The City Bank is also one of the few banks in Bangladesh with centralised operations and IT set-up. Instead of a traditional, decentralised, geographically managed and branch-based business profit model; the bank adopted a centralised platform. In the City Bank Limited, businesses and operations are managed vertically from the head office through four distinct business divisions - corporate and investment banking, retail banking (including cards), SME banking, and treasury and market risks. As of 2009, the bank operated through 87 online branches, 10 SME centres, one full-fledged call centre, 46 of its own ATMs (plus 550 shared ATMs), SMS banking, online banking and POS. The total assets size of the bank in 2009 was BDT 48,649 million. CBL has implemented core banking solutions of Finacle of Infosys in 2003; however, the bank could not extract the value from such implementation until a group of talented senior management team members, having strong management skills and knowledge, coming mostly from multinational banks, joined the bank in 2008. This management team has taken bold initiatives to transform this traditional bank into a visionary, modernised, hi-tech commercial bank in Bangladesh. In 2010, this bank earned the prestigious Asian Banker's award of 'Strongest Bank in Bangladesh-2010', and the CEO of the bank received the Asian Banker's ‘Leadership Achievement Award 2010'.

5.2.4 Dutch Bangla Bank

Dutch Bangla Bank Limited (DBBL) started operations as a joint venture in 1996. As of 2009, the bank had 49 branches with a staff size of 898 and asset size of BDT 59,715 million. DBBL was the first bank in Bangladesh to be fully automated and to introduce electronic banking. DBBL has the largest IT budget in banking in Bangladesh. In 2003, the bank spent Tk.1.5 billion for bank automation, which is a record high investment in IT by a single private organisation in the country. DBBL pursued mass automation in banking as a Corporate Social Responsibility (CSR) activity and never intended profitability from this sector. In 2004, DBBL implemented Oracle’s Flex cube as their core banking solution. The bank also has the highest number of alternative delivery channels in Bangladesh. A DBBL client now has access to banking from any DBBL branch, ATM and POS. All these services are offered free of charge. As of August 2010, DBBL operated through 800 ATMs, which is the largest ATM network of a single bank both in Bangladesh as well as in Southeast Asia. DBBL is the only local bank to have an off-site data recovery site (DRS) for ensuring customers’ transaction records and back-ups. DBBL is also the pioneer in introducing SMS banking in Bangladesh. DBBL also offers

VISA and MasterCard credit facilities. The retail sector was found to be the main focus of DBBL.

5.2.5 Dhaka Bank

Dhaka Bank Limited (DBL), a public limited company, started its operations in 1995. As of 2009, DBL has 44 branches with 925 staff and total asset size of BDT 62,215 million. The bank offers a full range of banking and investment services with state-of-the art technology. The bank implemented Oracle India's Flex cube for their core banking solutions. The bank offers SMS, Internet, debit card, credit card and ATMs. DBL implemented an internally developed workflow system, OCAS (i.e. Online Credit Administration System) in 2008. In 2010, the bank introduced mobile phone-based remittance services, the first in Bangladesh as well as in South Asia. In 2008, the bank decided to implement centralised loan operations and trade services phase-wise from 2009. Foreign trade is the core area of the business of DBL.

5.2.6 Eastern Bank

Eastern Bank Limited (EBL) is one of the leading private commercial banks in Bangladesh. It was established in 1992 by a group of educated and successful businessmen. It is one of the most modern and technologically advanced banks in Bangladesh. This bank provides various types of loans and card products and is also the first amongst private commercial banks in Bangladesh to have implemented centralised trade, loan operations and deposit services. The bank implemented real time centralised core banking software, Oracle's Flex cube, for the very first time in Bangladesh in 2003. The total asset size of the bank as of 2009 was BDT 50,313 million. As of 2009, branches totalled 30; however, with the small number of branches, this bank has created an impact where both technology and business processes are integrated to offer prompt services to its clients. The bank mainly provides loans to the corporate sector.

5.2.7 Mercantile Bank

Mercantile Bank Limited (MBL) started operations in 1999. As of September 2009, the bank operated through 41 branches with 1030 staff. The total size of bank assets as of 2009 was BDT 54,200 million. The bank was found to be using PC banking software developed by Leads Corporation of Bangladesh since 2001, in distributed architecture, and has separate databases for all branches and the head office. This bank also has limited scale online banking services, SMS banking, ATM and credit cards. This bank is famous for various types of deposit schemes such as monthly saving schemes, double benefit schemes, family maintenance schemes, etc. Mercantile Bank is also involved in Corporate Social Responsibility (CSR) activities.

5.2.8 United Commercial Bank

United Commercial Bank Limited (UCBL) is one of the oldest (established in 1983) and leading private commercial banks in Bangladesh with a network of 100 branches. The total staff in 2009 was 2260 and total assets were BDT 57,871 million. The bank has undertaken several projects in 1996 to implement core banking software and automate its business processes; however, none of these projects were successful. Therefore, the bank could not take further initiatives to implement core banking solutions. However, in 2008, the bank undertook another initiative to implement core banking software, and is now at the stage of providing training to employees. UCBL has been using PC Banking software developed by Leads Corporation of Bangladesh since 2000. Besides the offline banking activities, this bank provides ATMs, POS and mobile services. This bank also provides any branch banking for deposit products.

5.2.9 Janata Bank

Janata Bank Limited (JB) is the second largest state-owned commercial bank in Bangladesh. It was established as per the Bank Nationalized Act 1972, and the erstwhile United Bank Limited and Union Bank Limited were combined and renamed as Janata Bank. As per the 'Enterprise Growth and Bank Modernization Project', in 2007, Janata Bank was corporatised and renamed as Janata Bank Limited. JB operates through 848 branches including four overseas branches. The total staff of the bank in 2009 was 13,234 and asset size was BDT 240,258 million. Janata Bank currently uses various locally-made software provided by various vendors, and has limited scale Internet banking services, ATM and card services. Currently a project is running for the implementation of centralised online banking to be implemented phase-wise from 2010. Janata Bank has bagged various awards and recognition for its diverse products and services, wide national coverage and contribution to the rural economy. The bank has been awarded 'World's Best Bank Award in Bangladesh' for the years 2006, 2007, 2008 and 2009.

5.3 E2E Solutions

The purpose of this section is to present the findings of the study with regard to the status of E2E Solutions in organisations (table 5.3). Aspects of E2E Solutions are identified as Single Point Processing, Single Point Data Entry, Integrated Databases, and Automated and Integrated Processes. It is evident that organisations are in different stages with respect to the implementation of different facets embedded into E2E Solutions; Single Point Processing (section 5.3.1), Single Point Data Entry (section 5.3.2), Integrated Databases (section 5.3.3), and Automated and Integrated Processes (section 5.3.4). Based on E2E Solutions' deployment,

banks are categorised into three types: high-end, mid-end and low-end E2E solutions' deployed banks (table 5.3).

Table 5. 3: Empirical Evidence for E2E Solutions' Adoption and Implementation in Organisations

Sl No	Name of Banks	E2E Solutions																					
		Single Point Processing			Single Point Data Entry	Integrated Databases	Automated and Integrated Processes																
							Client Interface Processes								Front End Pre-disbursement Processes						Back End After-disbursement Process (Use of Core Banking Solutions)		
		Retails	SME	Corporate			Website	Tele-Banking	SMS Banking	Internet Banking	ATM	POS	EDI with Client	Intranet with Clients	Use of PCs	Decision Support System	Intranet with loan officer	Work Flow	EDI with Regulatory Bodies	EDI With Support Parties	Automated Accounting	Automated Realization	Automated Reporting
***Type 1: High End E2E Solutions Deployed Banks* (see note 2)**																							
1	BA	√*	X**	X	X	√	√	√	√	√	√	X	√	√	√	√	√	√	X	√	√	√	√
2	BRAC	√	X	√	√	√	√	√	√	√	√	√	X	√	√	√	√	√	X	X	√	√	√
3	CBL	√	√	√	X	√	√	X	X	√	√	√	√	√	√	√	√	X	X	X	√	√	√
4	DBBL	√	X	X	X	√	√	√	√	√	√	√	X	√	√	√	√	X	X	X	√	√	√
5	DBL	√	X	X	√	√	√	√	√	√	√	X	√	√	√	√	√	√	X	√	√	√	√
6	EBL	√	√	√	√	√	√	X	X	√	√	√	√	√	√	√	√	√	X	√	√	√	√
***Type 2: Mid End E2E Solutions Deployed Banks* (see note 3)**																							
7	MBL	X	X	X	X	X	√	X	√	X	√	√	X	√	√	X	√	X	X	X	√	√	X
8	UCBL	X	X	X	X	X	√	X	√	X	√	X	X	√	√	X	√	X	X	X	√	√	X
***Type 3: Low End E2E Solutions Deployed Banks* (see note 4)**																							
9	JB	X	X	X	X	X	√	X	X	√	√	X	X	X	X	X	X	X	X	X	√	X	X

Note: 1. * Tick (√) means presence of the functionality
** Cross (X) means absence of the functionality
2. High-End E2E Solutions Deployed Banks: Centralized ICT Operation through Data Centre (DC) including Disaster Recovery Site (DRS) to which all other offices, branches and booths are connected through WAN with 24x7 hours attended operation.
3. Mid-End E2E Solutions Deployed Banks: Head Office, Zonal Office, Branch or booth having server to which all or a part of the computers of that location are connected through LAN.
4. Low-End E2E Solutions Deployed Banks: Head Office, Zonal Office, Branch or booth having stand-alone computer(s).

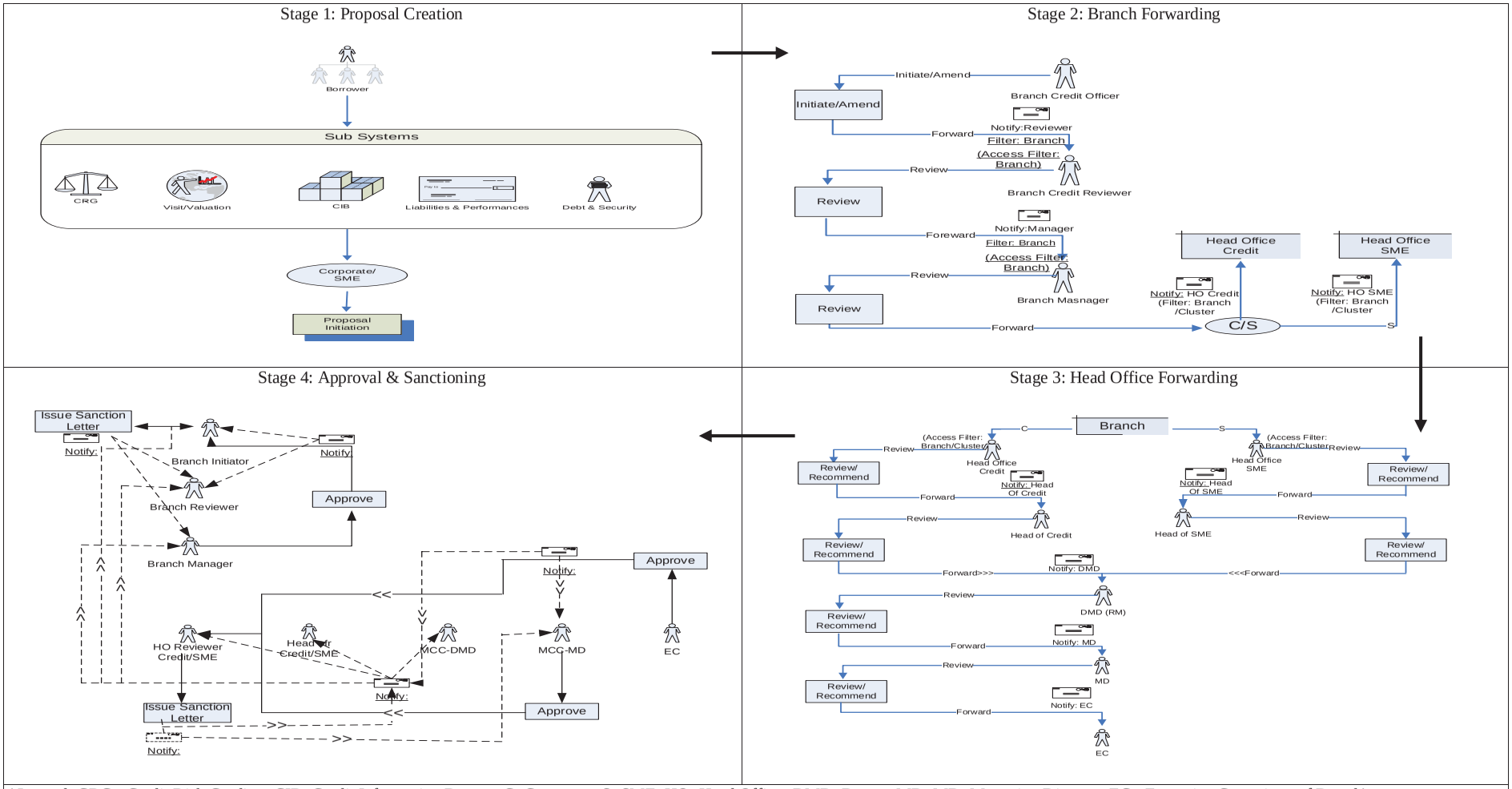
5.3.1 Single Point Processing

Single point processing refers to a scenario where a centralised office is responsible for price, process, approval, service, compliance and collection of loans provided by banks. While banks operate with many branches and booths, by pooling all loan applications and processes in a single location, single point processing ensures business process reorientation and internal business process integration. Single point processing avoids duplication of tasks and lessens the need for more staff and a middle office thus making the processing task faster and reducing the processing cost. It also provides economies of scale. In single point processing, branches are responsible for selling loan products and building customer relationships, thereby separating sales goals from credit decisions, and thus helping in making consistent decisions. Therefore, single point processing is evidenced as the 'best practice' approach.

Analysis reveals that while single point processing streamlines business processes and ensures process reorientation, out of nine banks, only two banks (CBL and EBL) implement single point processing for all types of loan products; retail, SMEs and corporate loans. One of the respondents in EBL affirms that *"...consumer finance, trade finance, project finance....all is processed from head office"*. Four banks (BA, BRAC, DBBL and DBL) implement single point processing for non-core loan products. For example, BRAC's main area of business is small and medium enterprise (SME) loans as around 70% of the loan portfolio is allocated to SMEs; BRAC follows single point processing for retail and corporate products.

It is revealed that single point processing is a digital business capability as technical strength or management strength alone are not enough; the right combination of these two is required for implementing single point processing. For example, for the implementation of single point processing, all branches, booths and head office need to be under the same networking for real-time transactions. At the same time, changes in work practices and routine are also required to pool all applications from branches and process them in a single location. Single point processing ensures these capabilities thus helping the unimpeded flow of business process within an organisation and system boundary. For example, six banks (BA, BRAC, CBL, DBBL, DBL and EBL) have similar technical strength but only two banks (EBL and CBL) implement single point processing for all loan products. Both banks' (EBL and CBL) senior management is found to have previous working experience with E2E Solutions while they were working in foreign banks.

It is revealed that implementation of single point processing requires significant changes in work practices, policies, change management, staff training and solutions integration. The opposite of single point processing is multiple point processing (shown in figure 5.1).



(Legend: CRG= Credit Risk Grading; CIB=Credit Information Bureau; C=Corporate; S=SME; HO=Head Office; DMD=Deputy MD; MD=Managing Director; EC= Executive Committee of Board)

Figure 5. 1: Multiple Point Loan Processing

It shows that in a distributed system, customers lodge a loan request at branches. The branch then initiates a loan proposal (stage 1), appraises it within the branch (stage 2) and forwards it to the head office (stage 3) for further analysis and approval (stage 4). However, in the case of single point processing, all applications are pooled from branches, and processed in a single location. Therefore, huge changes in the business process and management structure are required as it lessens the branch manager's loan processing and disbursement authority. It reduces the decision-making tiers and segregates the duties of loan marketing from loan processing. It makes the process faster, reduces the hand-offs and unnecessary double handling and thus provides a competitive advantage to the firm.

5.3.2 Single Point Data Entry

Single point data entry refers to a scenario where data related to loan application processing is recorded once. In this arrangement, data authenticity is high and the chance for error is less. It is revealed that having technology in place does not ensure single point data entry; organisational routine, processes and managerial capability are required to create this capability.

Analysis reveals that out of nine banks, only three banks (BRAC, DBL and EBL) follow single point data entry. Analysis shows that in single point data entry, data are entered into the database once with only one loan file prepared and all other staff use the file for further processing and amendments. It is revealed that in two banks (DBL and EBL) either head office or branches receive the loan application, but the loan file is maintained only in one location (e.g. head office) and data are entered into the system at head office level. As opposed to single point data entry, in a multiple point data entry system (for example, followed by BRAC), a loan file is created and maintained in multiple locations (e.g. branch, zonal, regional and head office) and data are entered into the system at multiple locations. Thus in a single point system, data authenticity is high. It saves time and reduces unnecessary tasks and thus provides value to the organisation.

Single point data entry is evidenced as a digital business capability. It is revealed that integration of database and system accessibility to staff are required for implementation of single point data entry: concurrently changes in the management practices, decisions, work routine and staff training are also important. It is revealed that banks use various technologies in the front end and the back end: single point data entry ensures the integration of data across these systems. Therefore, single point data entry optimises business processes across solutions. As the Head of System Applications of EBL states, *" ... we use Lending Automated Processing Software (LAPS) in the front end and CORE banking solutions in the back end....however, both*

are integrated... we do not need to input data separately...there is interfacing among the solutions". CBL follows multiple locations' data entry provisions. It is revealed that in the front-end, CBL uses Excel, MS word-based systems but uses Core banking solutions at the back-end and thus needs to enter data twice into the system as integration among the solutions is missing.

5.3.3 Integrated Databases

An integrated database system ensures the connection of a multiple database used by an organisation. It is revealed that an integrated database facilitates the execution of an E2E business process. Analysis shows that business processes cut across functional and organisational territory; therefore, the same set of information needs to be available to all process participants. Integrated databases store the information and supply the same information to all process participants. Integrated databases empower process participants and help in making independent decisions without relying on reporting from others. It facilitates faster and accurate decision making.

Analysis reveals that banks use various types of solutions, and each solution has a separate database. Integrated databases ensure a single source of truth for what managers are looking. Analysis shows that six banks (BA, BRAC, CBL, DBBL, DBL and EBL) have integrated databases. For example, EBL has a database in the Core banking solution as well as in the workflow system (i.e. Lending Automated Processing Software); however, both systems are integrated to produce a single set of data. It also reveals that in BRAC, the loan initiator, loan processor and loan approver all have access to the same set of information, thus helping in making independent decisions without relying on others to report.

It is revealed that integrated databases provide business agility to banks as they produce various types of MIS and help managers to act quickly in changed business circumstances. Integrated databases are found to be customer centric. It is thus possible to get a cumulative assets and liability position on clients in a single click. Integrated databases ensure a single source of information for all users of the system in order to ensure accuracy and effectiveness of decision making. The Head of System Applications of BRAC reports that, *"...our [bank] database is client centric...a customer might have a different stake with different branches of the bank...but by a single click we get their cumulative position....after opening an account clients are provided with a unique identification number which is used for subsequent transactions with the bank".* As opposed to integrated databases, three banks (MBL, UCBL and JB) have a distributed database system. For example, UCBL has 100 branches and thus has 100 separate databases.

Therefore, it is not possible to get the cumulative assets and liability position of banks and customers quickly and instantly in the distributed database system.

5.3.4 Automated and Integrated Processes

Automated and integrated processes help the E2E process to flow seamlessly without human intervention. It is revealed that automated and integrated processes help organisations to delineate electronically the processes, stages and staff roles in loan operations. It is evident that automated and integrated processes help in the unimpeded flow of business processes across organisations and solutions and thus results in automated processing. It is revealed that in an E2E loan process, customers, regulators and support services are involved beside banks' staff at various levels. Automated and integrated processes ensure integration among solutions and integration among the internal and external knowledge base and thus form an integral part of E2E Solutions. It is evident that in an E2E loan process, three different phases are observed; client interface process (i.e. receiving a loan application, receiving application fee, payment of loan amount and realisation of loan), pre-disbursement loan process (i.e. loan appraisal, analysis, data gathering and approval) and post-disbursement process (i.e. documentation, disbursement, accounting, monitoring and loan closing) and banks are found to have implemented various solutions to capture the whole E2E process.

(i) Clients' interface process: An automated client interface process ensures integration with customers for transfer of data (information and documents) both ways and results in paperless transactions. It allows customers to collect data and information on banking products and to place a request for services electronically. It also allows banks to communicate with customers electronically, collect information and documents necessary for processing a loan. Analysis reveals that clients' interaction with banks occurs in two stages. First, banks provide product information and collect loan applications and documentation from clients, and then further communicate with clients to process loans. Second is the stage of payments and repayments of loans. Analysis reveals that banks deploy various technologies including website, tele-banking, SMS banking, Internet banking, ATM, POS, EDI and Intranet for automating the client interface process.

(ii) Front-end pre-disbursement process: This process starts once the loan application is received from customers and finishes with an approve/reject decision. During this stage many staff are involved, from bottom to top, depending upon the loan size. At this stage, banks contact

regulatory bodies and support services to collect data and to make the necessary approval. An automated front-end pre-disbursement process ensures internal and external (beside customers) process integration, which is very important for an E2E process as it moves both inside and outside of an organisation. Analysis reveals that banks adopted various technologies in the front-end work process including PCs, Decision Support System (DSS), Internet, intranet, Workflow Management System and EDI and that helps them with automated processing, communication and decision making. However, 'stand-alone' technologies (e.g. PC, DSS and Intranet) are mostly adopted instead of 'interactive' technologies (e.g. workflow, EDI).

(iii) Back-end process: This process starts once the loan approval decision is made and finishes at the full realisation of the loan. It has three parts: accounting, realisation and reporting. A Core Banking Solution is used in the back-end process and this results in automated accounting, realisation and reporting.

Overall, automated and integrated processes connect customers, support industries and regulators with banks, as well as ensure internal process integration, both of which are required for an E2E loan process to flow unimpeded. This helps banks in automatic communication, analysis, decision making and reporting and replaces manual and paper-based processing and communication. Appendix 3 describes the E2E Solutions and appendix 4 summarises the technologies used in automated and integrated processes. The next section describes how E2E Solutions affect core process aspects in organisations.

5.4 How E2E Solutions Affect Core Process Performance

It is revealed that E2E Solutions deliver business value to organisations by impacting on the processes; core process aspects, and coordination and communication process aspects. This section documents how E2E Solutions deliver business value to organisations resulting from their impact on core processes. Core process performance is the degree to which E2E Solutions affect the internal organisation core operational task of a loan approval process, measures of which include faster processing, accurate risk assessment, ease of administration and processing cost reduction. Analysis reveals that four key aspects of 'core process' are impacted by E2E Solutions which are: processing time (section 5.4.1), risk assessment (section 5.4.2), loan administration (section 5.4.3) and processing cost (section 5.4.4). Table 5.4 summarises the associations of different aspects of E2E Solutions with core process level aspects.

Table 5. 4: Impact of E2E Solutions on Core Process Performance

E2E Solutions	Core Process Performance			
	Processing Time	Risk Assessment	Administration	Processing Cost
Single Point Processing	√	√	X	√
Single Point Data Entry	√	X	X	√
Integrated Databases	√	√	X	√
Automated & Integrated Processes	√	√	√	√
Website	X	X	X	√
Tele-Banking	√	X	X	√
SMS Banking	X	X	X	√
Internet Banking	X	X	X	√
ATM	X	X	X	√
POS	X	X	X	√
Intranet/E-Mail	√	X	X	√
EDI	√	X	X	√
PCs	√	√	X	√
Decision Support System (DSS)	√	√	X	√
Workflow System	√	X	X	√
Core Banking Solutions	X	X	√	√

Note: Tick (√) having impact on particular aspect of E2E Solutions on core process; whereas cross (X) means having no impact.

5.4.1 How Loan Processing Time is impacted by E2E Solutions

Loan processing time is the time spent after receiving a loan application from customers until making an approval/rejection decision. It is revealed that a bank's ability to process a loan quickly depends upon quick completion of both internal and external processing tasks. Analysis reveals that all aspects of E2E Solutions: single point processing, single point data entry, integrated databases, and automated and integrated processes help in faster loan processing.

Table 5.5 presents the summary of the impact of E2E Solutions on loan processing time. It is revealed that E2E Solutions speed up the internal processing task (e.g. making the proposal, analysis, presenting to the appropriate authority); however, it could not speed up the overall processing task as external processing tasks remain manual and lengthy. The Head of Branch Operations of DBBL affirms that *"...it is matter of one day to process a loan...if external process works in the same speed as internal process"*.

Table 5. 5: Summary of Evidence of E2E Solutions' Impact on Loan Processing Time	
Process Time	Evidence from organisations (BA, BRAC, CBL, DBBL, DBL, EBL, MBL, UCBL and JB)
E2E Solutions make the overall processing task faster.	Despite having potential, it is revealed that E2E Solutions could not help in reducing the overall loan processing time in all banks. It reports that all banks except MBL, UCBL and JB were able to reduce the internal loan processing time through E2E Solutions; however, could not create any impact on external loan processing task; thus as an aggregate E2E Solution could not make the loan processing task faster.

Although overall E2E Solutions could not make the loan processing task faster, different aspects of E2E Solutions; single point processing (section 5.4.1.1), single point data entry (section 5.4.1.2), integrated databases (section 5.4.1.3), and automated and integrated processes (section 5.4.1.4) create different levels of impact on loan processing time. Table 5.6 summarises how different aspects of E2E Solutions impact upon loan processing time.

Table 5. 6: Empirical Evidence of E2E Solutions' Impact on Loan Processing Time	
Mechanism	Evidence from organisations (BA, BRAC, CBL, DBBL, DBL, EBL, MBL, UCBL and JB)
Single Point Processing makes the processing task faster: (i) as all loans are processed at a single place; and (ii) by reducing the duplication of work.	It observes that single point processing makes the internal loan processing task faster in banks (BA, BRAC, CBL, DBBL, DBL and EBL), but could not expedite the external processing task. It is revealed that in Single Point Processing, all loan applications are pooled from branches and processed in a single centralised place (usually at the head office). By processing loans in a single location, banks avoid duplication of work and back and forth file transfer between branches and head office and all speed up the task.
Single Point Data Entry makes the loan processing task faster by avoiding double work.	Analysis reveals that single point data entry makes the internal loan processing task faster in banks (BRAC, DBL and EBL). Analysis shows that many staff are involved in a loan's processing and by entering data into the system only once, single point data entry avoids loan processing delay causes by multiple locations' data entry.
Integrated Databases make the loan processing task faster as: (i) data required for processing is quickly available; and (ii) it is easy to get the cumulative asset	Analysis reveals that integrated databases make the processing task faster in all banks except MBL, UCBL and JB. It is revealed that before implementation of integrated databases, banks needed huge amount of time for information retrieval and preparation of a loan proposal as data were either kept manually or in stand-alone computerised systems in dispersed geographically located offices. It shows that integrated databases help in faster and instant access to customer-related data and thus helps in faster decision making. As data is maintained in an organised way; thus in a single click, asset and liability position of customers can be generated and all results in faster

Table 5. 6: Empirical Evidence of E2E Solutions' Impact on Loan Processing Time	
Mechanism	Evidence from organisations (BA, BRAC, CBL, DBBL, DBL, EBL, MBL, UCBL and JB)
and liability position of a customer.	processing.
Automated and Integrated Processes help in quick loan processing by: (i) connecting internal and external loan processing parties; and (ii) processing data in a faster way.	Analysis reveals that automated and integrated processes help all banks except MBL, UCBL and JB to make the internal processing task faster. Analysis reveals that banks use Internet, intranet, and workflow for communication; however, as external parties are not ready, thus banks use these tools for internal use. For example, analysis shows that staff in BA use email-based system in loan processing, and this helps in quick loan processing. It is revealed that branches prepare the loan proposal and then they forward the hard copy; however, before that, they forward the soft copy through email, and head office starts working on the proposal before receiving the hard copy through post office or courier. Banks (BRAC, DBL and EBL) use workflow system for loan processing and that helps in quick processing. Faster data processing also results in quick loan processing. Analysis reveals that for faster data processing, banks (BA, BRAC, CBL, DBBL, DBL and EBL) use PCs and automated decision-making tools. EBL also uses various decision-making tools including ratio analysis, credit scoring, etc. and that helps in quick loan processing.

5.4.1.1 How Processing Time is impacted by Single Point Processing

In single point processing, all loan applications are pooled and processed in a single centralised location thus avoiding multiple processing tiers and more staff, and as a result, speeding up the loan processing task. It is revealed that single point processing ensures process reorientation and therefore processing tasks get faster. This helps to avoid duplication of work and back and forth communication among staff and results in quicker processing.

Analysis reveals that single point processing speeds up the loan processing task in banks (CBL and EBL). It is revealed that before implementation of single point processing, branches receive the loan application and process the loan initially and then forward to the next level (e.g. zonal office, head office) for further processing. This process was found to be lengthy and time consuming. But single point processing makes the loan processing task faster by reducing the decision-making tiers. A single processing centre directly receives the application and processes it thus avoiding the extra processing tasks taking place at the branches, zonal office and divisional offices. The Head of System Applications of EBL describes the state of processing time after implementation of single point processing, "*we are using 50 percent less staff than other banks; however, we are providing our clients faster services*". It also reveals that a few

banks (BA, BRAC, DBBL and DBL) implement single point processing for non-core loan products and achieve faster processing for non-core products compared with core loan products of the bank.

5.4.1.2 How Processing Time is impacted by Single Point Data Entry

It is revealed that single point data entry makes the loan processing task faster by avoiding duplication. Analysis shows that many staff and locations are involved in processing a loan, but by inputting data in a single location; the single point data entry system avoids duplication and makes the processing task faster. Single point data entry ensures accessibility to the same dataset for all process participants and therefore, contributes to faster processing.

Analysis reveals that four banks (BRAC, DBL and EBL) improved their loan processing cycle after implementation of single point data entry. It shows that in EBL, data for an application is entered into the system once and thus avoids the delay caused by multiple location data entry. It is revealed that EBL uses workflow (Lending Automated Processing Solutions) in the front-end processing and this essentially captures relevant data from the database (in the case of existing customers) while initiating a loan proposal. In the back-end, EBL uses Core banking solutions, and once loans are approved, loan files from workflow systems can be uploaded to the Core banking system with faster processing, and no need for additional data entry. It is also revealed that in the front-end, DBL uses RBS (Retail Business Solutions) and OCAS (Online Credit Approval Systems) and the back-end uses Core banking solutions and all systems are integrated. One system can capture data and information from other systems. The CIO of DBL describes how single point data entry helps in faster loan processing and mentions, *"...in case of existing customers making a fresh application, the system provides 80% of the data...rest 20% of the data need to be collected externally, for avoiding manual data entry we have implemented OCAS, and linked that with core banking solutions, once we just search in the database using client's identification number, OCAS automatically captured information from existing database"*.

5.4.1.3 How Processing Time is impacted by Integrated Databases

Analysis reveals that integrated databases help in quick loan processing. First, analysis shows that as integrated databases are accessible from every desk and office, this essentially helps in quick proposal preparation. Second, integrated databases help in assigning a unique identification number to clients; therefore, cumulative positions of clients are derived instantly, helping in faster processing.

Analysis reveals that integrated databases help in faster processing in all banks except MBL, UCBL and JB. It is revealed that in BA, before implementation of integrated databases, the bank needed much time for information retrieval and proposal preparation as all data were kept in stand-alone computerised systems. But after implementation of integrated databases, BA's decision-making process became faster when existing customers made fresh loan applications. The Deputy CIO of BA mentions that, *"...when (before) the system was in distributed mode...we could not take decision quickly...now within a second we could derive our bank liquidity position, asset position, liability position, customer's exposure..All are just matter of clicking on the keyboard...decision making process is faster".*

Analysis reveals that in processing loans, banks need four types of databases: clientele (personal information, clientele history), relationship (e.g. clientele business performance, clientele financial information database), and competitor and regulatory database (e.g. credit database). Once banks have all four, they could process loans faster. Integrated databases help in getting a holistic picture of a bank and that essentially helps in faster loan processing. The Senior Vice President of EBL reports that, *"...as we have a platform....within a minute I can get information on the total bank wide disbursement of loans in May, collection in July and outstanding in August...we can then fix our strategy what to do to recover the loan...if we do not have any IT platform..Then I have to go to all of the branches, give them a data format...someone may not understand what do to....then say one month after I can have a MIS but by this time the real time need of that delinquency study probably would have been over".*

5.4.1.4 How Processing Time is impacted by Automated and Integrated Processes

It is revealed that automated and integrated processes make loan processing tasks faster by: (i) approvals using email-based system/workflow system; (ii) data processing using automated decision-making tools; and (iii) communication and data gathering using EDI-based communication with clients and third parties.

It is revealed that four banks used an email-based system in loan processing and that essentially helped in quick loan processing (BA, BRAC, DBL and EBL). It shows that BA forwards the soft copy to the processing centre before sending the hard copy and thus makes the processing task faster. BA communicates with customers through email; uses Decision Support Systems (DSS); establishes EDI-based communication with customers for data gathering and document sharing and all essentially make the loan processing task faster. Analysis shows that EBL has

established an email-based culture within the bank and all the loan approval, enhancement, modifications and rescheduling are done through secured email-based communication.

It is revealed that because of the use of workflow in three banks (BRAC, DBL and EBL), loan processing becomes faster. It is revealed that if any process participant takes longer than the allocated time, workflow systems automatically send reminder emails, thus all staff are found to work faster. BRAC uses Kastle ULS originating System for SME loans. It is evident that after receiving the loan application; the unit office of BRAC inputs the data into the system and then forwards the file to the next level for appraisal. Thus, reliance on the post office is less and physical distance does not matter in loan processing. The Head of SME Operations of BRAC, therefore, mentions, *"...Unit [SME] office gets the file and then forwards to the zonal office, and then [after processing] to the head office for approval....before [manual system] it takes 7 days to process; and now [automated and integrated process] we can do it in a day"*. It also reveals that DBL uses RBS (Retail Banking System), and OCAS (Online Credit Approval System) for loan processing, therefore, the pre-disbursement processing task is faster. Analysis shows that initially branches used to send proposals to head office either through messengers (if branches are near to head office) and couriers, and this process takes time, and delays the loan processing; however, now within a click, loan proposals go to the next level for approval. It is revealed that previously it took 3-7 days in transit before loan proposals found the appropriate person at head office. The Head of Branch Operations of DBL mentions that *"...benefits of automated system is the time management...say before [implementation of automated solutions]...we [branch] send messenger with documents to head office...if we send them [messenger] at noon....because of road jam, the messenger would reach the head office at evening and by that time staff at head office level starts leaving the office..Next day, officer starts working on the file at noon and by this time 12 working hours have passed away....now we send within a finger tip...within a minute...this 12 hours saving is huge for me [branch]...my branch is near to head office..Those who are far away they can save more"*.

Automated and integrated processes also help in faster data processing which results in quicker loan processing. It is revealed staff need to calculate ratio, credit scoring, fund flow statement, etc., for analysis of loan applications. Automated and integrated processes make the calculation task faster and more accurate. Analysis reveals that for faster data processing, banks (BA, BRAC, CBL, DBBL, DBL and EBL) use PCs and automated decision-making tools (e.g. DSS), and workflow systems.

It is revealed that in loan processing, banks rely on customers and third party support services and regulatory bodies. It is reported that banks use various automated systems for communicating with external parties and that essentially helps in faster processing. BA has established an EDI-based communication with their corporate customers and that helps them in getting quick information and faster processing. EBL established networking with their big corporate houses, and thus data and documents are exchanged faster. Banks (BA, DBL and EBL) established EDI-based communication with support services (e.g. lawyers and third party information collection agencies) that essentially help in getting quick services and faster loan processing.

5.4.2 How Risk Assessment is impacted by E2E Solutions

Accurate risk assessment is the extent to which E2E Solutions help in ascertaining the correct riskiness of a loan proposal. The study reveals that E2E Solutions help in accurate risk assessment by: (i) separating loan marketing tasks from the risk assessment tasks; (ii) supplying organised sources of data to the processing staff; and (iii) use of credit scoring and sophisticated tools for risk assessment. As summarised in table 5.7, E2E Solutions help in risk assessment in banks (BA, DBL and EBL).

Table 5. 7: Summary of Evidence of E2E Solutions' Impact on Risk Assessment

Risk Assessment	Evidence from organisations (BA, BRAC, CBL, DBBL, DBL, EBL, MBL, UCBL and JB)
E2E Solutions make the overall risk assessment task accurate.	It reports that E2E Solutions help in accurate risk assessment in banks (BA, DBL and EBL). It is revealed that by separating risk assessment task from marketing task, banks (EBL) control the critical risk arising in processing a loan. Furthermore, the use of credit scoring and other computerised-based assessment tools also help in accurate risk assessment in banks (BA, DBL and EBL).

Analysis reveals that three aspects of E2E Solutions: Single Point Processing (Section 5.4.2.1), Integrated Databases (Section 5.4.2.2), and Automated and Integrated Processes (Section 5.4.2.3) help in accurate risk assessment in banks. Table 5.8 shows the evidence of how various aspects of E2E Solutions help in accurate risk assessment.

Table 5. 8: Empirical Evidence of how Risk Assessment is Impacted by E2E Solutions	
Mechanism	Evidence from organisations (BA, BRAC, CBL, DBBL, DBL, EBL, MBL, UCBL and JB)
Single Point Processing helps in accurate risk assessment by: (i) separating the loan processing task from loan marketing task; and (ii) helping in consistent decision making.	Analysis reveals that Single Point Processing helps in reducing the critical risk in banks (CBL and EBL) by controlling the critical risk arising in processing a loan. First, all loans are processed in a single location; the person who maintains the relationship with clients or markets the loan is different from the person who processes the loan. Therefore, personal prejudice, liking and dislike would not work in the loan assessment and therefore, consistent decisions can be made. Second, a group of specialised staff process all loans, expertise develops among loan officers and that results in a proper risk assessment.
Integrated Databases help in risk assessment as: (i) existing customers are easily traceable, thus reduces the chance of fraud; and (ii) organised sources of data are available.	Analysis reveals that integrated databases help in accurate risk assessment in banks (BA, DBL and EBL). It is revealed that EBL maintains a full set of information in their database. It is revealed that a client may have a loan account in one branch, L/C in another branch, and O/D facility is another branch, but by a single click EBL gets all the asset and liability position of clients instantly and accurately and this helps while assessing a fresh loan application. Integrated database helps in assigning a unique identification number to customers, stores data in an organised way. Thus, it helps in quick data retrieval and accurate assessment.
Automated and Integrated Processes help in accurate risk assessment as banks use Decision Support Systems (DSS) and tools in risk assessment.	Analysis reveals that banks use Excel-based risk assessment tools, as well as decision support system (BA, DBL and EBL) and this helps in accurate risk assessment. Analysis reveals that BA uses credit scoring system for small loans and that helps them in making consistent decisions. For the large loan, BA uses Excel-based decision making tools, such as Credit Risk Grading (CRG), ratios and fund flow statements. DBL uses OCAS (Online Credit Approval System) for large and SME loans, and RBS (Retail Banking System) for retail loans and it has in-built programming for ratio analysis, CRG analysis, credit scoring analysis and projection analysis, and once the data is entered into the system, system guides in making accept/reject decision.

5.4.2.1 How Risk Assessment is impacted by Single Point Processing

Single point processing controls critical risks arising in loan assessment. First, by separating loan marketing tasks from risk assessment tasks, single point processing helps in accurate risk assessment. It helps in making a consistent decision based on the merits of the loan application. It helps in risk assessment by controlling the influence of personal prejudice, choice, likings and dislike in risk assessment. Second, as a group of specialised staff process all loans, expertise develops among staff thus helping in accurate risk assessment.

It is revealed that single point processing helps in accurate risk assessment in banks (CBL and EBL). It is revealed that in the EBL, branch managers maintain relationships with clients and receive loan applications, but loans are processed by other staff at central processing centres. Thus, accurate decisions can be made as applications are assessed on merit. Single point processing also helps CBL control critical risks arising in branches. The Deputy Director of SME of CBL mentions that *".....as due to 'special relation' [with clients] branch managers provide loans without properly judging the credit worthiness...now [Single Point Processing] we stopped this...therefore....default rates are less"*.

5.4.2.2 How Risk Assessment is impacted by Integrated Databases

Analysis reveals that integrated databases help banks (BA, DBL and EBL) in accurate risk assessment as they help in storing customers' historical and current data and furnish them to the processing staff in an efficient way.

It is revealed that proper risk assessment depends upon the availability and accuracy of information on potential clients. Integrated databases supply data in an organised way, and thus help in detecting fraud (if any) on the part of customers. Integrated databases assist BRAC in historical analysis of clients' performance and prepare various analytical reports that help in accurate risk assessment. For the existing clients, BRAC keeps records of loan applications, acceptance and rejection history as well as other non-loan related service history of customers, and that further helps in risk assessment. The Head of System Applications of BRAC mentions, *"If a person [client] took a remittance services in year X and has applied for a loan and declined in year Y...we keep all the database...credit department is the main users of the data"*.

Integrated databases help in getting data on customers in an efficient way and thus help in accurate decision making. It is revealed that a client might have had transactions with a bank at a different point of time or at the same time but with different branches. It is crucial to know the cumulative position of existing customers while assessing fresh loans. Integrated databases help in getting clients' data in an organised way. Analysis reveals that integrated databases help EBL to accurately assess their existing client base. The Head of Credit Risk Management of EBL explains, *"a client may maintain different types of loan account with different branches…. our technologies are robust enough to produce clients' latest cumulative affair in a single click"*.

5.4.2.3 How Risk Assessment is impacted by Automated and Integrated Processes

Analysis reveals that automated and integrated processes help in accurate risk assessment as they help in choosing the right customers. It is revealed that the use of DSS and Excel-based tools help in making consistent decisions, and in identifying good from bad/marginal borrowers. It is revealed that in banks, staff keep moving from one bank to another bank, one branch to another within a bank, but the use of decision-making tools help in making consistent decisions, thus lessening the impact of personal bias and prejudice in risk assessment.

Analysis reveals that in a bank some managers are conservative and this may be reflected in their loan application accept/rejection decisions if assessment is done manually. But the use of decision support tools helps in making consistent decisions as managers are guided by tools. It is revealed that DBL uses DSS for risk assessment which essentially helps in making accurate decisions. The Head of Credit Administration of DBL mentions, *"...managers are different...some are conservative, some are relaxed, some are aggressive....but at the institutional level a bank should provide the same level of services to the clients, regardless where is the location of the branch or who is the manager does not matter...technology helps us to ensure that"*.

Analysis reveals that banks provide various types of loans where risk patterns are different. Automated and integrated processes help banks to grade the risk and that essentially helps in setting an appropriate price for covering the riskiness of the loan. The Assistant Vice President of BA mentions that, *"...after receiving a loan application in the process of appraisal we use software...we have different risk grading software....for manufacturing, for trading, for MBFI we use software..Just plugging the data from balance sheet...we get the output"*. It is revealed that after implementation of E2E Solutions, non-performing loans at EBL decreased as EBL was in a better position to distinguish good borrowers from bad borrowers. EBL uses different algorithms including credit scoring, CRG, ratio and data mining tools in processing a loan; therefore, these help in accurate decision making.

5.4.3 How Loan Administration is impacted by E2E Solutions

Ease of loan administration means the degree to which E2E Solutions help in managing the after disbursement loan administration process; accounting, realisation and reporting. Analysis reveals that E2E Solutions automate loan administration by automating the accounting functions, loan realisation and reporting. The Head of Credit Risk Management of EBL affirms, *"...system*

is preparing the amortization schedule, system is providing us signals for loan realization...computer preparing the default lists, computer generating the reminder letter...different nature of reminder letter...we have options like sending this letter to clients through e-mail and Internet". Analysis reveals banks (BA, BRAC, CBL, DBBL, DBL, EBL, MBL and UCBL) automate their loan administration after implementation of E2E Solutions. Table 5.9 summarises the empirical evidence of E2E Solutions' impact on loan administration in banks.

Table 5. 9: Summary of Evidence of E2E Solutions' Impact on Loan Administration

Loan Administration	Evidence from organisations (BA, BRAC, CBL, DBBL, DBL, EBL, MBL, UCBL and JB)
E2E Solutions make the administrative job easier.	It observes that E2E Solutions make the loan administration job easier in all banks except UCBL and JB; although full potentiality of E2E Solutions is unrealised because of software misfits. It is revealed that both types of IT platform, centralised IT platform (BA, BRAC, CBL, DBBL, DBL and EBL) and decentralised IT platform (MBL) support loan administration; however, centralised platform is more effective and covers both pre-disbursement processes (loan limit upload; regulatory and policy requirement fulfilment; loan amount upload) and post-approval processes (amortization schedule calculation, loan interest and amount calculation and realisation, interest accruals calculation, excise duty and VAT calculation and deduction, loan rescheduling, loan enhancement and closing); reporting; however, the decentralised IT platform covers the post-approval processes.

Analysis reveals that automated and integrated processes of E2E Solutions impact on loan administration. Table 5.10 provides the empirical evidence from banks on how automated and integrated processes impact on loan administration.

Table 5. 10: Empirical Evidence of how Loan Administration is Impacted by Automated and Integrated Processes

Mechanism	Evidence from organisations (BA, BRAC, CBL, DBBL, DBL, EBL, MBL, UCBL and JB)
Automated and Integrated Processes help in loan administration by automating: (i) accounting functions; (ii) loan realisation; and (iii) reporting tasks.	Analysis reveals that except JB, all other banks automate the loan administrative task. Analysis reveals that loan administration has three stages: accounting, realisation and regulatory reporting and all the banks have automated accounting. However, JB found to have those facilities in only 136 branches and does not have automated realisation and reporting features. Likewise, MBL and UCBL also do not have automated reporting provision.

Analysis reveals that once the approval decision is made, the loan administration process starts. It reveals automated and integrated processes automate the accounting functions of loan administration (e.g. amortisation schedule, instalment payment, interest rate calculation). It is revealed that banks implement core banking solutions for automating accounting functions. For example, in BA, software calculates the amortisation schedule, Internet suspense and profit calculation, and thus manual work is fully replaced by automated work. The Manager of DBBL mentions, *"nowadays you would not see much paper on the loan officer's desk…. everything kept on the system…however, in old days we have to maintain huge sized book registers….pile up those registers on our desk ..… a bank officer sitting on the chair cannot be seen from the front"*.

The second part of loan administration is loan realisation. Analysis reveals that banks use core banking solutions for automatic loan realisation. It is revealed that loan accounts are linked with savings accounts, and the system automatically deducts the loan amount from the linked accounts. If the linked account lacks sufficient balance, the system generates an intimation letter and SMS to customers. It is revealed that in EBL, the loan instalment is automatically deducted from a subsidiary account; the system sends the intimation letter to customers. The CIO of EBL reports that *"...system automatically deducts the amount from the linked account if there is sufficient balance....if not, whenever money comes into the account, system automatically adjusts the loan amount...system always searches for money"*.

The last part of loan administration is reporting. Analysis reveals that banks submit 400 plus reports to the central bank on a quarterly basis. Banks use core banking solutions, as well as in-house developed software to prepare reporting for the central bank. It is revealed that, on an average, banks needed 10 to 15 days to prepare central bank reporting in a manual way; however, as the system generates all the reporting, this is now a matter of a day to prepare all reporting.

5.4.4 How Processing Cost is impacted by E2E Solutions

This section presents the degree to which E2E Solutions help in saving postage charges, paper costs and wages in connection with loan processing. Analysis reveals that E2E Solutions reduce the cost of loan processing by proper reorientation of business process and automation. Table 5.11 summarises how E2E Solutions help in accurate risk assessment in banks (BA and EBL).

Table 5. 11: Summary of Evidence of E2E Solutions' Impact on Processing Cost	
Processing Cost	Evidence from organisations (BA, BRAC, CBL, DBBL, DBL, EBL, MBL, UCBL and JB)
E2E Solutions reduce the processing cost.	It reports that E2E Solutions help in reducing the loan processing cost in banks (BA and EBL). It is revealed that by avoiding the duplication of work and manual work, E2E Solutions help in reducing the processing cost. Analysis shows that after implementation of E2E Solutions, EBL operates with 50% less staff and thus helps in reducing the processing cost.

Analysis reveals that all of the aspects of E2E Solutions impact on loan processing costs: Single Point Processing (section 5.4.4.1), Single Point Data Entry (section 5.4.4.2), Integrated Databases (section 5.4.4.3), and Automated and Integrated Processes (section 5.4.4.4). Table 5.12 shows the evidence from organisations on how different aspects of E2E Solutions impact on loan processing costs.

Table 5. 12: Empirical Evidence of how Loan Processing Cost is Impacted by E2E Solutions	
Mechanism	Evidence from organisations (BA, BRAC, CBL, DBBL, DBL, EBL, MBL, UCBL and JB)
Single Point Processing helps in reducing the costs by: (i) reducing the number of decision-making staff; (ii) avoiding duplication of work; and (iii) helping to run the branch with fewer and less costly managers.	Analysis reveals that implementation of single point processing reduces the loan processing cost in banks (EBL). Analysis reveals that CBL implemented single point processing very recently, and is yet to receive the cost saving benefits. However, EBL reduces the cost the loan processing cost by reducing the requirements for staff and reducing the staff involved in loan processing. As loan processing in EBL is done at Central Processing Centre, lower salaried managers run the bank branches. Analysis shows that DBL processes retail loans through centralised system, therefore, DBL's requirements of staff for retail loan processing is reduced to 25 from 60. Cost of processing for retail loans is less than other loans in DBL.
Single Point Data Entry reduces the Processing Cost by avoiding duplication of work.	Analysis reveals banks (BRAC, DBL and EBL) achieve cost savings by implementing single point data entry. It is revealed that EBL reduced the staff required for loan processing once it implemented single point data entry. It is revealed that as requirement for data entry staff is less in banks (DBL) thus cost of processing decreases.
Integrated Databases reduce the loan processing cost as: (i) it avoids manual data storage, gathering; and (ii) it reduces monitoring and reporting cost.	It is revealed that all banks except MBL, UCBL and JB reduced the processing cost after implementation of integrated databases. It is evident that in BA as the database is integrated, the cost of data retrieval is minimal as same data is used again and again without incurring an additional cost. It is revealed that as banks get the reports in shortest possible time, no need to maintain paper books. It is revealed that banks (BA and EBL) had big internal audit team;

Table 5. 12: Empirical Evidence of how Loan Processing Cost is Impacted by E2E Solutions	
Mechanism	Evidence from organisations (BA, BRAC, CBL, DBBL, DBL, EBL, MBL, UCBL and JB)
	however, after implementation of integrated solutions, banks operate with few audit members as real time monitoring is possible from head office thus cost reduces.
Automated and Integrated Processes reduce the loan processing cost as: (i) less manpower is required and; (ii) manual and paper-based communication is reduced.	Analysis reveals that automated and integrated processes help banks to save costs in different ways; making the communication process automated (BA, DBL and EBL); making the processing task paperless (BA, DBL and EBL); and making the loan administration task automated (BA, BRAC, CBL, DBBL, DBL, EBL, MBL and UCBL). It is revealed that DBL uses OCAS (Online Credit Approval System) for SME loans; thus less paperwork is required for SME loans in comparison with other loan products.

5.4.4.1 How Processing Cost is impacted by Single Point Processing

By pooling all loan applications from branches and processing in a single location, single point processing reduces loan processing costs by reducing the staff required to process loans. It avoids duplication of work and hand-offs and thus reduces the wastage of resources. In single point processing systems, less people and lower salaried staff can run a branch as the point of marketing, and decision-making tasks are done at head office level, contributing to lower loan processing costs.

Analysis reveals that EBL achieved cost savings after implementation of single point processing as EBL operates with 50% less staff. Analysis reveals that before implementation of single point processing, EBL had to maintain at least one loan officer for each type of loan, including SME, consumer finance, retail, real estate, syndicate loan, project loan, etc. However, loan applications do not necessarily come evenly in branches. But, in single point processing, all loans are processed at head office level, therefore, maximum utilisation of resources could be made and less staff process the loan, essentially reducing loan processing costs.

Single point processing also allows banks to run branches with less salaried staff and lessens the need for middle level offices and therefore processing costs are reduced. This is because the branches are sales and marketing points; decision-making tasks are done at head office thus no middle level office is required to monitor and control branches' operations. The Head of Credit Risk Management of EBL describes their operations after implementation of single point processing, *"At the branch level, we used to maintain at least one loan officer for each type of loan…one for SME loan, one for retail, one for project loan, one for LC operations, one for bills…However, loan applications do not come evenly to a branch. [With] the centralized online*

system, we keep only one loan officer at the branch to collect all types of loan application and send those to the head office…. 6 to 7 people can run a branch, …it used to be 30 to 40 people.. Furthermore, lower management level (i.e. less salaried) people can run a branch as all decisions are made at head office level".

5.4.4.2 How Processing Cost is impacted by Single Point Data Entry

Single point data entry reduces the cost of loan processing by avoiding duplication of work and involving less staff in loan processing.

It is revealed that after implementation of single point data entry, EBL reduced the manpower required for loan processing. It is revealed that in DBL data need to be inputted into the system once and banks can use the data repeatedly in future without incurring additional cost. It is revealed that loan processing costs are also reduced as requirements for data entry officers in banks are less. As opposed to single point data entry, multiple point data entry increases processing costs. It is revealed that in CBL, the SME centre keeps records of loan applications received; applications are forwarded to head office, and sanctioned amounts and sanctions in progress apply. However, central processing centres also maintain a similar type of database; thus the SME centre and CPC (Central Processing Centre) are duplicating work by involving more staff.

5.4.4.3 How Processing Cost is impacted by Integrated Databases

Integrated databases reduce the processing cost by reducing the need for manual work in data storage, data retrieval and data gathering. Integrated databases assist in real-time monitoring, thus reducing monitoring costs. Analysis reveals that integrated databases reduce the loan processing costs in banks (BA, BRAC, CBL, DBBL, DBL and EBL).

Analysis shows that banks used to maintain physical data storage spaces; however, the need for physical space for data storage is less as all data is maintained digitally. It is revealed that integrated databases help management to retrieve data instantly and the same data can be used again and again without incurring additional costs. Analysis shows that manual searching of data involves time and cost which are reduced once banks have integrated databases. It also helps in generating a huge amount of analytical reporting. It is revealed that once databases are integrated, then a single unique code for each customer rules over the entire database and, using this code number, it is possible to get the total position of a customer in a single click. The CIO of DBL explains how integrated databases reduce cost, *"...IT reduces the cost...removes the duplication of job...as once you [would] enter the data into the system and record it...you need*

not to re-enter the data in the product life....just need to update the database...2nd time, 3rd time data entry is not required". Analysis also reveals that integrated databases reduce auditing costs. As databases are accessible from all locations, real-time monitoring of customers and bank staff is possible. System audits and virtual audits are possible. It is revealed that EBL had a large audit team, now few staff do all the audit work.

5.4.4.4 How Processing Cost is impacted by Automated and Integrated Processes

Automated and integrated processes bring automation in communication, front-end and back-end operations, and payment services and all these contribute positively in loan processing cost.

Analysis reveals that the success of E2E Solutions depends upon acceptance by customers. It is revealed that by integrating customers with the technologies, banks (BA, DBL and EBL) reduce communication costs. Analysis reveals that banks establish EDI and email-based communication with customers and thus reduce loan processing costs. Analysis reveals that because of email and EDI-based communication, banks send soft copies of statements and documents to clients, and save paper and postage costs. In payment systems, banks deploy ATM machines and reduce the costs of payment services. The CIO of BA mentions that *"...one ATM is equivalent to a teller...but benefits of an ATM are that it does not need any vacations...any sick leave and works 24/7"*. Banks also deploy various alternative delivery channels (e.g. ATM, POS and Internet banking) and that essentially reduces the cost of operations. EBL does not provide any paper statements to customers, rather they send statements in PDF form by email, reducing postage and paper costs.

Besides customer interaction and payment services, banks use intranet and workflow for loan processing, and thus replace paper-based processing with automated processing. It is revealed that BA makes the processing task 60% paperless as BA keeps all the data in the system. It shows that DBL uses OCAS (Online Credit Approval System) for SME loans and thus avoids paper-based processing. Analysis reveals that DBL also saves courier and postage charges. EBL adopts an emailing system for loan approval decisions. EBL does not maintain any hard copy or paper unless required by law. The CIO of EBL reports *"...the major benefits that I am getting from the system is preparing the statutory reporting of Bangladesh Bank [the central bank], say CL, SBS,...we provide 400 reports.. this report preparation is huge job, as we are doing that centrally therefore, volume of works in the branches are less and reduce manpower from branch level as these are auto-generated"*.

Analysis reveals that banks automate back-end operations using core banking solutions. Loan accounting and maintenance tasks are fully automated; less human resources are required for back-end operations. The Head of Credit Administration of EBL mentions about the reduction of processing cost in EBL, *"...processing becoming paperless...both front end and back end, therefore, processing is faster and costs are less"*. It is also reported that in BRAC, back-end operations are fully automated. The system does the amortisation schedule calculation, instalment realisation, enhancement, interest charge and loan closing; no manual paperwork is involved. By opening a web-based system, banks also save costs by asking clients to input the data into the system directly. The Head of Trade Operations of EBL reports, *"...by opening of web based application system...we did 60% of our job outsourcing...we [bank staff] need not to enter data into the system; we just verify the data provided by clients"*.

5.5 How E2E Solutions Affect Coordination and Communication Performance

This section documents how different facets of E2E Solutions affect the coordination and communication process. Coordination and communication performance is the degree to which E2E Solutions affect the coordination and communication task in a loan approval process, measures of which include communication, coordination, document sharing, controlling and monitoring. This research reveals that implementation of E2E Solutions and resulting enhanced performance of coordination and communication can best be captured by ease of communication (section 5.5.1), ease of coordination (section 5.5.2), ease of document sharing (section 5.5.3), ease of controlling (section 5.5.4) and ease of monitoring (section 5.5.5). Table 5.13 shows the association of E2E Solutions with coordination and communication process performance.

Table 5. 13: Impact of E2E Solutions on Coordination and Communication Process Performance

E2E Solutions	Coordination and Communication Performance				
	Communication	Coordination	Document Sharing	Controlling	Monitoring
Single Point Processing	X	X	X	√	X
Single Point Data Entry	X	X	X	X	X
Integrated Databases	X	X	X	√	√
Automated & Integrated Processes	√	√	√	X	X
Website	√	X	√	X	X
Tele-Banking	√	X	X	X	X
SMS Banking	√	X	X	X	X
Internet Banking	√	X	X	X	X
ATM	√	X	X	X	X
POS	√	X	X	X	X
Intranet/E-Mail	√	√	√	X	X
EDI	√	X	√	X	X
PCs	X	X	X	X	X
DSS	X	X	X	X	X
Workflow Management	X	√	√	X	X
Core Banking Solutions	X	X	X	X	X

Note: Tick (√) having impact on particular aspect of E2E Solutions on Process Level Indicators; whereas cross (X) means having no impact.

5.5.1 How Communication is impacted by E2E Solutions

Ease of communication is the extent to which E2E Solutions ease communication with customers, regulators and external support services. An E2E loan process starts with receiving a loan application from clients. Banks take support services from accountants, lawyers and approval from central banks and government agencies. Once the approval decision is made, banks contact customers for disbursement of the loan and realisation of the same. Analysis reveals that banks implement E2E Solutions by implementing various technologies such as website, tele-banking, SMS banking, ATM, POS, EDI and Internet for easing the communication process. Table 5.14 shows the evidence of E2E Solutions' impact on the communication process in organisations.

Table 5. 14: Summary of Evidence of E2E Solutions' Impact on Communication	
Communication	Evidence from organisations (BA, BRAC, CBL, DBBL, DBL, EBL, MBL, UCBL and JB)
E2E Solutions make the overall loan processing related communication (with clients and external loan related parties) easier.	It reports that E2E Solutions help in improving the communication with customers and other process participants in banks (BA and EBL). It is revealed that by deploying Internet, ATM, website, POS, EDI and by providing proactive training to customers and support parties, banks (BA and EBL) improve their communication process. It is revealed that EBL provides account statements to customers through email. Whereas, BA establishes EDI-based communication with corporate customers and thus improves communication process.

It is revealed that the communication process is impacted by automated and integrated processes of E2E Solutions. Table 5.15 shows the evidence from organisations on how communication is impacted by automated and integrated processes.

Table 5. 15: Empirical Evidence of how Communication is Impacted by Automated and Integrated Processes	
Mechanism	Evidence from organisations (BA, BRAC, CBL, DBBL, DBL, EBL, MBL, UCBL and JB)
Automated and Integrated Processes help in communication with external process participants by: (i) using Internet-based communication; and (ii) automating the payment services.	It shows that all banks deploy website, some (BA, BRAC, CBL, DBBL, DBL and EBL) provide loan application downloadable option and online mortgage calculator. Tele-banking (BA, BRAC, DBBL and DBL), SMS banking (BA, BRAC, DBBL, DBL, MBL and UCBL) are also deployed for communication with customers. In case of automating payment services, banks have ATM, Internet banking and POS services. A few banks (BA, DBL and EBL) establish EDI-based communication with customers and support services. Banks are also found to be ready to establish EDI-based communication with regulatory bodies; however, none of the banks could establish EDI-based communication with regulators. Email-based communication with foreign credit rating services is also found to be common in banks.

It is revealed that an automated communication process makes the back and forth communication with customers, support services and regulators easier. It helps banks to provide product-related information (e.g. interest rate, mode of payment, security, and collateral, terms and conditions) to clients. Previously, banks used hand-outs and newspaper advertisements for disseminating product-related information. But now, banks use various online channels (e.g. website, mobile marketing, telemarketing) for providing product-related information to their clients. Without visiting a bank, a customer can judge his/her purchasing power by using an

online calculator and information provided on the website. The CIO of EBL mentions that *"...before coming to our bank and by visiting the website customers can judge 100% of their purchasing power....what are the documents required, what are the terms and conditions...online mortgage calculators all are there".*

Once the customers are satisfied with the products, customers make a formal request for a loan in a prescribed format. It is revealed that previously customers needed to come to branches to collect an application form. But now customers can download forms from the website, collect the form by email and then fill in the form and send it by courier. The Head of Branch Operations of DBBL mentions *"...we [bank] uploaded the small loan/credit card application form into our website...customers can download the form...fill it up and send us through post...we will then process the application".* As a physical signature is important in Bangladesh, thus a formal online request is not possible. For the best utilisation of technology in the communication process, banks take the necessary pre-signature from customers, and then communicate with customers online. The Head of IT in EBL reports that for an initial application *"they sign the documents. However, for renewals or for increases, clients can contact with us through e-mail and send documents online"*.

After making a loan request, customers need to know the status of their application. Banks also contact customers for additional documentation and information. Banks use various technologies in this communication process. Banks implement Internet, tele-banking, SMS banking and Internet banking for communicating with customers. For example, BRAC provides Internet banking facilities for their customers and customers can view the status of loan applications from their end, as the Head of System Applications of BRAC mentions *"...end users feel rather happy....no need not make telephone calls or visit to bank to see the status of the loan application….customers can view it from their end...they can check if there is any deficiency in documentation".*

Besides customers, banks use support services. For example, banks need accountants for verifying the statements provided with the loan application, third parties for collecting additional information and attorneys for legal opinions. Banks also contact regulating authorities, such as Credit Information Bureau, Land Registry Office, Bangladesh Road Transport Authority, Ministry of Finance, National Board of Revenue, Export Promotion Bureau (EPB), etc. Analysis reveals that banks are in different stages in connecting with external support services; however, none were found to have established online communication with regulators. It is revealed that EBL contacts support services online. EBL scans customers' loan application

forms and photographs and sends them to the third party for verification. The third party also communicates with EBL through an email-based system. Analysis shows that EBL contacts their attorney and D&B credit rating agencies through email.

Once the loan application is approved, further communication with customers is required for disbursement and realisation. It is revealed that banks have various alternative delivery channels (ATM, Internet banking and POS) for making and receiving payments. It is revealed that in DBBL, retail clients withdraw money from ATMs, and the bank, instead of cheques/cash, provides clients with ATM cards. DBBL has fund transfer facilities; therefore, clients also transfer funds from one account to another account. DBBL also has an SMS alert system; once a transaction takes place in the client's account, clients get an immediate message for the transaction. Analysis reveals that DBBL provides an intimation to their clients through SMS; if the customers forget to pay a loan instalment, the system automatically sends an intimation. BA sends statements and approval letters to clients through email. The CIO of BA reports, *"...we have an alert system...if any transaction occurred in any client's account...they got instant SMS"*.

5.5.2 How Coordination is impacted by E2E Solutions

Ease of coordination is the extent to which E2E Solutions improve internal loan processing tasks. Analysis reveals that an E2E loan process cuts across functional departments, and is an example of 'joint production' by many staff. Analysis reveals that E2E Solutions help in improving the loan coordination task by connecting internal process participants. It is revealed that banks implement various technologies for internal loan coordination, ranging from Internet to workflow systems. Analysis reveals that banks (BA, CBL, DBBL, DBL, and EBL) smooth their loan coordination tasks by implementing E2E Solutions. Table 5.16 provides empirical evidence of how E2E Solutions improve loan coordination.

Table 5. 16: Summary of Evidence of E2E Solutions' Impact on Coordination

Coordination	Evidence from organisations (BA, BRAC, CBL, DBBL, DBL, EBL, MBL, UCBL and JB)
E2E Solutions make the loan coordination activities easier.	It is revealed that banks (BA, CBL, DBBL, DBL and EBL) improve the loan coordination task after deployment of E2E Solutions. It reports that banks improve the loan coordination task by using workflow system (OCAS and RBS by DBL and LAPS by EBL) or/and email-based system (BA, CBL, DBBL and EBL).

Analysis reveals that automated and integrated processes of E2E Solutions impact on loan coordination. The mechanism through which automated and integrated processes improve the loan coordination task is presented in table 5.17.

Table 5. 17: Empirical Evidence of how Coordination is Impacted by Automated and Integrated Processes

Mechanism	Evidence from organisations (BA, BRAC, CBL, DBBL, DBL, EBL, MBL, UCBL and JB)
Automated and Integrated Processes help in coordination as: (i) work process is automated; and (ii) roles and responsibilities are easily definable and controllable through automated system.	Analysis reveals that loan processing is an example of joint production, and where coordination is important. Automated and Integrated Processes help in coordinating loan task in in all banks except MBL, UCBL and JB. It is revealed that BRAC uses Universal Lending System (ULS) loan originating system. It works like online forum. It automates the loan processing; staff needs not to come to office for approving loan decisions and can work from home. The individuals' roles, responsibilities can be fixed and defined through the system. Analysis reveals that DBL uses RBS and OCAS for coordinating loan processing activities. It is revealed that the system automatically sends the reminder email, if anyone holds the file more than the allocated time. EBL uses Lending Automated Processing System (LAPS), and it is an integrated end-to-end web-based software solution that automates the entire lending process.

Analysis shows that in the loan coordination process (e.g. sending sanction letter, documentation, loan limit loading and loan criteria fixation, loan status sharing) banks use various IT-based systems. Analysis reveals that two departments at the branch level (relationship and credit administration) and four departments at the head office level (credit risk management, credit administration, loan recovery and legal department) are involved in loan processing. Banks use various workflows, Internet and core banking solutions for loan coordination. The Head of Credit Risk Management of EBL describes how technologies help in coordination, *"we use two types of systems for loan process…LAPS (Lending Automated Processing System) and CORE banking solutions. Through LAPS is used for pre-disbursement, where work process and decision making authority are predefined…loan originator collects the application and all the data required…..then entered those into the system and pass it to the next level, if next authority agrees it moves to higher authority approves, if all three approves, we put visa on it and disburse the loan using CORE banking solutions"*.

Analysis reveals that customers lodge an application at branches and maintain contact with branches; however, the loan is processed at head office level. The head office and branch coordination process is done through an IT-based system. For example, through the system,

branches upload the loan application and head office downloads the application and processes it. Once approved, head office loads the loan limit against the account maintained with branches. Against the loan limit set by head office, branches disburse the loan to customers. Thus, automated and integrated processes smooth the intra and inter-departmental loan coordination. The Head of Process Re-engineering and Change Management of DBL mentions that *"...before [implementation of Workflow Management System] everyone complains to everyone...no one takes the responsibility of delaying the processing job...now they [loan officers] cannot do that as communication process is automated and fully tracked"*.

Automated and integrated processes smooth the process coordination by reducing the need for physical meetings. It helps in tracking the loan application status. Analysis reveals that a workflow system works as an online forum; staff need not have physical meetings and physical files need not move from one person to another for further processing and approval. Analysis shows that BRAC uses the Universal Lending System (ULS) loan originating system. It works like an online forum. The Head of System Applications of BRAC mentions, *"...[Workflow Management System] before, there was physical meeting with branch people and head office people for loan processing, now online discussion replaces the physical round table discussion"*.

5.5.3 How Document Sharing is impacted by E2E Solutions

The ease of document sharing is defined as the extent to which E2E Solutions help in sharing documents among loan processing staff. Analysis reveals that loan processing is a paper intensive task and thus banks implemented E2E Solutions for effective document sharing among staff. Analysis reveals that a few banks implemented a document management system; some created a secure folder on their website for document sharing, and some used secured Intranet for sharing documents. The empirical evidence of how E2E Solutions impact on document sharing is presented in table 5.18.

Table 5. 18: Summary of Evidence of E2E Solutions' Impact on Document Sharing

Document Sharing	Evidence from organisations (BA, BRAC, CBL, DBBL, DBL, EBL, MBL, UCBL and JB)
E2E Solutions make the loan document sharing task easier.	It is revealed that E2E Solutions make the document sharing task easier in banks (BRAC, DBL and EBL). It is revealed that a number of banks (BRAC, DBL and EBL) implement document management systems, and other arrangements (email-based system, or creating file sharing space on the web), and that essentially helps in document sharing among staff.

Analysis reveals that automated and integrated processes help banks to share documents among the processing staff, although on a limited scale. Table 5.19 shows how document sharing is impacted by automated and integrated processes.

Table 5. 19: Empirical Evidence of how Document Sharing is Impacted by Automated and Integrated Processes

Mechanism	Evidence from organisations (BA, BRAC, CBL, DBBL, DBL, EBL, MBL, UCBL and JB)
Automated and Integrated Processes help banks to electronically share documents among staff.	Analysis reveals that banks implement Automated and Integrated Processes with an expectation of sharing documents electronically, but organisations could use the system partially on a limited scale. It is revealed that BA sends the soft copy of loan proposal to head office, before sending the hard copy through courier. BA also creates secure space on the website and sends the link to the concerned people to download from that location. It is revealed that BRAC publishes their circular, changes in the policy and other documents on the website and gives email instructions to all concerned officers to download the documents from the website. It is observed that EBL implements a document management system; but uses the system for remote branches. CBL uses automated system for document management. MBL created a system to share documents among loan officers.

Analysis reveals that in loan processing; customers apply for a loan application and provide supporting documents to branches. Banks then prepare a separate set of documents and papers based on customers' applications, and both sets of documents are placed with the appropriate authority for approval. It is revealed that the document sharing process is now easier and swifter. Analysis reveals that BRAC uses Universal Lending Solutions for document sharing among loan officers. DBL uses Online Credit Administration System (OCAS) for document management. On the other hand, EBL uses Lending Automated Processing Solutions (LAPS) for document sharing. BA uses an email-based system for document sharing. The Head of Credit Risk Management reports, *"...we ask the branches to send us soft copy of the proposal and then later on they send us the hard copy...we also transfer documents through e-mail and in case of emergency we asked them to send through Fax"*. It also reveals that DBL shares documents related to SME loans through the OCAS system. The Head of Credit Operations reported that *"...I have counted that for arriving a loan proposal to me [Head of Credit Risk Management] takes at least seven days (7)...3/4 days in transit and 3/4 days in the central dispatch at head office...but in the Online Credit Administration System (OCAS) this is instant"*.

5.5.4 How Controlling is impacted by E2E Solutions

Ease of controlling is defined as the extent to which the bank establishes centralised controlling over branches' loan operations. In loan processing, controlling is very important otherwise loans may be provided without judging their merits. Analysis reveals that E2E Solutions help in controlling the branches' loan operations from head office. It helps banks to upload the loan limit, disburse the loan and check the documentation from head office. A centralised controlling system provides more satisfaction as it is evidenced as being more regulatory and policy compliant. The study reveals that banks (BA, CBL, EBL and MBL) established centralised controlling over branches' loan operation after deployment of E2E Solutions. The summary of empirical evidence of E2E Solutions' impact on controlling is presented in table 5.20.

Table 5. 20: Summary of Evidence of E2E Solutions' Impact on Controlling

Controlling	Evidence from organisations (BA, BRAC, CBL, DBBL, DBL, EBL, MBL, UCBL and JB)
E2E Solutions help in controlling of branches' loan operations.	It is revealed that banks (BA, CBL, EBL and MBL) established effective controlling after deployment of E2E solutions. Analysis reveals that E2E Solutions help banks in loan processing, limit upload, loan limit disbursement, documentation check-up from a centralised location, thus, the chance for any malpractice is low.

Analysis reveals that two aspects of E2E Solutions; Single Point Processing (section 5.5.4.1) and Integrated Databases (section 5.5.4.2) help banks to establish control over branches' loan operations. How E2E Solutions impact on controlling is presented in table 5.21.

Table 5. 21: Empirical Evidence of how Controlling is Impacted by E2E Solutions

Mechanism	Evidence from organisations (BA, BRAC, CBL, DBBL, DBL, EBL, MBL, UCBL and JB)
Single Point Processing helps in establishing centralised controlling as all loans are processed in a single location and branches are just point of sales and service.	Analysis reveals that Single Point Processing helps in establishing effective controlling in banks (CBL and EBL). Few banks (BA, BRAC, DBBL and DBL) implement Single Point Processing for non-core segment of loan product, thus those banks achieved effective controlling only for those loan products. It is revealed that in single point processing, branches are the sales and service point as all loans are processed at a centralised location, therefore, effective controlling can be ensured. As all loans are pooled from branches and processed in a single location, thus managers effectively control the loan operations. Strict implementation of credit policy can be adhered to.
Integrated Databases help in effective controlling as	Analysis shows that integrated databases help in establishing effective controlling in banks (BA, BRAC, CBL, DBBL, DBL and EBL). It is revealed that in BA how much credit facility one customer can enjoy

Table 5. 21: Empirical Evidence of how Controlling is Impacted by E2E Solutions	
Mechanism	Evidence from organisations (BA, BRAC, CBL, DBBL, DBL, EBL, MBL, UCBL and JB)
roles, responsibilities of every loan officer can be pre-defined and structured from a central location.	is defined from head office. Head office also defines the documentation the branch should collect from customers before disbursing the loan. It is revealed that in CBL, before implementation of integrated databases, much malpractice was reported to take place. But now physical distance does not matter to control branches as all limit fixations, limit loading, performance analysis are done from head office.

5.5.4.1 How Controlling is impacted by Single Point Processing

Analysis reveals that by stopping all unauthorised transactions, single point processing helps in establishing effective controlling in banks. First, in the single point processing, all loans are pooled from branches and processed in a single location. Thus senior management can exert more control over the approval process. It is revealed that DBBL implemented single point processing for retail loans and achieved effective controlling over retail loans. Analysis reveals that unauthorised disbursement for retail loans in DBBL stopped. Second, the checker and maker are different people in single point processing. Branch managers do the marketing, and head office level staff do the processing. Therefore, this ensures cross verification. It is revealed that in multiple point processing systems, branch managers often disburse loan in their end by keeping some conditions unfulfilled. It also revealed that it was common for branch managers to accept deposits at a higher rate and provide loans at a lower than prescribed rate due to a very personal relationship with customers. But single point processing stops these unauthorised transactions. This is affirmed by the Head of Credit Administration of EBL, *"...lots of fraud and forgery happens before [Single Point Processing].....branch managers provide overdraft of Tk.5/6 million without asking the head office...this has been stopped totally...they [branch manager] do not have any power"*.

Third, in single point processing, one department at head office processes the loan, and another department checks the documents, terms and conditions, and uploads the loan limit. Branches then disburse the loan against the loan limit set by the head office. Thus there is scope for cross checking before disbursing the loan and the chances of any malpractice by a single department or branch level are less. The Head of Credit Risk Management of EBL mentions, *"...we [Credit Risk Mgt Department] set the loan limit from the head office...but clients cannot enjoy the limit...there is another department [Credit Administration Department] who looks after documentation...clients have to provide all the documents...and once the documentation is done*

and system is updated...after then clients can draw loan from their account maintained with branches".

5.5.4.2 How Controlling is impacted by Integrated Databases

Analysis reveals that integrated databases help in establishing centralised controlling of loan operations as banks can define roles and responsibilities of individual loan officers; load the loan limit, check the documentation and disburse the loan from head office. Analysis shows that integrated databases help banks (BA, CBL and EBL) to implement centralised controlling.

Analysis reveals that integrated databases help head office to define the roles and responsibilities of the process participants through the system. The loan limits of customers' accounts are also defined from head office, and thus branches are forced to abide by head office instructions. It shows that through the system, head office can seize the disbursing power of staff, and enhance and upgrade the delegation of authority. Head office can set the documentation to be collected from the customers, and thus ensure the proper documentation. If there is any lack in documentation, the system would not allow disbursing the loan and thus branches cannot go beyond the bank's policy.

It is revealed that that integrated databases stop the chances of doing any unethical jobs. This is because as soon as it occurs, it is evident to others. There is no chance to hide information from management. Whereas, in the case of a decentralised system, unethical jobs are not evident until any manual reporting comes to the attention of top management. But by this time, the staff member who commits the unethical job may switch over to another bank or resign or retire. It also reveals that in CBL lots of malpractice had taken place while the bank had a distributed system. But an integrated system provides more satisfaction, as all the data and information are accessible from head office; management need not wait for branches' reporting. It is revealed that physical distance does not matter in exerting control over branch operations as all limit fixation, limit loading and performance analysis are done from head office. The CIO of CBL thus mentions, *"Some of our branch managers sanction loans to some clients without the consent of head office. Some provide loans at cheaper rates, and some accept deposits at a higher rate...through technology now everything is controlled and monitored from head office'.*

Analysis also reveals that integrated databases allow banks to undertake system and virtual audits. Both internal and central bank's audit teams need not go to the branches physically for auditing as all the data are accessible centrally. Concurrent auditing is also possible once the bank has integrated databases; otherwise, banks need to do an historical audit. The Head of

Credit Administration of EBL mentions, *"...control, compliance, and concurrent audit, whatever you say, if you have automated system then in real sense you can run concurrent audit otherwise it is not possible, it will be historical audit...if you can run the concurrent audit you can bring all the critical risk in control, you can address the fraud and forgery"*.

5.5.5 How Monitoring is impacted by E2E Solutions

Ease of monitoring is defined as the extent to which E2E Solutions help in monitoring customers and staff. Monitoring is very important for ensuring performance of both customers and staff. Customers need to be always tracked otherwise the loan delinquency rate may increase. Staff monitoring is also important for measuring performance and that essentially increases staff productivity. Analysis reveals that E2E Solutions enhance the monitoring ability of banks (BA, BRAC, CBL, EBL, DBBL and DBL). The empirical evidence of E2E Solutions' impact on monitoring is presented in table 5.22.

Table 5. 22: Summary of Evidence of E2E Solutions' Impact on Monitoring

Monitoring	Evidence from organisations (BA, BRAC, CBL, DBBL, DBL, EBL, MBL, UCBL and JB)
E2E Solutions increase the monitoring ability of the clients and employees.	It reveals that E2E Solutions enhance monitoring capability of all banks except MBL, UCBL and JB. It shows that after implementation of E2E Solutions, the cumulative position of a customer can be generated. Customers' real-time performance can also be monitored and that effectively helps banks' loan recovery efforts. E2E Solutions improve the monitoring ability of the banks' own staff and managers as all the data is accessible from the head office. The bank management can monitor the performance of the branches, activities of their staff on a regular basis and do not necessarily need to be present on the spot. It is revealed that branch managers used to hide the negative information; however, now this has been stopped completely.

Analysis reveals that integrated databases of E2E Solutions impact on the monitoring ability of banks. Table 5.23 provides the evidence from organisations on how monitoring is impacted by integrated databases.

Table 5. 23: Empirical Evidence of how Monitoring is Impacted by Integrated Databases	
Mechanism	Evidence from organisations (BA, BRAC, CBL, DBBL, DBL, EBL, MBL, UCBL and JB)
Integrated Databases help in monitoring as real time information is accessible from all locations in an organised way.	Analysis reveals that integrated databases allow all banks except MBL, UCBL and JB to monitor their staff and customers effectively. It is revealed that BA used to face monitoring problems as database was separate for branches, and customers were found to have accounts with different branches. However, BA now monitors customers' performance in real time as they integrated their databases. If customers missed one instalment, staff hunt for recovery which was not possible before implementing integrated databases. Analysis reveals that CBL's database is customer centric therefore customers' asset and liability position can be generated easily and accurately. It reveals bank management now monitor their clients' performance on daily basis and effectively use early warning system. It also reveals that BRAC could derive bank's liquidity position, asset position, customers' exposure, profit position in the shortest possible time, and just a matter of clicking on the keyboard.

It is revealed that integrated databases allow banks to undertake real-time monitoring of customers, loan processing staff and managers and this is why one of the respondents rightly mentions that *"MIS is used as a highly dependable monitoring tool"*. Analysis reveals that monitoring is required for borrowers, otherwise non-performance loans may increase. The CIO of DBL mentions *"...system gives us [bank] alert if any customer misses any loan instalment...system also produces the intimation letter for borrowers as well as for guarantors"*. It is revealed that while banks had a distributed database, branch managers did not share the default list with head office. But this cannot be done once the bank has integrated databases as clients' performance can be monitored from head office. It is revealed that in EBL, as soon as head office detect a default client, the recovery cell starts working with default borrowers, finds out the reasons, provides guidelines to improve the scenario and that essentially increases the loan recovery chances. The Head of Credit Risk Management of EBL mentions, *"There is a saying...protect the ship when it starts sinking...if it is already sunk, better to abandon the ship because of huge cost associated...likewise, it's better to cooperate with clients before sunk [default], as it would be costly to service sunk borrowers....strong MIS help us to identify the customers who are close to being sunk"*.

Analysis also reveals that integrated databases are essentially customer centric, where one customer's asset and liability position with all branches of a bank can be generated in a single click, and there is no need to check individually. Thus integrated databases help banks to offer

value-added services to clients and provide opportunity for cross sales. Rationalisation of services is also possible once the database is integrated.

Besides customer monitoring, integrated databases help in monitoring bank staff's day-to-day operations and performance. Analysis reveals that once the bank has a centralised IT platform, staff think that they are being continuously monitored from head office, therefore, staff are restrained from committing any unethical job for fear of immediate leakage of information to senior management. Analysis reveals that in the absence of real-time monitoring, branch managers often disbursed loans without head office approval, or disbursed a different amount than the amount sanctioned by head office. In case of distributed databases, it was not possible for senior management to monitor branch operations effectively. Analysis reveals that integrated databases remove the physical distance barrier for monitoring. The CIO of BA says, *"...monitoring is easier...head office can monitor branch operations...due to improved relationship with some clients...managers sometime disburse the loan without proper documentation and approval...this has been stopped as branches' operations can be viewed from head office"*.

Overall, analysis reveals that E2E Solutions improve organisational core process aspects (e.g. processing time, risk assessment, loan administration, processing cost) and coordination and communication process aspects (e.g. communication, coordination, document sharing, controlling and monitoring) which in turn impact on productivity. Table 5.24 summarises the core process and coordination and communication process aspects of E2E Solutions.

Table 5. 24: E2E Solutions' Performance Aspects and Empirical Evidence

Intermediate Performance	Explanation	Aspects of Processes
Core Process Performance	The degree to which E2E Solutions affect the within organisation core operational task of a loan approval process.	E2E Solutions make the overall processing task faster.
		E2E Solutions make the overall risk assessment task accurate.
		E2E Solutions make the administrative job easier.
		E2E Solutions reduce the processing cost.
Coordination and Communication Performance	The degree to which E2E Solutions affect the coordination and communication task in a loan approval process.	E2E Solutions make the overall loan processing related communication (with clients and external loan related parties) easier.
		E2E Solutions make the loan coordination activities easier.
		E2E Solutions make the loan documents sharing task easier.
		E2E Solutions help in controlling of branches' loan operations.
		E2E Solutions increase the monitoring ability of the clients and employees.

5.6 The Impact on Productivity

Productivity is defined as an organisational ability to process loans in a given point of time. It is revealed that E2E Solutions improve core process aspects, and coordination and communication aspects which in turn improve productivity. This section documents the resulting impact of core process performance, and coordination and communication performance of E2E Solutions on organisational level performance captured by productivity. Section 5.6.1 describes how core process performance resulting from the implementation of E2E Solutions impacts on productivity whereas Section 5.6.2 discusses the impact of coordination and communication performance on productivity.

5.6.1 How Core Process Performance Affects Productivity

This section documents the impact of different aspects of core processes on productivity. Analysis reveals that two aspects of core process; faster processing (section 5.6.1.1) and ease of administration (section 5.6.1.2), impact upon productivity. Table 5.25 shows the empirical evidence on how core process performance affects productivity in organisations.

Table 5. 25: Empirical Evidence of How Core Process Performance Affects Productivity	
Mechanism	Evidence from organisations (BA, BRAC, CBL, DBBL, DBL, EBL, MBL, UCBL and JB)
Faster loan processing increases the productivity of banks as: (i) staff can process more loans within a given time period; and (ii) fewer staff are needed for loan processing.	It is revealed that faster processing improves the overall banks' (BA, DBBL, DBL and EBL) productivity. It reports that through implementation of single point loan processing and data entry (EBL) and use of email-based or workflow system (BA, DBBL, DBL and EBL) banks were able to reduce the internal loan processing cycle, therefore, loan officers processed more loans in a given point of time. For example, for preparing a loan proposal it took four (04) staff, however, now one (01) staff member can initiate a loan proposal (BA).
Ease of loan administration increases the productivity of banks as: (i) banks can handle more loan accounts; and (ii) less staff are required for loan approval.	It is revealed that ease of loan administration enhances banks' productivity (BA, CBL, DBBL, DBL and EBL). It is revealed that because of automated pre-disbursement processes (e.g. loan limit upload; regulatory and policy requirement fulfilment) and post-approval processes (e.g. amortization schedule calculation, excise duty and VAT calculation and deduction, loan rescheduling), and automated reporting system, banks deploy more resources in the front-end customer services and marketing, and that essentially increases overall productivity. Banks found to have more loan accounts because of ease of loan administration.

5.6.1.1 How Faster Processing Affects Productivity

Analysis reveals that E2E Solutions improve faster loan processing and this essentially increases bank productivity. Faster processing helps loan officers to handle more loan applications in a given point of time and ensures proper utilisation of resources and therefore banks' productivity increases.

Analysis reveals that after implementation of E2E Solutions, loan officers can process loans in a faster manner as they get information quickly, get documents quickly and all contribute to enhanced productivity. Analysis reveals that after deployment of E2E Solutions, banks can run with fewer staff (BA, DBL, DBBL and EBL). Therefore, banks were found to open new branches without recruiting additional staff. It is revealed that preparation of a loan proposal takes less time and staff, and this essentially increases productivity. The Head of Syndicated Loans of BA mentions that *"...before say for processing a loan... a single loan proposal is being segregated into various parts and assign people accordingly...one officer is for data collection, one officer is for document collection, two officers is for write up..now one officer can do all of the total process...I have seen that many staff from loan side and being deployed*

elsewhere....this is because of technology...banks are opening new avenues, new business, new branches without recruiting new people".

Faster processing ensures proper utilisation of time and resources, and results in fewer hand-offs and more productivity. After deployment of E2E Solutions, the task becomes faster; thus banks served more clients in a given point of time. Analysis reveals that retail credit accounts of DBBL increased tremendously as a loan officer can process loans quickly with the help of technology. It is revealed that DBBL's loan accounts increased from 40,000 to 500,000 within three years of the implementation of E2E Solutions. The Head of Branch Operations of DBBL thus mentions, *"....the way our client base increases.....in the same pace we need not to increase our employee base...we support our huge client base with the help of technologies".*

It is revealed that E2E Solutions make the process faster and that eventually increases bank productivity. E2E Solutions save time, empower staff, reduce mistakes and all contributed to improved productivity. Analysis reveals that E2E Solutions make the process faster in EBL. EBL thus operate with 50% less staff. It is revealed that per person loan disbursement in EBL is highest among private banks in Bangladesh. The Head of Credit Risk Management of EBL explains how IT helps in improving productivity, *"...in the manual system for doing a work you may need 10 hours...however, in an automated centralized environment the same work you can do in two hours and within two hours you can get one hour for checking and re-checking…you can improve not only the output but also the accuracy... you will be always faster in comparison to other person...you can be more accurate in comparison to other person...you will be an efficient worker in comparison to other person...so individual level as well as in bank level you can always work faster".*

5.6.1.2 How Ease of Administration Affects Productivity

Analysis reveals that automated loan administration contributes positively to productivity. It is revealed that because of automated administration, banks focus more on front-end business development and that essentially contributes to the growth and development of the bank.

Analysis reveals that because of ease of administration brought by E2E Solutions, banks provide more emphasis on customer hunting and product marketing and therefore, banks are able to serve more customers in a given point of time, but with the same level of staff. E2E Solutions save time as manual tasks take more time and resources. The CIO of BA explains how ease of administration increases bank productivity, *"... [Before implementation of IT] we used to start*

our year closing function one week before ending the financial year...however....now system does all the works...all provisioning, calculation, closing function is just matter of an hour".

Analysis also reveals that ease of administration helps banks do all regulatory reporting within a shorter time. It reveals that banks submit 400 plus reports to the central bank on a quarterly basis. As reporting is automated in banks, very few staff in a short time could prepare all these reports. The Head of Trade Operations in EBL mentions, *"...central bank's auditing is going on in the bank right now.....the amount of data they [audit team] require is huge...if we had manual system, it would take two months to furnish them with all required data, however, as we have automated system, it takes only one day to prepare the data set"*. It also reveals that as BA's reporting task is automated; it hugely increases staff productivity levels. The Head of Credit Administration of BA reports that, *"...say within the 10th of this month, we have prepared 500 pages of MIS where different types of analysis is there....that was possible only due to technology...manually this is also possible...but we may need 100 people...but still you have some chances of false reporting"*.

Analysis reveals that because of automated loan administration, banks run branches with less staff. It is revealed that BRAC needs 1/3 less staff in the branch level. Analysis reveals that BRAC has 41,000 retail loan accounts (besides corporate and SMEs) and technology makes it possible to manage; manually it would never be possible unless additional staff were recruited. BRAC introduces one new product per month, and this is possible because of the automated system. Analysis reveals that DBL processes more loans, as the back-end process is automated. DBL runs branches with fewer staff as well. The Head of Branch Operations of DBL therefore observes that, *"...say in branch opening I have seen that minimum 18/20 staff needed [before]...but now [after having automated system] 5/6 people can run a branch and client services would not be hampered"*. With less staff, banks handle more loan accounts. Analysis reveals DBBL handles 500,000 loan accounts through technology. The Manager of DBBL mentions that *"....since [1996] inception to 2004 [implementation of IT], we have only 40 thousand accounts...but now [2009] we have 500,000 accounts"*. E2E Solutions help banks to open more branches per year which was not possible in the manual system. The Deputy CIO of DBBL therefore mentions *"...manual banks cannot open more than 5/6 branches in a year.....but in our case we can open 5/6 branches per month, this is because of IT"*.

5.6.2 How Coordination and Communication Performance Affects Productivity

This section documents and describes the empirical evidence arising from organisations on how coordination and communication performance affects productivity. Analysis reveals that ease of coordination (section 5.6.2.1), ease of controlling (section 5.6.2.2) and ease of monitoring (section 5.6.2.3) affect productivity. Table 5.26 summarises empirical evidence on how coordination and communication performance affect productivity.

Table 5. 26: Empirical Evidence of How Coordination and Communication Performance Affects Productivity

Mechanism	Evidence from organisations (BA, BRAC, CBL, DBBL, DBL, EBL, MBL, UCBL and JB)
Ease of coordination increases the productivity of banks by: (i) making the coordinating task faster; and (ii) synchronising the task, and thus reduces the hand-offs.	Analysis reveals that ease of coordination improves productivity in banks (BA, DBBL, DBL and EBL). It is revealed that loan process is an example of 'joint production' and many internal staff are involved in processing a single loan. E2E Solutions improve the coordination of loan tasks, automate the loan processing, save time in coordination and thus enhance banks' productivity. It ensures quick loan disposal and banks handle loan accounts in given point of time.
Effective controlling increases the productivity of banks as it ensures better utilisation of resources.	It is revealed that effective controlling improves banks' (BA and EBL) productivity. Effectively controlling ensures the better utilisation of resources by ensuring fewer hand-offs. Fewer staff can control the operations and that ultimately increases banks' productivity. It is revealed that in EBL, controlling can be done from head office; and audit team need not go to branches; thus, bank does not need to have zonal or divisional controlling office. It is revealed that EBL implements effective control mechanism and thus EBL does not need a big audit team.
Easy monitoring increases the productivity of the banks as: (i) fewer staff can monitor many clients and branch operations; and (ii) effective use of resources.	It is revealed that ease of monitoring improves banks' (BA, CBL, DBBL, DBL and EBL) productivity. It is revealed that CBL achieves effective monitoring after implementing E2E Solutions. Thus employees' performance, daily activities, business development, all can be monitored from the head office and that ultimately leads to higher productivity. It is revealed that EBL had pretty big team at the head office for branch monitoring; however, now EBL works with less than 2/3 of previous staff. Before implementing E2E Solutions, DBBL needed to monitor customers' performance based on account-wise transactions with various branches; however, now it is possible to get a cumulative position of customers in a single click. Thus effective monitoring saves time and increases productivity.

5.6.2.1 How Ease of Coordination Affects Productivity

Analysis reveals that ease of coordination boosts banks' productivity as banks process more loans in a given period of time by avoiding manual and lengthy coordination tasks. Analysis reveals that in an E2E loan process, many staff and departments are involved. E2E Solutions make the coordination process smoother, automate the process and therefore, save time and energy and that essentially increases banks' productivity. Analysis reveals that in the manual coordination process, it takes two/three months to process a loan. However, in the case of automated coordination, a loan can be processed in a maximum of seven days. This huge time-saving result is due to automated coordination and that translates into higher productivity. It is revealed that in BA, automated coordination helps in making faster decisions, thus banks can handle more loan applications in a given time. Analysis reveals that in manual processing, three/four loan officers were needed to prepare a loan proposal; however, now all the work of preparing a loan proposal can be handled by a single staff member.

Effective coordination reduces the unnecessary delay of tasks which in turn increases banks' productivity. In an automated coordination system, it is possible to track the time spent in processing a loan. Thus, automated coordination ensures better utilisation of time and that ultimately hits at the productivity level. In an automated system, if any person unnecessarily takes more than allocated time, the system automatically sends reminder emails. It is revealed that DBL uses an automated coordination system, and that essentially improves the bank's ability to serve more clients. The Head of Branch Operations of DBL mentions that, *"beside faster services to the client...branch level managers sometime complain that they have [branch] forwarded the proposal a month ago...still they did not get the approval...they sometimes are not sure about the physical movement of the proposal...now through the online tracking system...they know the status of the proposal and the reason for possible delay and take corrective actions immediately"*. It is revealed that EBL coordinates loan processing through IT, therefore, now there are fewer hand-offs, as loan applications are coming from all around to the central processing centre. The head of Credit Operations of EBL reports that, *"....we work on the scan copy of documents and we have facility like intra mail...saves lots of time for processing and reduces the handoffs"*.

5.6.2.2 How Ease of Controlling Affects Productivity

E2E Solutions helps banks to establish control over all of the branches and offices and that essentially increases productivity.

It is revealed that E2E Solutions allow banks to control branches from head office. Thus banks need not maintain intermediary controlling offices (e.g. zonal, regional, divisional office). Banks can run with fewer controlling staff. Analysis reveals that banks used to operate with intermediary controlling offices (e.g. regional head office); however after deploying E2E Solutions, banks do not need to maintain these middle offices and thus E2E Solutions help to run a bank with fewer staff by ease of controlling and that ultimately enhances banks' productivity.

Analysis reveals that E2E Solutions help banks to establish a control mechanism, and individuals' roles and responsibilities can all be defined through the system. Therefore, banks run with fewer audit staff. It is revealed that in BA, systems define individual officers' roles and responsibilities therefore BA effectively controls all of the physically dispersed offices from head office. After deploying E2E Solutions, BA transferred most of the audit team members to the business side, as few staff can control the whole branch operations. Thus, effective controlling ensures the best utilisation of manpower and contributes to enhanced productivity.

5.6.2.3 How Ease of Monitoring Affects Productivity

Analysis shows that E2E Solutions improve the monitoring ability of banks and that essentially improves bank productivity as few people can monitor the branches and customers' performance. Furthermore, because of improved monitoring, staff work proactively and thus banks' productivity increases.

Analysis reveals that banks used to have separate departments for monitoring as manual monitoring requires a huge number of staff. But after deployment of E2E Solutions, banks' monitoring ability improved and that essentially reduced the requirement for more staff for monitoring. For example, in CBL, one staff member used to monitor five branches, and CBL had 20 members in the monitoring team. However, after deployment of E2E Solutions, only one staff member monitored the whole branch operations (88 branches).

Second, E2E Solutions help in effective monitoring of customers and that essentially improves banks' productivity. In the manual system, banks had to do account-wise performance analysis and then accumulate all to get a cumulative performance. But E2E Solutions help banks to get the cumulative asset liability position of customers in the shortest possible time. The system automatically signals if a client has missed any loan instalment. Thus E2E Solutions improve banks' productivity as the system does most of the monitoring task by engaging fewer staff. The Head of Branch Operations of CBL mentions, *"...we have huge client base...say manual*

monitoring may be possible for 100 borrowers...but if your borrowers' size are 1000 then no way to monitor them manually...if you cannot monitor or supervise clients...loan default would increase...we have monitoring tool...we use early warning system and some control mechanisms for monitoring purpose...when is the loan renewal date, whether all are insured or not, whether all stock reports are in order or not, all instalment are done regularly or not....lots of parameters we can set against a loan account".

Analysis also reveals that monitoring is also required for performance measurement and for taking corrective actions. Analysis reveals that E2E Solutions help senior management to analyse individual staff performance and follow-up, and thus staff work proactively resulting in a higher level of organisational productivity. Analysis reveals that by setting various early warning systems, EBL effectively monitors branches and customer operations and that ultimately improves productivity. The Head of CRM of EBL mentions, *"...without IT we could not monitor branches' operations...branch managers only handle with recovery cases and do not share information with others, but now through IT, we are monitoring clients, we are taking precautions before happening of actual events...We are giving instructions to managers to settle default accounts, or increase follow-up....say we are giving benefit of doubt to the branch managers that they are honest... but this is always good to have a reminder..this is done through technology...say if your boss is not saying anything; your work may get slowed but once you know that your work is continuously monitored by another department, continuously followed-up, consciousness automatically grows among managers to work proactively".*

Overall, analysis reveals that core process performance, and coordination and communication process performance effectively improve banks' (BA, DBL, DBBL and EBL) productivity. Table 5.27 shows the aspects of core process and coordination and communication process performance impact on the organisational productivity level.

Table 5. 27: How Core Process Performance and Communication and Coordination Performance Affect Organisational Performance

Productivity	Explanation	Aspects of Process Performance
Organisational Performance (e.g. Productivity)	The degree to which core process performance and coordination and communication performance of E2E Solutions increase organisational performance, measured through productivity.	Faster Processing increases productivity.
		Ease of Administration increases productivity.
		Ease of Coordination increases productivity.
		Ease of Controlling increases productivity.
		Ease of Monitoring increases productivity.

5.7 Summary

This chapter demonstrated that E2E Solutions are key determinants for improving business process aspects in organisations, which in turn are required for improving organisational level productivity. This study identified the aspects of E2E Solutions: Single Point Processing, Single Point Data Entry, Integrated Databases, and Automated and Integrated Processes that are required for deriving value. Using empirical data from nine banks, this study demonstrated how E2E Solutions ensure business process reorientation, process automation, and internal and external integration which are required for deriving value in an E2E business process scenario. This chapter demonstrated that E2E Solutions deliver more value (rather than IT alone or BPR alone) to business as E2E Solutions capture both IT and business process capability.

This chapter provided evidence that deployment of E2E Solutions improves organisational level productivity by improving core process aspects, and coordination and communication process aspects. The empirical evidence showed that the business value of IT can be found at the business process level and that not all process level aspects have impact on organisational level performance measured by productivity. The chapter revealed the 'embedded' nature of E2E Solutions' value and found that realisation of value from E2E Solutions is complex and difficult as it depends upon multiple parties participating in the business process (e.g. customers, regulators and other third party support services) and bank managers do not necessarily have control over all process participants. This chapter concluded by presenting a preliminary business value model of E2E Solutions (figure 5.2). Figure 5.2 suggests that E2E Solutions positively impact on core process performance, and coordination and communication performance which in turn improve organisational performance measured by productivity. Core process performance is captured from processing time, risk assessment, administration and processing cost whereas coordination and communication performance is captured by communication, coordination, document sharing, controlling and monitoring. The arrows in figure 5.2 indicate a positive impact.

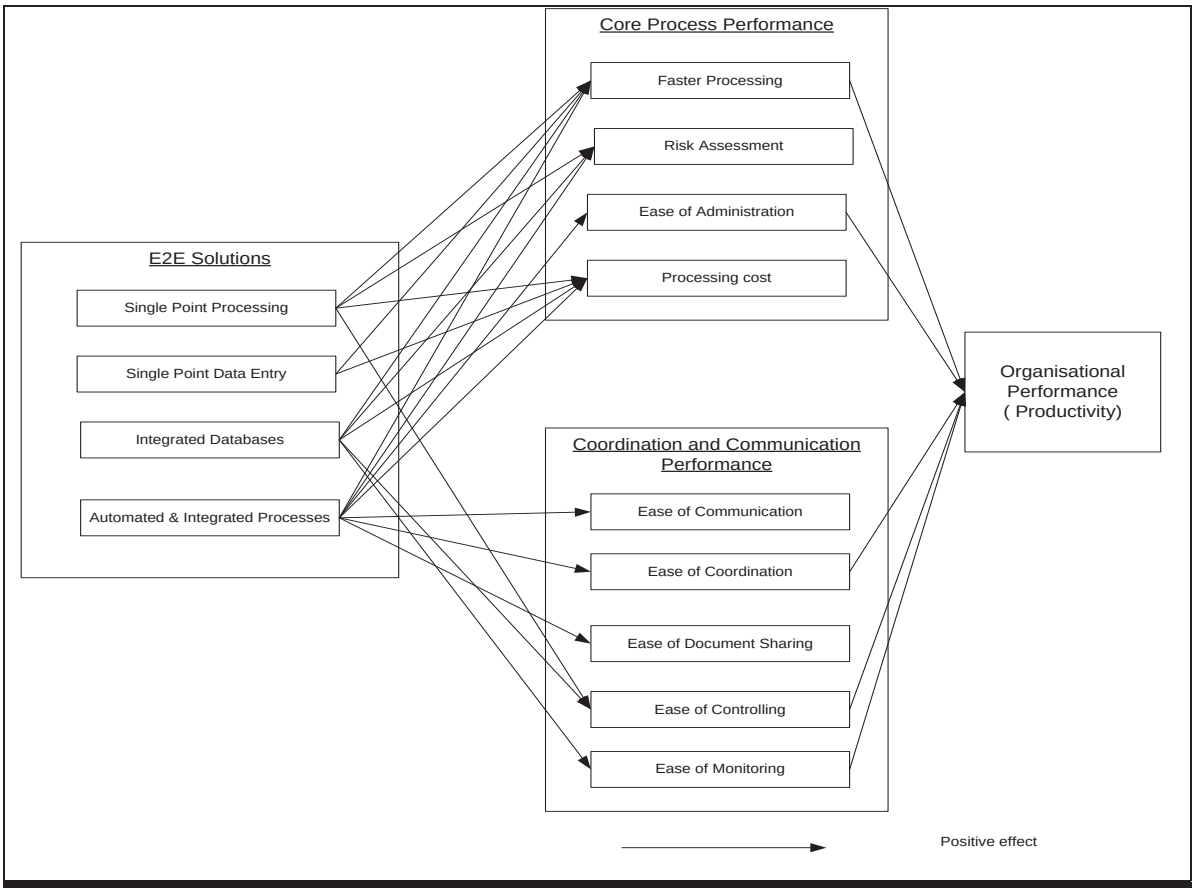


Figure 5. 2: A Model of E2E Solutions' Business Value

The next chapter (chapter 6) will address the second research question of this study and try to uncover how the value conversion contingencies impact on the business value of E2E Solutions.

Chapter Six

Business Value Conversion Contingencies

6.0 Introduction

Chapter 5 revealed that E2E Solutions impacted upon core process, and coordination and communication process which in turn impacted on organisational performance, i.e. productivity. This chapter deals with the second research question, presenting and discussing how the achievement of business value of E2E Solutions is negatively impacted by value conversion contingencies. Analysis reveals that the value conversion contingencies occur at the business process level, and the factors which impeded the E2E Solutions' value are both internal and external in nature. Analysis reveals that senior management ability is very important for deriving value from E2E Solutions and the lack of which results in non-realisation of value in organisations (section 6.2). It reveals that E2E Solutions require complementary resources and failure to ensure them creates barriers in the realisation of value (section 6.3). It is evident that as part of the implementation of E2E Solutions, organisations implement software either locally made or foreign made. However, software misfits emerge as one of the value conversion contingencies as locally-made software suffers from functionality problems, and foreign-made software suffers from localisation and customisation problems (section 6.4). A loan approval process involves both internal and externally facing processes, and thus integration among internal and external processes is important. However, such integration is missing in organisations (section 6.5). Analysis reveals that value realisation from E2E Solutions is a 'collaborative work' where customers' active participation is required. But lack of customer readiness hampers the realisation of value (section 6.6). It is revealed that the performance of E2E Solutions depends upon the adequacy and availability of information, the lack of which hampers E2E Solutions' performance (section 6.7). As E2E Solutions connect dispersed organisations' offices, customers, support parties and regulators, thus value realisation from E2E Solutions is dependent on the existing IT infrastructure of the country (section 6.8), and impeded by the regulatory environment (section 6.9). Each of these value conversion contingencies is defined and described, and their impact upon core process performance and coordination and communication performance is detailed. This chapter begins with a short discussion of research objectives and questions (section 6.1) and concludes by presenting a summary of the chapter (section 6.10).

6.1 Research Objective and Questions

The objective of the research is to investigate the derivation of business value from E2E Solutions in developing countries. To attain the research objective, two research questions were formulated. This chapter deals with the second research question presented below.

Research Question 2. How is the achievement of business value from E2E Solutions impacted by value conversion contingencies?

6.2 Senior Management Ability

Senior management ability is the *'degree to which the senior management are able to derive value of end-to end (E2E) solutions'*. This section starts with describing how senior management ability is manifest (section 6.2.1). It is revealed that lack of senior management ability hampers core process performance (section 6.2.2) and coordination process performance (section 6.2.3) of E2E Solutions, the impact of which is described and documented with reference to organisations.

6.2.1 How Senior Management Ability is manifest

The study reveals that senior management ability impacted upon the derivation of value from E2E Solutions. Senior management's skills and experience are required for IT investment decisions, selection, implementation and use in organisations. But it is revealed that the senior management team is not capable of ensuring assimilation of E2E Solutions in organisations and thus impedes the value realisation from E2E Solutions. The aspects of lack of senior management ability are shown in table 6.1 with empirical evidence. It is revealed that (lack of) senior management ability is manifested by not having appropriate IT skills, or prior experience of E2E processes and solutions, and senior management resisting the implementation and use of best practice processes embedded in E2E Solutions.

The study reveals that most senior management in organisations are from pre-IT generations, and do not have work experience with automated systems, and therefore lack IT skills. It is revealed that both IT education and IT implementation in banks are recent phenomena in Bangladesh. It is revealed that IT was introduced as a subject in educational institutions in Bangladesh in the late 1990s and a local bank (EBL) implemented sophisticated software for the first time in 2003. Thus, bank senior management lacks both IT education and work experience. The Head of Credit Risk Management of EBL affirms that, *"....you can climb up the ladder of job hierarchy, but that does not mean that you have better IT skills. IT skill is matter of*

education and training....computer literacy is a recent phenomenon...say last ten (10) years computer literacy getting focused in banking but this IT education gets popular in abroad say 30 years before, thus in foreign countries those who are on top are IT focused, here (Bangladesh) are not". As IT is a recent phenomenon in Bangladesh, it is not surprising to find non-IT people leading IT projects and IT departments in banks. Analysis reveals that in JB, the head of the IT department is a non-IT person. The Senior Principal Officer of IT in JB thus reports, *"Our head of IT is a manual person. He comes from general banking side. He did not even touch any ATM card, credit card in his whole banking career".* Analysis reveals that less than 1% of senior management in banks (JB, MBL, and UCBL) know how to open and shut down a computer properly. It is revealed that in JB, if senior management was asked to shut down a computer; they simply disconnect the power connection, and do not even know the proper shut-down procedure.

Table 6. 1: Empirical Evidence of Senior Management Ability

Aspects	Evidence from organisations (BA, BRAC, CBL, DBBL, DBL, EBL, MBL, UCBL and JB)
Senior management do not have appropriate IT skills.	Senior management's IT skills are absent in banks (DBL, DBBL, MBL, UCBL, and JB). It is revealed that IT is a very recent phenomenon in local banks in Bangladesh. Senior management team in banks (DBBL, DBL, MBL, UCBL, and JB) used to work in the manual-based banking and thus, did not get scope for learning and practising IT.
Senior management do not have prior experience of E2E processes and solutions.	Prior job experience with the E2E Solutions' environment is missing among senior management in all banks except BRAC, CBL and EBL. It is revealed that foreign banks are the early adopters of E2E Solutions in Bangladesh, however, senior management in all banks except BRAC, CBL, and EBL do not have any prior working experience with foreign banks.
Senior management resist the implementation and use of best practice process embedded in E2E Solutions.	Analysis reveals that senior management team in banks (DBBL, DBL, MBL, UCBL and JB) is IT hostile. Senior management does not prefer to use IT in banking operations (DBBL and DBL) and prefers manual and paper-based processing and is highly resistant to change. Senior management in banks (MBL and JB) creates barriers to IT use and implementation for fear of transparent work process brought by IT (JB), and possible dominance of IT staff (MBL).

Besides IT skills, prior work experience with E2E Solutions is missing among senior management in banks. It is revealed that senior management is used to working with local banks where work processes are manual. Senior management teams thus did not get any exposure to

E2E Solutions' use in organisations. However, this experience is important for value realisation from E2E Solutions. The importance of prior job experience is evident by comparing two banks (DBBL and EBL). Both have the same IT platform. However, EBL's business processes are automated as its senior management team had prior experience with an automated environment; DBBL's work processes are manual as senior management did not the required experience. An executive at Corporate Credit Division of the bank notes the importance of senior management in the assimilation of E2E Solutions; *"top management used to do the manual work all through their banking career...although we use the same IT platform...some banks are becoming paperless but we are not...because all decisions rest with top management.... Even a deputy CEO of… private bank after drawing money from ATM counts twice, as he does not believe in technology".* Analysis shows that senior management's prior work experience with an automated environment ensures proper use of IT. For example, CBL is one of the oldest private banks and implemented technology in 2002; however, the then senior management team did not have prior working experience with IT. Therefore IT remained useless in the bank until 2008 when a new CEO joined the bank having vast working experience with various foreign banks. It is revealed that in MBL despite having some types of IT, senior management prefers manual work and looks for paper, vouchers and registered books. The Senior Vice President of MBL notes, *"A big shake is required in the senior management team.....paper works come from inefficiency".*

Analysis also reveals that senior management teams resist the implementation and use of best practice processes embedded in E2E Solutions. Senior management resists because of fear of possible loss of control in banks as they lack IT skills. Senior management also resists as they do not have proper experience with automated environments. Senior management thus wants to avoid responsibilities as implementation of best practice of E2E Solutions requires business process reorientation, change management, training and resource mobilisation. Senior management teams are highly resistant to change and do not want to move beyond their comfort zone (e.g. manual process). The Head of IT of MBL describes the reasons for resistance of senior management, *".....mindset problem prevails in all levels including the top....another problem is avoidance of responsibilities of top management...this is something like as we do not know the things and if we do that adverse things might happen...one type of fear works....whether I [senior management]can adjust with the environment; whether my job will be at stake; whether the new entrant will be ruling over our set of people or environment, whether I can work in that environment... some threat works and all are deterring factors".*

6.2.2 How Senior Management Ability Affects Core Process Performance of E2E Solutions

Analysis reveals that lack of senior management ability impeded three aspects of core process: processing time, risk assessment and processing cost. The empirical evidence of how senior management ability hampers the core process performance of E2E Solutions is presented in table 6.2.

6.2.2.1 How Senior Management Ability Affects Loan Processing Time

Analysis reveals that senior management is a part of an E2E loan process. Senior management provides the final approval/reject decision in loan approval (except retail loans where lower level management is involved). Senior management teams lack IT skills and experience and are not comfortable with an automated processing system. Thus process time gets slowed. Analysis shows that banks process retail credit (i.e. small amounts) in an automated and faster way than large loans, as in retail credit, lower level management is involved. The Manager of DBBL thus reports; *".....automated system is possible for small sized loan where decision making authority lies in lower or mid management and where loans are repetitive in nature...however, for large project loans, lower/mid level managers do not have the maturity for decision making...that should move towards top management...and at some stages you must bring it in form of hard copy paper because you need to place it to the board for approval".* It is also revealed that in the absence of best practice embedded in E2E Solutions, faster processing is hampered. Banks were found to process loans at multiple locations, thus best use of technology is missing in banks that would make the processing task faster. It is revealed that after having technology in place, senior management avoids responsibilities of ensuring the best use of technologies and thus processing tasks are hampered. It is revealed that as senior management does not want to move from manual to automated processes' implementation and therefore, technology could not make the processing task faster. Thus the Vice President of Credit and Change Management of DBL expresses his concern as: *"Good software is of no use unless business process has been redesigned to take the fullest benefits of technology...and this is the job of senior management and board".*

Table 6. 2: Evidence for how Senior Management Ability Impacted the Core Process Performance of E2E Solutions	
Mechanism	Evidence from organisations (BA, BRAC, CBL, DBBL, DBL, EBL, MBL, UCBL and JB)
Lack of Senior Management Ability results in slower processing as; (i) IT is not properly used; and (ii) there is a reliance on manual work processes.	It is revealed that despite having IT in banks, IT was not used properly or used IT without reorientation of business process. Therefore, IT could not make the task faster in banks (DBBL, DBL, MBL, UCBL and JB). It is observed that banks (DBBL and DBL) after having the IT platform could not reorient the business process to take advantage of technologies. This is because top management resists the implementation of best practices. Analysis reveals that technology-based loan processing has potential to make the processing faster, but senior management in banks (MBL, UCBL and JB) prefer to work in the manual way.
Lack of Senior Management Ability results in inaccurate loan risk assessment as management does not; (i) implement control mechanisms; and (ii) ensure proper use of technologies.	It is revealed that banks (BRAC, DBBL, DBL, MBL, UCBL and JB) do not use technology properly for risk assessment and do not implement business process reorientation for ensuring proper risk assessment. First, it is revealed that banks did not implement centralised loan processing; therefore, managers do the loan marketing job as well as processing task. Thus, proper risk assessment is hampered as same people (e.g. manager) do all the work; cross checking provision is absent. Second, it is revealed that despite having DSS, credit scoring and Excel-based system, banks do not use these tools for risk assessment, rather provide loans based on manual judgement and therefore personal relationship gets priority rather than merits of the loan.
Lack of Senior Management Ability results in higher loan processing cost as; (i) doing paper-based lending; and (ii) not ensuring the best use of technologies.	Analysis reveals that lack of senior management ability hampers proper use of technology and this result in manual processing. Thus technology could not bring any cost savings in banks (DBBL, DBL, MBL, UCBL and JB). It shows that banks (DBL, DBBL and BRAC) could not make the work process automated and thus could not reduce the wages cost, paper and postage cost after implementation of E2E Solutions. Analysis also reveals that JB could reduce their existing 13,000 staff to one half once the bank implements and uses technologies in the banking operation; however, initiatives from senior management are absent.

6.2.2.2 How Senior Management Ability Affects Risk Assessment

Analysis reveals that appropriate use of technologies and implementation of best practice embedded in the E2E Solutions ensure proper risk assessment; however, both are missing in organisations (BRAC, DBBL and DBL) as senior management provides loans based on personal relationships and manual judgements.

Analysis shows that after having the technology in place, banks do not use it and prefer to assess risk judgementally. Analysis reveals that banks have DSS, credit scoring tools and techniques; however, senior management wants to work in black and white. Loans are provided based on

'special relationships' and merit does not work and thus risk assessment tools are of no use in risk assessment. The IT Consultant of JB reports his bank situation, *"...merit never works in the bank in loan processing"*. It is revealed that DBL does not use OCAS (Online Credit Administration System), although it has built-in DSS. Analysis also shows that senior management prefers manual systems, as in a manual system nothing can be tracked. The Vice President of Credit and Change Management of DBL mentions, *"...senior management mindset will also need to be changed.....we want to do things [loan processing] in black and white...where automation does not work"*. It is revealed that banks (MBL, UCBL and JB) have Excel-based risk assessment tools in their PCs; however, they hardly provide loans based on rigorous risk assessment. Analysis shows that centralised loan processing ensures the controlling of critical risk, but senior management is highly resistant to change to implement centralised processing systems.

6.2.2.3 How Senior Management Ability Affects Processing Cost

Analysis reveals that lack of senior management ability increases processing cost. It is revealed that automated tasks are absent in loan processing as senior management prefers manual processing. Thus paper, printing and postage costs associated with loan processing increase. Analysis reveals that despite having technologies (e.g., workflow, email), loans are processed manually. Loan processing costs also increase as technology was implemented without business process reorientation and therefore, staff remains the same. IT makes the inefficient process automated and could not reduce the wages cost. In addition, processing costs increase as banks follow relationship-based lending as opposed to technology-based lending. The Head of Business Systems Management of BRAC mentions; *"...as a matter of policy, BRAC Bank would not provide any loan without looking at the paper application and documents, therefore, loan originating system is of no use...it rather doubles the work"*. Likewise, analysis shows that because of requirements of the internal audit team, DBBL could not restrict their paperwork and thus could not reduce processing costs.

6.2.3 How Senior Management Ability Affects Coordination and Communication Performance of E2E Solutions

Analysis reveals that lack of senior management ability impedes three aspects of coordination and communication processes: communication, coordination and controlling. The empirical evidence of how senior management ability hampers the coordination and communication process performance of E2E Solutions is presented in table 6.3.

Table 6. 3: Evidence for how Senior Management Ability Impacted the Coordination and Communication Performance of E2E Solutions	
Mechanism	Evidence from organisations (BA, BRAC, CBL, DBBL, DBL, EBL, MBL, UCBL and JB)
Lack of Senior Management Ability results in manual communication due to the lack of initiatives to integrate customer support services with technology.	It is reported that because of lack of initiatives by senior management in banks (DBBL, DBL, MBL, UCBL and JB), the communication process with customers, third parties and sanctioning bodies are still manual. It is revealed that senior management did not take any initiatives to influence customers to adopt online services, despite having alternative delivery channels; ATM, phone banking and SMS banking. Proactive initiative is missing in banks (MBL, UCBL and JB) to communicate online with third parties' support services.
Lack of Senior Management Ability results in manual coordination as; (i) less use of IT in loan approval; and (ii) retaining of manual loan processing.	It is revealed that senior management in banks (MBL, UCBL and JB) did not take any initiatives to coordinate loan processing tasks in an automated way. It is revealed that in MBL to coordinate loan processing, sophisticated technology must be in place; however, existing systems are fragmented and real-time integration among solutions is missing. Use of email is absent in MBL for loan processing. It is revealed that internet/automated loan processing is absent in UCBL as management prefers manual processing.
Lack of Senior Management Ability results in manual controlling as; (i) management is highly resistant to change; and (ii) unwilling to implement automated controlling provision.	Because of resistance to change and lack of working exposure in an automated environment, senior management of banks (BRAC, DBBL, DBL, UCBL, and JB) could not implement centralised controlling. It is revealed that after having IT in banks (DBL, and DBBL); senior management did not implement centralised controlling as they lack proper exposure to implementation of centralised controlling system. It is revealed that senior management in JB did not have any idea of how centralised controlling works. It is revealed that as senior management is used to working in the same bank from the start of their banking career, thus do not have any prior knowledge of automated centralised controlling.

6.2.3.1 How Senior Management Ability Affects Ease of Communication

In a loan approval process, customers, support parties and regulators are involved. Analysis reveals that banks have deployed various technologies and alternative delivery channels for communication with the E2E process participants. As electronic banking services are new in Bangladesh, proactive initiative is required from bank management to educate and train customers and other process participants. But proactive initiative is absent, and thus technologies remain idle and communication processes remain manual. It is observed that in DBL, senior management did not take any initiatives to integrate customers with the bank's e-

banking services. Phone banking and SMS banking channels remain unutilised in DBL. It is revealed that DBBL has a web-based application system for corporate clients; however, due to lack of initiative, the bank was yet to offer web-based services to other clients. As the Deputy Manager of DBBL mentions; *"....we could not make customers ready to use the web-based application system...we need to give them training and then an ID and password. We were in the team at some point of time and then moved back to operations...at that time we have successfully tested it and we had agreed that IT people will do the rest of the work, however, they did not do that"*. It is also evident that banks (MBL, UCBL and JB) hardly communicate online with customers as online communication culture is missing in banks.

6.2.3.2 How Senior Management Ability Affects Ease of Coordination

It is revealed that lack of senior management initiative hampers automated loan coordination in banks. It is observed that if senior management uses technologies, lower level staff feel encouraged to use technologies as well. It is revealed that lack of senior management ability results in non-utilisation of IT in loan coordination in banks (MBL, UCBL and JB). It is revealed that senior management prefers manual processing as they are used to seeing papers, books and vouchers and are reluctant to use technologies in coordinating loan tasks. Senior management not only uses the existing technologies, but also hesitate to implement sophisticated technologies. Therefore, technology remains useless in banks. Thus, proper initiatives to move from manual processing to automated processing are absent. The Senior Vice President of MBL mentions; *"...again I would say about the mindset...top management should take decision that I do not want to see any paper on the desk....on the desk we will have desktop and laptop...we will use Internet, workflow for decision making..I will do my part and then forward to my next level and so on...as long as we have mindset like red paper is debit voucher, blue paper is guarantee form, white paper is cash voucher then it is not possible to use IT... we need to remove manual banking concept totally from our memory"*. It is also evident that in JB, because of mentality problems among senior management, the bank could not implement IT for loan coordination.

6.2.3.3 How Senior Management Ability Affects Ease of Controlling

Analysis reveals that lack of senior management ability hampers implementation of centralised controlling in banks (DBBL, DBL, UCBL and JB).

Analysis shows that banks have technology in place; however, they could not implement centralised controlling as senior management did not have working experience with an

automated centralised controlling system. Analysis reveals that centralised controlling is normally practised by foreign banks in Bangladesh. But as senior management does not have working experience with foreign banks, and thus lacks proper knowledge of centralised controlling, senior management is hesitant to implement centralised controlling. It is revealed that change management and business process reorientation are required for implementation of centralised controlling. Lack of prior knowledge hampers such implementation. Furthermore, branch managers resist the implementation of centralised controlling and senior management does not want hassles with branch managers. The Manager of DBBL mentions; *"...it [centralized operations] depends on the intention of the top management...if the end-users perceive that top management are adamant and have firm determination...then they [end-user] take it religiously and would not resist...he/she might have some discomfort and express their dissatisfaction but this would not hamper the implementation process"*.

6.3 Complementary Resources

'The organisational availabilities of complementary resources to derive value of E2E Solutions' emerge as one of the value conversion contingencies. It is observed that complementary resources are very much needed for deriving value from E2E Solutions. While organisations implement E2E Solutions, they could not ensure complementary resources and essentially impeded E2E Solutions' value. This section presents how the complementary resources are manifested (section 6.3.1) and the impact of complementary resources on core process performance (section 6.3.2) and coordination and communication performance (section 6.3.3) of E2E Solutions.

6.3.1 How Complementary Resources are manifest

Lack of complementary resources impeded value derivations from E2E Solutions in organisations. Complementary resources are manifested by five aspects: staff IT skills, negotiation skills of implementation team, training, resistance from staff and financial resources. The aspects of complementary resources are shown in table 6.4 with empirical evidence.

Table 6. 4: Empirical Evidence of Complementary Resources	
Aspects	Evidence from organisations (BA, BRAC, CBL, DBBL, DBL, EBL, MBL, UCBL and JB)
Employees do not have appropriate IT skills.	It is revealed that proper IT skills are missing among staff in all banks except BA and EBL. Analysis reveals that both IT education and IT implementation in banks are new phenomena in Bangladesh; thus most of the staff did not get chance to learn IT from either educational institution or from workplace.
Implementation team lacks the skills and experiences to interact and negotiate with the software vendors.	While most of the banks have implemented commercial software, a competent team for negotiation with software vendors for customisation and localisation is missing in all banks except BA. It is revealed that most of the implementation team members did not have prior project implementation and software use experiences. In the absence of competent team, banks have implemented software without proper UAT (User Acceptance Test), customisation and localisation. Analysis reveals that IT vendors dominate in the implementation process, as IT team could not indicate their needs to vendors.
Internal training lacks sufficient focus on IT/software and change management issues.	Appropriate training on IT and change management are absent in banks (DBBL, DBL, MBL, UCBL, and JB), although training on basic banking policy and practices is frequently conducted. It is revealed that banks have their own training institute, and conduct training all through the year. However, most training is conducted on banking policy and practices, very little on use of IT in banking operations, business process redesign and change management.
Staff resist the introduction of new technology.	Analysis reveals that banks (DBL, UCBL, and JB) could not implement and use E2E Solutions properly as staff resisted. It is revealed that because of managers' and staff resistance, DBL could not use the Online Credit Approval System (OCAS) in loan processing. Staff in banks (UCBL and JB) are very static and highly resistant to change. It is revealed that employees in JB create a political environment within the bank and staff pursue their own interest at the expense of organisational interest and do not follow professional conduct.
There are insufficient financial resources to fully implement and customise software.	Financial resources are problematic in banks (BRAC, CBL, DBBL, DBL, MBL and UCBL) and thus localisation of the software (BRAC, CBL, DBBL and DBL) and full implementation (MBL and UCBL) are hampered. Analysis reveals that IT was implemented in banks (BRAC, CBL, DBBL and DBL); however, proper customisation is missing due to cost issues. It is revealed that customisation of the software is as costly as cost of original software, and banks are having financial trouble, thus customisation is hampered. Banks (MBL, UCBL) also suffer from financial problems in the implementation stage.

Analysis reveals that IT skills are missing among staff in banks. It is revealed that IT education and implementation in banks have taken place in very recent times. Therefore, staff did not get

chances to learn IT from their educational institutions nor from their workplaces. Furthermore, because of the permanent nature of jobs, banks retain all staff once recruited despite poor IT skills and lack of attitude to learning IT. Thus, less IT skilful and aged staff dominate in banks. This group of staff is highly resistant to change. The Head of Credit Administration of UCBL describes the IT skill of bankers in Bangladesh; *"...human resource capability and its support to technology is less...our new generation (less than 35) is technology savvy as they learn about technology from their home, and next to new generation (35 Plus) are weak, and 45+ plus generation are hesitant to adopt technology. Later group consider IT as problematic, however, this group is highly predominant in the banking sector"*. Because of aged staff and the permanent nature of jobs, banks start with providing elementary IT training, but could not succeed as staff are highly resistant to change. Staff do not want to learn computers. For example, JB is one of the oldest banks in Bangladesh and most of the staff of JB are above 50 years of age. It is revealed that at JB, aged staff are not even forced to touch technology, and when staff were asked to learn IT, they provided many excuses for not attending IT training; headache, short-sightedness, pain in finger, etc. The IT Consultant of JB explains, *"While asking them (staff) to use computer they said no, no, no, no, this is not possible for me and gave several excuses.....say, I have headache, I have short sightedness, I have problem with my finger....even once I said that if they [staff] break the computer while operating, bank would take the full responsibilities....then after they do not want to use computer"*. This scenario prevails in other banks as well.

A competent IT implementation team is required for ensuring customisation and localisation of software. Analysis reveals that while banks implemented commercial software, implementation team members do not have prior software implementation experiences. Therefore, proper customisation and localisation is hampered. Software is implemented without proper testing, and eventually creates problems while being used later. In the absence of lack of competent teams, software vendors were found to dominate in the stages of contracting, negotiation, implementation and customisation. For example, BRAC implemented Universal Lending Software (ULS) without proper User Acceptance Tests (UATs). The absence of competent teams also causes problems in DBBL with IT implementation. One of the team members at DBBL describes software implementation experiences as *'jumping into the sea'*. Thus, implementation teams could not press their demands to the vendors as they did not know about the functionalities and architecture of the software. Therefore, software was not properly localised at DBBL. It is revealed that because of inexperienced IT teams, software vendors charge lower prices upfront to sell the product and then charge more for customisation as

implementation teams do not know how many customisations are required for the software to work in the local context. The Assistant Vice President of BA describes the poor skills of implementation team members and its consequences; *".....banks' knowledge base is not up to that level to negotiate with the foreign vendors...for negotiating properly, you need to know the process fully...say for example, for accepting a web based application of a car loan, we have to know the documents that are needed....once you do not know then foreign vendors play the game.....vendors are clever and they realized that if they charge high price like what they used to charge in developed countries; they cannot sell their products..and therefore, what they used to do is delete features of software and charge the entry fee minimum and then charge huge prices for customisation of the products...our banks do not understand this fully....when banks realise that they need customisation here and there and banks ask for customisation, say local banks ask for 10 customisations...but foreign vendors know that at least 30 customisations are required to work the process, and later on while local banks ask for more customisations....vendors are saying that for doing the rest of the 20 customisations they need to pay X amount of dollars...local banks cannot afford to pay this extra amount and then do the works manually despite having IT"* .

Implementation of E2E Solutions brings lots of changes to the work practices' routine and thus proper training in IT and change management are required; however, this is absent in banks. It is revealed that IT training is required for staff with no/less IT skills. But training on change management is required for all staff whatever IT skills they have. As skilful staff resist the adoption of IT, banks have training institutes conduct training all through the year. But training modules dominate the traditional materials on banking policy, rules and practice. Training is rarely conducted on IT and change management. Skilful trainers are also absent in banks. It is revealed that staff also resist taking training. For example, staff in JB do not want to take training. UCBL takes a long-term strategy to train their staff, but progress to date is very disappointing. The Head of IT of UCBL mentions that; *"....I cannot ask a I or II class student to sit for SSC (Secondary School Certificate) examination....no one can jump ahead and do the SSC exam..We are giving them time to understand and conceive computer...then will provide the basic training first and then the advanced level".*

Staff are the ultimate users of any system in organisations. Staff should accept the system cordially for realisation of the value from technology. But staff's acceptance of IT in banks is very poor as staff resist the introduction and use of IT. Staff resist as they lack trust in the system. Staff trust paper-based systems as they can see signatures, and scope remains for joint signatures. But, in an automated system, staff do not see any signature or document and thus do

not want to use IT. The Vice President of Credit and Change Management of DBL describes why they could not use workflow in loan processing, *"....staff resistance is the big challenge...like one person processes a loan and it then escalates to the next level and this level [middle level] is not happy with the online system as this person do not see any signature and therefore, questioned about authenticity of data and documents"*. Staff also resist manual processing, as they can share responsibilities by processing loans together. For example, in paper-based processing all the process participants sign on a single loan proposal. Thus staff feel safe in the case of loan default. But an automated workflow system empowers staff, and therefore they do not want to exercise his/her delegated authority. Therefore, staff feel insecure in using an IT/workflow system in loan processing. Staff also resist because of technophobia. It is observed that staff in banks (UCBL and JB) are rigid and highly resistant to change. Staff in JB do not see any personal gain in bank automation, and thus do not want to work for bank automation.

Financial resources are very important for the proper running and fine tuning of E2E Solutions. E2E Solutions require additional finance because of the evolving nature of business processes and technology. Analysis reveals that banks are having financial trouble and that impedes realisation of value from E2E Solutions as banks could not ensure proper customisation. Software vendors charge huge amounts in customisation and the cost of customisation is equivalent to software prices. Banks implement software with expectations of automating business processes. But business processes are found to be manual, as banks could not ensure proper customisation due to financial constraints. For example, due to budget shortages, banks (BRAC, DBL, DBBL, and CBL) could not customise the software and give access to the software to all staff. The Manager of DBL mentions; *"Our software does not support the grace period concept of term nature loan...we have asked the vendor to provide us the solutions, but they denied changing their core feature .....We were insistent, therefore, vendor had agreed to change, and however, they would charge the amount almost equivalent to the original software price. Therefore, after doing cost benefits analysis we have moved back from our stance and those problems are handled manually"*. UCBL is moving slowly in E2E Solutions' implementation because of funding shortage.

6.3.2 How Complementary Resources Affect Core Process Performance of E2E Solutions

Analysis reveals that lack of complementary resources impeded various aspects of core process performance: loan processing time, risk assessment and loan processing cost. Table 6.5 documents the empirical evidence.

Table 6. 5: Evidence for how Complementary Resources Impacted the Core Process Performance of E2E Solutions

Mechanism	Evidence from organisations (BA, BRAC, CBL, DBBL, DBL, EBL, MBL, UCBL and JB)
Lack of Complementary Resources result in slower loan processing as: (i) staff often make mistakes and are not conversant with the technology; and (ii) staff resisted the use and implementation of technology.	It is revealed that faster processing of loans is hampered as staff lack IT skills and are resistant to use the IT in banks (CBL, DBBL, DBL, MBL, UCBL and JB). Analysis reveals that due to resistance from staff, OCAS (Online Credit Administration System) is not used for loan processing in DBL. Limited IT skills hamper implementation of automated processing system in DBBL. It is revealed that DBBL's staff are not conversant with IT and thus training on IT and change management is required. Analysis shows that 50% of staff of CBL are not IT skilful and this causes unnecessary delay in loan processing. UCBL took a crash program for enhancing IT skills of their staff; bought 600 computers and provided each desk with a computer, provided cash incentives for attending IT training. Despite this UCBL could not make processing tasks faster.
Lack of Complementary Resources result in inaccurate risk assessment as: (i) staff lack IT skills and; (ii) staff resisted the implementation of risk assessment tools.	It is revealed that E2E Solutions are not used for risk assessment in all banks except BA and EBL. Analysis reveals that because of staff resistance, DBL could not use OCAS system in loan processing although it has decision support systems and scoring system that guide on risk assessment. It is revealed that because of staff resistance, DBBL could not implement best practice embedded in E2E Solutions which control critical risk. It also reveals that banks (MBL and UCBL) have DSS, Excel-based risk assessment tools; however, do not use them, and rather provide loans based on manual judgement. Staff in JB assign arbitrary credit scoring while assessing risk.
Lack of Complementary Resources result in higher loan processing cost as: (i) limited use of technologies due to staff' resistance and; (ii) lack of localisation of software due to	Analysis reveals that E2E Solutions could not reduce the processing cost in banks (CBL, DBBL, DBL, MBL, UCBL and JB) because of limited/no use of technology and thus manual tasks still remain. Analysis reveals that DBL could run the bank with 50% less staff if technology was utilised properly. It is revealed that due to staff resistance, DBL could not implement OCAS (Online Credit Administration System) and business process reorientation. Thus processing tasks are manual and relationship-based. Analysis reveals that because of funding shortage and lack of competent IT team, banks could not localise their software, and thus many of the tasks

Table 6. 5: Evidence for how Complementary Resources Impacted the Core Process Performance of E2E Solutions	
Mechanism	Evidence from organisations (BA, BRAC, CBL, DBBL, DBL, EBL, MBL, UCBL and JB)
the lack of staff experience.	need to be handled manually. Staff of CBL were found to be less IT skilful; therefore, CBL recruited more IT skilful staff while retaining the old ones. Therefore, technology did not reduce the need for staff, rather it increased staff size. It is revealed that if JB could implement and use IT then JB could run with only 50% of existing staff.

6.3.2.1 How Complementary Resources Affect Processing Time

It is revealed that loan approval is an E2E process and staff at various levels are involved. Analysis reveals that because of the limited IT skills of staff, banks could not effectively utilise E2E Solutions to make loan processing tasks faster. Staff are less conversant with the technology, thus processing tasks remain slow. The Head of Business Systems Management of BRAC describes the importance of skills of every single staff member in the E2E process; *"...workflow system is the E2E system...it would not work unless all level people cooperate ...this workflow process follows some logic and goes to some level before it [loan] gets approved"*. It is revealed that in DBL, staff do not know data entry procedures and often commit mistakes and that essentially hampers faster processing. The Head of IT of DBL mentions, *"....we face problems from user level....say users don't key in data properly ....do not follow our instructions carefully...system provides some default figure, however, you need to change those depending upon cases....staff often forget to change the default rate...and that essentially creates problems"*. It is revealed that MBL implements PCs and email facilities; however, staff do not use them for loan processing. The Senior Vice President of MBL mentions, *"...we just use computer as replacement of calculator...the difference is big screen and small screen"*. It is revealed that technology is of no use in UCBL as staff are not comfortable in using technologies. The Network Manager of UCBL mentions; "....*it takes 5 minutes to write his/her name with the computer"*. Beside staff's IT skills, they also resisted implementing business process reorientation thus process tasks remain slow even after implementation of technologies (DBL and DBBL).

6.3.2.2. How Complementary Resources Affect Risk Assessment

An E2E Solution's ability to make risk assessment tasks accurate depends upon the proper use of E2E Solutions. But proper risk assessment tasks in banks are hampered as staff resist using technology. It is revealed that OCAS (Online Credit Administration System) has a built-in DSS but is useless in DBL as staff resisted using it for risk assessment. Staff also suffer from not

having required IT skills. It is revealed that for using technology in risk assessment, staff need to know about accounting ratios, fund flow statements, projections and analysis of financial statements. But besides technical skills, staff also lack accounting skills. Thus, technology remains useless for risk assessment. The Head of SME Operations of BRAC explains; *"...loan processing is an end-to-end process, if data entry is not perfect then completing the task is bound to be problematic. That is why, although we have implemented globally practised LAPS (Lending Automation Processing System) software, we cannot use it".* It is revealed that in JB, staff assign risk scores arbitrarily as they lack the required skills to use technology for risk assessment. Most of the staff in JB do not have a proper understanding of credit scoring and ratio. Staff do not have skills in reading financial statements. Thus JB could not use technology in risk assessment.

6.3.2.3 How Complementary Resources Affect Processing Costs

Analysis reveals that banks could not reduce loan processing costs after implementation of E2E Solutions. It is revealed that because of staff resistance and less IT skills, loan operations are manual. Thus, E2E Solutions could not reduce the paper, postage and wages cost. For example, DBL implemented OCAS (Online Credit Administration Solutions); however, they could not use the system as middle level managers resisted. It is revealed that DBBL could not reduce the processing cost after implementation of technology, as due to staff resistance, the bank could not reorient the business process. The lack of customisation and localisation reduces the usability of software in banks. Thus banks need to do many of the processing tasks outside of software, and IT could not restrict the requirements of staff. BRAC could not use the software as it was implemented without a proper User Acceptance Test (UAT). Thus, BRAC could not reduce the costs of loan operations. It is also revealed that after implementation of IT, rather than reducing the existing staff, banks recruited additional IT skilful staff. Thus, rather than reduce the cost, IT increases the cost. For example, CBL recruited more staff after implementation of IT.

6.3.3 How Complementary Resources Affect Coordination and Communication Performance of E2E Solutions

This section presents the study's findings on how complementary resources impeded aspects of coordination and communication processes. Analysis shows that lack of complementary resources hampers the implementation of centralised controlling. Table 6.6 shows the empirical evidence of how lack of complementary resources impeded the implementation of centralised controlling.

It is revealed that after having the IT platform in place, banks could not implement centralised controlling because of resistance from staff. This is because centralised controlling stops unauthorised lending in branches. Analysis shows that managers do not want to implement centralised controlling as it lessens their authority and reduces flexibility in their work. Analysis shows that once the bank implements centralised controlling, the managers cannot provide loans as they wish. Thus managers resist implementing centralised controlling. The Head of Credit and Business Process Re-engineering of DBL explains why staff resisted the implementation of centralised controlling, *"...manager thinks that their empowerment will be hampered once we implement centralized operations...in branch banking there are various departments, lots of people are working here and there...managers feel that they are running a big show...managers do not want to get rid off additional [loan processing] responsibilities"*.

Table 6. 6: Evidence for how Complementary Resources Impacted the Coordination and Communication Performance of E2E Solutions

Mechanism	Evidence from organisations (BA, BRAC, CBL, DBBL, DBL, EBL, MBL, UCBL and JB)
Lack of Complementary Resources hampers centralised controlling as staff resisted the introduction of the system.	It is revealed that due to staff resistance, centralised controlling could not be implemented in banks (DBBL, DBL and JB). Analysis reveals that after having the IT infrastructure, centralised controlling system could not be implemented in banks (DBL and DBBL) as staff resisted. Whereas, in JB, staff do not want to work for implementation of IT and thus centralised controlling could not be ensured.

6.4 Software Misfits

Software Misfits are defined as *'the degree to which the software is aligned with local needs and practice'*. Analysis reveals that software misfits impeded the business value realisation and hampered both core process and coordination and communication process performance of E2E Solutions. This section starts by describing how software misfits are manifested (section 6.4.1). As software misfits impact on core process performance (section 6.4.2), and coordination and communication process performance (section 6.4.3), the impact of software misfits is also described and documented.

6.4.1 How Software Misfits are manifest

It is revealed that commercial software is developed for generic business needs, and needs to be customised to match with local business needs. But because of lack of customisation and localisation, banks are suffering from software misfits. In addition, the Bangladesh banking

market is not saturated and decision-making criteria for loans are not fixed, and this also causes software misfits. The aspects for software misfits are shown in table 6.7 as well as the empirical evidence.

Table 6. 7: Empirical Evidence of Software Misfits

Aspects	Evidence from organisations (BA, BRAC, CBL, DBBL, DBL, EBL, MBL, UCBL and JB)
Gaps exist between the functionalities of the software and organisational requirements.	Analysis reveals that gaps exist between the business requirements and functionalities of the software used by all banks except BA and EBL. Banks (BRAC, CBL, DBBL and DBL) implemented foreign software with huge functionalities; however, due to constraints in the area of management, regulatory environment, customers' readiness, banks could use only 20%-40% of the functionalities and much of the functionalities remain unexplored. Whereas banks (MBL, UCBL and JB) that use locally made software are suffering from the less functionalities problem. It is evident that BA formed a joint venture company with a foreign vendor and developed world standard software. Therefore, BA uses the full functionalities of the software.
Software does not support the country-specific requirements.	Analysis reveals that those who have implemented foreign made software have difficultly in matching software with country-specific requirements (BRAC, CBL, DBBL, DBL and EBL). It is revealed that foreign software is developed for world practices which are mostly absent in Bangladesh and vendors did not localise the software to match with industry norms and practices.
Localisation, customisation and updates of software are costly and slow.	It is revealed that banks (BRAC, CBL, EBL, DBBL, DBL and JB) are having dissatisfaction with the after sales services of their IT vendors. First, customisation of the software is very costly. Second, vendor charges user-based costing; therefore, not all staff of the banks have software access. Third, vendors' support offices are outside of Bangladesh, therefore, after sales services are very slow. Fourth, vendors do not allow banks to customise the software. Thus, for critical changes, banks need to wait for vendors to come and fix and this process is very slow.

Analysis reveals that huge gaps exist in the functionalities of the software and organisational requirements and gaps exist in both directions; requirements exceeded functionalities, and requirements are less than the functionalities provided. While organisations pay full price for software, they could not use and exploit its full potential and thus business value remains unexplored. The Vice President of Credit and Change Management of DBL thus mentions, *"...it [software] has huge functionality...but what I observed that the bank is using only 30-40% of the software"*. Analysis reveals that for various reasons, including lack of customisation, size of the bank and market, and absence of technology-friendly regulatory environments, banks could

not use software optimally. The CIO of the CBL mentions that their software supports many products and services, but the existing small market size and structure do not permit them to offer those services to customers. He mentions, *"...in the software there is lots of derivatives products...we [Bangladesh] do not have any of such products...say the software we use and Citi NA use are the same...but this is beneficial for Citi NA as derivative products are practiced in developed countries".* Analysis reveals that banks that use locally-made software are also having problems as this software hardly satisfies organisational requirements. The CIO of UCBL mentions that their software fulfils only 20% of their requirements.

The ultimate success of any software implementation depends upon the software-business process fit. It was observed that commercial software is a *'strait jacket'*, developed for generic needs. Bangladesh's banking practice is not up to world standards. This market is also small, so none of the renowned software vendors come forward to develop software for the unique needs of Bangladeshi banks. Thus, banks are having trouble matching business processes with software. The Manager of DBL mentions, *"....we have problem in setting up central bank's guidelines into the software...say loan becomes irregular (substandard, doubtful and bad and loss) and the question of adjustment of that loan comes, we face various problems...existing rules say that at first interest income need to be adjusted and then principal amount; however, global practice is opposite-adjust the principal amount and then adjust interest as income".* As mentioned, the banking business in Bangladesh is not saturated, and thus decision-making criteria are not fixed. Furthermore, banks have been found to introduce new products quite often. This also causes problems in stabilising the software within the bank. For example, it was observed that the credit policy in BRAC changes every 15 days and the bank launches new products every month. This causes problems for BRAC in using workflow systems. Despite this, banks prefer to implement foreign software because of trust and more functionality.

Analysis reveals that banks are dissatisfied with the costs of customisation, localisation, software updates and after sales service of the vendors, because of the large amount of money charged for each customisation of software. As CIO of CBL mentions, *"there are only a few key international enterprise solution vendors in the market. They charge a huge amount of money. We need to pay them in dollars...it is unaffordable for small banks like us...Our options are limited [as] local vendors could not fulfil our needs. Furthermore, local vendors may discontinue their operations as there is no strong regulatory body to oversee them. Therefore, we have no option other than going for [a cut-down] version of foreign software".* Software vendors' charges are calculated on user-based costing, and thus, banks cannot provide software access to all staff. Moreover, if customer numbers or branch size increase, banks pay additional

money to IT vendors. IT vendors maintain the source code, thus banks need to rely on foreign vendors for any changes in the software and need to pay by fee for service. None of the foreign software vendors have sales and support offices in Bangladesh. Thus, it takes a long time to restore online services once they are disrupted. Foreign vendors frequently change their software versions and force banks to buy upgraded versions of the software. On the other hand, local software is very cheap; quality and after sales services are very poor and local vendors thus suffer from business discontinuity.

6.4.2 How Software Misfits Affect Core Process Performance of E2E Solutions

The purpose of this section is to describe the study's findings with respect to how core process performance of E2E Solutions is impeded by software misfits. The study reveals that three aspects of core process performance: loan processing time, loan administration and processing cost are impeded by software misfits. The empirical evidence of how core process performance of E2E Solutions is impeded by software misfits is presented in table 6.8.

Table 6. 8: Evidence for how Software Misfits impacted the Core Process Performance of E2E Solutions

Mechanism	Evidence from organisations (BA, BRAC, CBL, DBBL, DBL, EBL, MBL, UCBL and JB)
Software Misfits increase the loan processing time by forcing the bank to process the loan manually.	Analysis reveals that software misfits hamper faster loan processing in banks (BRAC, DBL, MBL, UCBL and JB). It is revealed that Online Credit Administration System (OCAS) was not used in DBL as bugs arose afterwards and loan processing task is manual and slow. BRAC implemented workflow without proper UAT (User Acceptance Test). Loan processing is paper-based and slow. Whereas, banks (MBL, UCBL and JB) also suffer from software misfits problem, and thus process automation could not be achieved.
Software Misfits adversely affect the ease of loan administration as proper customisation and localisation are missing.	It is revealed that software misfits hamper the ease of loan administration in all banks except BA. It is revealed that banks (MBL, UCBL and JB) use local software which supports only accounting part of loan administration and does not support the realisation and reporting. Whereas foreign software supports all aspects of loan administration but suffers from customisation and localisation problems (BRAC, CBL, DBBL, DBL and EBL). For example, grace period concept of term loan is not supported by the software used by DBL. CBL faces trouble using software in loan rescheduling and back-to-back Letter of Credit (L/C) operations.
Software Misfits increase processing cost as: (i) functionalities	The E2E Solutions' ability to reduce processing cost is hampered because of software misfits in all banks except BA. It is revealed that software functionalities are unutilised in banks (BRAC, CBL, DBBL, DBL, and EBL). For example, DBL uses 10-20% of

Table 6. 8: Evidence for how Software Misfits impacted the Core Process Performance of E2E Solutions	
Mechanism	Evidence from organisations (BA, BRAC, CBL, DBBL, DBL, EBL, MBL, UCBL and JB)
remain unused; (ii) manual work remains; and (iii) software maintenance is costly.	software functionalities. BRAC implemented Universal Lending Solutions (ULS); however, could not use the software as proper customisation was missing and thus manual work remains after implementation of software. Software misfits force banks (BRAC, CBL, DBBL, DBL, and EBL) to manual and relationship-based banking. Thus banks could not reduce the staff requirements, paper, postage and wages cost. Maintenance of the software is also costly, as vendor charges user-based costing and for frequent upgrades and resulting customisation.

6.4.2.1 How Software Misfits Affect Loan Processing Time

It is revealed that in loan approvals, many internal staff and external parties are involved. Banks deploy various types of software for processing the task in a faster way. However, software misfits force banks to process loans manually, and faster processing is hampered. Loan approval processes in Bangladeshi banks are different to world practices. But software is not properly customised. Thus, despite having software, banks work in manual ways as they do not want to pay high customisation fees. For example, BRAC implemented Universal Lending Solutions (ULS); however as vendors did not do proper customisation, loan processing tasks are still paper-based and slow.

It is also revealed that the loan market in Bangladesh is not saturated. Thus, decision-making criteria for availing a loan are not yet fixed. This creates problems in matching the software with the business process. For example, DBL developed an OCAS (e.g. workflow) in-house for faster loan processing, but could not use it as decision-making criteria and loan disbursement guidelines always change and this is difficult to accommodate in software.

6.4.2.2 How Software Misfits Affect Ease of Loan Administration

In loan administration, three tasks are involved: accounting, realisation and reporting. Software misfits create problems in automated accounting and reporting. It is revealed that in Bangladesh, the loan interest calculation (e.g., daily, monthly, quarterly, yearly), amortisation calculation, loan classification and interest suspense realisation procedure are all country-specific. Therefore, it is difficult to accommodate country-specific accounting procedures into the foreign software as it is made for generic business needs. Furthermore, customisation is highly costly and banks do not want to pay high costs for customisation, thus ease of loan administration is hampered. The Manager of DBL reports, *"....say for term nature loan as per Bangladesh Bank [central*

bank of Bangladesh] guidelines we cannot charge any interest for first few months, and this period is called monitoring period, and after that instalment starts. However, monitoring period concept is not supported in global software, therefore we handle term nature loan manually".

As banks face problems at the data level because of software misfits, this essentially impacts on the reporting level. As software guided-accounting procedures differ from country-specific requirements, data generated from the software need to be adjusted. In addition, conflicts arise in the format level as well. Software-prescribed format differs from regulator-prescribed format. Each bank sends over 400 reports to the central bank quarterly; however, banks face huge problems in reporting. The Head of IT of DBL thus mentions, *"...as per Bangladesh Bank [central bank of Bangladesh] guidelines we have to prepare lots of returns and statement, our software does not match with these....differs when we prepare statement on recovered loan and interest suspense and the amount differs with GL (General Ledger) provided by our software and the amount to be reported to CIB (Credit Information Bureau)....if we do it manually this is fine but as we have implemented a system, we want automatic report generation".*

6.4.2.3 How Software Misfits Affect Processing Costs

Analysis reveals that software misfits increase loan processing costs. It is revealed that much of the software functionalities remain underutilised, and thus costs of banking operations increase. Costs also increase as paper cost, postage cost and wages cost remain more after implementation of software. Banks could also not restrict the need for staff for processing loans. It was observed that because of software misfits, loan administrative tasks need to be handled outside of the software. Thus, wages and paper costs increase. The Branch Manager DBL mentions that, *"...we have spent million dollars for software purpose...ultimately we are using 10/20 percent of the total functionalities".*

Analysis reveals that maintenance of software is costly. For every customisation, vendors charge money. IT vendors also charge user-based costing, and for opening of additional branches or for providing users with software access, banks have to buy licences from software vendors. Thus, recurring costs increase. Besides, banks need to pay more fees if customer numbers increase. Software vendors push the bank for implementation of updated software and banks are compelled to buy the latest version and then need to do new customisation to match with business processes. Thus, a senior banker having working experience of foreign, locally-made, and in-house developed software describes the implementation of software as equivalent to the punishment of *'lifetime imprisonment'* and mentions:

"....my understanding is that foreign software implementation in my bank would be disastrous....you can easily realise if I give you an example...let's talk about Dutch Bangla Bank Limited (DBBL) case....they use i-Flex of Oracle...this is World renewed software...the support centre is in India....every moment you need to stay online for communicating with vendor....therefore, all the time you are relying for services on others. Second, this is high cost software. High cost means very high cost.....beside one time huge upfront payment; they need to pay US$2500 quarterly as license fee, beside the maintenance fee. There was a contract period say up to three years and during that time maintenance fee would not be changed but after that it will be changed, however, at what percentage the rate will be changed was not mentioned in the contract. After finishing 3 years, Oracle mentioned that AMC (Annual Maintenance Contract) would be 23% instead of initially agreed 18%...They also increased the 3 month fixed license fee from 2500US$ to 8500US$. Third, if you want to open new branches and certainly you will do, you are obliged to pay them additional fees for creating new users' accounts. Fourth, more pathetic that DBBL has implemented the software in 2004, and now in 2009, Oracle is asking DBBL to upgrade the system and buy the new version, otherwise they would stop the service...upgradation also means new customisation and again this customisation is temporary. Overall that means you have to accept the price fixed by vendor, you have to do whatever the vendor asked you to do; you cannot stop your services and discontinue your operations. So once you entered into a contract with a foreign IT vendor, you cannot get out from the 'lifetime imprisonment' as this is not like anti-virus software, if you do not like it you can't simply discard it".

6.4.3 How Software Misfits Affect Coordination and Communication Performance of E2E Solutions

This section presents the study findings with respect to how coordination and communication performance of E2E Solutions is impeded by software misfits. It is revealed that software misfits negatively impacted on communication, controlling and monitoring. Table 6.9 shows the empirical evidence.

Table 6. 9: Evidence for how Software Misfits Impacted the Coordination and Communication Performance of E2E Solutions

Mechanism	Evidence from organisations (BA, BRAC, CBL, DBBL, DBL, EBL, MBL, UCBL and JB)
Software Misfits hamper communication as they do not support alternative delivery channels.	Analysis reveals that banks (MBL, UCBL and JB) could not improve communication process with their customers and support parties as software misfits restrict banks from implementing alternative delivery channels. It reports that for implementation of alternative banking channels, database and IT infrastructure need to be integrated. But banks (MBL, UCBL and JB) have a distributed IT system and thus could not implement alternative delivery channels to integrate with customers and other parties.
Software Misfits create problems in ease of controlling as software architecture is decentralised.	It reports that banks (MBL, UCBL and JB) could not implement centralised controlling system as technology does not support implementing this provision. This is because of distributed software architecture in banks (MBL, UCBL and JB). Therefore, real-time integration is not possible, nor is centralised controlling.
Software Misfits hamper ease of monitoring as: (i) databases are segregated and not live; and (ii) databases are account centric.	It observes that effective monitoring of staff and customers is not possible in banks (MBL, UCBL and JB) as software does not allow it. It is revealed that for real-time monitoring, database needs to be customer centric, as opposed to account centric. However, banks (MBL, UCBL and JB) have segregated and account centric database. Thus real-time monitoring of customers who have various asset and liability accounts with different branches of banks is not possible.

6.4.3.1 How Software Misfits Affect Ease of Communication

Analysis reveals that existing local software used by banks does not permit offering alternative delivery channels, thus the customers' interaction part is manual. As the IT consultant of JB mentions, *"....local vendor's software is offline...they [local vendor] do not have any initiative for developing online products"*. Analysis reveals that for implementation of ATM, POS, kiosk, Internet banking, phone banking and SMS banking, the databases of all branches of a bank need to be integrated. However, local software does not support such real-time database integration. It was observed that banks (MBL, UCBL and JB) have distributed software architecture and therefore, could not effectively serve their clients. The Head of IT of UCBL reports that they have suggested that their vendors change the database from SQL-based to Oracle-based and then they will be able to effectively serve their clients.

6.4.3.2 How Software Misfits Affect Ease of Controlling

Analysis reveals that because of software problems, banks could not implement real-time centralised controlling. It is revealed that in the case of centralised controlling, staff roles and responsibilities are defined from the head office. The head office controls the loan disbursement of branches. Thus, IT infrastructure of banks needs to be in a centralised platform and integrated. However, existing local software in banks (MBL, UCBL and JB) does not support centralised controlling, as IT infrastructure is in a distributed mode. The IT Consultant of JB thus mentions, *"I am not talking about the capability of the vendors.....but the products they (local vendors) bring to the bank are not capable to run in parallel with the foreign software, not that much efficient to that level.....local products do not support online banking, online monitoring and centralized controlling"*.

6.4.3.3 How Software Misfits Affect Ease of Monitoring

Analysis reveals that databases need to be integrated and account centric for real-time monitoring of customers and staff but existing local software used by banks does not allow this real-time monitoring. It was observed that in the distributed database system, all branches have their own server and database, and once they push the data into the central server, head office gets the central MIS. Thus, real-time monitoring is not possible. Furthermore, because of account centric databases, it is not possible to generate the cumulative position of a customer in an organised way. The Head of IT of UCBL mentions that, *"Online banking is not supported by their software, existing system support only standalone computerization and automation"*.

6.5 Integration

'The degree to which the internal and external processes are integrated' emerges as one of the value conversion contingencies. The study reveals that in an E2E loan process, multiple internal and external parties are involved, and integration among these parties is very important for the unimpeded flow of an E2E process. But integration with internal and external processes is missing in organisations. This section starts with describing how integration is manifested (section 6.5.1). It then documents how the lack of integration impeded the various aspects of the core process (section 6.5.2) and coordination and communication process (section 6.5.3) performance of E2E Solutions.

6.5. 1 How Integration is manifest

Integration is formed by three aspects: (i) internal process integration is found to be absent in the organisation; (ii) integration with external support parties is found to be absent in the organisation; and (iii) integration with external regulatory sanctioning bodies is found to be absent in the organisation. The various aspects of integration are shown in table 6.10 as well as the empirical evidence.

Table 6. 10: Empirical Evidence of Integration

Aspects	Evidence from organisations (BA, BRAC, CBL, DBBL, DBL, EBL, MBL, UCBL and JB)
Internal process integration is found to be absent in the organisation.	It is revealed that internal process integration is absent in banks (MBL, UCBL and JB). Analysis reveals that because of lack of process integration, banks work in distributed mode, and use paper-based processing. It shows that branches prepare and forward paper-based loan application, and head office further prepares another loan proposal and approves the loan. Branches do not have access to information and data of head office and vice versa.
Integration with the external support parties is found to be absent in the organisation.	Analysis reveals that integration with external support parties is largely absent in banks (BRAC, DBBL, CBL, MBL, UCBL and JB), despite initiatives taken by banks (BA, DBL and EBL). It is revealed that banks rely on various external support services for loan processing including lawyers and information collection agencies, and accountants. However, integration among those parties is absent.
Integration with external regulatory sanctioning bodies is found to be absent in the organisation.	It is revealed that banks are obliged to take approval from regulatory bodies before disbursing; however, integration with external sanctioning parties is missing in all banks. It is revealed that as part of mandatory requirements, each bank has to check the outstanding loan status of applicants with other banks from Credit Information Bureau (CIB). Other sanctioning bodies include Bangladesh Road Transport Authority (BRTA), Land Registration Office. But the communication process with the regulatory bodies is manual and lengthy despite having IT in banks.

A loan process is an example of 'joint production' and many internal staff at various levels are involved, and to and forth communication with branches and head office is also necessary. However, internal process integration is absent in banks (MBL, UCBL and JB) as branches and head office work as isolated offices without integration. The Head of IT in UCBL reports that *"In a loan processing there are many steps, like after application, it goes to management committee of the branch, then goes to Head Office EC committee, then is placed with the board...before final approval there are lots of steps.. Bringing all of them into the online process is so far difficult for us with the existing technology and knowledge base"*.

Besides internal processing staff, banks also rely on external support services. For example, banks take services from third parties for information collection on borrowers, and services from lawyers and accountants to check the authenticity of documents and data provided by clients. Analysis reveals that banks (BRAC, CBL, DBBL, MBL, UCBL and JB) could not establish any online interface with support services, despite having internal preparedness. The Head of Business System Management of BRAC reports, *"...they [support services] do not have any concept of online.....they do not have any concept of e-mail. For example, we do the Contract Point Verification (CPV) of clients and they provide us the hard copy report"*. Likewise, banks also take services from lawyers to check documents provided by clients, and this communication process is manual. The Head of Branch Operations of CBL mentions that, *"...we collect vetting from lawyer and we do all the side works manually"*. However, most of the banks were found to be ready for online communication and deployed technologies. But external parties are neither ready nor interested in establishing online interfaces. The Head of IT of DBBL mentions that, *"to communicate with support services, we are fully ready, but counterparties are not"*.

In addition to internal processing and support services, banks have to get approval from external sanctioning bodies before final loan disbursement. External sanctioning bodies are Credit Information Bureau (CIB), Land Registration Office, Bangladesh Road Transportation Authority (BRTA), Export Promotion Bureau (EPB), Customs, National Board of Revenue (NBR), etc. Analysis shows that for every type of loan, banks have to mandatorily get approval from the Credit Information Bureau (CIB). However, none of the banks could establish external integration with the external sanctioning bodies. The Head of IT in EBL reports that, *"for loan processing, the Credit Information Bureau (CIB) at Bangladesh Bank (i.e. central bank) is the only place to collect data on borrowers and about their declared loan. However, we need to wait for 1/1.5 months to get approval from CIB. That could easily be provided online.....Due to some 'unknown' reasons online integration is still not there; although we are hearing for the last two years that the central bank would provide us with an online interface with CIB"*. Likewise, depending upon the loan types, banks have to get approval from other government institutions. For example, for a car loan, banks check registration status with the Bangladesh Road Transportation Authority (BRTA). But the communication and work process at BRTA is manual. The Team Manager of CBL thus affirms, *"upon completion of a car registration we may provide [the owner] with a loan. However, the car registration process at BRTA (Bangladesh Road Transportation Authority) is manual. We have no control over the process"*. Analysis reports that banks are ready to integrate with regulatory bodies; but regulatory bodies

are not willing to communicate online with banks. Regulatory bodies do not want to automate their work processes. It is revealed that sanctioning bodies have the capacity to provide data and approval online. But due to 'unknown' reasons, banks still have to process tasks manually with sanctioning bodies.

6.5.2 How Integration Affects Core Process Performance of E2E Solutions

Analysis reveals that lack of integration impeded different aspects of core process performance of E2E Solutions: loan processing time and loan processing cost. The evidence for how lack of integration impedes the core process performance is shown in table 6.11.

Table 6. 11: Evidence for how Integration Impacted the Core Process Performance of E2E Solutions

Mechanism	Evidence from organisations (BA, BRAC, CBL, DBBL, DBL, EBL, MBL, UCBL and JB)
Lack of Integration hampers the loan processing cycle by making the internal and external process task slow.	Analysis reveals that lack of integration hampers faster loan processing in all banks. It observes that banks could not reduce the overall process time after deploying E2E Solutions, as process integration is absent in banks. It observes that loan processing is the job of many parties' integration; bank to bank integration, bank to Credit Information Bureau (CIB) integration; bank to police office integration; bank to tax office integration; bank to accounting and lawyers' firm integration. However, this integration is absent in banks. Thus loan processing task is manual and slow.
Lack of Integration increases the processing cost by forcing banks to do manual and paper-based work; thus paper, postage and wages costs are high.	It is revealed that lack of integration forces all banks to process internal and external processing tasks manually and paper-based. Thus could not reduce the paper, postage, printing and wages cost after deploying E2E Solutions. Analysis reveals that banks are ready and paying rent for technologies; however, could not establish online communication. Banks are working as 'silos' without having interfacing between branches and head office. Support services and sanctioning bodies work manually. Thus banks' expectations of reducing processing cost did not materialise in the absence of integration among process participants.

6.5.2.1 How Integration Affects Loan Processing Time

Analysis shows that loan processing is the job of many parties' integration; head office to branch integration; bank to bank integration; bank to Credit Information Bureau (CIB) integration; bank to tax office integration; and bank to accounting and lawyers' firms integration; however, external integration is absent in banks. Therefore, banks could not make the processing task faster after deploying E2E Solutions.

It is revealed that faster internal processing is meaningless in the absence of integration with support parties and sanctioning bodies. Banks wait a long time for completion of external processing tasks. For example, using IT, a bank could process the internal loan processing tasks within 3-7 days but external tasks require 1/1.5 months. Thus, E2E Solutions could not make the overall task faster. The Head of Credit Administration of EBL mentions, *"In house automation is becoming meaningless without integration with regulators and third parties. For example, in collateral based loan, land is usually used as primary security.....however, as per existing rules it has to be registered as mortgaged with the sub-registry office of land.....all the works [at sub-registry office] are manual....takes huge time to do the registered mortgage"*. The communication process with the Credit Information Bureau (CIB) is manual and slow. It takes on an average two months to get approval from CIB. The Assistant Vice President of Credit Department of BA mentions, *"...if CIB [Credit Information Bureau] goes online, I think we can make 20% of progress of loan process automation...they [CIB] send us report two months later"*. Because of slow approval and services of external parties, banks (MBL, UCBL and JB) also process internal tasks slowly as they do not see any real benefits in working faster. However, others (BA and EBL) process the internal tasks faster and then negotiate to make the overall external process faster. And as soon as they get the external approval, they disburse the loan without any delay. Furthermore, some banks ignore the external process as it is slow and manual despite approval from sanctioning bodies being mandatory. As the Head of Branch Operations of DBL reports, *"although it is not legally permitted, we sometimes provide loans to…clients without obtaining clearance from CIB (Credit Information Bureau of central bank), as it takes a long time and customers get annoyed ....we get their undertaking stating that if something goes wrong with CIB reports, they (borrowers) should return the full loan amount instantly"*.

6.5.2.2 How Integration Affects Loan Processing Cost

It is revealed that lack of integration increases loan processing costs. Banks are ready to establish online interfaces with the external bodies. But banks do not have control over external processes and external processing tasks are carried out manually. Therefore, banks could not restrict the wages costs, paper and postage costs. The Head of Credit Risk Management of EBL mentions, *"....Our technologies are not integrated..... [Bank] We are working with a system and my regulatory [Central Bank] is working with another system...They cannot see our system from their end...We cannot see their system as well...we do not have any integration, say bank to bank integration, bank to CIB (Credit Information Bureau) integration, bank to police office*

integration, bank to tax agency integration....loan processing is the function of many parties' integration....but you [bank] are investing in a high price technology structure for doing only certain percentage of the total job".

This shows that lack of integration increases work volume and therefore, processing cost increases. For example, because of the lack of integration and coordination among various departments at the central bank, banks send the same reports to various departments at the same time. It is revealed that each bank mandatorily submits 400 reports to the central bank, and many of them are duplicate or triplicate. The entire communication task with the central bank is manual. The Manager of DBBL mentions that, *"...inter-departmental link up is absent in Bangladesh Bank...we provide same information to various departments of Bangladesh Bank [Central Bank]...they can provide us space in their web site and we can upload information as per their instruction...however, this is absent...We are doing duplication, triplication of job".*

6.5.3 How Integration Affects Coordination and Communication Performance of E2E Solutions

Analysis reveals that despite having technology in place, organisations could not improve the coordination and communication process with third party support services and sanctioning bodies. The evidence for how (lack of) integration impeded the ease of communication of E2E Solutions is shown in table 6.12.

Table 6. 12: Evidence for how Integration Impacted the Coordination and Communication Performance of E2E Solutions

Mechanism	Evidence from organisations (BA, BRAC, CBL, DBBL, DBL, EBL, MBL, UCBL and JB)
Lack of Integration hampers the ease of communication as bank has to do manual communication with external support services and sanctioning bodies.	It is observed that because of lack of integration the communication process with the external loan related parties (e.g. customers, support parties, regulatory bodies) is manual and paper-based in all banks. It is revealed that banks are ready to establish online interfacing with external parties including Credit Information Bureau (CIB), but external parties are not ready and interested to communicate online with banks. Furthermore, banks do not have much control over the external process.

Analysis reveals that banks' communication with external support parties and sanctioning bodies is manual. Although few banks have established online interfaces with third party support services, none of them could establish online contact with sanctioning bodies. This could be because sanctioning bodies are government institutions and a profit motive is absent. It is revealed that a few regulators implement software, but communication aspects are still

manual. For example, Bangladesh Bank (central bank) is one of the sanctioning bodies and has implemented software. But bank to central bank integration is absent. The person-in-charge of Data Centre of DBBL reports, *"...both [Bank and Central Bank] use software, we take data from the system and report it manually to central bank; Central Bank takes it manually and then input the data into their system...unnecessary job, window dressing of data possible"*. Besides Bangladesh Bank, there are other sanctioning bodies and all communication processes with external sanctioning bodies are done manually. The Head of IT of CBL reports, *"...in case of lending local regulators play a role...that means with whom you are linked up..say Bangladesh Bank is a party, Ministry of Finance is a party, National Board of Revenue is a party, and their information is very much necessary for loan proposal and approval, and all work processes are manual"*.

6.6 Customer Readiness

Customer readiness refers to the *'degree to which customers have the skills and desire to engage in electronic transactions'*. The study results reveal that in an E2E loan process, customers are very important as they initiate the process and banks then carry it out. How customer readiness is manifested is described below (section 6.6.1). The negative impact of customers' readiness on core process performance is described (section 6.6.2) as is the coordination and communication performance (section 6.6.3) of E2E Solutions.

6.6.1 How Customer Readiness is manifest

The analysis reveals that customer readiness is very important for deriving value from E2E Solutions, as customers initiate the E2E process. However, customers are not ready in organisations. The Head of SME at BRAC describes the importance of customers in an E2E loan process and the extent of customer readiness in the banking context of Bangladesh: *"...what are important in the loan process is customers; customers from their end start the process and provide us information, they will upload the data into the system, however, the client base are not very IT skilful, not educated and need support in filling an application"*. The aspects of customer readiness are shown in Table 6.13 as well as empirical evidence from organisations.

Table 6. 13: Empirical Evidence of Customer Readiness

Aspects	Evidence from organisations (BA, BRAC, CBL, DBBL, DBL, EBL, MBL, UCBL and JB)
Customers are not well educated.	It is revealed that customers of banks (BRAC, CBL, DBBL, DBL, MBL, UCBL and JB) are not well educated. It shows that banks' customers do not know how to maintain a business

Table 6. 13: Empirical Evidence of Customer Readiness	
Aspects	Evidence from organisations (BA, BRAC, CBL, DBBL, DBL, EBL, MBL, UCBL and JB)
	transaction history (BRAC, CBL, UCBL and JB); and need help to fill out loan application as they frequently commit mistakes (BRAC, CBL, DBBL, DBL, MBL, UCBL and JB). It also shows that most of the customers do not read and write English, the official business language in Bangladesh.
Customers do not have IT skills.	Analysis shows that most of the customers do not have required IT skills to communicate electronically with banks (BRAC, CBL, DBBL, DBL, MBL, UCBL and JB). Thus, technology is mostly used within the bank as bankers' efforts to connect with customers electronically are hampered because of lack of IT skills of customers. Alternative delivery channels are less popular and customers do not respond if they are contacted via mobile/ SMS.
Customers do not have access to IT.	Analysis reveals that most of the customers in banks (BRAC, CBL, DBBL, DBL, MBL, UCBL and JB) do not have access to various types of IT (e.g., Internet, computer, electricity). IT is mostly available in the city area, although 70% of total population lives in the rural area. It reports that about 60% of the households are outside of the electricity coverage and only 2-3% of the total population have Internet connection. Lack of capacity to subscribe to IT is also evident.
Customers prefer physical interactions.	It shows that customers (e.g. retail, SMEs, corporate) prefer to interact with staff in all banks physically rather than through any online means. It shows that EBL lost many customers after implementation of Single Point Processing, as customers prefer relationship-based lending. Banks (BA, DBBL and DBL) thus did not implement Single Point Processing for fear of losing customers. Alternative delivery channels (ATM, POS, Internet banking, phone banking, SMS banking) are less used in banking as customers come into branches for transactions. BRAC thus maintains 400 plus SME unit offices around country to serve clients, despite having kiosks, ATMs, Internet and phone banking.
Customers' fraud is common.	Analysis reveals that most of the customers in all banks except BA and EBL are not reliable and trustworthy. It reports that customers provide false statements, provide false and exaggerated facts and figures, and hide negative information. It reports that once customers take a loan, customers change their address, phone numbers and thus it is difficult for bankers to track customers.

Analysis reveals that most banking customers are not properly educated. It is observed that customers do not know how to fill in a loan application and they need help from bankers. Customers do not maintain records of transactions and do not know how to maintain data in a double entry accounting system. The Deputy Manager of CBL mentions, *"...rural people and SMEs are not bankable...they do not maintain any record and financial statement"*. Customers

often make mistakes in loan classifications and coding. Customers are of three types: retail, SME and corporate. It is revealed that corporate customers are a bit more advanced than retail and SME, but corporate customers are less in number. While the business language in Bangladesh is English, and the content of the website is in English, most customers can read and write neither English nor even the official language of the country, i.e. Bengali. The instructions for using ATMs, SMS and Internet banking are in English as well. Furthermore, customers do not cooperate with banks. They do not inform banks if they change their contact addresses. The Head of Operations in EBL hopes that some day in the future customers will be as educated as customers in western countries and would come to the bank and say, *'Sir I have changed my address and phone number, please update your database'"*.

Analysis reveals that most customers do not have perquisite IT skills to adopt electronic banking services. The study results show that customers are not technology savvy and thus suffer from technophobia. Customers come to branches for money withdrawals and depositing despite having access to ATMs and cash deposit machines. The Senior Manager of Trade Services at CBL mentions, *"...IT nervousness works in both general people and educated people; people are fearful of IT...still they are not confident about IT.....we have lots of ATMs and still customers come to branch for bigger amount withdrawals"*. Customers do not know how to use email, or write SMS text, or how to browse websites, download application forms or use an online calculator. Banks have websites and uploaded forms but customers seldom visit them. It was observed that banks have adopted technology; customers seldom guided banks to adopt and implement technology. Customers are less IT skilful as IT education is a new phenomenon in Bangladesh. Therefore, most technology savvy people are young and not necessarily all of them have bank accounts. It is revealed that the government of Bangladesh introduced IT as a compulsory subject in school. But after two years, the government made IT an optional subject as skilled IT trainers were non-existent in rural schools. The Head of Credit Administration of UCBL mentions; *"In Bangladesh, people do not know how to fill in the web based application, how to upload the documents as computer literacy is a new phenomenon. Government has just introduced computer education in the school level; however, expertise teachers are not available in rural area to teach computers, and therefore, it becomes an optional subject. Therefore, it will take years to improve the computer literacy of our people"*.

Access to IT (e.g. computer, Internet, electricity) is also a problem for customers. This is due to the lack of availability and lack of financial capacity to buy and subscribe to IT. It is revealed that the Internet is absent in rural areas and only 2-3% of people subscribe. A total of 60% of households are outside of electricity coverage. Thus, customers cannot place their banking

demands over the Internet and electronic banking has not gained much popularity. Proactive education of customers from this part of bank management is also missing. The Vice President of Credit and Change Management of DBL mentions; *"...at first you [customers] need to have infrastructure in place....and then we can request, push the clients and take the initiatives and educate them"*. Analysis also reveals that IT is still very costly in Bangladesh. The cost of computers and Internet subscription fees are high and beyond the reach of most customers.

The study result shows that cultural barriers of customers prevail. The majority of customers prefer physical interaction with bankers. They lodge a loan application after talking to managers. Customers come to the bank branches and have tea and coffee there and talk about social and political issues with managers in line with managers' preference and influence on the approval process. Customers have a perception that 'relationships' work better in getting loans than 'merits' and this is the case. They want evidence of their transactions in the form of seals and signatures. Analysis shows that most customers and businesses lack transparency and therefore, customers do not want to disseminate information over the phone or email because of fears of information leakage. The Assistant Vice President of BA mentions: *"...business people are not transparent at all and are afraid of information dissemination through online. They might say offline, Sir, published information [Financial Statement] is not the true business information and this [showing another set of statement] is the real information....they would not tell this secret information over e-mail"*. In case of payment services, customers prefer to visit branches rather than withdraw from ATMs; however, there is an improving trend. Analysis reveals customers used to count notes after withdrawing from an ATM, but now customers are increasingly trusting of machines but not of human beings.

The study result shows that customer fraud is common in banking. This is because of the absence of fraud detection mechanisms, moral ethics and the rule of law. As proper infrastructure is absent, fraud detection is difficult and therefore, customers take chances with loans by committing fraud. It is possible for a single customer to open many bank accounts with a single bank in different names and addresses. Fraud also takes place in the absence of the rule of law as the judicial system is corrupt. The Senior Vice President of MBL mentions, *"....a strict legal enforcement is required so that customers can realise that for providing wrong/false information he or she has to face law suits...if clients provide us the true information, then our analysis and selection process would be right, manual work would be less"*. It is also revealed that customers lack sufficient moral and ethical practice. Customers often visit banks before taking a loan; however, they may not pay back the loan, or change address and phone number, and stop contact with the bank. The Head of Operations of EBL expresses his frustration: "*We*

face problems in dealing with humans...once they take loan they do not walk closer to the bank...this is not a problem abroad...this is a behavioural problem of our customers...abroad a thief also has a character, but our customers don't have any character". Customers provide false, fake documents and information. The Manager and Vice President of DBL reports: *"even though we have a money counting machine still we need to count money by hand as on, an average, 5 or 6 counterfeit notes come to us daily...this is a country context barrier…. technology cannot solve".* Analysis also reveals that 'joint' fraud also takes place in banks where customers commit fraud with the help of bankers. It is revealed that bankers help customers to prepare fake financial reports and get loans from banks. Bankers also help to issue false bank statements and help to get loans from other banks by showing bank solvency.

6.6.2 How Customer Readiness Affects Core Process Performance of E2E Solutions

This section presents the impact of the lack of customer readiness on core process performance of E2E Solutions. The study findings reveal that customer readiness impedes various aspects of core process performance: loan processing time, risk assessment and processing cost. Table 6.14 shows the empirical evidence of how core process performance of E2E Solutions is negatively impacted by the level of customer readiness.

Table 6. 14: Evidence for how Customer Readiness Impacted Core Process Performance of E2E Solutions

Mechanism	Evidence from organisations (BA, BRAC, CBL, DBBL, DBL, EBL, MBL, UCBL and JB)
Lack of Customer Readiness hampers faster processing as: (i) customers provide false data that requires further checks; and (ii) customers need help and cannot provide data as required by bank.	It is revealed that lack of customers' readiness hampers faster loan processing in all banks. It shows that data and information provided by customers need further verification as customers' fraud is common. Thus, loan processing cycle gets delayed. It is also evident that technology-based lending is not possible, as customers need help with loan application and documentation. Therefore, banks follow relationship-based lending. For example, BRAC maintains SME booths, zonal offices to serve clients by operating near to customers.
Lack of Customer Readiness hampers risk assessment as: (i) customers cannot provide data as required; and (ii) customers provide false and misleading data.	It shows that lack of customers' readiness hampers the use of technologies in risk assessment in all banks except BA and EBL. It is revealed that most of the banks' customers do not maintain the day-to-day transaction history of business. They do not prepare financial statements and thus technology-based assessment is not possible. It is revealed that customers provide misleading statements, data and information as well. Thus DSS, Credit Scoring, etc. cannot be applied for assessing customers' risk exposure. Risk assessment found

Table 6. 14: Evidence for how Customer Readiness Impacted Core Process Performance of E2E Solutions	
Mechanism	Evidence from organisations (BA, BRAC, CBL, DBBL, DBL, EBL, MBL, UCBL and JB)
	to be judgemental.
Lack Customer Readiness increases the processing cost as: (i) banks follow relationship-based lending as opposed to technology-based lending; and (ii) paper-based communication and manual payment services.	It observes that because of relationship-based lending, and less adoption and use of existing online services by customers, none of the banks could reduce the loan processing cost increases in all banks. It shows that as customers provide false information, banks have to deploy staff and third parties for information verification, and it increases the cost of operation. It is revealed that as customers need help, thus implementation of single point processing is difficult, and thus banks adopted relationship-based lending, and could not restrict the staff requirement after implementation of E2E Solutions. It also reveals that most of the banks have alternative delivery channels; Internet banking, phone banking, ATM, SMS banking; however, very small segments of customers use them; therefore, besides technology, bank has to maintain human set-up to serve clients and thus cost increases.

6.6.2.1 How Customer Readiness Affects Loan Processing Time

The analysis shows that lack of customer readiness causes delays in loan processing. A bank's ability to undertake faster loan processing depends upon the availability of authenticated information on customers. But the data and information provided by customers may not be reliable and trustworthy. Banks need to collect additional data and verify customer-provided data and thus faster loan processing is hampered. The real purpose of a loan and the purpose stipulated in the application may also differ, and therefore, rigorous information searches are required. The Senior Vice President of MBL reports, *"...the reason for which customers apply for a loan and the real purpose of the loan differs substantially, and therefore, we have to interview customers"*. Customers may also provide 'rosy' pictures in the balance sheet and income statement they prepare. That essentially increases bankers' work and delays the whole process. This is why the Manager of DBL mentions; *"...we also live in a society where we cannot provide loans based on information provided by clients only"*.

Loan processing cycles also get delayed as customers are not always capable of furnishing information as required by banks. Most customers are not skilled in preparing financial statements and do not maintain their business transaction history. Customers lack a corporate set-up, and thus bankers talk to customers, visit customers, ask for information, ask for additional documentation, and talk to suppliers, customers and neighbours to get the required

information. Banks thus cannot use technology effectively in loan approvals. This is why banks adopt 'relationship-based lending' as opposed to 'technology-based lending'. The Vice President of Credit and Change Management of DBL shares his observation on why banks could not derive value from technology by making the processing task faster: *"....counter party [customers] need to be sophisticated; they should also provide us information in an organized way; you will find lots of businesses they have set up their businesses with BDT. 5 billion, however, they do not have any corporate set-up; they cannot provide us information in a professional way and therefore, if environment does not grow, we would not get the end result of technology implementation".*

6.6.2.2 How Customer Readiness Affects Risk Assessment

A complete set of information is required in technology-based risk assessment. But it is hampered as one group of customers provides false and misleading data and another group does not maintain any records of their business transactions. Thus, risk assessment is manual and judgemental. Banks visit clients and deploy third parties for inspection and information collection. Analysis reveals that banks have Decision Support Systems (DSS) and Credit Scoring Systems but they could not use them. The Vice President of Credit and Change Management of DBL mentions; *"...customers prepare their documents in black and white and that do not fulfil our requirements to take approval/reject decision, therefore, we take decision based on our own judgment, not necessarily based on facts and figure".* For document checks, banks take the services of expert individuals or lawyers to check the authenticity of the documents by looking at their physical features; therefore, the chances of wrong assessment are high.

Risk assessment is hampered as customers do not maintain records of business transactions. Customers do not maintain data the way bankers ask. Most customers do not maintain any financial statements; some have not even heard of a balance sheet and income statement. Therefore, because of unstructured data, banks cannot use technology for risk assessment. The Head of SME of BRAC mentions; *"...truly speaking small business do not maintain any financials....just keep records in a register book; they don't understand balance sheet...after talking to them it seems to me that this is the first time they heard about balance sheet...if you want to do CRG (Credit Risk Grading), ratio analysis we need facts and figures".*

6.6.2.3 How Customer Readiness Affects Processing Cost

It is evident that E2E Solutions could not reduce processing costs, and rather increase costs in some instances as customers are not ready to adopt and use online services and communicate online. It is evident that banks could not reduce wages, paper and postage costs after deploying E2E Solutions because of the required maintenance of the physical set-up and work procedures.

Analysis reveals that the way the banks need information and data for loan processing cannot be provided by customers, therefore, banks are forced to follow relationship-based lending. Thus, banks could not restrict staff requirements for processing loans as well as manual work and both essentially increase the loan processing costs. Analysis also reveals that there are gaps between the data and information provided by clients and the reality. Therefore, banks deploy staff and third parties for checking and rechecking the data provided by customers. The cost thus increases. Furthermore, for reaching the breakeven point and to make profit from technology, a certain percentage of customers should adopt the technology. But existing customers are not ready to adopt technological services. Despite having ATMs, phone banking and Internet banking, customers prefer manual banking. In case of any investment such as technology investment, the cash outlay becomes negative at zero point. As more and more customers use the technology, the more the bank will be able to recover the cost. Because of lack of customer readiness, banks are not able to reach the breakeven point from their technology investment. Therefore, the Senior Vice President of MBL mentions that as customers do not want to share the cost of technological services, banks who have offered technological services have a 'big heart'. Besides, customers are very cost conscious and do not want to accept soft copies of statements and vouchers as they do not want to incur paper and printing costs.

6.6.3 How Customer Readiness Affects Coordination and Communication Performance of E2E Solutions

This section presents the study findings on how the lack of customer readiness impeded the coordination and communication process performance of E2E Solutions. It shows that lack of customer readiness hampers communication and controlling processes. The evidence from organisations of how customer readiness impedes the coordination and communication performance of E2E Solutions is presented in Table 6.15.

Table 6. 15: Evidence for how Customer Readiness Impacted the Coordination and Communication Performance of E2E Solutions	
Mechanism	Evidence from organisations (BA, BRAC, CBL, DBBL, DBL, EBL, MBL, UCBL and JB)
Lack of Customer Readiness hampers ease of communication as: (i) customers prefer physical interaction, proof and evidence; (ii) customers do not have means to communicate online; and (iii) automated communication not possible as customers' fraud is common.	It reports that lack of customer readiness hampers the ease of communication in all banks except BA and EBL. It reports that customers prefer physical interaction with banks, despite having alternative banking channels. Customers also lack IT skills, and access to IT to press banking demand over Internet. It reports that SME customers are mostly illiterate, and thus prefer relationship-based lending. Customers also need help and thus prefer physical interaction with bankers. It is revealed that cost of IT is also a reason for less access to IT. It is revealed that bankers also prefer physical meetings with customers to detect the customers' fraud by asking many cross verification questions.
Lack of Customer Readiness hampers ease of controlling as: (i) customers prefer branch-based banking; and (ii) customers are not ready to forward information as needed.	It reports that banks (BA, DBBL and DBL) could not implement centralised controlling because of lack of customer readiness. It is revealed that in case of centralised controlling, customers' data need to be in structured format to process loan from a distant place. But customers' data is very unstructured and that can't be detachable from the person who maintains physical contact with customers. Thus, centralised controlling is not possible, loan needs to be localised. Furthermore, customers also threatened banks to switchover to other non-centralised banks if they implement centralised controlling.

6.6.3.1 How Customer Readiness Affects Ease of Communication

Analysis reveals that online communication is hampered as customers do not have the means (education, skills and access) to communicate and place their banking needs over the Internet. Thus, Internet banking did not gain popularity. It is revealed that Internet penetration in Bangladesh is very low because of high subscription fees, computer costs and lack of skills. It is revealed that 60% of total households in Bangladesh are outside electricity coverage, and 40% have electricity supply but suffer from severe load shedding. This is why after having lots of functionalities in the software; banks could not offer them to customers. For example, interactive websites are absent from banks.

Analysis reveals that customers prefer physical interaction with bankers as they lack trust in IT-based systems coupled with fear of technology. Customers prefer to collect money from tellers, rather than ATM withdrawals. They are also hesitant to accept computer-generated copies as they want seals and signatures. The Head of IT of DBL reports, *"while providing system*

generated documents to the clients...we write [this is] a system generated copy that does not require a signature'. However, clients come to us for a seal and signature as they don't trust the system generated copy". Analysis reveals that customers also do not want to disseminate information over the Internet or phone for fear of possible leakage of information. This is why customers seldom comply with the SMS intimation and instructions. They rarely visit websites and download loan forms. Customers feel dishonoured if asked to pay loan instalments by receiving computer-generated letters or SMS instructions. The Manager of Branch Operations DBL mentions, *"....say car loan usually never gets defaulted....but last month five people did not pay their monthly instalments. Today, I called them and talked to them and just few minutes before three of them repay their instalments. They said 'Ohh....Ohhh...I forget to pay...I was waiting for your reminder'...clients expect us to call and request; clients do not even read and reply to our SMS intimation....they want us to nod our head to them and address them 'Sir', as if we run the bank with their money".*

Because of fraudulent activities of customers, online communication processes get hampered. Bankers thus prefer manual communication and personal contact to verify the information provided by clients. It is revealed that customers do not share information voluntarily. Thus bankers interrogate customers to get the real information. Customers do not disclose the demerits of the property to be used as mortgage. The Head of Credit Risk Management of MBL mentions, *"Still we don't believe that without signature a customer can provide true information".* Analysis reveals that once customers get loans, it is very difficult to get the funds back. There is even no remedy if customers take out loans by providing false/exaggerated information. Therefore, bankers work very conservatively and prefer physical communication to keep customers always tracked. Bankers prefer to have physical contact and maintain a social relationship to get the loan repaid by creating social pressure, as legal procedures to get repayment are complicated. Therefore, online communication is hampered.

6.6.3.2 How Customer Readiness Affects Ease of Controlling

It is revealed that banks could not implement centralised controlling because of the possible negative reaction of customers. It is revealed that some banks (CBL and EBL) have lost their customers after implementation of centralised controlling as customers switched over to other banks. It is revealed that a centralised controlling system stops any kind of undue transaction. The Vice President of Credit and Change Management of DBL mentions, *"...now we moving to centralized operations and only few banks are practicing this...if we could do this clients would not get any undue favour from managers, therefore, they [customers] threatened us not to*

implement centralized operations and saying that they would switch over to some other banks.....here Bangladesh Bank's role in important.....if they [Bangladesh Bank] instruct all banks to implement centralised operations then no clients would threaten us to switchover". It is also revealed that bank customers are not ready for centralised operations. Customers do not maintain records of transactions and misguide banks often. This is why loan processing and controlling are localised and relationship-based.

6.7 Information Infrastructure

Information infrastructure refers to the *'availability and adequacy of information resources'*. The study result reveals that availability and adequacy of information on customers is very much necessary for loan approval as a loan is approved based on information. However, existing information infrastructure of the country is not reliable and it impedes performance of E2E Solutions. This section starts with describing how the information infrastructure is manifested (section 6.7.1). It then discusses the impact of information infrastructure on core processes (section 6.7.2), coordination and communication (section 6.7.3), and process performance of E2E Solutions.

6.7.1 How Information Infrastructure is manifest

The aspects of information infrastructure are shown in table 6.16 as well as the empirical evidence for these aspects.

Table 6. 16: Empirical Evidence of Information Infrastructure

Aspects	Evidence from organisations (BA, BRAC, CBL, DBBL, DBL, EBL, MBL, UCBL and JB)
Reliable sources of information on customers (e.g. database) are absent.	It is revealed that reliable sources of information on customers are unavailable to any of the banks. A database on customers is important in loan approval decision making. However, a country level database is absent in Bangladesh. Thus, banks have developed their own database. But their database is of limited coverage as it covers only the existing customers' related information, and does not include other banks' customers, and new customers' data.
It is difficult to verify the identity of customers.	Analysis reveals that it is very difficult for all banks to uniquely identify individual or business customers. This is because of absence of identification number such as nationality card, social security card and unique business code. Analysis reveals that government has provided voter card for 1/3 of total voters. However, it is of no use in banking as not all the people have this card. Furthermore, as banks do not have computerised database of the voter cards, some customers prepare false voter ID cards and submit with loan application.
There is little	It is revealed that for loan approval, it is important to know the applicant's

Table 6. 16: Empirical Evidence of Information Infrastructure	
Aspects	Evidence from organisations (BA, BRAC, CBL, DBBL, DBL, EBL, MBL, UCBL and JB)
information sharing among banks.	credit related information with other banks. But information sharing among banks is absent. Therefore, banks write letters to other banks to find out clients' existing asset and liability position with those banks; some banks respond and some do not. Bankers make phone calls and request to share information. But, access to relevant information is hampered as information sharing gateway is absent.
Accounting and auditing standards are not trustworthy.	It shows that financial statements provided by customers to all banks are less reliable because of substandard auditing and accounting in Bangladesh. It shows that corporate governance is absent in Bangladesh. Businesses prepare different sets of financial statements for different purposes. Businesses prepare one set of statements for bank purpose, another set of statements for tax authority purpose and another set for their own purpose and all are prepared by certified public accountant and audited by competent authority.
There is no external credit rating agency.	It shows that as credit rating agency is absent in Bangladesh, all the banks have to process the entire loan related task on their own. As credit rating services are absent, banks need to do the entire credit assessment-related task. Bankers search for information, collect and verify documents, then rate their customers. The comfort provided by a credit rating agency to banks is missing in Bangladesh.

Bankers need customers' personal and business history (e.g., social history, job history, credit history, creditability and rating) for loan approval. But external databases on customers do not exist. Furthermore, databases on industries: total demand and supply, trade and market size are also absent. It is revealed that establishing a database is a macro-initiative, and the government should come forward to do so. But initiative is absent. It seems that politicians/businessmen are not interested in establishing any database in Bangladesh. If there were databases, then accurate and authenticated information would be available to banks and loan default information would be reflected. Therefore, businessmen resist the implementation of any database. The Senior Vice President of MBL explains why businessmen do not want to establish databases: *"...politicians are businessmen and if there is no database they can hide the defaulting information quite easily. Due to absence of national database one customer is showing one net worth to me and different net worth to other bank. This would not be possible if there is a central database as same information will be reported everywhere, no scope for false representation".*

It is very difficult to verify the identity of customers and businesses in Bangladesh. Unless customers are effectively tracked, manual tasks are necessary and technology-based lending is not possible. It is revealed that having a unique ID helps banks to locate and identify a person

and business easily and effectively and it reduces the chances of committing customer fraud. It also helps banks to get the information on clients in a very structured and organised way. The Head of Business Systems Management of BRAC describes; *"...we cannot uniquely identify a borrower...same Mamun Siraji will go to some other bank and add MD before the name and will become MD Mamun Siraji and prepare a fake passport apply for loan and take BDT. 50 lacs from the bank, bank would think that passport is reliable; however, this is not so. A passport should have highest acceptability but we can't cross check as we do not have database on passport....even you can get true passport in different name from Immigration Authority of Bangladesh....just changing few spelling of your name...Immigration Authority cannot even track it as they [Immigration Authority of Bangladesh] don't have any database as well".* It is revealed that the government has recently introduced voter cards, but only a fraction of eligible voters have got voter ID cards (30 million out of 160 million population). But due to lack of political initiative, banks could not make the voter ID card mandatory for loan applications. The database on existing voter cards is not available to banks. Thus bankers cannot identify true voters and customers could prepare fake voter cards and submit them with a loan application. The Senior Manager of Applications Support of BRAC bank mentions, *"....initially we made the national ID card a must for loan application and then realize that people prepare fake ID card from Nilkhet [place for photocopy and Photostat] by paying only TK. 30 and we gave up"* .

In a loan approval process, bankers need information on applicants' asset liability position with other banks. But the information sharing gateway among banks is absent, thus, banks collect information manually from other banks, or rely on customers' declarations. Banks write letters and make phone calls to other banks to get information. But either because of rivalry or privacy or lack of database or reluctance, banks do not share their customers' data information with other banks. The Head of Business Systems Management of BRAC mentions; *"...there is no combined efforts among the banks.....we do not talk to each other; we don't share information among ourselves....combined effort is needed as all work like 'silo' we do lots of things which we can share with others and others can share with us....combined effort could be in the field of IT, say developing our own product or could be establishing a 'data bank' to share among us".* Although, the central bank's role is important for establishing linkages among banks, they cannot take this initiative as not all banks have online platforms and centralised databases.

Once accounting and auditing standards are trustworthy, then customer/business-provided financial statements would be reliable and reflect the true business scenario. But, accounting and auditing standards in Bangladesh are not trustworthy. The Senior Vice President of MBL mentions, *"....our accounting standard is very poor, accounting firm does not have any*

minimum professional ethics, otherwise they would not prepare 'order made' statement". One of the causes of lack of professionalism among auditors and accountants is due to the absence of 'rule of law' in the country as there are few instances of fine imposition or cancellation of professional membership for their professional misconduct. The Head of Credit of EBL mentions; *"I have not heard of any certified public accountant firm in Bangladesh being sued or penalized for malpractice".* It is revealed that as accountants and auditors lack professional ethics, businesses prepare multiple sets of financial statements in a given financial year. Analysis shows that businesses prepare inflated balance sheets and income statements for bank loan purposes, and show losses or less profit for tax purposes, and prepare another set of statements for investors. The Head of Operations of EBL thus mentions; *"Some businesses maintain three sets of financial statements - one for tax authority purpose, one for bank purpose, one for their own needs.....in such a situation how can you make decision solely based on analysis of such reports"?*

Credit rating services are very important for quick and accurate loan processing. However, credit rating services are absent in Bangladesh. It is revealed that banks need varieties of information on customers, such as information on business potentiality, the management structure, the strengths and weaknesses. As credit rating companies are absent in Bangladesh, banks cannot collect information on customers promptly and accurately. But in the case of foreign customers, banks need not visit customers physically as information can be obtained from international credit rating agencies (such as D&B Credit Rating Service). However, for local customers, banks need to collect information by paying a physical visit. The Deputy Manager of DBBL mentions; *"...abroad all the credit related data is commercially available in the market...for loan analysis data comes automatically from private sectors, government sectors. Furthermore, you can also purchase data. Whereas, in Bangladesh, still we are not sure for apprising a loan what are the document and related information we need to consider, nor even if we have any third party who would provide us information and rating on companies".* In the absence of credit rating services, banks deploy individual third party agencies to collect data for banks and for Contract Point Verification (CPV). But services from individual agencies are very poor due to the lack of professionalism. They misguide banks by providing wrong information in exchange for bribes from customers.

6.7.2 How Information Infrastructure Affects Core Process Performance of E2E Solutions

The study analysis shows that lack of information infrastructure creates barriers to organisations improving core process aspects. It is revealed that lack of information infrastructure impeded faster loan processing, accurate risk assessment and processing cost reduction. The evidence for how core process performance aspects are negatively impacted by information infrastructure is shown in table 6.17.

Table 6. 17: Evidence for how Information Infrastructure Impacted the Core Process Performance of E2E Solutions

Mechanism	Evidence from organisations (BA, BRAC, CBL, DBBL, DBL, EBL, MBL, UCBL and JB)
Unreliable Information Infrastructure hinders faster processing as it forces banks to: (i) collect data manually; (ii) ensure the true identity of the applicant; and (iii) verify the information and documents provided with application.	It is revealed that unreliable information infrastructure hampers faster loan processing in all banks. First, unreliable information infrastructure forces banks to collect data manually on clients. Banks maintain physical relationship for gathering information and that essentially hampers faster loan processing. Second, in the absence of unique identification number, database and information sharing gateway, banks deployed staff and third party agencies to collect information and verify the information provided by clients. This manual and extra task delays the loan approval cycle. Third, unreliable auditing and accounting standards force banks to collect additional data on clients from other sources to corroborate data provided by customers. This double work makes the processing lengthy. Fourth, as credit rating services are absent, banks do their own rating on clients and collect data and that essentially takes time and delays the loan processing cycle.
Unreliable Information Infrastructure hinders risk assessment as: (i) database on customers is not authentic; (ii) ascertaining the true identity of customers is difficult; (iii) financial statements are less trustworthy; and (iv) no external agencies exist to verify the data and rating services.	Analysis reveals that unreliable information infrastructure hinders all banks in using technology for risk assessment. It is revealed that risk assessment in banks is judgemental because of absence of database and information on customers. Absence of unique identification number also creates barriers for tracking customers easily and effectively. Thus, scope remains for customers' fraud. Analysis reveals that despite having DSS, credit scoring and Excel-based tools for risk assessment; banks could not use them as financial statements do not reflect the true business scenario of customers. It also reveals that the risk assessment task would have been accurate if banks could get authentic information on customers from credit rating agencies; however, credit rating services are absent in Bangladesh.
Unreliable Information	It is revealed that unreliable information infrastructure increases loan processing cost in all banks.

Table 6. 17: Evidence for how Information Infrastructure Impacted the Core Process Performance of E2E Solutions	
Mechanism	Evidence from organisations (BA, BRAC, CBL, DBBL, DBL, EBL, MBL, UCBL and JB)
Infrastructure increases the processing cost as banks; (i) maintain physical contact with clients; (ii) collect and verify data manually; and (iii) deploy third party agencies and pay fee for collecting information on customers.	It shows that unreliable information infrastructure forces banks to follow relationship-based lending and cost thus increases. It is revealed that in the absence of database and unique identification numbers, banks collect data manually and this incurs additional cost for banks. Furthermore, as the data and information provided by clients are unreliable, banks deploy third party agencies to collect and verify information provided by clients and that incurs cost. It is revealed that financial statement based-lending (e.g., technology-based lending) is not possible as trustworthy auditing and accounting standards are absent. Thus, processing cost increases.

6.7.2.1 How Information Infrastructure Affects Loan Processing Time

Analysis reveals that the lack of information infrastructure hampers faster loan processing. This is because either the information required for loan approval is not available or it is available but not reliable. Thus, bankers need to do further searches for data and that essentially delays the processing time. Besides additional data gathering, the data provided by clients has to be verified and true identification of customers has to be ascertained. But absence of a database and unique identification numbers creates barriers to ascertaining the identity of customers and thus delays approval cycles. This is why the Head of Credit Risk Management of EBL mentions, *"you do not get the full benefits of automation unless and until there is third party database to verify the data provided by the clients"*. This reveals that developed countries' banks are in better positions to approve loans with certainty because of the availability of social security numbers and databases. This is not possible in Bangladesh in the absence of a proper information infrastructure. Financial statements provided by clients are not trustworthy. Thus, technology is of no use for faster data processing and approval. The Manager of DBBL mentions; *"...say in abroad there is a SSN (Social Security Number); therefore, identifying someone is not difficult; however, in Bangladesh this is very difficult. Therefore, branch staff need to very alert and concerned about the identity of a person, continuous visit and third party visit is required and for loan processing this is kind of barriers as this essentially delays the loan processing cycle"*.

It is also revealed that the absence of credit rating services hampers faster loan approval. It was observed that in the case of foreign trade, banks could easily provide faster approval decisions by taking the credit services from international credit rating agencies. But this is not possible in

the case of local loans as credit rating services for local clients are absent in Bangladesh. Hence, bank staff collect and analyse data and process it. All these tasks are manual and time-consuming, and that essentially hampers faster processing. Banks also deploy third party agencies to collect data, but third party services are not reliable. Furthermore, bank to bank data sharing is absent. This also delays the processing time. No effective initiative from government is visible to establish an information infrastructure. Banks also do not get help from government. For example, the net worth position shown on a loan application could be verified from the National Board of Revenue (NBR) as customers and businesses submit tax files. But NBR does not want to share data with banks despite several calls made by the Association of Banks in Bangladesh. If NBR were to, then banks could easily verify customers' data provided with loan applications.

6.7.2.2 How Information Infrastructure Affects Risk Assessment

It is revealed that banks could not use Decision Support Systems (DSS), credit scoring and Excel tools for risk assessment because of the absence of a reliable information infrastructure. It is revealed that as a database is absent; financial statements are unreliable, information sharing is absent thus banks could not use technology for risk assessment. The Head of Business Systems Management of BRAC mentions; *"...trust me, in Bangladesh, in pre-disbursement loan processing, the electronic loan system would not work....we have all the system in place....say calculation of ratio; fund flow statement, Credit Scoring...loan officer just do it for shaking of doing it.....They (loan officer) also know this is just supporting, ...most of work they do manually, they visit the company, collect information, talking to the clients and while doing those entire manual jobs, judgment automatically builds".*

It is revealed that financial statements are the main sources of data for risk assessment. Banks get automated credit score, ratio and analytical reports from the system once data from financial statements is plugged in. But bankers have less trust in financial statements as customers prepare manipulated financial statements for loan purposes. Businesses prepare different sets of financial statements for different purposes. Bankers thus apply their own judgement and use their long banking experience to assess the riskiness of a project by involving senior bankers in the risk assessment process. The Head of Credit Administration of UCBL explains, *"....loan proposal can't capture all the information as there is no existing database, therefore, we formed a five member credit committee and we sit together, we have threat broad discussion on the good aspects of loan, on the bad aspects of loan, on the financial aspects, liquidity aspect and industry prospects and then we apply our long banking experience in taking approve/reject*

decisions". The absence of credit rating agencies also hampers proper risk assessment. It is revealed that the risk assessment in foreign trade is easer as services from international credit rating agencies are available. But banks could not do that for local customers as credit rating services are absent for local customers.

6.7.2.3 How Information Infrastructure Affects Processing Cost

Analysis reveals that unreliable information infrastructure increases loan processing costs. It is revealed that technology-based lending is not possible in banks as adequate and reliable information resources are absent and financial statements are not trustworthy. Thus, banks could not reduce the wages, printing and postage cost after deploying E2E Solutions. Banks are forced to maintain relationship-based lending and could not restrict the staff needed in loan processing. Banks maintain offices near their clients to get authentic data and information, and therefore, operational costs increase. For example, BRAC has 400 plus SME centres. Bankers often visit clients to keep track of them. The Deputy Manager of DBL mentions,*"....as we have some information gap, therefore, by rotation either me or my manager visits client in every alternative month....by looking at their activities, in 75% of cases we can understand the client's business condition"*.

Analysis reveals that unreliable information infrastructure forces banks to engage in manual tasks by involving many staff. Therefore processing cost increases. For example, in the absence of authenticated and adequate information on customers, loans are approved in a committee by involving many staff at various levels. Thus, technologies (e.g. workflow) are of less use. Banks take services from accountants and lawyers to verify the reliability and authenticity of statements and documents provided by clients. Thus processing cost increases. Furthermore, customer tracking, especially in the case of consumer finance, is very difficult. Therefore banks deploy third parties and their own staff for Contract Point Verification (CPV), just for checking customers' name, address, phone number, job, etc. This is an additional task as customers often commit fraud and there is no database of customers with which to compare. The Vice President of Credit and Change Management of DBL therefore mentions, *"...if we could have the Social Security Number or unique identification number or a database from which we could verify the customer's provided data, then we could do many works by sitting in our office; we may not need to do CPV (Contract Point Verification)"*.

6.7.3 How Information Infrastructure Affects Coordination and Communication Performance of E2E Solutions

The purpose of this section is to describe how the information infrastructure impedes coordination and communication performance of E2E Solutions. It is revealed that unreliable information infrastructure hampers ease of communication. The empirical evidence of how information infrastructure impedes the ease of communication is shown in table 6.18.

Table 6. 18: Evidence for how Information Infrastructure Impacted the Coordination and Communication Performance of E2E Solutions

Mechanism	Evidence from organisations (BA, BRAC, CBL, DBBL, DBL, EBL, MBL, UCBL and JB)
Unreliable Information Infrastructure hinders ease of communication as; (i) web-based communication is difficult, and (ii) electronic verification of customer-provided data is not possible.	Analysis reveals that unreliable information infrastructure hampers ease of communication in all banks except BA and ECBL. It is revealed that absence of database and unique identification number hampers web-based communication with customers. It also reveals that unreliable information infrastructure forces banks to maintain physical communication to verify the authenticity of data by asking cross check questions and proof of documents. It shows that online communication with customers is risky as customers cannot be easily tracked and located.

It is revealed that for online communication with customers, it is important to know the identity of customers. However, as databases and unique identification numbers are absent, banks hesitate about online communication and prefer manual communication. This shows that offline meetings provide more confidence to bankers than online communication. As offline meetings provide scope to see customers, ask for supporting documents and ask many cross verifying questions. For example, for ascertaining the sales figures of a business, bankers used to ask about daily sales, weekly sales, monthly sales and yearly sales data at different points of time in the meeting. Bankers used to ask for many documents, and check the spelling of names in different documents, which is not possible in electronic communication. The Head of Business System Management of BRAC mentions, *"...if we [bank] can identify, Yes, this is Mr. X and this is Mr. X's identification number, and address, and then we can implement web based system".*

It is also revealed that web-based systems are of less value, as supporting tasks cannot be done electronically. Information collection and verification and document verification are not possible electronically. Therefore, banks did not implement web-based systems although they

have the provision. The Head of Applications Support of EBL mentions; *"After having the functionalities of Web based loan application system; we did not offer this provision to clients as documentation, tracking, verification, acceptance of fee, nothing is possible online".*

6.8 IT Infrastructure

IT infrastructure means the *'adequacy of physical IT infrastructure and services'*. Analysis reveals that because of the 'embedded' nature of E2E Solutions, value derivation depends upon IT infrastructure of the country. It is revealed that the present IT infrastructure in Bangladesh is unreliable and this impedes the value realisation from E2E Solutions. This section starts with documenting how the IT infrastructure is manifested (section 6.8.1). The impact of IT infrastructure on core processes (section 6.8.2) and coordination and communication processes (section 6.8.3) in the performance of E2E Solutions are also described and documented.

6.8.1 How IT Infrastructure is manifest

IT infrastructure is manifest in this study by electricity, Internet and communication links. The study findings reveal that IT infrastructure in Bangladesh is unreliable and costly and that creates barriers to derive value from E2E Solutions. The Head of Application Support of EBL explains the present IT infrastructure scenario of Bangladesh; *".....Infrastructure are not in very good shape in Bangladesh....all electricity, link, telephone, Internet, TV cable lines connected by overhead poles and all are within the reach of thieves'.....and you cannot locate which one is what once one gets disconnected".* The aspects of IT infrastructure and empirical evidence are shown in table 6.19.

Electricity is very much necessary for proper use of E2E Solutions. Uninterrupted electricity supply is required in an automated E2E process as branches and head office level staff work on a particular loan proposal at the same time by using a single database. Thus electricity supply is required in all geographically located offices all the time. Electricity supply is also required in all the customers' touch points. However, banks suffer from poor electricity supply in Bangladesh. Analysis shows that although bank branches are located all over the country, 60% of households are outside of electricity coverage. It is revealed that electricity is absent in some areas where bank branches are located. Voltage ups and downs are also common, hampering the use of technology. It is revealed that 5-6 hours of electricity load shedding is also common in the rural areas. While electricity supply is better in the city area, still 2/3 hours of electricity load shedding occurs during office hours. Thus, online banking services are severely affected.

The Head of SME of BRAC mentions; *"Infrastructure is a big issue..... Full one day electricity blackout is common in some parts of Bangladesh, this is the number one problem"*.

Table 6. 19: Empirical Evidence of IT Infrastructure

Aspects	Evidence from organisations (BA, BRAC, CBL, DBBL, DBL, EBL, MBL, UCBL and JB)
Electricity supply is unreliable.	It is revealed that all banks struggle to use E2E Solutions because of unreliable electricity supply. It is revealed that existing electricity supply in the country meets only 50% of total demand; therefore, frequent load shedding occurs. Furthermore, electricity is fully absent in some areas where bank (JB) branches are located. Furthermore, voltage ups and downs are frequent, thus hampering proper use of technology.
Internet infrastructure is unreliable.	Analysis reveals that Internet infrastructure in Bangladesh is unreliable and it hampers electronic banking operations in all banks. Furthermore, Internet is absent in some areas and thus not all banks' (JB) branches are connected with Internet. It is revealed that Internet speed is very slow and file attachment and download take huge amount of time. Furthermore, as Internet wire goes overhead; the line is often disconnected due to theft and wind.
Communication link is unreliable.	Analysis shows that all banks are dissatisfied with the existing communication infrastructure as it hampers banks' online offerings. Banks (BA, DBBL, DBL, EBL and UCBL) are having 2/3 redundant links as existing infrastructure is highly unreliable. Communication link is also absent in some areas, and very expensive. Communication link also suffers from; (i) slow speed; (ii) frequent disruption; and (iii) poor after sales service.

Proper Internet infrastructure is required for E2E Solutions' implementation and use. The Internet is required for hosting the website, connecting the branches, and communicating with customers and other parties of an E2E loan process. However, the present Internet services are unreliable and suffer from many problems. First, Internet is absent in some rural areas. Second, Internet gets disconnected as secured networking is absent. Third, it is revealed that Internet speed is very slow and a simple document download and upload takes a huge amount of time. Therefore, much functionality of E2E Solutions remains unexplored. It shows that fibre optic broadband is comparatively speedier than EDGE services; however, it gets disconnected frequently. The Software Developer of BA mentions, *"...if you compare with the western system...our internet infrastructure is very poor...bandwidth is very poor...our download capacity is very poor...say we get only 32 MB.....people coming here from outside get frustrated after using Internet facility in Bangladesh"*.

Besides electricity and the Internet, communication networking links are also important for E2E Solutions' implementation and use. Networking is required among geographically located offices and workstations for data and process integration. But communication networking is found to be very much more fragile in Bangladesh. Therefore, the biggest challenge for banks is to remain connected with branches, kiosks, ATM booths and all other delivery points. It is revealed that the entire optic fibre link goes overhead with T&T phone and dish line, therefore, service interruption is frequent. The Head of IT Security of EBL expresses his frustration; *"connectivity is an issue.... although within the city connectivity is not a problem. However, all are overhead wires and the line gets disconnected due to strong wind, or theft. We [therefore] need to maintain two or three redundant lines"*. Because of link problems, branches get disconnected from head office, data centres and ATM booths, and then the whole banking operations are interrupted. This is why: banks maintain two/three redundant links for uninterrupted services. But it is not surprising that all communication networking links disconnect at times. As a secured line for communication link is absent in Bangladesh, links are always exposed to external risks. Bangladesh is a tropical country and lots of natural calamities take place including flooding, cyclones, etc. and this also causes link disconnection. The Head of IT Security of EBL reports, "....*we maintain three/four links however, sometime all get disconnected"*. Theft of the communication wire is also another threat. Therefore, the Head of Application Support of EBL advises, *"Connectivity line goes overhead within our reach but it should go either too high or through underground to the reach of thieves"*.

Speed, cost and after sales service of communication vendors are also worrying for banks. Slow speed of the communication link also disrupted online banking operations. The bandwidth required for proper functioning of software is absent in rural areas. Furthermore, a communication link is also absent in some rural areas. Thus, banks could not bring all the rural branches under common networking. Absence of communication networking also restricts banks from opening branches as per their choice as communication infrastructure is poor in rural areas. The Head of Business Systems Management BRAC mentions; *"....we cannot open branches in all of rural areas.....quality of link and redundancy are secondary to us as ensuring the link is our main concern.....Bangladesh is a little place, a small country, however, network is absent in some areas and this is very frustrating"*. Analysis reveals that speed of communication link is better in Dhaka City (capital city) but worse in other parts of the country. Therefore, banks (DBBL, DBL) have both a data centre and disaster recovery centre within a city (e.g., Dhaka), although the central bank's guidelines say that data centres and disaster recovery centres should be located in two different earthquake/risk zones. But as high speed Internet

required to copy data from the data centre to the disaster recovery centre is absent outside of Dhaka, both data centres and disaster recovery centres are located within Dhaka city. Analysis shows that rent of the communication link is another concern for all banks, although in the last four/five years costs have gone down. This is because optic fibre is unavailable in the rural area and V-Sat is the only option for bringing all the rural branches under networking. However, V-Sat has some problems and it requires more bandwidth, and does not support all features of software. It is revealed that banks are not happy with the services of the communication vendors as some do monopolistic business and after sales service is very slow. Although vendors promise high levels of uptime, they could not maintain their promises. For detection and rectification of communication lines, it takes up to 4/5 hours and online banking operations are hampered during this time.

6.8.2 How IT Infrastructure Affects Core Process Performance of E2E Solutions

Analysis shows that existing IT infrastructure is unreliable and this essentially forces banks to maintain alternative arrangements that increase loan processing costs. Table 6.20 shows the empirical evidence from organisations of how IT infrastructure increases loan processing costs.

Table 6. 20: Evidence for how IT Infrastructure Impacted the Core Process Performance of E2E Solutions

Mechanism	Evidence from organisations (BA, BRAC, CBL, DBBL, DBL, EBL, MBL, UCBL and JB)
Unreliable IT Infrastructure increases the loan processing cost as banks: (i) maintain alternative sources of electricity; (ii) maintain redundant communication links for 24x7 services; and (iii) pay higher rent for IT.	Analysis reveals that unreliable IT infrastructure increases loan processing cost in all banks. It is revealed that banks maintain three alternative sources of electricity; IPS, generators and government-supplied electricity, thus cost of operations increase. For example, DBBL maintains 2x110KV generators for electricity supply in the data centre. Banks have 3/4 redundant communication links for 24x7 services and that increases the cost of operation. Analysis reveals that banks are directed to open branches in rural areas but IT in rural areas is very expensive. National Internet Exchange is absent in Bangladesh, therefore, local Internet comes through Singapore, Malaysia or some other countries; therefore, incurs costly international bandwidth for sending local emails.

Analysis shows that unreliable IT infrastructure increases the cost of loan operations. This is because of maintenance of alternative sources of electricity. It is revealed that as 5/6 hours of

load shedding is a regular phenomenon in Bangladesh therefore, for uninterrupted services, banks maintain 2/3 layers of electricity supply and cost increases. As a Deputy CIO of BA expresses his anxiety; *"we are facing huge electricity problem, we have three redundant lines for electricity to provide uninterrupted online services to clients. We have PDB (Power Development Board of Bangladesh) supplied line; we have generators for this building; furthermore, for our office we also maintain additional generators for power supply, and that ultimately increases cost"*.

Loan processing cost also increases because of the unreliable communication link. It is revealed that banks have 3/4 redundant links as lines often disconnect, and lines are frequently down. For example, EBL has four redundant links: DDN, satellite, T&T line and optic fibre and each has separate costing. Furthermore, the use of foreign software is more costly as it requires more bandwidth. The Deputy CIO of BA mentions; *"...another problem of foreign software is it requires high bandwidth.....but say we are had only 64 KBPS...but in case of foreign software you need minimum 256 KBPS..You cannot run even in 128 KBPS... 512 KBPS is better...this is costly"*. Furthermore, the rent of the communication link is 5-10 times more costly in rural branches than urban branches. It is revealed that banks have to mandatorily open branches in rural areas, but IT is very costly in rural areas. It is revealed that satellite is the only option to connect rural branches, but satellite is hugely costly.

6.8.3 How IT Infrastructure Affects Coordination and Communication Performance of E2E Solutions

Analysis reveals that unreliable IT infrastructure affects various aspects of coordination and communication performance of E2E Solutions. This section documents the study findings of how unreliable IT infrastructure impeded the ease of communication, ease of coordination, ease of document sharing, ease of controlling and ease of monitoring. The evidence for how various aspects of the coordination and communication process are impeded by IT infrastructure is shown in table 6.21.

Table 6. 21: Evidence for how IT Infrastructure Impacted the Coordination and Communication Performance of E2E Solutions

Mechanism	Evidence from organisations (BA, BRAC, CBL, DBBL, DBL, EBL, MBL, UCBL and JB)
Unreliable IT Infrastructure hampers ease of communication as: (i) IT is absent in	It is revealed that unreliable IT infrastructure hampers effective communication with customers and other parties in all banks. It is revealed that banks could not deploy kiosks, ATMs all over the country, as IT is missing in some parts of Bangladesh.

Table 6. 21: Evidence for how IT Infrastructure Impacted the Coordination and Communication Performance of E2E Solutions	
Mechanism	Evidence from organisations (BA, BRAC, CBL, DBBL, DBL, EBL, MBL, UCBL and JB)
some parts of the country; and (ii) IT is frequently disconnected and thus hinders customer services.	It observes that Internet is very slow; uploading and downloading documents take huge amount of time. Therefore, full-fledged web-based loan system implementation is difficult. It also reveals that due to electricity and networking failure, branches and ATMs often disconnect with data centre, and hamper customer services.
Unreliable IT Infrastructure hampers ease of coordination as: (i) IT is absent in some branches; and (ii) IT does not support full functionalities of the software.	It is revealed that unreliable IT infrastructure hampers ease of coordination in banks (BRAC, UCBL and JB). It shows that BRAC has implemented Kastle ULS (Universal Lending Solutions); however, due to link and electricity failure, banks could not deploy ULS in all the branches. Whereas, JB has branches in rural areas where electricity, Internet and communication network are fully absent. It shows that UCBL connects its rural branches using V-Sat link, but it does not support software functionalities.
Unreliable IT Infrastructure hinders document sharing in an electronic way.	Analysis reveals that unreliable Internet hampers electronic document sharing in all banks. It is revealed that for document management, banks require high speed Internet which is mostly absent in most parts of Bangladesh. It observes that a standard loan application takes 5 MB of data and the present Internet infrastructure does not support that.
Unreliable IT Infrastructure hinders centralised controlling.	It is revealed that centralised controlling is not possible in one bank (JB) as bringing all the remote branches under the same IT umbrella is difficult. It reports that JB has 848 branches, and out of those, 407 branches are in the rural areas. It observes that IT infrastructure is very poor in rural areas. Internet, electricity and communication links are absent in some rural areas. And once available, the speed is very slow.
Unreliable IT Infrastructure hinders centralised monitoring.	It is revealed that centralised monitoring is not possible in one bank (JB) as bringing all the branches within a common networking is difficult in the existing IT scenario in Bangladesh. It reports that JB has 848 branches, and out of those, 407 branches are in the rural areas where IT infrastructure is very fragile. Out of 407 rural branches of JB, seven branches do not have any electricity.

6.8.3.1 How IT Infrastructure Affects Ease of Communication

Analysis reveals that unreliable IT infrastructure hampers proper communication with customers and external parties. It is revealed that unreliable IT infrastructure restricts banks in offering various services to clients. Furthermore, it also hampers the existing offerings. Analysis shows that Internet is very slow in Bangladesh, and thus none of the banks offered a full-fledged

web-based system to customers. The required bandwidth is absent for running a web-based loan application system. Telephone infrastructure is not supportive for providing online services to customers. The Head of IT of BA mentions that; *"....we have implemented the phone banking solutions...but not yet fully operational because of scarcity of hunting number".* Unreliable IT infrastructure also hampers the services of existing offerings. It is revealed that ATM services are hampered because of link and electricity failure. The link failure also hampers online banking services. Furthermore, as banks implemented integrated databases, branches always need to connect with the data centre. But frequent link failure hampers branches' services. In that scenario, managers of disconnected branches ask their customers to go to another nearby branch or provide them with services by communicating with the data centre over the telephone.

6.8.3.2 How IT Infrastructure Affects Ease of Coordination

Analysis reveals that unreliable IT infrastructure hampers ease of coordination. This is because the unreliable infrastructure hampers the use of existing technologies for coordination and restricts banks from deploying sophisticated technologies, e.g., workflow. For example, JB could not ensure IT in all branches, as JB is a rural-based bank and IT is absent in rural branches. Therefore, loan coordination tasks are found to be manual in JB. Unreliable IT infrastructure also hampers banks' use of existing IT for coordination. For example, BRAC implemented Kastle ULS (Universal Lending Solutions); however, due to link and electricity problems, BRAC could not use the workflow for loan processing. The Head of Business Systems Management of BRAC mentions; *"....I took the matter [why ULS does not work in the rural area] seriously and then realize the ULS (Universal Lending System) is better for archival purpose and for long run.....however, due to electricity and link, Internet problem...manual job is faster..We then made arrangement with courier services.* Likewise, the software UCBL uses does not support all functionalities in rural areas as the required bandwidth is absent in rural areas.

6.8.3.3 How IT Infrastructure Affects Ease of Document Sharing

It is revealed that loan processing is a paper intensive task, and an example of 'joint production'. Thus, frequent file and document transfers from one place to another place, from one desk to another desk are required. Banks have implemented various technologies (e.g. document management system, website, intranet, etc.) for document sharing. But banks could not use technologies effectively because of the poor IT infrastructure of the country. Analysis shows electronic document sharing is difficult as Internet speed is very slow. As document sharing is not possible electronically, banks take different strategies for faster document transfer. Banks

make arrangements with courier services and deploy runners with motor bikes to share documents among branches and head office. The Head of Applications Support of EBL describes, *".....we could not do the document management part fully automated due to infrastructural problem....our bank's IT platform has improved tremendously however, our national IT infrastructure did not grow commensurately. For example, we have four redundant communication links - DDN, Satellite, and T&T line and fibre optic....however,.....if a country infrastructure does not provide high speed services then how can you do the document management online....while doing online transactions we do not do document transfer..I mean image transfer as it takes huge bandwidth....initially we had 128 KBPS but it has increased two/three times but not adequate for document management".*

6.8.3.4 How IT Infrastructure Affects Ease of Controlling

The analysis shows that for centralised controlling, all the branches should be under real-time networking and have a single database. However, one bank (JB) could not implement centralised controlling as networking and integrated databases could not be established because of the absence of IT infrastructure in rural areas. It reveals that electricity is absent in seven branches of JB whereas electricity voltage ups and downs also create barriers for the bank (JB) in deploying technologies in its branches. Furthermore, communication links are absent in many rural areas in Bangladesh. Thus the present IT scenario means centralised controlling is not possible in JB.

6.8.3.5 How IT Infrastructure Affects Ease of Monitoring

The study findings show that unreliable IT Infrastructure hampers centralised monitoring in one bank (JB) as IT is absent is some areas, especially in rural areas, therefore, some branches are outside the range of networking. It is reported that the bank (JB) is facing trouble implementing centralised and real-time monitoring of customers and staff as IT is absent in some branches. Networking among branches and a single database are preconditions for implementing centralised monitoring. But these are absent in JB. It is also revealed that out of 848 branches of JB, 407 branches are in rural areas where IT is unreliable. It is shown that seven rural branches of JB run without electricity supply thus PCs and Internet could not be deployed in those branches. It is revealed that some branches of JB suffer from voltage problems, thus PCs do not run properly in those branches. Therefore, JB has a long-term plan (7/8 years) to bring all the branches under a common IT platform and after then effective monitoring could be possible. The IT consultant of JB thus shared his plan of IT implementation: *"Last mile solution is not*

available for rural branches...not even the electricity; therefore, we have taken phase by phase automation plan".

6.9 Regulatory Environment

The regulatory environment, *'degree to which regulatory environment supports electronic transactions'*, emerges as a value conversion contingency. A loan approval is an E2E process of bankers, customers, regulators and support services; thus the regulatory environment is important. But the regulatory environment in Bangladesh is not technology-friendly and hampers value realisation from E2E Solutions. This section describes how the regulatory environment is manifested (section 6.9.1). The impact of the regulatory environment on core process (section 6.9.2) and coordination and communication process (section 6.9.3) aspects is also analysed.

6.9.1 How Regulatory Environment is manifest

Analysis reveals technology-friendly rules and regulations are absent. The existing banking rules and regulations favour manual processing and conflict with the use of technologies in loan operations. This is because of fast running by the banks and slow moving by the regulators. Aspects of the regulatory environment are shown in table 6.22 as well as empirical evidence for these aspects.

It is shown that an appropriate regulatory environment for electronic banking is absent in Bangladesh. Rules such as a Dispute Resolution Act, and rules on security and fraud are absent. Therefore, banks are restricted from offering online services to customers. Banks applied to Bangladesh Bank (the central bank) for permission to offer electronic banking services but were denied. For example, banks applied for mobile banking, Electronic Fund Transfer (EFT) and the use of credit cards for online transactions. However, the central bank did not allow them. This is why the Head of Business Systems Management mentions; *"...I am ready but my Central Bank is not permitting us.....say we did not get permission for fund transfer and it is the root of everything and it opens the scope of e-commerce....I am stuck now"* . Despite this, banks offer some electronic banking services after taking precautions to lessen its impact in the case of lawsuits. For example, Internet banking and ATMs are not legally permitted but banks offer these services. In the case of ATM services, banks maintain security by installing cameras, taking prior customer signatures, and allowing for small amount withdrawals. The CIO of CBL explains how their 24/7 online banking contravenes prevailing banking regulations as *"existing rules say that a bank only can honour a cheque if it is placed in order and over the counter*

during the official banking hours, say from 9AM to 3PM". Analysis also reveals that existing regulations also favour manual transactions. For example, KYC (Know Your Customer) is an act introduced by the government to stop money laundering. But KYC favours manual transactions with customers as opposed to electronic transactions.

Table 6. 22: Empirical Evidence of Regulatory Environment

Aspects	Evidence from organisations (BA, BRAC, CBL, DBBL, DBL, EBL, MBL, UCBL and JB)
Regulatory Environment does not support electronic transactions.	It is revealed that existing rules and regulation conflict with the use of technologies in loan approval in all banks. Furthermore, rules on dispute resolution, security aspects and an Electronic Signature Act are also missing in Bangladesh. Analysis reveals that web-based lending is not permitted. Credit card is not allowed for online transaction. EFT is not permitted and ATM transaction is not legalised.
National banking policy is oriented towards manual processes.	Analysis reveals that existing national banking policy favours manual approval in all banks. Existing banking guidelines favour manual write-up, physical signature, maintenance of registered books, voucher, documentation and manual reporting. Therefore, regulators and auditors favour manual approval process.
Regulatory Environment does not support electronic verification/ identity.	Analysis reveals that online communication in all banks is unacceptable for evidencing purpose. It is also reveals that regulators do not accept online communication as proof for legal purpose. Therefore, despite having technologies, banks prefer manual communication, acceptance and signature.
Slow court system necessitates manual verification of customers' identity and processing of loan applications.	It is observed that legal procedure for loan recovery or settling customers' fraud is very slow and bureaucratic. Thus all banks follow manual loan approval and verification to tackle loan defaults and customers' fraud. It is shown that it takes on an average 10 years to settle a loan default case. It is revealed that legal foreclosure of a mortgage asset is very difficult, and a bank may not succeed in realising the loan amount by selling off mortgaged property. It is also revealed that loan defaulters do not face any legal and social consequences in Bangladesh. Therefore, banks protect their asset by maintaining physical relationship with borrowers, taking lots of documentation, taking signatures and by involving guarantors. Banks also follow social mechanism for loan recovery.

It is revealed that national banking policy is oriented towards manual processes. Existing banking guidelines favour paper-based approval, maintenance of registered books, vouchers,

physical signature and manual reporting. It also favours documentation with revenue stamp, official seal and signature. Therefore, use of technologies in banking operations is very low. Banks thus follow manual approval process as prescribed by regulators. The Manager of DBL describes; *"....if you take even a single taka [Bangladeshi currency] as a bank loan, you have to sign on more than 10 documents and for the bank we have to give seal and stamps on all those documents and if we could not do that and even if a single document is missing, Bangladesh Bank [central bank] would lodge a huge audit complaint and our job will be at stake...why should we go for risk of doing automation?".* Analysis reveals that the central bank also follows a 'two-eyed policy' for implementation of banking policy as the central bank was found to be relaxed while auditing foreign banks in Bangladesh and with banks having a 'special' relationship. For example, EBL has implemented automated trade services; however, the central bank did not take any action against EBL as the deputy governor and the CEO of EBL are very close friends. The Head of Operations of EBL explains, *"Implemented paperless automated trade services…that was not supported by Central Bank regulations….We were almost paperless, with everything kept in the system...The Central Bank's auditors got furious and complained that [the] bank was not regulatory compliant... [That] complaint went to the Deputy Governor (DG) of Central Bank.....luckily the then DG and my CEO … are good friends".* Bankers are thus very fed up with regulators, and suggest implementing technology-friendly rules and regulations. The Head of IT in MBL thus advises; *"...regulators need not invest in new regulations, they can copy the existing rules of Australia or USA and implement it here in Bangladesh with few adjustments".*

The study result reveals that the existing regulatory environment does not support electronic verification/identity. This is why bankers, customers and auditors prefer a physical transaction and verification. Therefore, despite having technological capability, banks do not offer web-based services and do not execute email or phone instructions. Analysis shows that clients do not want to accept system-generated copy and statements and ask for signatures on the auto-generated statements. This is why banks write on the system-generated copy, *'this is system generated copy does not need any seal and signature'*; however, customers come to the bank for a seal and signature. Analysis shows that as rules on electronic verification are absent, regulators do not do system audits or electronic audits and prefer manual auditing. The Head of IT of CBL mentions; *".....if the Central Bank's auditor team would ask us to show them system generated copy or reports.....if they accept system audit....then we need not prepare additional set of papers for Central Bank.....we could show in system that, look, this loan is originated by X, checked and verified by Y and approved by Z".*

It is revealed that the slow court system necessitates manual verification of customers' identity and processing of loan applications. The existing default loan recovery procedure is bureaucratic and time-consuming. As legal procedure for loan recovery takes time, banks are very cautious in providing loans. They take lots of documents, physical signatures, mortgaged property and personal guarantees for loan applications. This is why banks approve a loan by involving many staff to share the responsibility. Bankers prefer manual processing, physical meetings and physical signatures. It is revealed that the use of technology is more in foreign trade than in the local loan approval process. This is because there is certainty with international organisations of getting the money back and international rules apply in foreign trade. Thus automation works in foreign trade but not in local loan approval as local legal frameworks apply for local loans. The Senior Vice President of MBL mentions; *"... in case of funded product when cash money is involved we try to make it secured by writing, documenting it as much as we can, collecting more information and taking signature from top to bottom. We have lack of trust in customers and do not rely on customers' wording. We have lack of trust in the existing legal framework as if the loan eventually defaults, you would not get the loan back in next 10 years because of bureaucratic court procedure and corruption, therefore, for more security we make 'Collective Decision'".*

6.9.2 How Regulatory Environment Affects Core Process Performance of E2E Solutions

The study findings in relation to how the regulatory environment impedes various core process aspects are shown in this section. The study results show that the regulatory environment impedes both faster processing and loan processing cost. Table 6.23 shows the evidence from organisations of how the regulatory environment negatively impacts on core process aspects.

6.9.2.1 How Regulatory Environment Affects Processing Time

Analysis reveals that the existing regulatory framework hampers faster loan processing in banks. The unfriendly regulatory framework forces banks to follow manual processing and thus faster processing is hampered. In a loan approval, many parties are involved and to and forth communication is required. But banks could not use and deploy technologies to expedite the approval cycle. For example, existing rules do not support web-based loan applications. Thus customers come to branches to make an application. Banks cannot process loans based on customer emails or faxed instructions. Furthermore, the existing Know Your Customers (KYC) Act favours manual approval processing. Besides, the existing regulatory environment impedes

internal approval processes, as the existing banking policy favours a paper-based approval. Regulators want to see physical documents, vouchers, registered books and signatures when they audit banks. Thus workflow and web-based processing are of no use in loan approvals which would have the potential of making processing tasks faster. The slow court procedure also favours manual approval and relationship-based lending. Therefore, E2E Solutions' ability to make the loan approval faster is hampered due to the absence of a technology-friendly regulatory environment.

Table 6. 23: Evidence for how Regulatory Environment Impacted the Core Process Performance of E2E Solutions

Mechanism	Evidence from organisations (BA, BRAC, CBL, DBBL, DBL, EBL, MBL, UCBL and JB)
Regulatory Environment has slower loan processing time as: (i) banks follow manual contract and verification; and (ii) banks follow manual processing.	It is revealed that existing regulatory environment hampers faster loan approval in all banks. It is revealed that rules on Electronic Signature Act, web-based transactions and dispute resolution are absent in Bangladesh. Furthermore, the use of credit card for online transactions and EFT are not permitted and all hampers faster loan processing time. It is revealed that existing rules (e.g., KYC) favour relationship-based lending as opposed to technology-based lending. It is revealed that existing banking policy and slow court system favour manual processing. The maintenance of paper-based documentation, stamps, physical signature and seal also make the loan approval cycle slow.
Regulatory Environment increases processing cost as it: (i) favours manual communication; (ii) favours paper-based processing and; and (iii) restricts bank from using full functionalities of the software.	It is shown that existing regulatory environment increases loan processing cost in all banks. It is revealed that regulatory environment does not support online communication with customers and external parties. Thus, despite having technology and alternative banking channels, banks could not reduce postage and paper cost. Banks also could not reduce the cost of payment services. Existing regulatory framework forces banks to follow relationship-based lending; thus wages cost remain high. Despite having workflow technology, intranet and Internet, loan approval is paper-based as regulators, auditors prescribed paper-based approval. Banks approve loan using technology and also prepare documentations for regulators and thus cost increases. Banks are paying full rent for software but could not exploit the full potential (use only 10-20% of the functionalities) as existing rules do not support web-based lending, EFT and Internet banking.

6.9.2.2 How Regulatory Environment Affects Processing Cost

It is revealed that existing regulatory barriers increase the loan processing cost. As electronic transactions and verification are not supported, technology does not help much in communication with customers and support services. Therefore, paper and postage cost increases. It is revealed that banks on a quarterly basis send 400 reports and statements to the central bank. This reporting to the central bank is largely manual. Existing rules favour manual/relationship banking. For example, the Know Your Customer (KYC) rule suggests banks maintain sufficient physical contact with customers before entertaining any loan facility. Therefore, technology could not restrict manual communication and physical contact with customers and thus, cost increases. Because of the regulatory environment, banks sometimes undertake unnecessary paperwork. For example, banks' loan process is automated and they then prepare paperwork and vouchers to satisfy regulators. Therefore, processing cost increases. The Deputy Branch Manager of DBL mentions, *"... [Now] we are using online platform that essentially doubles our work....we are processing the loan using IT, however, we are keeping a set of papers for regulatory purpose...for regulatory requirements".* It is also revealed that the existing regulatory framework permits banks to use only 10-40% of the functionalities of the software, although banks pay full price for technology.

6.9.3 How Regulatory Environment Affects Coordination and Communication Performance of E2E Solutions

Analysis reveals that the coordination and communication process performance of E2E Solutions is negatively impacted by the regulatory environment. It is revealed that the regulatory environment impedes the ease of communication and document sharing. The empirical evidence for how aspects of the coordination and communication process are impeded by the regulatory environment is shown in Table 6.24.

6.9.3.1 How Regulatory Environment Affects Ease of Communication

The study result shows that the existing regulatory environment hampers email-based communication with customers and other process participants. The loan process starts with receiving a loan application from customers. Banks have implemented software and have web-based loan application systems. But banks could not offer these services to customers as electronic transaction and verification are not supported by existing laws. Soft copies of documents are not acceptable for legal documentation purposes. Banks cannot accept fees online, as credit cards are not permitted in online purchases. EFT is not legalised in Bangladesh.

Table 6. 24: Evidence for how Regulatory Environment Impacted the Coordination and Communication Performance of E2E Solutions	
Mechanism	Evidence from organisations (BA, BRAC, CBL, DBBL, DBL, EBL, MBL, UCBL and JB)
Regulatory Environment hinders ease of communication in an electronic way as it favours: (i) physical contact; and (ii) physical signature and payment.	It is evident that existing regulatory environment hampers ease of communication with customers and loan related parties in all banks except BA and EBL. It is evident that web-based and email-based communication are not supported by the existing laws. Banks cannot carry out email/fax instructions. Existing rules do not support the use of ATMs for transactions. Thus alternative delivery channels are not popular in Bangladesh. It is evident that as soft copy does not have any legal validity, thus both banks and customers do not accept soft copy from each other. Thus, technology remains useless in communication.
Regulatory Environment hinders document sharing in an electronic way as: (i) soft copy does not have legal validity; and (ii) Electronic Signature Act is absent.	It is revealed that existing regulatory environment hampers electronic document transfer in all banks. It is revealed that soft copy does not have any legal validity as judges, auditors do not accept soft and scanned copy of documents for evidencing purpose. Hence, banks preserve and maintain hard copy of document with proper stamps and signature. Therefore, technology is rarely used in document sharing purposes.

Furthermore, the existing regulatory environment favours physical contact and signatures. The Head of IT of CBL mentions, *"we can provide those (clients) with the web-based loan application systems... However, there are no rules in the country as to whether we can accept money/fee using the online systems. Therefore, web-based loan applications are of no use for clients...as they need to come to the branch to physically make payments and to sign documents"*. Furthermore, existing rules (e.g. Know Your Customer) force banks to establish physical contact with customers and thus hamper electronic transactions and communication. Banks have deployed ATMs and POS for disbursing the loan application and receiving the loan payment. But ATM transactions are not supported by existing law, and thus banks could not proactively educate customers to use ATMs. Analysis also reveals that EFT (Electronic Fund Transfer) is not allowed in Bangladesh. The Head of IT of BRAC thus reports, *"....with our existing system we are capable to EFT (Electronic Fund Transfer), we are capable to run electronic banking, we are capable to handle internet banking...if you go to our website you will find that we are doing some internet banking but not fully as we have restrictions from regulators"*. Because of regulatory barriers, banks could not use IT for communication purposes. As Head of Business Systems Management BRAC rightly mentions, *"We do not have any regulatory framework,*

therefore, the online banking we are doing is basically within the bank and we could not reach towards customers".

6.9.3.2 How Regulatory Environment Affects Ease of Document Sharing

Analysis reveals that existing regulatory barriers hamper electronic document transfer. It is revealed that court, central bank and auditors do not accept soft copy or a scanned copy. Email and faxed instructions are not accepted as valid instructions in court and regulatory agencies. Therefore, both banks and customers prefer hard copy of documents with proper seal, stamp and signature. Banks accept hard copy of loan applications from customers and customers also accept hard copy of statements which are duly signed and sealed from banks. Regulators also prefer physical signatures, paper-based processing and physical register books. Hence, the loan processing task is found to be hard copy-based in banks. Furthermore, in some cases, hard copy and signature are not sufficient; it needs to be substantiated by a government revenue stamp and signature of eye witnesses. Therefore, IT is not used for document sharing. The Head of IT of MBL mentions, *"Banks in Bangladesh prefer physical documents as soft documents have no legal footholds, therefore, implementing fully fledged document management system would take a long time…some banks even though don't accept soft copy of bio-data for job application purpose".*

Table 6.25 summarises the aspects of value conversion contingencies.

Table 6. 25: Aspects of E2E Solutions' Value Conversion Contingencies

Construct	Explanation	Aspects
Senior Management Ability	The degree to which senior management is able to derive value from E2E Solutions.	Senior management does not have appropriate IT skills.
		Senior management does not have prior experiences of E2E processes and solutions.
		Senior management resists the implementation and use of best practice process embedded in E2E Solutions
Complementary Resources	The organisational availabilities of complementary resources to derive value from E2E Solutions.	Employees do not have appropriate IT skills
		Implementation team lacks the skills and experiences to interact and negotiate with the software vendors.
		Internal training lacks sufficient focus on IT/software and change management issues.
		Staff resist the introduction of new technology.
		There are insufficient financial resources to fully implement and customise software.
Software Misfits	The degree to which the software is	Gaps exist between the functionalities of the software and organisational requirements.

Table 6. 25: Aspects of E2E Solutions' Value Conversion Contingencies

Construct	Explanation	Aspects
	aligned with local needs and practices.	Software does not support the country-specific requirements.
		Localisation, customisation and updates of software are costly and slow.
Integration	The degree to which the business processes (internal and external) are integrated.	Internal process integration is found to be absent in the organisation.
		Integration with external sanctioning bodies is found to be absent in the organisation.
		Integration with the external support parties is found to be absent in the organisation.
Customer Readiness	The degree to which customers have the skills and desire to engage in electronic transactions.	Customers are not well educated.
		Customers do not have IT skills.
		Customers do not have access to IT.
		Customers prefer physical interactions.
		Customers' fraud is common.
Information Infrastructure	The availability and adequacy of information resources.	Reliable sources of information on customers (e.g. database) are absent.
		It is difficult to verify the identity of customers.
		There is little information sharing among banks.
		Accounting and auditing standards are not trustworthy.
		There is no external credit rating agency.
IT Infrastructure	The adequacy of physical IT infrastructure and services.	Electricity supply is unreliable.
		Internet infrastructure is unreliable.
		Communication link is unreliable.
Regulatory Environment	The degree to which regulatory environment supports electronic transactions.	Regulatory environment does not support electronic transactions.
		National banking policy is oriented towards manual processes.
		Regulatory environment does not support electronic verification/identity.
		Slow court system necessitates manual verification of customers' identity and processing of loan application.

6.10 Summary

This chapter explored how the business value derivation from E2E Solutions is impeded by value conversion contingencies, and presented a theory of the business value of E2E Solutions (figure 6.1). This chapter extends the explanation of how business value is derived from E2E Solutions (chapter 5) by integrating value conversion contingencies. From analyses based on nine Bangladeshi banks, this chapter reveals that the the eight value conversion contingencies impede the various aspects of core process and coordination and communication process

performance of E2E Solutions. The value conversion contingencies are: senior management ability, complementary resources, software misfits, integration, customer readiness, information infrastructure, IT infrastructure and the regulatory environment.

By identifying and demonstrating how the business value of E2E Solutions is impacted by value conversion contingencies, this chapter reveals the 'embedded' nature of E2E Solutions' value which explains the existence of the IT productivity paradox in developing countries (e.g. Bangladesh). This chapter's findings reveal that value conversion contingencies are both internal and external in nature. This chapter also reveals that the value conversion contingencies impact at the business process level performance. This chapter suggests that for exploiting the full potential of E2E Solutions, managers should remove all internal value conversion contingencies. Furthermore, managers should also actively negotiate with the government and other external bodies for the removal of external value conversion contingencies.

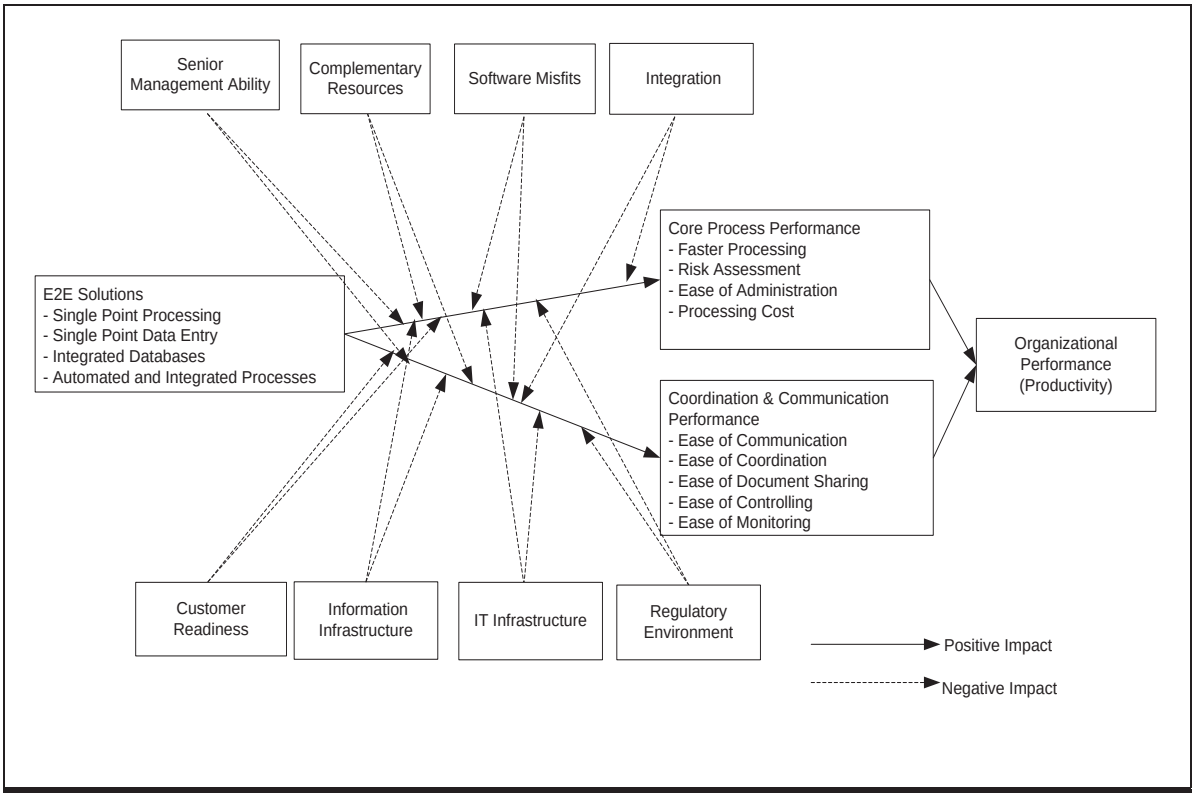


Figure 6. 1: An Integrated Model of E2E Solutions' Business Value

The final chapter (chapter 7) of the thesis will be presented next. The major points considered therein will be related to:

- Theorisation of the research findings.

- Core contribution of the research.
- Limitations of the research.
- Direction for future research.

Chapter Seven

Conclusion

7.0 Introduction

The objective of this study was to investigate the derivation of business value from E2E Solutions in developing countries. This chapter begins by presenting the rationale for the study and outlines the research strategy adopted (section 7.1). It then presents the summary of the empirical research findings (section 7.2). It then discusses the research findings with reference to the existing literature together with the contribution the study makes to the broader IT value literature (section 7.3). This research sets an agenda for what needs to be done. This chapter concludes by presenting a summary (section 7.4). The chapter forms a narrative summary of the entire research project.

7.1 Rationale for the Study

As previously illustrated, the IT productivity paradox (Solow 1987) exists in developing countries. However, the IT value conversion contingencies, i.e., factors that explain the IT productivity paradox, are an area that is under researched. As recently as 2009, Goh and Kauffman documented the dearth of academic research on IT value conversion contingencies but few papers have addressed the topic since. A complicating factor is that all existing IT value conversion contingencies have been focused on the developed countries. The research on IT value conversion contingencies in developing countries has been to date non-existent (Heeks 2010). This scarcity in the extant literature needed to be addressed and the causes of the IT productivity paradox needed to be revealed.

Analysis revealed that the contemporary business process had moved across organisational and system boundaries. Organisations implement E2E Solutions as part of a programme of E2E process redesign that extends across organisational boundaries to connect customers, suppliers and partners (Bubak *et al.* 2006; Frye and Gulledge 2007). An E2E Solution is defined as *'single or integrated solutions that help the business process to flow unimpeded across organisational boundaries from beginning to end'*. While a shift from stand-alone IT implementation to E2E Solutions is evident (Bubak *et al.* 2006), the value realisation process of E2E Solutions and value conversion contingencies are not well documented in the extant literature. Existing E2E Solutions' literature merely focuses upon conceptual and implementation issues.

An analysis of extant IT value literature revealed that deriving and managing the business value of IT has been an issue for management in the last two decades (Kohli and Grover 2008). First, it is revealed that due to 'IT-embeddedness', rather than separating IT from business processes, IT should be conceptualised as a digital business capability (cf.Kohli and Grover 2008) for proper appreciation and management of IT value. But this conceptualisation is missing in the extant IT value literature. This issue thus needed to be addressed.

Second, while the business process level is the appropriate level for measuring the business value of IT (cf.Barua *et al.* 1995) and identifying IT value conversion contingencies (cf.Davern and Kauffman 2000), the business process level analysis of IT value is scarce (cf.Radhakrishnan *et al.* 2008). This lack of research may be because of limited access to the confidential nature of process level data (cf.Scheepers and Scheepers 2008). Thus the scarcity of process level analysis of IT value also needed to be addressed. Furthermore, while the process level is the appropriate level for identifying the value conversion contingencies (cf.Davern and Kauffman 2000), most of the conversion contingencies' literature is at organisational (e.g.,Weill 1990; 1992) and industry level (e.g.,Li and Ye 1999). Such issues needed to be addressed in the research on IT value. Specifically, a greater understanding of how E2E Solutions deliver business value and how E2E Solutions' value is impacted by value conversion contingencies is necessary in developing countries.

7.1.1 Research Objective and Method

The objective of this study was *"to investigate the derivation of business value from E2E Solutions in developing countries"*. In order to achieve this research objective, two research questions were posited:

> RQ 1: How do E2E Solutions deliver business value?
>
> RQ 2: How is the achievement of business value from E2E Solutions impacted by value conversion contingencies?

Due to the exploratory nature of the research objective, a case study approach was adopted. Data was collected from nine Bangladeshi banks over a 12 month period from April 2009 to March 2010. Data was collected utilising both interview and document gathering techniques. The collected data was analysed using open, axial and selective coding techniques.

7.2 The Empirical Findings

This section documents the empirical findings of the study. It provides an overview of the major findings in relation to each of the research questions developed. Section 7.2.1 presents the empirical findings of the first research question: how do E2E Solutions deliver business value. The empirical findings of the second research question: how is the achievement of business value impacted by E2E value conversion contingencies, are presented in section 7.2.2. Based on the empirical findings, the propositions developed are further refined by specifying hypotheses and presented in section 7.2.3. The credibility of the research findings and limitations of this study are also presented (section 7.2.4).

7.2.1 How E2E Solutions Deliver Business Value

This research yielded a significant indication that E2E Solutions helped organisations create value by streamlining the core business process and by improving the coordination and communication process. Overall, it revealed that as E2E Solutions ensured IT capability and business capability, E2E Solutions deliver value by reorienting business processes, and integrating internal and external processes.

Table 7.1 summarises how E2E Solutions deliver value to organisations by improving core process aspects. Core business process is captured by processing time, risk assessment, loan administration and processing costs. Analysis showed that an E2E Solution streamlined the internal work process, reduced the decision-making tiers, reduced the unnecessary hand-offs, ensured the availability of internal and external data to the users and consequently speeded up the loan processing cycle. In summary, both IT capability and business capability of E2E Solutions helped banks to reduce processing time. By the same token, E2E Solutions helped in accurate risk assessment. It revealed that IT alone or business process reorientation alone may help in partial risk assessment. By reorienting the business process, E2E Solutions ensured the specialisation of task, and therefore ensured accurate risk assessment, and helped banks to make consistent decisions. E2E Solutions helped banks to detect internal and external fraud, and provided various analytical tools (e.g. DSS) to managers for proper risk assessment.

E2E Solutions made the loan administrative task easier. E2E Solutions automated the loan administration tasks by automating loan accounting, loan realisation and reporting tasks. Therefore, loan administrative tasks were found to be easier and less human intervention was required for completion of loan administrative tasks. E2E Solutions reduced the loan processing costs in a number of ways. By reorienting the business process, E2E Solutions reduced the

duplication of tasks. They reduced hand-offs, decision-making tiers and unnecessary file transfers, thus reducing processing costs. The digitised capability of E2E Solutions also reduced processing costs by reducing the need for paper and postage, manual data storage, retrieval, manual monitoring, controlling and reporting.

Table 7. 1: How E2E Solutions Impact Core Process Aspects

Process Level	Explanation	Core Process Aspects	E2E Solutions enabled core process aspects by:
Core Process Perform-ance	The degree to which E2E Solutions affect the within organisation core operational task of a loan approval process.	E2E Solutions make the overall processing task faster.	• Reduce the loan processing tiers and places. • Reduce the duplication of works. • Reduce the unnecessary hand-offs. • Help in quick data retrieval and dissemination. • Connect the internal and external process participants. • Process the data in a faster manner.
		E2E Solutions make the overall risk assessment task accurate.	• Avoid the conflict of interest by separating the risk assessment task from loan marketing task. • Help in consistent decision making by developing specialisation. • Help in quick customer tracking. • Ease detection of staff and customers' fraud. • Supply the data in an organised way to users. • Use of DSS/ tools for risk assessment.
		E2E Solutions make the administrat-ive job easier.	• Automate the loan accounting functions. • Automate the loan realisation process. • Automate the internal and external reporting process.
		E2E Solutions reduce the processing cost.	• Reduce the requirement for staff for loan processing. • Avoid the duplication of works and hand-offs. • Help to run branches with fewer and lower level (lower salaried) staff. • Avoid manual data storage and gathering. • Avoid manual monitoring and reporting. • Make the loan administration task automated. • Reduce the manual and paper-based communication.

Table 7.2 summarises how E2E Solutions deliver value to organisations by improving coordination and communication process aspects. Analysis revealed that E2E Solutions deliver value (e.g., higher productivity) by improving the coordination and communication process. Coordination and communication processes are captured by communication, coordination, document sharing, controlling and monitoring. E2E Solutions deliver value by improving the customer and supplier communication process. E2E Solutions helped banks share information with customers, and receive applications and documentation online, thus expediting the communication process. E2E Solutions improved collaboration with customers by allowing for online filling in of loan applications, uploading data and updating information.

By automating the task, E2E Solutions expedited the loan coordination process. It revealed that an E2E loan process is a 'joint production', that is, it involves many staff. E2E Solutions helped in defining the processing staff's roles and responsibilities through the system, thus coordination tasks worked in an automated way. E2E Solutions reduced the need for manual coordination. E2E Solutions delivered value by helping banks to share documents electronically. It revealed that while loan applications are lodged at geographically scattered branches, loan applications are processed at head office level, therefore, document sharing among branches and head office is important. Banks were found to use a web-based system, Internet and intranet for document sharing, and that essentially sped up the document sharing process. E2E Solutions helped in controlling the loan operations of bank branches by changing the work practices, and by defining the roles and responsibilities of staff electronically. By pooling loan applications from branches to be processed at a single location, E2E Solutions reduced the critical risk. It ensured that staff work within set boundaries, thus the possibility of over disbursement or charging less than the prescribed interest rates was less. E2E Solutions helped in the real-time monitoring of customers and staff. The customer centric database helped to get the cumulative position of a customer in a single click. Both customer and staff performance analysis becomes easier through E2E Solutions.

Table 7. 2: How E2E Solutions Impact on Coordination and Communication Process Aspects

Process Level	Explanation	Coordination and Communication Process Aspects	E2E Solutions enabled coordination and communication process aspects by:
Coordina-tion and Commun-ication Process Perform-ance	The degree to which E2E Solutions improve the coordination and communication task in a loan approval process.	E2E Solutions make the overall loan processing related communication (with clients and external loan related parties) easier.	• Use of Internet and web-based communication system. • Automate the loan payment services. • Use of Internet banking/ATM/POS for loan realisation. • Speed up the communication systems. • Allow customers to upload data, information into the system.
		E2E Solutions make the loan coordination activities easier.	• Use of workflow/software-based coordination. • Define the users' roles and responsibilities through the automated system. • Use of automated processing system, thus physical meeting replaced by online meeting/forum.
		E2E Solutions make the loan documents-sharing task easier.	• Share the documents electronically. • Use of web-based system for document sharing. • Use of workflow for document preservation.
		E2E Solutions help in controlling branches' loan operations.	• Pooling of all loan applications from branches and process in a single location. • Structure the roles, responsibilities of every loan officer through automated system.
		E2E Solutions increase the monitoring ability of the clients and employees.	• Real-time monitoring of customers and staff as database is integrated and live. • Generate cumulative position of a customer with all branches easily, as database is customer centric as opposed to account centric. • Set up of an early warning system for monitoring customers and staff.

Table 7.3 illustrates how E2E Solutions improve organisational level productivity by impacting on process level performance. Analysis revealed that E2E Solutions and productivity do not have a causal relationship, rather an indirect relationship. It revealed that not all aspects of process performance are translated into higher productivity. Higher levels of organisational productivity are dependent on faster processing, ease of administration, ease of coordination, ease of controlling and ease of monitoring.

Table 7. 3: How Core Process and Coordination and Communication Process Performance Affect Organisational Performance

Organisational Level	Explanation	Process Performance Aspects	How Core Process and Coordination and Communication Process affect productivity
Organisational Performance (e.g. Productivity)	The degree to which core process performance and coordination and communication performance of E2E Solutions increase organisational performance, measured through productivity. Productivity is defined as an organisational ability to process loans at a given point of time.	Faster Processing increases productivity.	• Staff processed more loans in a given point of time. • Fewer staff needed for processing a loan.
		Ease of Administration increases productivity.	• Bank can handle more loan accounts. • Fewer people required for doing a task. • Frees staff from back-end administration and puts more resources into front-end marketing.
		Ease of Coordination increases productivity.	• Faster approval of a loan application. • Reduce the hand-offs.
		Ease of Controlling increases productivity.	• Reduce the need for middle level controlling office. • Less staff needed for controlling and auditing.
		Ease of Monitoring increases productivity.	• Fewer staff can monitor huge number of clients and branch operations. • Staff work proactively, thus increases productivity.

7.2.2 How the Business Value of E2E Solutions is impacted by Value Conversion Contingencies

Analysis revealed that eight value conversion contingencies negatively affect business value: senior management ability, complementary resources, software misfits, integration, customer readiness, information infrastructure, IT infrastructure and regulatory environment. This study's

results revealed that value conversion contingencies occur at the business process level. The E2E value conversion contingencies and how they negatively impact on various aspects of E2E process performance are outlined in table 7.4.

How such value conversion contingencies impact upon business value is reflected in the changes in the various aspects of core process, and coordination and communication process performance as documented in tables 7.1 and 7.2. Analysis revealed that lack of senior management ability negatively impacts on processing time, risk assessment, processing cost, communication, coordination and controlling. However, loan processing, risk assessment, processing cost and controlling are negatively impacted by a lack of complementary resources. Banks implemented software as part of the implementation of E2E Solutions, but software misfits emerged as one of the value conversion contingencies. The process performance aspects that were negatively impacted by software misfits include processing time, loan administration, processing cost, communication, monitoring and controlling. It revealed that organisations implemented solutions for an entire E2E process; however, due to lack of integration with external process participants, banks could not make the loan processing task faster. Thus, they needed to maintain offline communication with external parties. As a result, loan processing cost increased. It revealed that value realisation of E2E Solutions was hampered because of the lack of customer readiness. It revealed that customer requests triggered an E2E process, and as the customers were not ready, the banks could not improve processing time, risk assessment, processing cost, communication and controlling.

The study results showed that the external environment greatly impacted on the E2E Solutions' value. It revealed that due to lack of proper information infrastructure, banks could not effectively use E2E Solutions and thus processing time, risk assessment, processing cost and communication were negatively impacted. E2E Solutions relied on the public IT infrastructure, and unreliable IT infrastructure (e.g., electricity, Internet and communication link) of the country negatively impacted on processing cost, communication, coordination, document sharing, monitoring and controlling. The banking sector of Bangladesh is highly regulated, but the existing regulatory environment is not technology-friendly and thus negatively impacted on processing time, processing cost, communication and document sharing.

Table 7. 4: How Business Value is Impeded by Value Conversion Contingencies	
Contingency Factors	Impact of Value Conversion Contingencies on various process performance aspects
Senior Management Ability is defined as the degree to which senior management is able to derive value of E2E Solutions.	**Slower Processing** as: (i) no/less use of IT; and (ii) retaining the manual work processes. **Inaccurate Risk Assessment** as: (i) non-implementation of controlling mechanisms; and (ii) no/less use of DSS/tools for risk assessment. **Increases Processing Cost** as: (i) maintaining of relationship-based lending; (ii) not ensuring the best use of technologies; and (iii) not implementing the best practice embedded in E2E Solutions. **Manual Communication** as: (i) lack of initiatives to integrate customers with E2E Solutions; and (ii) lack of initiatives to integrate with support services. **Manual Coordination** as: (i) no/less use of IT in coordination task; and (ii) favouring manual work processes. **Manual Controlling** as: (i) management is highly resistant to change; and (ii) resistance of implementation of controlling provision.
Complementary Resources are defined as the organisational availabilities of complementary resources to derive value of E2E Solutions.	**Slower Processing** as: (i) staff are less conversant with the technology; (ii) staff resisted the use and implementation of technology. **Inaccurate Risk Assessment** as: (i) staff lack IT skills; and (ii) staff resisted the use of DSS/tools in risk assessment. **Increases Processing Cost** as: (i) limited use of technologies as staff' resisted; and (ii) lack of localisation of software results in manual tasks. **Manual Controlling** as staff resisted implementing the centralised controlling system.
Software Misfits are defined as the degree to which the software is aligned with local needs and practices.	**Slower Processing** as it forces banks to process loans manually. **Manual Loan Administration** as proper customisation, localisation is not done in the software. **Increases Processing Cost** as: (i) software functionalities remain underutilised; (ii) manual processing as software does not support; and (iii) costly maintenance and upgrade of the software. **Manual Communication** as software does not support the alternative delivery channels. **Manual Controlling** as software architecture is in decentralised mode. **Manual Monitoring** as: (i) databases are segregated and not live; and (ii) databases are account centric rather than customer centric.
Integration is defined as the degree to which the business processes (internal and external) are integrated.	**Slower Processing** as internal and external process is unintegrated, thus manual and slow. **Increases Processing Cost** as communication with sanctioning bodies, support services is manual and paper-based. **Manual Communication** as bank has to do manual communication with external support services and sanctioning bodies.
Customer Readiness is defined as the degree to which customers have	**Slower Processing** as: (i) customers provide false data that require further checks; and (ii) customers need help with loan applications and cannot provide data as required for loan processing. **Inaccurate Risk Assessment** as: (i) customers cannot supply data required for risk assessment; and (ii) customers provide false and misleading data and

Table 7. 4: How Business Value is Impeded by Value Conversion Contingencies	
Contingency Factors	Impact of Value Conversion Contingencies on various process performance aspects
the skills and desire to engage in electronic transactions.	thus risk assessment tools are of no use. **Increases Processing Cost** as: (i) bank has to follow relationship-based lending and could not restrict the requirements for staff; and (ii) less adoption of alternative delivery channels by customers. **Manual Communication** as: (i) customers prefer physical interaction, proof and evidence; (ii) customers do not have means to communicate online; and (iii) customers are less trustworthy. **Manual Controlling** as: (i) customers prefer branch-based banking; and (ii) customers are not ready to forward information through online as needed.
Information Infrastructure is defined as the availability and adequacy of information resources.	**Slower Processing** as: (i) banks collect data manually; (ii) banks need to ensure the true identity of applicants, and rigorously verify information and documents provided by clients. **Inaccurate Risk Assessment** as: (i) customer database is absent; (ii) difficult to ascertain true identity of customers; (iii) financial statements are less trustworthy; (iv) no external agencies to verify the data and rating services. **Increases Processing Cost** as: (i) maintaining of physical contact for loan processing, collecting and verifying the data provided by clients; and (ii) deploying third party agency for customer tracking. **Manual Communication** as: (i) web-based communication is difficult; and (ii) information provided by the clients cannot be verified online, thus manual communication is required.
IT Infrastructure is defined as the adequacy of physical IT infrastructure and services.	**Increases Processing Cost** as bank has to maintain: (i) alternative sources of electricity; (ii) redundant communication link for 24x7 uninterrupted services; and (iii) high rent of technology in rural areas. **Manual Communication** as IT infrastructure: (i) is absent in some parts of the country; and (ii) is unreliable thus hampers customer services. **Manual Coordination** as IT: (i) is absent in some areas; and (ii) does not support the functionalities of the software. **Manual Document Sharing** as Internet speed is slow, thus electronic document sharing is difficult. **Manual Controlling** as it is not possible to bring all branches under single networking. **Manual Monitoring** as it is not possible to bring all branches under single networking.
Regulatory Environment is defined as the degree to which the regulatory environment supports electronic transactions.	**Slower Processing** as banks do manual processing and contract point verification. **Increases Processing Cost** as: (i) favours manual communication; (ii) favours paper-based processing; (iii) restricts bank from full use of software functionalities. EFT, web-based application not legalised. **Manual Communication** as: (i) favours physical contact; and (ii) favours physical signature and payment services. **Manual Document Sharing** as: (i) soft copy does not have any legal validity; (ii) absence of Digital Signature Act, thus requires hard copy, signature and seal.

7.2.3 Business Value Model of E2E Solutions and Hypothesis Development

By demonstrating how E2E Solutions deliver value (detailed in chapter 5 and summarised in tables 7.1, 7.2 and 7.3) and how business value of E2E Solutions is impacted by value conversion contingencies (detailed in chapter 6 and summarised in table 7.4), this thesis refined the propositions by specifying hypotheses (table 7.5) and derived a model of the business value of E2E Solutions (figure 7.1).

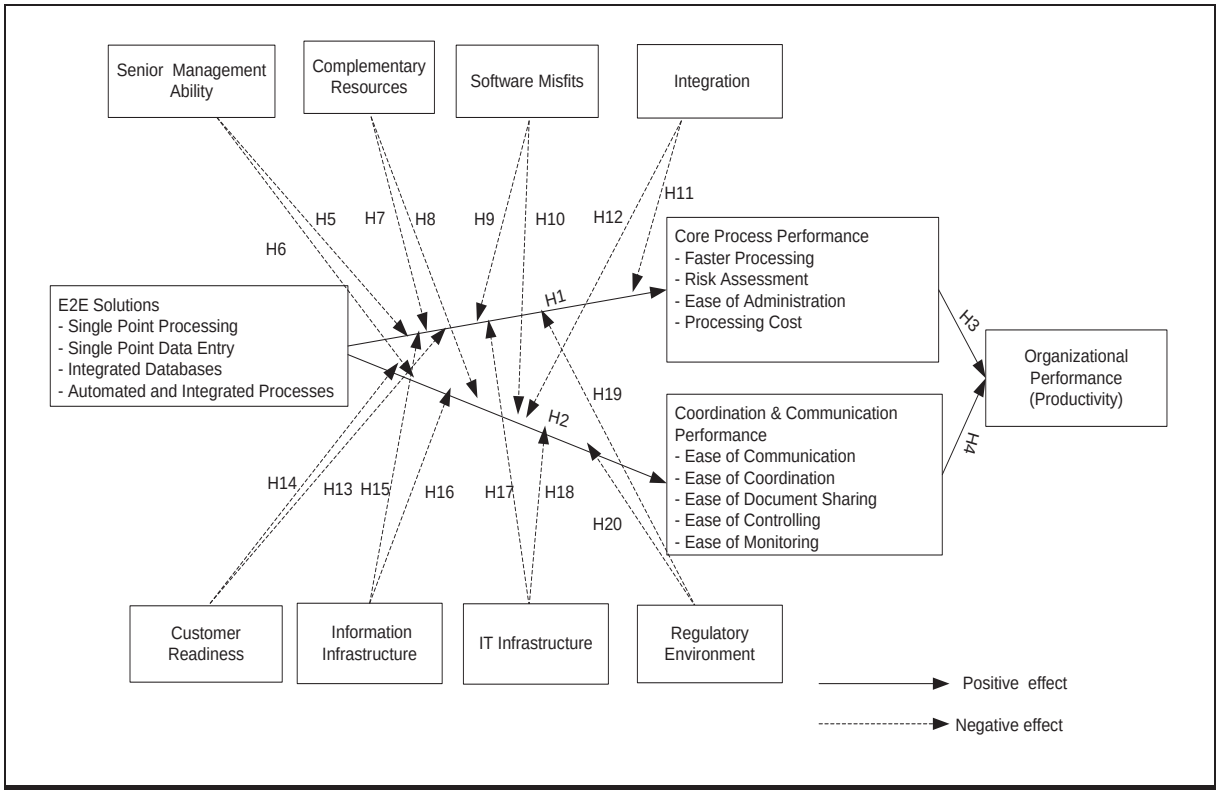


Figure 7. 1: An Integrated Model of E2E Solutions' Business Value

Table 7. 5: Summary of Results
H1: Core Process Performance is enabled by E2E Solutions.
H2: Coordination and Communication Performance is enabled by E2E Solutions.
H3: Core Process Performance of E2E Solutions enabled organisational performance.
H3a: Faster Processing enabled organisational performance.
H3b: Ease of Administration enabled organisational performance.
H4: Coordination and Communication Process Performance of E2E Solutions enabled organisational performance.
H4a. Ease of Coordination enabled organisational performance.
H4b. Ease of Controlling enabled organisational performance.
H4c. Ease of Monitoring enabled organisational performance.
H5: Senior Management Ability negatively affects core process performance.
H5a. Senior Management Ability increases loan processing time.
H5b. Senior Management Ability hampers accurate risk assessment.
H6: Senior Management Ability negatively affects coordination and communication process performance.
H6a. Senior Management Ability hampers ease of communication.
H6b. Senior Management Ability hampers ease of coordination.
H6c. Senior Management Ability hampers ease of controlling.
H7: Complementary Resources negatively affect core process performance.
H7a. Complementary Resources increase loan processing time.
H7b. Complementary Resources hamper accurate risk assessment.
H7c. Complementary Resources increase processing cost.
H8: Complementary Resources negatively affect coordination and communication process performance.
H8a. Complementary Resources hamper ease of controlling.
H9: Software Misfits negatively affect core process performance.
H9a. Software Misfits increase loan processing time.
H9b. Software Misfits increase the difficulty of loan administration.
H9c. Software Misfits increase processing cost.
H10: Software Misfits negatively affect coordination and communication process performance.
H10a. Software Misfits hamper ease of communication.
H10b. Software Misfits hamper ease of controlling.
H10c. Software Misfits hamper ease of monitoring.
H11: Integration negatively affects core process performance.
H11a. Integration increases loan processing time.
H11b. Integration increases loan processing cost.
H12: Integration negatively affects coordination and communication process performance.
H12a. Integration hampers ease of communication.
H13: Customer Readiness negatively affects core process performance.
H13a. Customer Readiness increases loan processing time.
H13b. Customer Readiness hampers accurate risk assessment.
H13c. Customer Readiness increases processing cost.
H14: Customer Readiness negatively affects coordination and communication process performance.
H14a. Customer Readiness hampers ease of communication.
H14b. Customer Readiness hampers ease of controlling.
H15: Information Infrastructure negatively affects core process performance.

Table 7. 5: Summary of Results
H15a. Information Infrastructure increases loan processing time.
H15b Information Infrastructure hampers accurate risk assessment.
H15c. Information Infrastructure increases processing cost.
H16: Information Infrastructure negatively affects coordination and communication process performance.
H16a. Information Infrastructure hampers ease of communication.
H17: IT Infrastructure negatively affects core process performance.
H17a. IT Infrastructure increases processing cost.
H18: IT Infrastructure negatively affects coordination and communication process performance.
H18a. IT Infrastructure hampers ease of communication.
H18b. IT Infrastructure hampers ease of coordination.
H18c. IT Infrastructure hampers ease of document sharing.
H18d. IT Infrastructure hampers ease of controlling.
H18e. IT Infrastructure hampers ease of monitoring.
H19: Regulatory Environment negatively affects core process performance.
H19a. Regulatory Environment increases loan processing time.
H19b. Regulatory Environment increases processing cost.
H20: Regulatory Environment negatively affects coordination and communication process performance.
H20a. Regulatory Environment hampers ease of communication.
H20b. Regulatory Environment hampers ease of document sharing.

7.2.4 Credibility of the Study and Potential Limitations

The credibility of any research findings is very important, and every researcher must address and report on the credibility of a study's results (cf.Lincoln and Guba 1985). This was achieved in this study by establishing construct validity, internal validity, external validity and reliability as suggested by Lee (1989), Sarker and Lee (2002) and Yin (1994). In the theory development process, this study purposefully selected organisations (cf.Miles and Huberman 1984). Nine banks were selected for in-depth study based on the preliminary interviews with 30 banks.

First, this research is a single case study of the banking sector in Bangladesh. Thus, limitations of a single case study are applicable.

Second, an E2E loan process in the consumer and business lending sections of nine commercial banks is the embedded unit of analysis. Thus the findings of the thesis cannot be generalisable to all E2E Solutions' performance and value conversion contingencies. Although focusing on a single case (e.g. banks in Bangladesh), and a single process (e.g. E2E loan process) helps in managing the extraneous industry factors that might make the analysis complex, given the universal nature of E2E Solutions (connecting many parties of an E2E process), it can be expected that many of the findings are applicable to other processes and sectors.

7.3 Discussion and Conclusions

This section illustrates and discusses the contribution of the study to the business value of IT literature. It starts with theorising the empirical findings of this study in relation to the extant IT value literature (section 7.3.1). The contribution this research makes to the IT value literature and practice are documented (section 7.3.2). This section concludes by presenting the possibility for future extension of this research in relation to the business value of IT (section 7.3.3).

7.3.1 Discussing the Divide: Research Findings and Extant Literature

This section starts with discussing the E2E Solutions' performance in light of the existing business value of IT literature. This section then theorises the value conversion contingencies: senior management capability, complementary resources, software misfits, integration, customer readiness, information infrastructure, IT infrastructure and regulatory environment, in light of extant IT value contingency literature.

7.3.1.1 How E2E Solutions Deliver Business Value

Previous research (Barua *et al.* 1995; Davamanirajan *et al.* 2006; Mukhopadhyay *et al.* 1995) reported that the immediate effects of IT are manifest in process improvements. This study reinforces this fact, yet goes further by concluding that E2E Solutions improve organisational performance (e.g. productivity) by enabling core process performance (e.g. processing time, risk assessment, administration and processing cost) and coordination and communication process performance (e.g. communication, coordination, document sharing, controlling and monitoring). This study also explains how E2E Solutions impacted on process level aspects before impacting on an organisational level variable such as productivity.

While measuring the organisational impact of various types of IT (e.g. profit, productivity, competitive advantage), factors reported in the extant literature as intermediate process level performance of IT were: capacity utilisation, cost of coordination, inventory performance, service performance, satisfaction, efficiency, operational quality, process quality, lead time, etc. (cf.Wan *et al.* 2007). All these reported factors were considered as internal organisational process indicators. This is perhaps because of focusing on stand-alone IT value, and ignorance of the contemporary nature of the E2E business process (e.g.,Barua *et al.* 1995; Karimi *et al.* 2007). This research, as carried out in the E2E process context, found that the E2E Solutions impacted on both internal organisational processes (as reported in the extant literature) as well as on externally facing processes before impacting on organisational productivity (both

processes here were conceptualised as core process and coordination and communication processes).

Previous IT value research found that IT positively impacted on various intermediary process level aspects such as cycle time reduction (Lee 2001), processing cost (Lee 2001), communication (Barua *et al.* 2004) and coordination (Gattiker and Goodhue 2005) before impacting at organisational level. This research extended these findings in the E2E Solutions' context and found that E2E Solutions enabled these process performance aspects before improving organisational productivity. This research further identified process level performance aspects which were previously unreported in the extant IT value literature. Such process level aspects are: accurate risk assessment, ease of administration, ease of document sharing, ease of controlling and ease of monitoring.

Previous research measured the business value of stand-alone IT (Radhakrishnan *et al.* 2008), or BPR (Terziovski *et al.* 2003), or net-enabled business contexts (Barua *et al.* 2004) or EDI (Lee and Kim 2005). This research combines research on stand-alone IT, BPR and net-enabled technologies, as E2E Solutions capture IT capability and business process capability, and ensures internal and external process integration. This study extends previous research in the context of the E2E business process, and demonstrated that digital business capability (combination of IT capability and business capability) is required for deriving value. For example, for proper risk assessment, both IT platform and process reorientation are required, and in the risk assessment process the use of IT alone or business process reorientation alone would be minimal.

When comparing this study's findings with other literature on (stand-alone) IT value (Shang and Seddon 2000), it was revealed that deriving value from E2E Solutions is more complex and difficult than deriving value from stand-alone IT (e.g. ERP). For example, Shang and Seddon (2000) reported that ERP reduced the cycle time of payroll processing. However, payroll processing is considered to be within the organisational process where manager control is operational. But this study revealed that reduction of the loan processing cycle through E2E Solutions depends upon participation from internal organisational staff, customers, sanctioning bodies and support services. This applies to other process level variables (e.g. risk assessment) as well. This research thus found that value realisation of E2E Solutions is a 'collaborative' work of banks, customers, support services and sanctioning bodies, and network aspects must be considered in examining the derivation of IT value.

This study also supports the previous literature in that the process level is the appropriate level for studying IT value (cf.Karimi *et al.* 2007; Radhakrishnan *et al.* 2008) and not all process level variables impacted on organisational level performance (cf.Barua *et al.* 1995).

7.3.1.2 Senior Management Ability and Business Value of E2E Solutions

The literature comments on the mediating and moderating role of top management support for IT assimilation (Armstrong and Sambamurthy 1999; Liang *et al.* 2007) and IT value realisation (Weill 1992). These studies focused on the impact of positive aspects of top management (funding commitment, providing direction, performance monitoring) in IT assimilation and value realisation and all were conducted at organisational level. This study extends prior research on this concept as it was conducted at the business process level and illustrated how a lack of senior management ability hampered value realisation from E2E Solutions. This research conceptualised senior management ability by IT skills, prior experience of E2E Solutions, and resistance to and use of best practice of E2E Solutions. This research revealed that in an E2E process, senior management's 'hands-on' participation is required. But senior management does not have the required IT skills and experiences to execute the process using E2E Solutions. Therefore, banks could not improve processing time, risk assessment and coordination. Furthermore, senior management did not implement the controlling provision embedded in E2E Solutions. Overall, E2E Solutions did not create any positive impact on processing cost reduction.

7.3.1.3 Complementary Resources and Business Value of E2E Solutions

In this study, complementary resources are manifested by five aspects: (i) employees do not have appropriate IT skills; (ii) implementation team lacks the skills and experiences to interact and negotiate with the software vendors; (iii) internal training lacks sufficient focus on IT/software and change management issues; (iv) staff resist the introduction of new technology; and (v) there are insufficient financial resources to fully implement and customise software. Previous researchers (Barua *et al.* 1996; Chircu and Kauffman 2000; Park *et al.* 2007) studied the role of training, human resources and knowledge barriers in IT assimilation and value realisation in organisations. This research extends the research on this concept as many aspects (ii and v) appear to be unreported as value conversion contingencies and illustrates how a lack of complementary resources hampers the processing cycle, risk assessment, processing cost and controlling.

7.3.1.4 Software Misfits and Business Value of E2E Solutions

Various phenomenon of software misfits (e.g. types of software misfit, methodology for analysing misfit, sources of misfit, managing the misfit) are analysed in the extant IT literature (Sia and Soh 2002; Sia and Soh 2007; Strong and Volkoff 2010; Wu *et al.* 2007). However, software misfit has not been analysed in the previous literature as an IT value conversion contingency. This study revealed three aspects of software misfit: gaps existing between the functionalities of the software and organisational requirements (this appears inStrong and Volkoff 2010); software not supporting the country-specific requirements (this appears in Davison (Davison 2002; Soh *et al.* 2000), and localisation, customisation and updates of software being costly and slow, impeding the processing time, loan administration, processing cost, communication, controlling and monitoring. Therefore, organisational ability to improve productivity through E2E Solutions is hampered.

Furthermore, in terms of manifestation of software misfit, prior research (Strong and Volkoff 2010) represents functionality misfit in terms of deficiencies, where organisational requirements are not met by the software. This research extends the functionality misfit by adding 'excess functionalities', and demonstrates that deficiency in software hampers many of the process aspects; quick processing, loan administration, communication, controlling and monitoring. Excess functionalities are also a value conversion contingency, and that essentially increases the loan processing cost. While previous research (Marble and Lu 2007) reported that global software is costly for Asian organisations, this research demonstrated how, after implementation, customisation, localisation, update costing and services impeded organisations in deriving value from E2E Solutions.

7.3.1.5 Integration and Business Value of E2E Solutions

Prior researchers (Gagnon and Pinsonneault 2009; Srivardhana and Pawlowski 2007; Wagner 2006) reported that integration is important for value realisation from ERP Solutions. However, by integration previous research referred to the tight coupling of the system and process (Srivardhana and Pawlowski 2007), business internal alignment (Wagner 2006) and integration among multiple geographic business divisions (Gagnon and Pinsonneault 2009). An E2E process viewpoint is missing, however, in the extant literature. This study thus extends the previous research on this concept by capturing both internal and external process integration as it captures E2E process. This study illustrates how lack of integration hampers process time, processing cost, ease of communication and document sharing. Thus, this study indicates to the

managers that they should ensure internal and external integration for realisation of value from E2E Solutions.

7.3.1.6 Customer Readiness and Business Value of E2E Solutions

Customer readiness is reported as important in various studies of IS implementation success (Jaruwachirathanakul and Fink 2005; Mols 2000; Pikkarainen *et al.* 2004) and business value realisation (Barua *et al.* 2004). These studies measure customer readiness in terms of customer acceptance of online offerings and offer various reasons for customer non-acceptance including security (Larpsiri *et al.* 2002) and privacy (Hoffman *et al.* 1999). This study revealed that in an E2E process, customer interaction takes place in the stages of process initiation and processing the task, not just at the stage of delivery of services as captured in the extant literature. This research thus develops the customer readiness concept by capturing customer education, IT skills, access to IT, customer channel preferences and customers' fraudulent habits. This study's results revealed that a lack of customer readiness negatively impacted on processing time, risk assessment, processing cost, communication and controlling. This study empirically tested and demonstrated the observation of Kohli and Grover (2008) that the value realisation of IT is a 'collaborative' work between the organisation and customers. This study's results showed that both customer 'willingness' (e.g. channel preference) and 'ability' (e.g. education, skills and access) are required in order to participate in the value generation process. However, negative cultural aspects of customers (e.g. fraud) and lack of 'ability' also hamper banks in assimilating E2E Solutions properly.

7.3.1.7 Information Infrastructure and Business Value of E2E Solutions

Prior research (Davenport *et al.* 2001; Seddon *et al.* 2010) noted that improved access to relevant and accurate information by key organisational decision makers leads to increased organisational benefits. The impact of (external) information infrastructure on IT performance and use has been previously unreported. This research thus developed an information infrastructure concept and demonstrates the impact of (external) information infrastructure on organisational ability to realise value from E2E Solutions. In this research, information infrastructure is manifested by constraints in the area of database, identity of customers, information sharing among banks, accounting and auditing standards, and external credit rating agency. This study's results show that external information infrastructure hampers organisational ability to realise value by negatively impacting on: processing time, risk assessment, processing costs and communication.

7.3.1.8 IT Infrastructure and Business Value of E2E Solutions

IT infrastructure (Doern and Fey 2006; Kapurubandara 2006; Kshetri 2007; Molla and Licker 2005) has been previously reported as a main barrier to IT adoption and implementation in developing countries. Furthermore, Melville *et al.* (2004) also developed a conceptual IT value model and reported that national context (e.g., IT infrastructure) may impact upon IT value. But empirical studies on how IT infrastructure impacted on IT value are unreported. This study documents that the performance of E2E Solutions depends upon national IT infrastructure. It revealed that as E2E Solutions connect customers, support services, sanctioning bodies and geographically located offices, they are thus impacted by national IT infrastructure. It revealed that poor IT infrastructure (e.g. electricity, Internet and communication links) of the country negatively impact on organisational core process performance (e.g. processing time), and coordination and communication process performance (e.g. communication, coordination, document sharing, controlling and monitoring).

7.3.1.9 Regulatory Environment and Business Value of E2E Solutions

The regulatory environment (Zhu and Kraemer 2005; Zhu *et al.* 2004) has been previously reported as important for determining e-business payoffs in developing countries. This research extends the notion of regulatory environment to situations where an E2E business process is captured by enterprise solutions. First, while previous research (Zhu and Kraemer 2005; Zhu *et al.* 2004) focuses on the regulatory environment's impact on e-business payoffs at industry level, this research documented the regulatory impact at the business process level. Second, prior research focuses on regulatory impact at the stage of service delivery and acceptance. This research goes beyond this by illustrating how a regulatory environment impacted on both service delivery and acceptance, as well as on a bank's internal processing task (e.g. internal processing, document sharing). The study's results revealed that existing regulatory environments negatively impacted on processing time, processing cost, communication and document sharing.

7.3.2 Major Contributions of the Research

This research represents a timely response to the call for more research by Goh and Kauffman (2009) on IT value conversion contingencies, who mention, *'IT Value latency has not been analysed in the depth needed to reveal its causes'*. This thesis articulates the challenges of E2E Solutions in a developing country. Prior to this study, few studies had been examined by researchers in developed countries. Although the findings are subject to testing in the context of

different types of E2E Solutions and countries, the following contribution to the literature and practice can be presented.

7.3.2.1 Contributions to Literature

The implementation barriers of various IT innovations in developing countries are well discussed in the organisational literature (Huang and Palvia 2001; Soja 2008). What is less understood is how value conversion contingencies affect IT value (cf.Goh and Kauffman 2009) and particularly derivation of value from E2E Solutions. The contribution of this study to the E2E literature and wider IT literature is presented below.

7.3.2.1.1 Contribution to E2E Literature

First, one of the key contributions of the research is the conceptualisation of E2E Solutions. While traditional IT value research (Davern and Kauffman 2000; Melville *et al.* 2004) focuses upon the IT investment and its link with capabilities and then on value, Kohli and Grover (2008) suggest conducting future research on digital business capabilities (rather than IT alone) and how to maximise the business outcome of these capabilities. Kohli and Grover (2008) theoretically observe that IT becomes an integral part of the processes and is not separable from the product (e.g. IT-embeddedness). Thus, business process and IT need to be considered together, rather than separate to one another. In this research E2E Solutions are evidenced as Single Point Processing, Single Point Data Entry, Integrated Databases, and Automated and Integrated Processes. Thus, E2E Solutions capture both IT capabilities (e.g. Integrated Databases, and Automated and Integrated Processes) and business capabilities (e.g. Single Point Processing, Single Point Data Entry), identifying the digital business capabilities required to derive value (cf.Kohli and Grover 2008).

Second, while realisation of value from (stand alone) IT is difficult (cf.Davern and Kauffman 2000), realisation of value from E2E Solutions is much more difficult: this research's findings are particularly worth mentioning. As revealed, IT capability, business process reorientation, and internal and external integration together deliver value. It also revealed that value realisation from E2E Solutions is a 'collaborative' work between organisation, customers, support services, and sanctioning authorities, and not necessarily managers having direct control over all of the process participants. This research thus contributes to the existing IT value literature by documenting the complexity of value derivation from E2E Solutions.

Third, by combining how E2E Solutions deliver value, and how the business value of E2E Solutions is impacted by value conversion contingencies, this study develops an integrated

model of E2E Solutions' business value, thus contributing to the IT value literature. This research explains the existence of an IT productivity paradox in developing countries. This research is one of the early studies conducted at the business process level in developing countries, and has opened the 'black box' of IT use in organisations by describing the derivation of value from E2E Solutions. By identifying the value conversion contingencies, this study contributes to the IT value literature in developing countries, where the IT productivity paradox exists, but research on IT value conversion contingencies is scare (cf.Heeks 2010).

7.3.2.1.2 Contribution to the wider IS Literature

First, by identifying an additional set of constructs and indicators of value conversion contingencies, this study contributes to the existing IT value literature. By adopting the Technology-Organisation-Environment (cf.Tornatzky and Fleischer 1990) theoretical lens, this study identifies the factors that impact on E2E Solutions' value, many of which were previously unreported in the IT value literature. Additional variables were identified: complementary resources, software misfits, integration, information infrastructure and IT infrastructure. This study also confirms the impact of previously reported IT value contingences in the E2E Solutions' context: senior management ability, customer readiness and the regulatory environment. Besides identifying new variables and proving old ones, this study provides a rich explanation of how value conversion contingencies negatively impact on the business value of E2E Solutions.

Second, this study integrates both the business value of stand-alone IT (e.g. ERP) (e.g.,Karimi *et al.* 2007) and Supply Chain Management/net-enabled technologies' (e.g.,Barua *et al.* 2004) studies into one model as E2E Solutions capture both within organisational processes as well as processes that move across the organisational territory and integrate customers, suppliers and other process participants. The prevalent literature rarely studied the business value of IT in an E2E process context (e.g. E2E Solutions).

Third, while prior process level study suffers from the problem of aggregation of processes (e.g.,Karimi *et al.* 2007), and focuses on process horizontally (e.g. function, unit) (e.g.,Gattiker and Goodhue 2005), this research filled the gaps in the previous research by considering E2E business processes that cut across functional and organisational boundaries. Furthermore, this research design focused on 'micro' (e.g. granular) aspects and was thus able to assess the IT value and identify the value conversion contingencies in an accurate way. This research design also fulfilled the concept of 'locus of control' and 'locus of value' for the firm (Davamanirajan *et al.* 2006).

Fourth, this research is one of few studies that use both Absorptive Capacity Theory (Cohen and Levinthal 1990) and the TOE framework (Tornatzky and Fleischer 1990) in studying IT value in an 'extended enterprise' context (i.e. E2E Solutions). While previous IS research on Absorptive Capacity Theory mostly discusses the absorptive capacity in an ERP context (e.g.,Srivardhana and Pawlowski 2007) and inter-organisational system contexts (e.g.,Malhotra *et al.* 2005), this research extends the previous research on Absorptive Capacity Theory by theorising an E2E Solution and the business value of E2E Solutions. This research is one of the early studies to adopt a TOE framework for theorising and identifying process level value conversion contingencies.

7.3.2.2 Contributions to Practice

Many of this study's findings offer guidance to management, IT practitioners and policy makers.

First, it provides a framework to help managers assess value conversion contingencies. Managers can understand what should go 'right' to achieve the anticipated value from E2E Solutions and they can then respond accordingly. By identifying the value conversion contingencies (e.g. Senior Management Ability, Complementary Resources, Software Misfits, Integration, Customer Readiness, Information Infrastructure, IT Infrastructure and Regulatory Environment) and illustrating the ways of impacting on business value, this study guides managers on how to manage them in order to make investment on E2E Solutions profitable.

Second, the negative role of senior management particularly guides senior management on the level of IT skills, experience and attitude required in the post-implementation stage to derive value. Besides their own capability, senior management needs to ensure the required complementary resources in organisations in order to derive value from E2E Solutions. As part of the implementation of E2E Solutions, bank management implements software, therefore, software needs to be properly customised and localised to fulfil organisational requirements. While implementing commercial software, the terms and conditions, provision of updates and localisation need to be properly checked and scrutinised prior to embarking on a software project. Software provides the capability to integrate both internal and external processes, and bank management needs to ensure this integration to derive value as lack of integration negatively impacts on the business value of E2E Solutions. As the business value of E2E Solutions is impacted by lack of customer readiness, a proactive role from bank managers is required to train customers and remove their cultural inertia. Furthermore, the right selection of customers is also important for deriving value of E2E Solutions. Bank managers (local and government banks) should assess the 'environment' status of the country before implementing

E2E Solutions if they want to realise the full potential. If implemented, managers need to be aware of the internal and external value conversion contingencies. In case of external value conversion contingencies, managers need to engage themselves in negotiation with government to establish information infrastructure, reliable IT infrastructure and a technology-friendly regulatory environment. Alternatively, bank managers can also structure their business model in such a way that can negate/limit the environmental influence while deriving value from E2E Solutions.

Third, this research also offers implications for policy makers as environmental factors have emerged as important in shaping E2E Solutions' value. Governments should accelerate E2E Solutions' implementation and use in organisations by ensuring information infrastructure and IT infrastructure. Governments should enact rules for IT and make existing rules technology-friendly.

7.3.3 Directions for Future Research

This study has provided a valuable foundation for the further study of E2E Solutions' performance and value conversion contingencies. This research is also an initial empirical study on E2E Solutions' value and value conversion contingencies. This study thus provides a base upon which future research on E2E Solutions' value and value conversion contingencies can build. However, this research is exploratory in nature and the findings are restricted by the limitations of the chosen research approach and procedures. Therefore, this area now requires further study.

This research is focused on E2E loan processing, and is based on a single case study of the banking sector in Bangladesh. Therefore, the findings of the study cannot be generalisable to other E2E Solutions' performance in developing countries. Consequently, the research model developed needs to be tested in a larger sample context. This framework can be validated in another E2E business process context within the bank (such as Letter of Credit Process) or in other industries (i.e. brokerage, leasing, insurance) in other developing countries.

As mentioned, this research followed a case study research approach. A follow-on study can be conducted using an action research approach for operationalisation of the E2E Solutions' value model to help managers derive value from E2E Solutions.

The value realisation from E2E Solutions is found to be an example of 'value co-creation' where participation of all process participants is required to derive value. This research is conducted in the context of organisations. Future research may be conducted on how partners (e.g. customers,

support services, regulatory agencies) co-create value and on the barriers that partners face in the value co-creation process.

As revealed, in an E2E Solution, value realisation is essentially a ‘collaborative' work of all process participants. Nevertheless, not all parties have access to what could be considered an equitable share of IT value. Furthermore, ‘IT value externalities’ (i.e. one party may benefit at the expense of others) may exist. Therefore, future research needs to consider how structuring the distribution of IT value among participants might help remove IT value externalities. In addition, research on the role of regulators in this process is required.

7.4 Summary

This study documented the derivation of business value from E2E Solutions. The emergence of E2E Solutions and existence of the IT productivity paradox in developing countries has increased the urgency for an understanding of E2E Solutions’ value and value conversion contingencies. Drawing upon the Absorptive Capacity Theory and the TOE framework, this study provided a theoretical support for how E2E Solutions ensure both IT capability and business capability to deliver higher level value such as productivity by impacting on core process and coordination and communication process aspects. Another highlight of the study is to demonstrate the negative effect of value conversion contingencies on the business value of E2E Solutions. This study seeks to reduce the paucity of research on IT value conversion contingencies, especially in the developing countries. However, this study was exploratory in nature and the research findings need to be further investigated.

Appendices

Appendix 1: Interview Guide

Project Title: End-to-End Solutions (E2E): An Exploration of Value Conversion Contingencies in a Developing Country

Context/Introducing

- ✓ Explain the purpose of the study.
- ✓ Explain the role of the interviewee.
- ✓ Give a brief description about the questions to be asked.

Part A

Demographic Profile of the Interviewee

1. Respondent's Working Department: (1- IT/MIS, 2- Loan Operations, 3- Foreign Exchange, 4- Credit Card, 5- Marketing, 6- General Banking)
2. Respondent's Job Title: PO/SPO/AVP)/Sr AVP/VP/SVP/EVP/DMD/MD
3. Respondent's Job Position: (1- Mid Management, 2- Top Management)
4. Respondent's Total Job Experience in the Banking Sector: _____Years
5. Respondent's Educational Background: (1-Bachalor, 2-Bsc in ICT/Computer Networking/EEE, 3- Masters/MBA, 4- M.Phill, 5-PhD, and details_____)
6. Any training on IT/MIS received by the respondent? (1-Yes, 2-No)
7. If yes in Question 6, then number of training received at home___and abroad___.

Part B

Organisational Background[3]

8. Bank Type: (1=Government Owned, 2= Local Owned, 3= Foreign Bank).
9. Year of Bank's Establishment.
10. Bank's Total Staff Size.
11. Bank's branches size.
12. Composition of Senior Management Team and their Background.
13. Bank's Total Asset Size (in million TK).
14. Describe the types of loans provided by the bank.
15. Technological Status in the Bank;

[3] Only one respondent in each bank filled this part.

Appendix

Technology	*Year of Implementation*	*Name of the Vendors*
Core Banking		
Workflow		
Phone Banking		
SMS Banking		
Internet Banking		
Card		
ATM		
Electronic Fund Transfer		
Point of Sale (POS)		
Others		

Part C

E2E Loan Process and E2E Solutions

16. Describe the sequence of activities that take place in an E2E loan approval process. Elaborate with examples.
17. Illustrate the role of various actors (bank staff, regulators, and support parties) in an E2E loan approval process.
18. E2E Solutions facilitate the unimpeded flow of an E2E business process:

    a) Explain the IT capabilities in the organisation that facilitate an E2E loan process.
    b) Describe the business capabilities in the organisation that facilitate an E2E loan process.

Part C

RQ 1: How do E2E Solutions deliver business value?

19. Examine how E2E Solutions improve:
    a) The internal loan processes; and
    b) Externally facing loan processes.

    Ascertain how those process performances improve the organisational performance.

For each types of performance aspects, demonstrate how E2E Solutions improve process level performance aspects which in turn impact the organisational performance aspect.	**Process Level Performance**		**Organisational Performance**
	Internal Process	**Externally Facing Process**	
Impact of E2E Solutions.	Describe the aspect(s) of internal loan process that is facilitated by E2E Solutions.	Describe the aspect(s) of externally facing process that is facilitated by E2E Solutions.	Describe the aspect(s) of organisational performance that is facilitated by various aspects of internal and externally facing process.
The mechanism of value delivery process of E2E Solutions.	Determine how E2E Solutions improve the internal processes.	Determine how E2E Solutions improve the externally facing processes.	Determine how the internal and externally facing processes facilitate the organisational performance.
Roles of actors (staff, regulators, support services) in the value derivation from E2E Solutions.	Determine how the various actors of E2E Solutions play roles in the derivation of value from E2E Solutions.	Determine how the various actors of E2E Solutions play roles in the derivation of value from E2E Solutions.	

20. Describe (if any) the impact of existing regulatory framework for banking on the derivation of value from E2E Solutions.
21. Describe (if any) the impact of public infrastructure on the derivation of value from E2E Solutions.

Part E

RQ 2: How is the achievement of business value from E2E Solutions impacted by value conversion contingencies?

22. Different types of value conversion contingencies for E2E Solutions in developing countries:

    a) Technology factors;

    b) Organisation factors; and

    c) Environment factors.

For each types of factors, determine how each type of factors impeded the derivation of value from E2E Solutions:	**Technology factors**	**Organisation factors**	**Environment factors**
Different technology, organisation and environment value conversion contingencies.	Determine all the technological value conversion contingencies.	Determine all the organisational value conversion contingencies.	Determine all the environmental value conversion contingencies.
How various process level performances of E2E Solutions are impeded by value conversion contingencies?	Describe how the technological factors impeded the various process level performances of E2E Solutions.	Describe how the organisational factors impeded the various process level performances of E2E Solutions.	Describe how the environmental factors impeded the various process level performances of E2E Solutions.
How each organisation handles the value conversion contingencies?	Describe how the bank handles technological factors to ensure the derivation of value from E2E Solutions.	Describe how the bank handles all the organisation specific value conversion contingencies.	Describe the organisation strategy to negate/lessen the impact of environmental value conversion contingencies on derivation of value from E2E Solutions.

23. For above; prompt as to how/if the following affect the derivation of business value from E2E Solutions in a developing country;
    i. Public Infrastructure;
    ii. Regulatory Environment;
    iii. Cultural Factors;
    iv. Demographic

Appendix 2: Ethics Approval Letter

Date: 5 April 2009

Approval No: 09629

Dear Mr Riyadh,

Following your submission of further information, the Australian School of Business Human Research Ethics Advisory Panel has recommended to your Head of School and the Human Research Ethics Committee that this project, being of minimal ethical impact, may proceed.

This approval is valid for 12 months from the date of this letter.

Yours sincerely

A/Prof Aybuke Aurum
(Convenor)
(Australian School of Business Human Research Ethics Advisory Panel)
cc: Prof G Low (HofS, ISTM)
****
Assoc. Prof. Aybuke Aurum
Information Systems, Technology & Management
Australian School of Business
University of New South Wales
Sydney NSW 2052 Australia
****

Appendix 3: Description of E2E Solutions

E2E Solutions	Definition
Single Point Processing	In a single point loan processing, one central unit (usually head office) is responsible for market, price, approval, service, compliance and collection of loans. Branches are responsible for selling loan products and building customer relationship, thereby separating sales goals from credit decisions. Single point processing makes the loan process lean; ensures proper utilization of resources, and ensures proper risk assessment by separating the marketing task of the loan from the processing task. Single point processing also ensures consistent decisions as all the loan applications are pooled in a single location from geographically dispersed branches. Single point loan processing avoids duplication of work as loan applications are pooled in a single location and thus result in no hand-offs.
Single Point Data Entry	Same data is entered into the system once. Avoids duplication of work and redundancy of data entry and ensures system integration. Data authenticity is high and chances for error become less.
Integrated Databases	Attainment of single sources of truth is possible once the databases are integrated. When databases are integrated, a single identification number will rule for all transactions of single customers.
Automated and Integrated Processes	Entire E2E process flows seamlessly without human intervention. Automated process also helps organization to delineate electronically the processes, stages, roles of each person and that requires less manpower and results in automated decision and paperless transactions. Automated and integrated processes have three distinct stages: (i) clients' interface process, (ii) front-end pre-disbursement process, and (iii) back-end process. (i) Clients' Interface Process: Clients' interaction with banks occurs at two stages. Firstly, banks collect loan application and documentation from clients, and further communicate with the clients to process a loan. Secondly, make payments and receive parts, once the loan has been sanctioned and disbursement into clients' account and realisation of the same. Technologies used in the clients' interface processes are website, tele-banking, SMS banking, Internet banking, ATM, POS, EDI and intranet. (ii) Front-end pre-disbursement process: This process starts once the loan application is received from customers and finishes once the approval/reject decision has been made. During this stage, lots of loan officers are involved, from bottom to top, depending upon the loan size. Bank has to contact regulatory bodies as well as support services for data and approval decisions. Technologies used in the process are PCs, Decision Support System, intranet, Work Flow Management System and EDI. (iii) Back-end process: This process starts once the loan approval decision has been made. It has basically three parts: accounting, realisation and reporting. Core banking solution is used in the process.

Appendix 4: IT use in the Automated and Integrated Processes

Technologies	Definition
Website	A website is a collection of interconnected WebPages, hosted under a common domain. Generally, all the pages of website are located on the same server, and have the same basic layout and interface, and are prepared and maintained as a collection of information by a person, group, or organization.
Tele-Banking	Tele-banking refers to the services provided through phone that requires the customers to dial a particular telephone number to have access to an account which provides several options of services.
SMS Banking	SMS banking is a technology-enabled service offering from banks to its customers, permitting them to operate selected banking services over their mobile phones using SMS messaging. SMS banking services are operated using push and pull message. Push messages are those sent from the bank to the customers, and pull services are provided on request of the bank's customers.
Internet Banking	Internet banking refers to the use of the Internet as a remote delivery channel for banking services. It is nothing but the WWW through which banks can reach their customers directly without any intermediaries. It permits the customer to conduct transactions from any terminal with access to the Internet.
Automated Teller Machine (ATM)	An electronic device used by bank customers to process account transactions. Typically, a user inserts into the ATM a special plastic card that is encoded with information on a magnetic strip. The strip contains an identification code transmitted to the bank's central computer by modem. Basically, an ATM functions as a cash counter of a bank branch.
Point of Sale (POS)	An electronic device having features to identify the special plastic card that is encoded with information on a magnetic strip. Actually, the device functions as a receiving desk of a cash counter of a bank branch.
Electronic Data Interchange (EDI)	Electronic Data Interchange (EDI) is the structured transmission of data between organizations by electronic means. It is used to transfer electronic documents or business data from one computer system to another computer system, i.e. from one trading partner to another trading partner without human intervention.
Personal Computer (PC)	A computer is a device that accepts and stores information and manipulates it for some result based on a program or sequence of instructions on how the data is to be processed.
Decision Support System	This software program provides credit decisions. It has an artificial intelligence and credit scoring and generates automated scoring once the data are inputted into the systems.
Intranet/Email	An intranet is a private computer network that uses Internet Protocol technologies to securely share any part of an organization's information or network operating system within that organization. Electronic mail, commonly called email or e-mail, is a method of exchanging digital messages across the Internet or other computer networks.
Workflow Management System	A workflow management system is a computer system that manages and defines a series of tasks within an organization to produce a final outcome or outcomes. A workflow management system is found suitable when many persons are to work jointly for an outcome.
Core Banking Solutions	Core Banking Solutions are the backbone of products and services which a bank offers. CORE stands for "Centralized Online Real-time Exchange". Core Banking Solutions provide a platform where communication technology and information technology are merged to suit core needs of banking. The computer software is developed to perform

Appendix

Technologies	Definition
	core operations of banking like recording of transactions, passbook maintenance, and interest calculations on loans and deposits, customer records, balance of payments and withdrawals are done. This software is installed at different branches of the bank and then interconnected by means of communication lines like telephones, satellite,Internet etc.

Bibliography

Adner, R. and C. E. Helfat (2003). "Corporate effects and dynamic managerial capabilities." Strategic Management Journal **24**: 1011-1025.

Al-Mashari, M. (2000). Constructs of Process Change Management in ERP Context: A Focus on SAP R/3. Americas Conference on Information Systems, Long Beach, California.

Alavi, M. and P. Carlson (1992). "A review of MIS research and disciplinary development." Journal of Management Information Systems: JMIS **8**(4): 45-62.

Albadvi, A., A. Keramati and J. Razmi (2007). "Assessing the impact of information technology on firm performance considering the role of intervening variables: Organizational infrastructures and business processes reengineering." International Journal of Production Research **45**(12): 2697−2734.

Allison, B. (1993). An Introduction to Research. Leicester, Ariad Associates.

Alpar, P. and M. Kim (1990). "A Microeconomic Approach to the Measurement of Information Technology Value." Journal of Management Information Systems **7**(2): 55-69.

Alvesson, M. and S. Deetz (2000). Doing critical management research. London, Sage Publications.

Amelinckx, I., S. Muylle and A. Lievens (2008). "Extending Electronic Sourcing Theory: An Exploratory Study of Electronic Reverse Auction Outcomes." Electronic Commerce Research and Applications **7**(1): 119-133.

Amit, R. and P. J. H. Schoemaker (1993). "Strategic Assets and Organizational Rent." Strategic Management Journal **14**: 33-46.

Andersen, T. J. and N. J. Foss (2005). "Strategic opportunity and economic performance in multinational enterprises: The role and effects of information and communication technology." Journal of International Management **11**: 293-310.

Andrew, T. N. and D. Petkov (2003). "The need for a systems thinking approach to the planning of a rural telecommunications infrastructure." Telecommunications Policy **27**(1): 75-93.

Armstrong, C. P. and V. Sambamurthy (1999). "Information technology assimilation in firms: The influence of senior leadership and IT infrastructures." Information Systems Research **10**(4): 304-327.

Ashurst, C., N. F. Doherty and J. Peppard (2008). "Improving the Impact of IT Development Projects: The Benefits Realization Capability Model." European Journal of Information Systems **17**(4): 352-370.

Au, Y. A., K. H. Goh, R. J. Kauffman and F. J. Riggins (2009). Planning IT investments for high payoffs: A rational expectations approach to gauging potential and realized value for the changing marketplace. Planning for Information Systems, Advances in Management Information Systems. Sharpe, Armonk, NY**:** 274-301.

Augier, M. and D. J. Teece (2009). "Dynamic capabilities and the role of managers in business strategy and economic performance." Organization Science **20**(2): 410-421.

Avgerou, C. (2003). The link between ICT and economic growth in the discourse of development. The International Federation of Information Processing, IFIP 9.4 and 8.2 Joint Conference on Organizational Information Systems in the Context of Globalization, Dordrecht, The Netherlands, Kluwer.

Avgerou, C. (2008). "Information systems in developing countries: a critical research review." Journal of Information Technology **23**: 133-146.

Badescu, M. and C. Garcés-Ayerbe (2009). "The impact of information technologies on firm productivity: Empirical evidence from Spain." Technovation **22**(2): 122-129.

Bakos, J. Y. and B. Nault (1997). "Ownership and investment in electronic networks." Information Systems Research **8**(4): 321-341.

Bakos, J. Y. and M. E. Treacy (1986). "Information Technology and Corporate Strategy: A Research Perspective." MIS Quarterly **10**(2): 107-119.

Ballantyne, D. (2004). "Dialogue and its role in the development of knowledge." Journal of Business and Industrial Marketing **19**(2): 114-123.

Bangladesh Bank (2009). "Bangladesh Bank." http://www.bangladesh-bank.org/.

Bangladesh Bank (2011). "Bangladesh Bank." http://www.bangladesh-bank.org/.

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

Baroudij, J., M. H. Olsona and N. D. B. Ives (1986). "An Empirical Study of the Impact of User Involvement on System Usage and Information Satisfaction." Communication of the ACM **29**: 232-238.

Barua, A., C. H. Kriebel and T. Mukhopadhyay (1995). "Information technologies and business value: An analytic and empirical investigation." Information System Research **1**(6): 3-23.

Barua, A., S. C. H. Lee and A. B. Whinston (1996). "The calculus of reengineering." Information Systems Research **7**(4): 409-428.

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

Baskerville, R., S. Pawlowski and E. McLean (2000). Enterprise resource planning and organizational knowledge: patterns of convergence and divergence. The International Conference on Information Systems, Brisbane, Australia.

Beaudry, A. and A. Pinsonneault (2005). "Understanding user responses to information technology: A coping model of user adaptation." MIS Quarterly **29**: 493-525.

Belleflamme, P. (2001). "Oligopolistic Competition, IT Use for Product Differentiation and the Productivity Paradox." International Journal of Industrial Organization **19**(1-2): 227- 248.

Benbasat, I., D. K. Goldstein and M. Mead (1987). "The Case Research Strategy in Studies of Information Systems." MIS Quarterly(September): 369-386.

Benbasat, I. and R. Weber (1996). "Rethinking ‘‘diversity’’ in information systems research." Information Systems Research **7**(4): 389-399.

Bibliography

Benbasat, I. and R. W. Zmud (2003). "The identity crisis within the discipline: Defining and communicating the discipline's core properties." MIS Quarterly **27**(2): 183-194.

Bernard, H. R. (2000). Social research methods., Thousand Oaks, CA: Sage.

Bharadwaj, A. (2000). "A Resource-Based Perspective on Information Technology Capability and Firm Performance: An Empirical Investigation,." MIS Quarterly **24**(1): 169-196.

Bharadwaj, A. S., S. G. Bharadwaj and B. Konsynski (1999). "Information Technology Effects on Firm Performance as Measured by Tobin's q." Management Science **45**(7): 1008-1024.

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

Boateng, R., A. Molla and R. Heeks (2009). E-commerce in Developing Economies: A Review of Theoretical Frameworks and Approaches. Emerging Markets and E-commerce in Developing Economies. K. Rouibah, O. Khalil and H. A. Ella. Hershey, PA, IGI.

Bogdan, R. and S. Biklen (1992). Qualitative research for education. Boston, MA, Allyn and Bacon.

Braa, K. and R. Vidgen (1999). "Interpretation, intervention, and reduction in the organizational laboratory: a framework for in-context information system research." Accounting, Management and Information Technologies **9**(1): 25-47.

Brocklesby, J. and S. Cummings (1996). "Foucault plays Habermas: an alternative philosophical underpinning for critical systems thinking." Journal of the Operational Research Society **47**: 741-775.

Brown, E. (2002). Accelerating the uptake of e-commerce by small and medium enterprises, Small Enterprises Telecommunications Center (SETEL).

Brynjolfsson, E. (1993). "The productivity paradox of information technology." Communication of the ACM **36**(12): 66-77.

Brynjolfsson, E. (1996). "The contribution of information technology to consumer welfare." Information Systems Research **7**(3): 281-300.

Brynjolfsson, E. and L. Hitt (2000). "Beyond Computation: Information Technology, Organizational Transformation and Business Performance." Journal of Economic Perspectives **14**(4): 23-48.

Brynjolfsson, E. and L. M. Hitt (1995). " Information technology as a factor of production: The role of differences among firms." Economic Innovation New Technology **3**(3): 183-199.

Brynjolfsson, E. and L. M. Hitt (1996). "Paradox lost? Firm-level evidence on the returns to information systems spending." Management Science **42**(4): 541-558.

Brynjolfsson, E. and S. Yang (1996). Information Technology and Productivity: A Review of the Literature. Advances in Computers. M. Zelkowitz. **43**.

Brynjolfsson Erik and L. Hitt (1998). "Beyond the productivity paradox." Communication of the ACM **41**: 49-55.

Bubak, O., R. L. Farley, C. Goebels, P. Gonzalez, T. Gulledge and R. Russell (2006). "Implementing SAP from end-to-end business process scenarios." International Journal of Management and Enterprise Development **3**(5): 419 - 437.

Burrell, G. and G. Morgan (1979). Sociological Paradigms and Organizational Analysis. London, UK, Heinemann.

Cachon, G. and M. Fisher (2000). "Supply chain inventory management and the value of shared information." Management Science **46**(8): 1032-1048.

Cata, T. and S. M. Lee (2006). "Adoption of Web-Based Applications in the Financial Sector: The Case of Online Insurance." Journal of Internet Commerce **5**(2): 41-61.

Cavaye, A. L. M. (1996). "Case study research: a multi-faceted research approach for IS." Information Systems Journal **6**: 227-242.

Cecez-Kecmanovic, D. (2010). "Doing critical information systems research - arguments for a critical research methodology." European Journal of Information Systems Management: 1-16.

Chan, Y. E. (2000). "IT Value: The Great Divide Between Qualitative and Quantitative and Individual and Organizational Measures." Journal of Management Information Systems **16**(4): 225-261.

Chatfield, A. T. and P. Yetton (2000). "Strategic Payoff from EDI as a Function of EDI Embeddedness." Journal of Management Information Systems **16**(4): 195-224.

Chatterjee, D., R. Grewal and V. Sambamurthy (2002). "Shaping up for e-commerce: Institutional enablers of the organizational assimilation of Web technologies." MIS Quarterly **26**(2): 65-89.

Chau, P. Y. K. and K. Y. Tam (1997). "Factors affecting the adoption of open systems: an exploratory study." MIS Quarterly **21**(1): 1-24.

Checkland, P. (1981). Systems Thinking, Systems Practice. Chichester, John Wiley.

Chen, M. (2005). "An analysis of the driving forces for Web services adoption." Decision Sciences and Management Information Systems **3**: 265-279.

Chen, M., D. Zhang and L. Zhou (2007). "Empowering collaborative commerce with Web services enabled business process management systems." Decision Support Systems **43**: 530-546.

Chen, W. and R. Hirschheim (2004). "A paradigmatic and methodological examination of information systems research from 1991 to 2001." Information Systems Journal **14**(3): 197-235.

Chen, Y., M. Lin and C. Chang (2009). "The positive effects of relationship learning and absorptive capacity on innovation performance and competitive advantage in industrial markets." Industry Marketing Management **38**: 152-158.

Chen, Y. H. and W. T. Lin (2009). " Analyzing the relationships between information technology,inputs substitution and national characteristics based on CES stochastic frontier production models." International Journal of Production Economics **120**(2): 552-569.

Cheng, T. C. E. and I. S. F. Chiu (2008). "Critical success factors of business process re-engineering in the banking Industry." Knowledge and Process Management **15**(4): 258-269.

Cheung, K. L. and H. L. Lee (2002). "The inventory benefit of shipment coordination and stock rebalancing in a supply chain." Management Science **48**(2): 300-306.

Chircu, A. M. and R. J. Kauffman (2000). "Limits to value in electronic commerce-related IT investments." Journal of Management Information Systems **17**(2): 59-80.

Chircu, A. M., R. J. Kauffman and D. Keskey (2001). "Maximizing the Value of Corporate Travel Reservation Systems." Communication of the ACM **44**(1): 57-63.

Chong, S. and G. Pervan (2007). "Factors Influencing the Extent of Deployment of Electronic Commerce for Small-and Medium-Sized Enterprises." Journal of Electronic Commerce in Organizations **5**(1,January-March): 1-29.

Chowdhury, A. (2003). "Information Technology and Productivity Payoff in the Banking Industry: Evidence from the Emerging Markets." Journal of International Development **15**(6).

Chowdhury, S. K. (2006). "Investments in ICT-capital and economic performance of small and medium scale enterprises in East Africa." Journal of International Development **18**: 533-552.

Chua, W. F. (1986). "Radical Developments in Accounting Thought." The Accounting Review **61**: 601-632.

Chwelos, P., I. Benbaset and A. S. Dexter (2001). "Research report: Empircal test of an EDI adoption model." Information System Research **12**(3): 304-321.

Cohen, W. and D. Levinthal (1990). "Absorptive capacity: A new perspective on learning and innovation." Administrative Science Quarterly: 128-152.

Cohen, W. M. and D. Levinthal (1994). "Fortune favors the prepared firm." Management Science **40**(2): 227-251.

Cook, T. D. and D. Campbell (1979). Quasi-experimentation: Design and Analysis Issues for Field Settings. Chicago, Rand McNally College Publishing Company.

Corrocher, N. and A. Ordanini (2002). "Measuring the digital divide: A framework for the analysis of cross-country differences." Journal of Information Technology **17**: 9-19.

Crook, C. and R. Kumar (1998). "Electronic Data Interchange: a multi-industry investigation using grounded theory." Information and Management **34**: 75-89.

Damanpour, F. and M.Schneiderw (2006). "Phases of the Adoption of Innovation in Organizations: Effects of Environment,Organization and Top Managers." British Journal of Management **17**: 215-236.

Darke, P., G. Shanks and M. Broadbent (1998). "Successfully completing case study research: combining rigor, relevance and pragmatism." Information Systems Journal **8**: 273-289.

Datta, P. I. (2011). "A preliminary study of ecommerce adoption in developing countries." Information Systems Journal **21**(1): 3-32.

Davamanirajan, P., R. J. Kauffman, C. H. Kriebel and T. Mukhopadhyay (2006). "Systems Design, Process Performance, and Economic Outcomes in International Banking." Journal of Management Information Systems **23**(2): 65-90.

Davamanirajan, P., T. Mukhopadhyay and C. H. Kriebel (2002). "Assessing the business value of IT in global wholesale banking: The case of trade services." Journal of Organizational Computing and Electronic Commerce **12**(1): 5-16.

Davenport, T. (1993). Process Innovation. Cambridge, MA, Harvard Business School Press.

Davenport, T., J. Harris, D. De Long and A. Jacobson (2001). "Data to knowledge to results: building an analytic capability." California Management Review (Fall) **42**(2): 117-138.

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

Davenport, T. H., J. G. Harris and S. Cantrell (2004). "Enterprise systems and ongoing process change." Business Process Management Journal **10**(1): 16-26.

Davern, M. J. and R. J. Kauffman (2000). "Discovering Potential and Realizing Value from Information Investments." Journal of Management Information Systems **16**(4): 121-143.

David, P. (1990). "The dynamo and the computer: An historical perspective on the modern productivity paradox." American Economic Review **80**(2 (May)): 35-61.

Davison, R. (2002). "Cultural Complications of ERP." Communications of the ACM **45**(7): 109-111.

Dayal, U., M. Hsu and R. Ladin (2001). Business process coordination: state of the art, trends, and open issues. 27th International Conference on Very Large Data Base. San Francisco, Morgan Kaufmann Publishers Inc**:** 3-13.

Dedrick, J., V. Gurbaxani and K. L. Kraemer (2003). "Information Technology and Economic Performance: A Critical Review of the Empirical Evidence." ACM Computing Surveys **35**(1): 1-28.

Dedrick, J. and K. L. Kraemer (2001). "China IT Report." The Electronic Journal on Information Systems in Developing Countries **6**(2): 1-10.

Dennis, A. R. and J. S. Valacich (2001). "Conducting Experimental Research in Information Systems." Communications of the Association for Information Systems **7**(5).

Devaraj, S. and R. Kohli (2000). "Information Technology Payoff in the Healthcare Industry: A Longitudinal Study." Journal of Management Information Systems **16**(4): 41-67.

Devaraj, S. and R. Kohli (2002). The IT Payoff: Measuring Business Value of Information Technology Investment. Upper Saddle River, NJ, Financial Times Prentice-Hall.

Devaraj, S. and R. Kohli (2003). "Performance impacts of information technology: Is actual usage the missing link?" Management Science **49**(3): 273-289.

Dewan, S. and K. L. Kraemer (1998). "International dimensions of the productivity paradox." Communications of the ACM **41**(8): 56-62.

Dewan, S. and K. L. Kraemer (2000). "Information Technology and Productivity: Evidence from Country-Level Data." Management Science **46**(4): 548-562.

Dewan, S. and C. K. Min (1997). "The substitution of information technology for other factors of production: a firm level analysis"." Management Science **43**(12): 1660-1675.

Dey, I. (1999). Grounding grounded theory: Guidelines for qualitative inquiry. San Diego, CA, Academic.

Doern, R. R. and C. F. Fey (2006). "E-commerce developments and strategies for value creation: The case of Russia." Journal of World Business **41**: 315-327.

Dong, L., D. Neufeld and C. Higgins (2009). "Top management support of enterprise systems implementations." Journal of Information Technology **24**(1): 55- 80.

Dong, S., S. X. Xu and K. X. Zhu (2009). " Information technology in supply chains: the value of IT enabled resources under competition." Information Systems Research **20**(1): 18-32.

Dube, L. and G. Pare (2003). "Rigor in Information Systems Positivist Case Research: Current Practice, Trends, and Recommendations." MIS Quarterly **27**(4): 597-635.

Dublin, R. (1969). Theory Building. New York, Free Press.

Dyer, J. H. and H. Singh (1998). "The relational view: Cooperative strategy and sources of inter-organizational competitive advantage." Accademy of Management Review **23**: 660-679.

Easterby-Smith, M., M. A. Lyles and E. Tsang (2008). "Inter-organizational knowledge transfer: Current themes and future prospects." Journal of Management Study **45**(4): 661-674.

Easterby-Smith, M., R. Thorpe and A. Lowe (1991). Management Research: an Introduction. London, Sage.

Efendioglu, A. M. and V. F. Yip (2004). "Chinese culture and e-commerce: an exploratory study." Interacting with Computers **16**(1): 45-62.

Eisenhardt, K. and M. Graebner (2007). "Theory building from cases: Opportunities and challenges." Academy of Management Journal **50**(1): 25-32.

Eisenhardt, K. M. (1989). "Building Theories from Case Study Research." Accademy of Management Review **14**(4): 532-550.

Ezzy, D. (2002). Qualitative Analysis. London, Routledge.

Fay, B. (1987). Critical Social Science: Liberation and its limits. Cambridge, Polity Press.

Feller, J., F. Patrick, F. Brian and H. Jeremy (2008). "From Peer Production to Productization: A Study of Socially Enabled Business Exchanges in Open Source Service Networks." Information Systems Research **19**(4): 475-493.

Fichman, R. G. (2004). "Going beyond the dominant paradigm for information technology innovation research: Emerging concepts and methods." Journal of the AIS **5**(8): 314-355.

Frye, D. W. and T. R. Gulledge (2007). "End-to-end business process scenarios." Industrial Management & Data Systems **107**(6): 749-761.

Gable, G., G. (1994). "Integrating Case Study and Survey research methods: an example in Information Systems." European Journal of Information Systems **3**(2): 112-126.

Gagnon, E. and A. Pinsonneault (2009). Extracting Value from ERP Investments: A Closer Look at the Integration Process. International Conference on Information System 2009.

Galliers, R. D. (1991). "Strategic information systems planning: myths, reality and guidelines for successful implementation." European Journal of Information Systems Management **1**(1): 55-64.

Galliers, R. D. (1992). Strategic Information Systems Planning: Concepts, Methods and Critical Success Factors. Proc Conf AIS'92 - Advanced Information Systems Conference. London**:** 1-5.

Galliers, R. D. and F. F. Land (1987). "Choosing an appropriate information systems research methodology." Communications of the ACM **30**(11): 900-902.

Gattiker, T. F. and D. L. Goodhue (2005). "What happens after ERP implementation: Understanding the impact of interdependence and differentiation on plant-level outcomes." MIS Quarterly **29**(3): 559-585.

Gebauer, J. and P. Buxmann (2000). "Assessing the value of interorganizational systems to support business transactions." Journal of Management Information System **4**(4): 61-82.

Giannakoudi, S. (1999). "Internet Banking: the digital voice of banking and money in cyberspace." Information & Communications Technology Law **8**(3): 205-243.

Gibbs, J., K. L. Kraemer and D. Jason (2003). "Environment and Policy Factors Shaping Global E-Commerce Diffusion: A Cross-Country Comparison." Information Society **19**: 5-18.

Glaser, B. (1978). Theoretical Sensitivity. Valley, CA, USA, Mill Sociological Press.

Glaser, B. G. and A. L. Strauss (1967). The discovery of grounded theory: Strategies for qualitative research. Chicago, Aldine.

Glynn, E., B. Fitzgerald and C. Exton (2005). Commercial Adoption of Open Source Software: An Empirical Study. International Conference on Empirical Software Engineering, Noosa Heads, Australia.

Goh, K. H. and R. J. Kauffman (2005). Towards a Theory of Value Latency for IT Investments. 38th Hawaii International Conference on System Sciences,. Hawaii,.

Goh, K. H. and R. J. Kauffman (2009). Quantifying IT Value Latency: The Case of the Financial Services Industry. 42nd Hawaii International Conference on System Sciences. Hawaii**:** 1-10.

Goldman, S. (2007). "The N-11: More Than an Acronym." Global Economics: 153.

Goodman, P. S. and E. D. Darr (1998). "Computer-aided systems and communities: mechanisms for organizational learning in distributed environments." MIS Quarterly **22**(4): 417-440.

Gradwell, T. (2003). "Outsourcing knowledge creation: don't give the game away." Specialty Chemicals **23**(8): 24-25.

Grandon, E. E. and J. M. Pearson (2004). "Electronic commerce adoption: an empirical study of small and medium US businesses." Information & Management **42**: 197-216.

Grant, R. M. (1996). "Toward a knowledge-based theory of the firm." Strategic Management Journal **17**: 109-122.

Grover, V. (1993). "An empirically derived model for adoption of customer-based inter-organizational systems." Decision Sciences and Management Information Systems **24**(3): 603-640.

Grover, V., S. Jeong, W. Kettinger and J. Teng (1995). "The implementation of business process reengineering." Journal of Management Information Systems **12**(1): 109-144.

Guba, E. (1990). The paradigm dialog. Beverly Hills, CA, Sage.

Guba, E. G. and Y. S. Lincoln (1994). Competing paradigms in qualitative research. Handbook of qualitative research. I. N. K. D. Y. S. Lincoln. Thousand Oaks, CA, Sage**:** 105-117.

Gupta, A. K. and V. Govindarajan (2000). "Knowledge flows within the multi-national corporation." Strategic Management Journal **21**: 473-496.

Hackney, R., H. Xu and A. Ranchhod (2006). "Evaluating Web Services: Towards a Framework for Emergent Contexts." European Journal of Operational Research **173**: 1161-1174.

Hage, J. (1980). Theories of organizations. New York, John Wiley and Sons.

Hamel, G. and C. K. Prahalad (1989). "Strategic Intent." Harvard Business Review **89**(3): 63-76.

Han, K., R. J. Kauffman and B. R. Nault (2005). Does IT Outsourcing Pay Off? Evidence from Industry-Level Data. The 2005 Workshop on IS and Economics (WISE). University of California, Irvine, CA.

Harrington, S. J. and T. Guimaraes (2005). "Corporate culture, absorptive capacity and IT success." Information and Organization **15**(1): 39-63.

Harris, R. W., A. Kumar and V. Balaji (2003). Sustainable Telecentres? Two Cases from India. The Digital Challenge: Information technology in the development context. S. Krishna and S. Madon. Ashgate, Aldershot.

Hart, P. and C. Saunders (1997). "Power and trust: Critical factors in the adoption and use of electronic data interchange." Organization Science **8**(1): 23-42.

Hawari, A. a. and R. Heeks (2010). "Explaining ERP failure in a developing country: a Jordanian case study " Journal of Enterprise Information Management **23**(2): 135-160.

Hawk, S. (2004). "A Comparison of B2C E-Commerce in Developing Country." Electronic Commerce Research and Applications **4:ITRC ,2000**: 181-199.

Heeks, R. (2002). "Information systems and developing countries: Failure, success, and local improvisations." The Information Society **101-112**(18): 2.

Heeks, R. (2010). "Do information and communication technologies (ICTs) contribute to development?" Journal of International Development **22**(5): 625-640.

Henderson, J. C. and N. Venkatraman (1993). "Strategic alignment: Leveraging information technology for transforming organizations." IBM Systems Journal **32**(1): 4-16.

Hendricks, K. B. and V. R. Singhal (2003). "The effect of supply chain glitches on shareholder wealth." Journal of Operations Management **21**(5): 501-522.

Hendricks, K. B., V. R. Singhal and J. K. Stratman (2007). "The impact of enterprise systems on corporate performance: a study of ERP, SCM, and CRM system implementations." Journal of Operations Management **25**(1): 65-82.

Hirschheim, R. (1985). Information system epistemology: an historical perspective. Research Methods In Information System. E. Mumford, R. Hirschheim, G. Fitzgerald and T. Wood-Harper. North-Holland, Amsterdam.

Hirschheim, R. (1992). Information Systems Epistemology: An historical perspective", In Information Systems Research: Issues, Methods and Practical Guidelines. R. D. Galliers. Oxford, UK, Blackwell Scientific Publications.

Hirschheim, R. and H. Klein (1989). "Four Paradigms of Information Systems Development." Communication of the ACM **32**: 1199-1216.

Hitt, L. and E. Brynjolfsson (1996). "Productivity, profit and consumer welfare: Three different measures of information technology." MIS Quarterly **20**(2): 121-142.

Hitt, L. M., D. J. Wu and X. Zhou (2002). "Investment in Enterprise Resource Planning: Business Impact and Productivity Measures." Journal of Management Information Systems **19**(1): 71-98.

Ho, S. J. and S. K. Mallick (2010). "The impact of information technology on the banking industry." Journal of the Operational Research Society **61**: 211-221.

Hodgkinson, R., L. Brooks, A. Barua, R. Kohli, S. Worthington and B. Zukis (2009). Returns on IT Investment: Could We Do Better? International Conference on Infotmation Systems. Phoenix.

Hoffman, D., T. P. Novak and M. Peralta (1999). "Building consumer trust online." Communications of the ACM **42**(4): 80-85.

Hu, Q. and J. J. Quan (2005). "Evaluating the impact of IT investment on productivity: a causal analysis at industry level." International Journal of Information Management **25**(1): 39-53.

Huang, Z. and P. Palvia (2001). "ERP Implementation Issues in Advanced and Developing Countries." Business Process Management Journal **7**(3): 276-284.

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

Indjikian, R. and D. Siegel (2005). "The Impact of Investment in IT on Economic Performance: Implications for Developing Countries." World Development **33**(5): 681-700.

Jain, R., A. Chandrasekaran and O. Erol (2010). "A framework for end-to-end approach to Systems Integration." International Journal of Industrial and Systems Engineering **5**(1): 79-109.

Jansen, J. J. P., F. A. J. van den Bosch and H. W. Volberda (2006). "Exploratory innovation, exploitative innovation, and performance: Effects of organizational antecedents and environmental moderators." Management Science **52**(11): 1661-1674.

Jaruwachirathanakul, B. and D. Fink (2005). "Internet banking adoption strategies for a developing country:the case of Thailand." Internet Research **15**(3): 295-311.

Jarvenpaa, S. and D. Leidner (1998). "Communication and Trust in Global Virtual Teams." Journal of Computer Mediated Communication **3**(4).

Jasperson, J. S., P. E. Carter and R. W. Zmud (2005). "A Comprehensive Conceptualization of Post-Adoptive Behaviors Associated with Information Technology Enabled Work Systems." MIS Quarterly **29**(3): 525.

Jenkins, A. M. (1985). Research Methodologies and MIS Research. Research Methods in Information Systems. R. A. H. E. Mumford, G. Fitzgerald and A. T. Wood-Harper. North Holland, Amsterdam**:** 103-117.

Jorgenson, D. W. (2001). " Information technology and the U.S. economy (Presidential address to the American Economic Association)." American Economic Review **91**(1): 1-32.

Jorgenson, D. W. and K. J. Stiroh (1995). "Computers and growth." Economic Innovation New Technology **3**(4): 295-316.

Jorgenson, D. W. and K. J. Stiroh (1999). "Information technology and growth." American Economic Review **89**(2 (May)): 109-115.

Jorgenson, D. W. and K. J. Stiroh (2000). "Raising the speed limit: U.S. economic growth in the information age." Brookings Pap. Econ. Act. **1**(1): 125-211.

Joshi, K. (1991). "Model of users' perspective on change: the case of information systems technology implementation." MIS Quarterly **15**(2): 229-242.

Kaplan, B. and D. Duchon (1988). "Combining qualitative and quantitative methods in information systems research: A case study." MIS Quarterly **12**(4): 571-586.

Kaplan, B. and J. A. Maxwell (1994). Qualitative research methods for evaluating computer information systems. Evaluating health care information systems, methods and applications. J. G. Anderson, C. E. Aydin and S. J. Jay. Thousand Oaks, CA, Sag**:** 45-68.

Kapurubandara, M. (2006). "A model for adoption of ICT and e-commerce in the developing countries: a pilot study of SMEs in Sri Lanka." http://bai2006.atisr.org/CD/Papers/2006bai6370.doc.

Kapurubandara, M. (2009). "A framework to e-transform SMEs in Developing Countries." Electronic Journal of Information Systems in Developing Countries **39**(3): 1- 24.

Kapurubandara, M. and R. Lawson (2007). SMEs in Developing Countries Need Support to Address the Challenges of Adoption e-commerce Technologies. 20th Bled eConference eMergence.

Karimi, J., T. M. Somers and A. Bhattacherjee (2007). "The Role of Information Systems Resources in ERP Capability Building and Business Process Outcomes." Journal of Management Information Systems **24**(2): 221-260.

Kathuria, R., S. J. Porth and M. P. Joshi (1999). "Manufacturing priorities: do general managers and manufacturing managers agree?" International Journal of Production Research **37**(9): 2077-2092.

Katz, H. (2002). How to embrace CRM and make it succeed in an organization. SYSPRO White Paper. SYSPRO. Costa Mesa, CA.

Kaynak, E., E. Tatoglu and V. Kula (2005). "An analysis of the factors affecting the adoption of electronic commerce by SMEs: evidence from an emerging market'." International Marketing Review **22**(6): 623-640.

Kedia, B. L. and R. S. Bhagat (1988). "Cultural constraints on transfer of technology across nations: implications for research in international and comparative management." Academy of Management Review **13**: 559-571.

Khadwalla, P. N. (1970). Environment and the organization structure of firms. Faculty of Management. Montreal, McGill University.

Khong, K. W. and S. Richardson (2003). "Business process re-engineering in Malaysian banks and finance companies." Managing Service Quality **13**(1): 54-71.

Kidder, L. A. (2004). "Straight-Through Processing in Commercial Lending: A Solution Waiting for Awareness of the Problem." Commercial Lending Review **19**(6): 9-18.

Kim, J., J. Xiang and S. Lee (2009). "The impact of IT investment on firm performance in China: an empirical investigation of the Chinese electronics industry." Technology Forecasting and Social Change **76**(5): 678-687.

Kirsch, L. J. (2004). "Deploying common systems globally: the dynamics of control." Information Systems Research **15**(4): 374-395.

Kitiyadisai, K. (2000). The implementation of IT in reengineering the Thai Revenue Department. In Information Flows, Local Improvisations and Work Practices. The IFIP WG9.4 Conference, Cape Town: IFIP.

Klein, H. K. and M. D. Myers. (1999). "A set of principles for conducting and evaluating interpretive field studies in information systems." MIS Quarterly **23**(1): 67-93.

Kohli, R. and V. Grover (2008). "Business Value of IT: An Essay on Expanding Research Directions to keep up with the Times." Journal of the Association for Information Systems **9**(1): 23-39.

Kraemer, K., J. Gibbs and J. Derick (2002). Impacts of globalization on e-commerce adoption and firm performance: A cross country investigation. Irvine, California, Center for research on information technology and organization, University of California.

Kraemer, K. L. and J. Dedrick (1994). " Payoffs from investment in information technology: Lessons from the Asia-Pacific region." World Development **22**(12): 1921-1931.

Krueger, J. N. (2003). The cognitive psychology of entrepreneurship. Handbook of Entrepreneurship Research: An Interdisciplinary Survey and Introduction. Z. J. A. D. B. Audretsch. Boston, Kluwer Academic.

Kshetri, N. (2007). "Barriers to e-commerce and competitive business models in developing countries: A case study." Electronic Commerce Research and Applications **6**: 443-452.

Kuan, K. K. Y. and P. Y. K. Chau (2001). "A perception-based model for EDI adoption in small businesses using a technology-organization-environment framework." Information & Management **38**(8): 507-521.

Kudyba, S. and R. Diwan (2002). "Research Report: Increasing Returns to Information Technology." Information Systems Research **13**(1): 104-111.

Kundi, G. M. and B. Shah (2009). "IT in Pakistan: Threats & opportunities for E-business." The electronic Journal on Information Systems in Developing Countries **36**(8): 1-31.

Kwahk, K. Y. and H. Ahn (2010). "Moderating effects of localization differences on ERP use: a socio-technical systems perspective." Computers in Human Behavior **26**: 186-198.

Lane, P. J. and M. Lubatkin (1998). "Relative absorptive capacity and inter-organizational learning." Strategic Management Journal **19**: 461-477.

Lane, P. J., J. E. Salk and M. A. Lyles (2001). "Absorptive capacity, learning and performance in international joint ventures." Strategic Management Journal **22**: 1139-1161.

Larpsiri, R., S. Rotchanakitumnuai, S. Chaisrakeo and M. Speece (2002). The impact of Internet banking on Thai consumer perception. The Conference on Marketing Communication Strategies in a Changing Global Environment. Hong Kong.

Lee, A. (1991). "Integrating positivist and interpretive approaches to organizational research." Organizational Science **2**(4): 342-365.

Lee, A. S. (1989). "A scientific methodology for MIS case studies." MIS Quarterly **13**(1): 33-50.

Lee, A. S. and R. L. Baskerville (2003). "Generalizing generalizability in information systems research." Information Systems Research **14**: 221-243.

Lee, C. P. and J. P. Shim (2007). "An Exploratory Study of Radio Frequency Identification (RFID) Adoption in the Health Care Industry." European Journal of Information Systems Management **16**: 712-724.

Lee, C. S. (2001). "Modeling the business value of information technology." Information and Management **39**: 191-210.

Lee, S. and G. G. Kim (2005). "The impact of partnership attributes on EDI implementation success." Information & Management **41**(2): 135-148.

Lee, S. and K. Kim (2007). "Factors affecting the implementation success of Internet based information systems." Computers in Human Behavior **23**(4): 1853-1880.

Lee, S. and S. H. Kim (2006). "A Lag Effect of IT Investment on firm Performance." Information Resources Management Journal **19**(1): 43-69.

Lee, Z. and J. Lee (2000). "An ERP implementation case study from a knowledge transfer perspective." Journal of Information Technology **15**: 281-288.

Leidner, D. E. and S. L. Jarvenpaa (1993). "The Information Age Confronts Education: Case Studies on Electronic Classrooms." Information Systems Research **4**: 25-54.

Leidner, D. E., G. Pan and S. L. Pan (2009). "The Role of Information Technology in Crisis Response: Lessons from the SARS and Asian Tsunami Disasters." Journal of Strategic Information Systems **18**: 80-99.

Lenox, M. and A. King (2004). "Prospects for developing absorptive capacity through internal information provision." Strategic Management Journal **25**: 331-345.

Li, M. and L. R. Ye (1999). "Information technology and firm performance: linking with environmental, strategic and managerial contexts." Information and Management **35**: 43-51.

Liang, H., N. Saraf, Q. Hu and Y. Xue (2007). "Assimilation of enterprise systems: the effect of institutional pressures and mediating role of the top management." MIS Quarterly **31**(1).

Licht, G. and D. Moch (1999). "Innovation and information technology in services." The Canadian Journal of Economics **32**(2): 363-383.

Lichtenthaler, U. (2009). "Absorptive capacity, environmental turbulence, and the complementary of organizational learning process." Academy of Management Journal **52**(4): 822-846.

Lin, C.-Y. (2008). "Determinants of the adoption of technological innovations by logistics service providers in China." International Journal of Technology Management and Sustainable Development **7**(1): 19-38.

Lin, H.-F. and S.-M. Lin (2008). "Determinants of e-business diffusion: A test of the technology diffusion perspective." Technovation **28**: 135-145.

Lin, W. T. (2009). "Business Value of Information Technology as Measured by Technical Efficiency: Evidence from Country-Level Data." Decision Support Systems **46**(4): 865-874.

Lin, W. T., C.-H. Chuang and J. H. Choi (2010). "A partial adjustment approach to evaluating and measuring the business value of information technology." International Journal of Production Economics **127**: 158-172.

Lin, W. T. and B. B. M. Shao (2006). "The business value of information technology and inputs substitution: the productivity paradox revisited." Decision Support Systems **42**(2): 493-507.

Lincoln, J. R. and G. Zeitz (1980). "Organizational Properties from Aggregate Data: Separating Individual and Structural Effects." American Sociological Review **45**: 391-408.

Lincoln, Y. S. and E. G. Guba (1985). Naturalistic inquiry. Beverly Hills , CA, Sage.

Lofland (1971). Analyzing Social Settings. Belmont, CA, Wadsworth.

Loveman, G. W. (1994). An assessment of the productivity impact of information technologies. Information Technology and the Corporation of the 1990s: Research Studies. T. J. Allen and M. S. Scott Morton. Cambridge, U.K, Oxford University Press**:** 84-110.

Lucas, H., D. Berndt and G. Truman (1996). "A reengineering framework for evaluating a financial imaging system." Communications of the ACM **39**(5): 86-96.

Lucas, H. C. (1993). The Business Value of Information Technology: A Historical Perspective and Thoughts for Future Research. Strategic Information Technology Management. R. Banker, R. Kauffman and M. A. Mahmood. Harrisburg, PA, Idea**:** 126-139.

Luken, R. and F. van Rompaey (2008). "Drivers for and barriers to environmentally sound technology adoption by manufacturing plants in nine developing countries." Journal of Cleaner Production **16**(1): 67-77.

Lyles, M. A. and R. S. Charles (1992). "Top management, strategy and organizational knowledge structures." Journal of Management Studies **29**(2): 155-174.

Lyytinen, K. and H. Klein (1985). The critical theory of Jurgen Habermas as a basis for a theory of information systems, Research Methods in Information Systems. Elsevier, Amsterdam, Mumford, E., Hirschheim, R., Fitzgerald, G. and Wood-Harper, T.

Maccoby, E. and N. Maccoby (1954). The interview: a tool of social science. Handbook of Social Psychology. Theory and Method. G. Lindzey. Reading, MA, Addison-Wesley. **I:** 449-487.

Madill, A., A. Jordan and C. Shirley (2000). "Objectivity and reliability in qualitative analysis: Realist, contextualist and radical constructionist epistemologies." British Journal of Psychology **91**(1): 1-20.

Madon, S. (1994). Design information systems for development planning. Alfred Waller, Henley.

Madon, S. (2003). IT Diffusion for Public Service Delivery: Looking for Plausible Theoretical Approaches Northampton, MA, Edward Elgar Pub.

Madon, S. (2004). Evaluating the developmental impact of e-governance initiatives: An exploratory framework. International Federation of Information Processing, The Netherland: Kluwer, IFIP 9.4 AND 8.2, Dordrecht.

Mahdi, M. O. S. and P. Dawson (2007). "The introduction of information technology in the commercial banking sector of developing countries: voices from Sudan." Information Technology & People **20**(2): 184-204.

Mahmood, M. A. and G. J. Mann (1993). "Impact of information technology investment: an empirical assessment." Accounting, Management and Information Technology **1**: 23-32.

Malhotra, A., S. Gosain and O. A. E. Sawy (2005). "Absorptive Capacity Configurations in Supply Chains: Gearing for Partner-Enabled Market Knowledge Creation." MIS Quarterly **29**(1): 145-187.

Marble, R. P. and Y. Lu (2007). "Culturalizing enterprise software for the Chinese context: An argument for accommodating guanxi-based business practices." International Journal of Production Economics **107**: 364-379.

Markus, M. L. and J. Pfeffer (1983). "Power and the Design and Implementation of Accounting and Control Systems." Accounting, Organisations and Society **8**(2/3): 205-218.

Markus, M. L. and D. Robey (1988). "Information Technology and Organizational Change: Causal Structure in Theory and Research." Management Science **34**(5): 583-598.

Marshall, C. and G. B. Rossman (1995). Designing qualitative research (2nd ed.). Thousand Oaks, CA, Sage.

Martínez, D., J. Rodríguez and J. L. Torres (2008). "The productivity paradox and the new economy: the Spanish case." Journal of Macroeconomics **30**(4): 1569-1586.

Matusik, S. F. and M. B. Heeley (2005). "Absorptive capacity in the software industry: Identifying dimensions that affect knowledge and knowledge creation activities." Journal of Management **31**: 549-572.

McAfee, A. (2002). "The Impact of Enterprise Information Technology Adoption on Operational Performance: An Empirical Investigation." Production and Operations Management **11**(1): 33-53.

McKendrick, D. (1992). "Use and impact of information technology in Indonesian commercial banks." World Development **20**(12): 1753-1768.

Melville, N., K. Kraemer and Gurbaxani (2004). "Review: Information technology and organizational performance: An integrative model of IT business value." MIS Quarterly **28**: 283-322.

Mendonca, M. A. A., F. Freitas and J. M. de Souza (2008). "Information technology and productivity: evidence for Brazilian industry from firm-level data." Information Technology for Development **14**: 136-153.

Miles, M. B. and A. M. Huberman (1984). Qualitative Data Analysis - A Sourcebook of New Methods. California, Sage.

Miles, M. B. and M. A. Huberman (1994). Qualitative Data Analysis: An Expanded Sourcebook. Thousand Oaks, C/A, Sage.

Miller, D. (1993). "The Architecture of Simplicity." Academy of Management Review **18**(1): 116-138.

Mitra, S. and A. K. Chaya (1996). "Analyzing Cost Effectiveness of Organizations: The Impact of Information Technology Spending." Journal of Management Information Systems **13**(2): 29-57.

Molla, A. and A. Bhalla (2006). "ERP and competitive advantage in developing countries: The case of an Asian company." The Electronic Journal of Information Systems in Developing Countries (EJISDC) **24**(1): 1-19.

Molla, A. and R. Heeks (2007). "Exploring E-Commerce Benefits for Business in a Developing Country." The Information Society **23**: 95-108.

Molla, A. and P. S. Licker (2005). "e-Commerce adoption in developing countries: a model and instrument." Information & Management **42**: 877-899.

Mols, N. P. (2000). "The Internet and services marketing: the case of Danish retail banking." Internet Research: Electronic Networking Applications and Policy **10**(1): 7-18.

Moodley, S. and M. Morris (2004). "Does e-commerce fulfil its promise for developing country (South African) garment export producers?" Oxford Development Studies **32**(2): 155-178.

Mooney, J. G., V. Gurbaxani and K. L. Kraemer (1996). "A Process Oriented Framework for Assessing the Business Value of Information Technology." Database Advances in Information Systems **27**(2): 68-81.

Mpogole, H., H. Usanga and M. Tedre (2008). Mobile phones and poverty alleviation: a survey study in rural Tanzania. M4D 2008. Karlstad, Sweden, ict4dblog.files.wordpress.com/2008/12/m4d-mpogole-final-paper4.doc.

Mukhopadhyay, T. and S. Kekre (2002). "Strategic and Operational Benefits of Electronic Integration in B2B Procurement Processes." Management Science **48**(10): 1301-1313.

Mukhopadhyay, T., S. Kekre and S. Kalathur (1995). "Business value of information technology: A study of electronic data interchange." MIS Quarterly **19**(2): 137-156.

Mukti, N. A. (2000). "Barriers to Putting Businesses on the Internet in Malaysia." Electronic Journal of IS in Developing Countries **2**(6): 1-6.

Myers (1998). Qualitative Research in Information Systems. M. D. Myers, http://www.aucklan-d.ac.nz/msis/isworld/.

Myers, M. D. (1995). "Dialectical hermeneutics: a theoretical framework for the implementation of information systems." Information Systems Journal **5**: 51-70.

Myers, M. D. and H. K. Klein (Forthcoming). "A set of principles for conducting critical research in information systems." MIS Quarterly.

Neuman (2000). Social Research Methods: Qualitative and Quantitative Methods. Needham Heights, MA, Allyn Bacon.

Newell, S., C. Tansley and J. Huang (2004). "Social capital and knowledge integration in an ERP project team: the importance of bridging and bonding." British Journal of Management **15**(S1): 43-57.

Ngwenyama, O., F. K. Andoh-Baidoo, F. Bollou and O. Morawczynski (2006). "Is there a Relationship Between ICT, Health, Education and Development? An Emperical Analysis of Five West African Countries From 1997-2003." Electronic Journal on Information Systems in Developing Countries **23**(5): 1-11.

Nicolaou, A. (2004). "Firm performance effects in relation to the implementation and use of enterprise resource planning systems." Journal of Information System **18**(Fall): 79- 105.

Nissen, H.-E. (1985). Acquiring knowledge of information systems: Research in a methodological quagmire. E. Mumford et al. Research methods in information systems. New York, Elsevier Science.

Nonaka, I. (1994). "A dynamic theory of organizational knowledge creation." Organization Science **5**(3): 14-37.

Nonaka, I. and G. v. Krogh (2009). "Tacit knowledge and knowledge conversion: Controversy and advancement in organizational knowledge creation theory." Organization Science **20**: 635-652.

O'Reilly, P. and P. Finnegan (2010). "Intermediaries in Inter-Organisational Networks: Building a Theory of Electronic Marketplace Performance." European Journal of Information Systems **19**: 462-480.

Okrent, M. D. and R. J. Vokurka (2004). "Process mapping in successful ERP implementations." Industrial Management & Data Systems **104**: 637-643.

Oliner, S. D. and Daniel E. Sichel (1994). "Computers and Output Growth Revisited: How Big is the Puzzle?" Brookings Papers on Economic Activity **2**: 273-317.

Oliner, S. D. and D. E. Sichel (2000). "The resurgence of growth in the late 1990s: Is information technology the story?" Journal of Economic Perspect **14**(4): 3-22.

Orlikowski, W. and J. Baroudi (1991). "Studying information technology in organizations: Research approaches and assumptions." Information System Research **2**(2): 1-28.

Orlikowski, W. and S. Iacono (2001). "Desperately seeking the “IT” in IT research: A call to theorizing the IT artifact." Information Systems Research **12**(2): 121-124.

Oz, E. (2005). "Information technology productivity: in search of a definite observation." Information & Management **42**: 789-798.

Palmer, J. and L. M. Markus (2000). "The performance impact of quick response and strategic alignment in specialty retailing." Information Systems Research **11**(3): 241-259.

Pan, S. L., S. Newell, J. Huang and R. D. Galliers (2007). "Overcoming knowledge management challenges during ERP implementation: The need to integrate and share different types of knowledge." Journal of the American Society for Information Science and Technology **58**: 404-419.

Papp, R. (1999). "Business-IT alignment: Productivity Paradox Payoff?" Industrial Management and Data Systems **99**(8): 367-337.

Pare, D. (2002). "B2B e-commerce services and developing countries: disentangling Myth from reality." www.gapreseach.org/production/publications.html.

Park, J.-H., H.-J. Suh and H.-D. Yang (2007). "Perceived absorptive capacity of individual users in performance of Enterprise Resource Planning (ERP) usage: The case for Korean firms." Information and Management **44**: 300-312.

Pavlou, P. A., H. T. J., W. Rodgers and E. Jansen (2005). "Measuring the return on information technology: A knowledge-based approach for revenue allocation at the process and firm level." Journal of the Association of Information Systems **6**: 199-226.

Payne, A., K. Storbacka and P. Frow (2008). Managing the co-creation of value, Cranfield School of Management.

Pearson, J. M. and E. E. Grandon (2006). "An Empirical Study of Factor That Influence E-Commerce Adoption/Non-Adoption in Small and Medium Sized Businessess." Journal of Internet Commerce **4**(4): 1-21.

Peguy, C. F. C., K. K. Christophe and N. N. P. Valere (2010). Investments in ICT-capital and productivity of SMEs empirical evidence from Cameroon. GLOBELICS , 7th International Conference, Parallel session 5: Innovation and diffusion of ICT. Dakar, Senegal.

Pennings, J. M. and F. Harianto (1992). "The diffusion of technological innovations in the commercial banking industry." Strategic Management Journal **13**: 29-46.

Peppard, J. and J. Ward (2003). "Unlocking sustained business value from IT investments." California Management Review (Fall): 52-69.

Phillips, L. E. (1981). "Assessing measurement error in key informant reports: a methodological note on organizational analysis in marketing." Journal of Marketing Research **18**: 395-415.

Pikkarainen, T., K. Pikkarainen, H. Kirjaluoto and S. Pahnila (2004). "Consumer Acceptance of Online Banking: An Extension of the Technology Acceptance Model." Internet Research **14**(3): 224-235.

Pohjola, M. (2001). Information technology and economic growth: A cross-country analysis. Oxford, UK, Oxford University Press.

Porter, M. and V. E. Millar (1985). "How information gives you competitive advantage." Harvard Business Review **July-August**.

Poston, R. and S. Grabski (2001). "Financial impacts of enterprise resource planning implementations." International Journal of Account Information System **2**: 271- 294.

Premkumar, G., K. Ramamurthy and M. Crum (1997). "Determinant of EDI adoption in the transportation industry." European Journal of Information System **6**: 107-121.

Radhakrishnan, A., X. Zu and V. Grover (2008). "A process-oriented perspective on differential business value creation by information technology: An empirical investigation." Omega **36**(6): 1105-1125.

Rai, A., S. S. Lang and R. B. Welker (2002). "Assessing the validity of IS success models: An empirical test and theoretical analysis." Information Systems Research **13**(1): 50-69.

Rai, A., R. Patnayakuni and N. Patnayakuni (1996). "Refocusing Where and How IT Value is Realized: An Empirical Investigation." Omega: International Journal of Management Science **24**(4): 399-412.

Rai, A., R. Patnayakuni and N. Patnayakuni (1997). "Technology Investment and Business Performance." Communications of the ACM **40**(7): 89-97.

Rajapakse, J. and P. B. Seddon (2005). Why ERP may not be suitable for organisations in developing countries in Asia. Working paper, Department of Information System. Melbourne, Australia, The University of Melbourne.

Ramirez, R., N. Melville and E. Lawler (2010). " Information technology infrastructure, organizational process redesign, and business value: an empirical analysis." Decision Support Systems **49**(4): 417-429.

Ranganathan, C. and J. S. Dhaliwal (2001). "A survey of business process reengineering practices in Singapore." Information & Management **39**(2): 125-134.

Rapp, A., N. Schillewaert and A. Wei Hao (2008). "The influence of market orientation on e-business innovation and performance: the role of the top management team." Journal of Marketing. Theory and Practice **16**(1): 7 -25.

Ravichandran, T. and C. Lertwongsatien (2005). "Effect of Information Systems Resources and Capabilities on Firm Performance: A Resource-Based Perspective." Journal of Management Information Systems **21**(4): 237-276.

Reagans, R. and B. McEvily (2003). "Network structure and knowledge transfer: The effects of cohesion and range." Administrative Science Quaterly **48**: 240-267.

Reich, B. H. and I. Benbasat (1996). "Measuring the linkage between business and information technology objectives." MIS Quarterly **20**(1): 55-81.

Remenyi, D., B. Williams, A. Money and E. Swartz (1998). Doing Research in Business and Management. London and New Delhi, Thousand Oaks, Sage

Riggins, F. J. and T. Mukhopadhyay (1993). "Interdependent benefits from interorganizational systems: Opportunities for business partner reengineering." Journal of Management Information System **11**(2): 37-57.

Riyadh, A. N., S. M. Akter and N. Islam (2009). "The Adoption of E-banking in Developing Countries: A Theoretical Model for SMEs." International Review of Business Research Papers **5**(6): 212-230.

Riyadh, A. N., N. Islam and I. Haque (2009). "E-finance in developing countries: the implementation and development of electronic finance systems in Bangladesh." Dhaka University Journal of Business Studies **30**(1).

Roach, S. S. (1987). "America's technology dilemma: A profile of the information economy." Morgan Stanley Special Economic Study **April**.

Roach, S. S. (1989). "Pitfalls of the new assembly line: Can service learn from manufacturing?" Morgan Stanley Special Economic Study **June 22**.

Roach, S. S. (1991). "Services under siege: The restructuring imperative." Harvard Business Review **39**(2): 82-92.

Roberts, N., P. S. Galluch, M. Dinger and V. Grover (2011). "Absorptive Capacity and Information Systems Research: Review, Synthesis, and Directions for Future Research." MIS Quaterly: 63.

Robey, D., J. Ross and M. Boudreau (2002). "Learning to implement enterprise systems: an exploratory study of the dialectics of change." Journal of Management Information System **19**(1): 17-46.

Rogers, E. M. (1995). Diffusion of Innovations. New York, The Free Press.

Rotchanakitumnuai, S. and M. Speece (2003). "Barriers to Internet banking adoption: a qualitative study among corporate customers in Thailand." International Journal of Bank Marketing **21**(6/7): 321-323.

Sabherwal, R., A. Jeyaraj and C. Chowa (2006). "Information system success: Individual and organizational determinants." Management Science **52**(12): 1849-1864.

Santos, D. B., K. Peffers and D. Mauer (1993). "The Impact of Information Technology Investment Announcements on the Market Value of the Firm." Information Systems Research **4**(1): 1-23.

Santos, D. B. and L. Sussman (2000). "Improving the Return on IT Investment: The Productivity Paradox." International Journal of Information Management **20**(6): 429-440.

Sarker, S. and A. S. Lee (2002). "Using a case study to test the role of three key social enablers in ERP implementation." Information & Management **40**(8): 813 - 829.

Sawyer, S. and A. Tapia (2003). The Computerization of Work: A Social Informatics Perspective. Computer and Society: Privacy, Ethics, and the Internet. J. George. New York, Prentice Hall.

Scheepers, H. and R. Scheepers (2008). "A process-focused decision framework for analysing the business value potential of IT investments." Information System Front **10**: 321-330.

Schmidt, T. (2010). "Absorptive capacity-one size fits all? A firm-level analysis of absorptive capacity for different kinds of knowledge." Managerial and Decision Economics **31**(1): 1-18.

Schreyer, P. (2000). The contribution of information and communication technology to output growth: a study of the G7 countries. STI Working Papers 2000/2, OECD. Paris.

Schwarz, A., M. Kalika, H. Kefi and C. Schwarz (2010). "A Dynamic Capabilities Approach to Understanding the Impact of IT-Enabled Businesses Processes and IT-Business Alignment on the Strategic and Operational Performance of the Firm." Communications of the Association for Information Systems **26**(4): 57-84.

Seddon, P., C. Calvert and S. Yang (2010). "A multi project model of key factors affecting organizational benefits from enterprise systems." MIS Quarterly **32**(2): 305-328.

Seddon, P. B. (1997). "A re-specification and extension of the DeLone and McLean model of IS success." Information Systems Research **8**(3): 240-252.

Segars, A. H. and V. Grover (1998). "Strategic information systems planning success: An investigation of the construct and its measurement." MIS Quarterly **22**(2): 139-163.

Sein, M. K. and G. Harindranath (2004). "Conceptualizing the ICT artefact: Toward understanding the role of ICT in national development." The Information Society **20**(1): 15-24.

Setia, P., V. Sambamurthy and D. Closs (2008). "Realizing business value of agile IT applications: Antecedents in the supply chain networks." Information Technology and Management **9**(1): 5.

Seyal, A. H. and M. M. Rahim (2006). "A preliminary investigation of electronic data interchange adoption in Bruneian small business organizations." The Electronic Journal on Information Systems in Developing Countries **24**(4): 1-21.

Seyal, A. H., M. N. A. Ranman and H. A. Y. H. A. Mohammad (2007). "A qualititative analysis of factors contributing electronic data interchange adoption among Bruneian SMEs, A pilot study." Business Process Management Journal **13**(5): 728-746.

Shang, S. and P. B. Seddon (2000). A Comprehensive Framework for Classifying Benefits of ERP Systems. The Sixth Americas Conference on Information Systems, Long Beach, CA.

Shang, S. and P. B. Seddon (2002). "Assessing And Managing The Benefits Of Enterprise Systems: The Business Manager's Perspective." Information Systems Journal **12**(4): 271-299.

Shao, B. B. M. and W. T. Lin (2002). "Technical efficiency analysis of information technology investments: a two-stage empirical investigation." Information Management **39**: 391-401.

Shao, B. B. M. and W. S. Shu (2004). "Productivity breakdown of the information and computing technology industries across countries." Journal of Operational Research Society **55**: 23-33.

Sharma, S. and N. Wickramasinghe (2004). Obstacles to SMEs for e-adoption in the Asia Pacific region. e-Business, e-Government & Small and Medium-Size Enterprises: Opportunities and Challenges. B. J. Corbitt and N. Al-Qirim. Hershey, PA, Idea Group.

Shenkar, O. and J. Li (1999). "Knowledge search in international cooperative ventures." Organization Science **10**(2): 134-143.

Shu, W. and P. A. Strassmann (2005). "Does information technology provide banks with profit?" Information & Management **42**(5): 781-787.

Sia, S. K. and C. Soh (2002). Severity Assessment of ERP-Organization Misalignment. The Twenty-Second International Conference on Information Systems, New Orleans.

Sia, S. K. and C. Soh (2007). "An assessment of package organisation misalignment: institutional and ontological structures." European Journal of Information Systems Management **16**(5): 568-583.

Sichel, D. E. (1997). The Computer Revolution: An Economic Perspective. Washington, D.C, Brookings Institution Press.

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

Soh, C., S. S. Kien and J. Tay-Yap (2000). "Enterprise resource planning: cultural fits and misfits: Is ERP a universal solution?" Communications of the ACM **43**(4): 47-51.

Soh, C. and M. L. Markus (1995). How IT creates business value: A process theory synthesis. 16th International Conference Information Systems. Association for Information Systems. G. Ariav, C. Beath, J. DeGross, R. Hoyer and C. F. Kemerer. Amsterdam.

Soja, P. (2008). "Difficulties in enterprise system implementation in emerging economies: Insights from an exploratory study in Poland " Information Technology for Development **14**(1): 31-51.

Solow, R. M. (1987). We'd Better Watch Out. New York, New York Times.

Srivardhana, T. and S. D. Pawlowski (2007). "ERP systems as an enabler of sustained business process innovation: A knowledge-based view." Journal of Strategic Information Systems **16**: 51-69.

Starbuck, W. H. (1976). Organizations and their environments,The handbook of industrial and organizational psychology. Chicago: Rand McNally, M.Dunnette (ed.).

Stiroh, K. J. (2001). " What drives productivity growth?" Economic Policy Reveiw **7**(1): 37-59.

Stock, G. N., N. P. Greis and W. A. Fischer (2001). "Absorptive capacity and new product development." Journal of High Technology Management Research **12**: 77-91.

Strassmann, P. A. (1990). The Business Value of Computers: An Executive's Guide. New Canaan, CT, Information Economics Press.

Straub, D. W. and R. T. Watson (2001). "Research commentary: transformational issues in researching IS and net-enabled organizations." Information Systems Research **12**(4): 337-345.

Strauss, A. (1987). Qualitative analysis for social scientists. Cambridge, England, Cambridge University Press.

Strauss, A. and J. Corbin (1990). Basics of Qualitative Research. Grounded Theory Procedures and Techniques. Newbury Park, CA, Sage Publications.

Strong, D. and O. Volkoff (2010). "Understanding Organization-Enterprise System Fit: A Path to Theorizing the Information Technology Artifact." MIS Quarterly **34**(4): 731-756.

Stuart, I., D. McCutcheon, R. Handfield, R. McLachlin and D. Samson (2002). "Effective case research in operations management: A process perspective." Journal of Operations Management **20**(5): 419-433.

Suresh, H. (2004). "What is customer relationship management (CRM)?" Supply Chain Planet.

Szulanski, G. (1996). "Exploring internal stickiness: Impediments to the transfer of best practice within the firm." Strategic Management Journal **17**(winter special issue): 27-43.

Tallon, P. P. and K. L. Kraemer (2003). How Flexibility Shapes Strategic Alignment and IT Business Value: Uncovering an Alignment Paradox. CRITO Working Paper UC-Urvine.

Tallon, P. P. and K. L. Kraemer (2006). "The development and application of a process-oriented thermometer of IT business value." Communications of the AIS **17**(45): 1-52.

Tallon, P. P., K. L. Kraemer and V. Gurbaxani (2000). "Executives' Perceptions of the Business Value of Information Technology: A Process-Oriented Approach." Journal of Management Information Systems **16**(4): 145-173.

Tam, K. Y. (1998). "The Impact of Information Technology Investments of Firms Performance and Evaluation: Evidence from Newly Industrialized Economies." Information Systems Research **9**(1): 85-98.

Teece, D. J. (2007). "Explicating dynamic capabilities: the nature and microfoundations of (sustainable) enterprise performance." Strategic Management Journal **28**: 1319-1350.

Teece, D. J., G. Pisano and A. Shuen (1997). "Dynamic capabilities and strategic management." Strategic Management Journal **18**: 509-533.

Teo, T. S. and P. K. Wong (1998). "An Empirical Study of the Performance Impact of Computerization in the Retail Industry." Omega:International Journal of Management Science **26**(5): 611-621.

Teo, T. S. H., S. Lin and K.-h. Lai (2009). "Adopters and non-adopters of e-procurement in Singapore: An empirical study." Omega **37**(5): 972-987.

Terziovski, M., P. Fitzpatrick and P. O'Neil (2003). "Successful predictors of business process reengineering (BPR) in financial services. ." International Journal of Production Economics **84**: 35-50.

Thompson, J. D. (1967). Organizations in action. New York:McGraw Hill.

Thompson, R. L., C. A. Higgins and J. M. Howell (1991). "Personal Computing: Toward a Conceptual Model of Utilization." MIS Quarterly **15**(1): 125-142.

Thong, J. Y. L. (1999). "An Integrated Model of Information Systems Adoption in Small Business." Journal of Management Information Systems **15**(4): 187-214.

Thouin, M., J. J. Hoffman and E. W. Ford (2008). "The Effect of Information Technology (IT) Investments on Firm-Level Performance in the Healthcare Industry." Health Care Management Review **33**: 60-69.

Tornatzky, L. G. and M. Fleischer (1990). The Processes of Technological Innovation. Lexington, Massachusetts, Toronto, Lexington Books.

Trauth, E. M. (1997). Achieving the research goal with qualitative methods: Lessons learned along the way. International Conference on Information Systems and Qualitative Research, Philadelphia, PA, IFIP TC8 WG 8.2.

Trkman, P. (2010). "The critical success factors of business process management." International Journal of Information Management **30**(2): 125-134.

Tsai, W. (2001). "Knowledge transfer in intra-organizational networks: Effects of network position and absorptive capacity on business-unit innovation and performance." Academy of Management Journal **44**: 996- 1004.

Uwizeyemungu, S. and L. Raymond (2009). "Exploring an alternative method of evaluating the effects of ERP: a multiple case study." Journal of Information Technology **24**: 251-268.

Uwizeyemungu, S. and L. Raymond (2010). "Linking the Effects of ERP to Organizational Performance: Development and Initial Validation of an Evaluation Method." Information Systems Management **27**(1): 25-41.

Valverde, S. C., R. L. Paso and F. R. Fernandez (2007). "Financial Innovations in Banking: Impact on Regional Growth." Regional Studies.

Van den Bosch, F. A. J., H. W. Volberda and M. De Boer (1999). "Coevolution of firm absorptive capacity and knowledge environment: Organizational forms and combinative capabilities." Organization Science **10**: 551-568.

Van Wijk, R., F. A. J. Van den Bosch and H. W. Volberda (2003). Knowledge and networks. The Learning and Knowledge Management. Blackwell Handbook of Organizational. M. Easterby-Smith and M. A. Lyles. Blackwell, Oxford, UK**:** 428-453.

Vinding, A. L. (2000). Absorptive Capacity and Innovation performance: A human capital approach. Department of Business Studies. Denmark, Aalborg University. **DRUID/IKE Group**.

Volberda, H. W. (1996). "Toward the flexible firm: How to remain vital in hypercompetitive environments." Organization Science **7**(4): 359-387.

Volberda, H. W., N. J. Foss and M. A. Lyles (2010). "Absorbing the Concept of Absorptive Capacity: How to Realize Its Potential in the Organization Field." Organization Science **21**(4): 931-951.

Wade, M. and J. Hulland (2004). "Review: the resource-based view and information system research: review, extension, and suggestions for future research." MIS Quarterly **28**: 107-142.

Wagner, H. T. (2006). The role of alignment and IS usage for business process performance: An empirical survey among German banks. Pacific Asia Conference on Information Systems (PACIS)**:** 138-151.

Walsh, J. P. and G. R. Ungson (1991). "Organizational memory." Academy of Management Review **10**: 57-91.

Walsham, G. (1993). Interpreting Information Systems in Organizations. Chichester, Wiley.

Walsham, G. (1995). "Interpretive case studies in IS research. Nature and method." European Journal of Information System **4**: 74-81.

Walsham, G. and S. Sahay (2006). "Research on Information Systems in Developing Countries: Current Landscape and Future Prospects." Information Technology for Development **12**(1): 7-24.

Walter, A., R. Thomas and G. G. Hans (2001). "Value Creation in Buyer-Seller Relationships: Theoretical Considerations and Empirical Results from a Supplier's Perspective." Industrial Marketing Management **30** (4): 365-377.

Wan, Z., Y. Fang and M. Wade (2007). A ten-year odyssey of the 'IS productivity paradox' - a citation analysis (1996-2006). The Americas Conference on Information Systems (AMCIS) 2007, Keystone, CO.

Weber, S. (2004). The Success of Open Source. Cambridge MA, Harvard University Press.

Weill, P. (1990). Do Computers Pay Off? Washington, DC, ICIT Press.

Weill, P. (1992). "The Relationship Between Investment in Information Technology and Firm Performance: A Study of the Valve Manufacturing Sector." Information Systems Research **3**(4): 307-331.

Weill, P. and M. Broadbent (1998). Leveraging the New Infrastructure: How Market Leaders Capitalize on Information Technology. Cambridge, MA, Harvard Business School Press.

Weill, P. and M. H. Olson (1989). "Managing investments in IT: mini case studies and examples." MIS Quarterly **13**(1): 3-17.

Wheeler, B. C. (2002). "NEBIC: A Dynamic Capabilities Theory for Assessing Net-Enablement,." Information Systems Research **13**(2): 125-146.

Whetten, D. A. (1989). "What constitutes a theoretical contribution?" Academy of Management Review **14**(4): 490-495.

Wieder, B., P. Booth, Z. P. Matolcsy and M.-L. Ossimitz (2006). "The impact of ERP systems on firm and business performance." Journal of Enterprise Information Management **19**(1): 13-29.

Wiersema, M. and K. Bantel (1992). "Top management team demography and corporate strategic change." Academy of Management Journal **35**: 91-121.

Willcocks, L. P. and S. Lester (1999). Beyond the IT Productivity Paradox. Wiley, Chichester.

Williams, M. L. and M. N. Frolick (2001). "The Evolution of EDI for Competitive Advantage: The FedEx Case." Information Systems Management **18**(2): 47-53.

Williamson, O. E. (1983). Organizational innovation: The transaction cost approach. Lexington, MA, Lexington Books.

Wong, P. K. (2002). "ICT Production and Diffusion in Asia: Digital Dividends or Digital Divide." Information Economics and Policy **14**(2): 167-188.

World Bank (2010). "World Bank Report,2009." www.worldbank.org.

Wu, J. H., S. S. Shin and M. S. H. Heng (2007). "A methodology for ERP misfit analysis." Information & Management **44**: 666-680.

Xu, S., K. Zhu and J. Gibbs (2004). "Global Technology, Local Adoption: A Cross-Country Investigation of Internet Adoption by Companies in the United States and China." Electronic Market **14**(1): 13-24.

Xue, Y., H. Liang, W. R. Boulton and C. A. Snyder (2005). "ERP implementation failures in China: case studies with implications for ERP vendors." International Journal of Production Economics **97**(3): 279-295.

Yang, J. and K. Ahmed (2009). "Recent trends and developments in e-banking in an underdeveloped nation - an empirical study." International Journal of Electronic Finance **3**(2): 115 - 132.

Yin, R. K. (1989). Case study research: Design and methods Newbury Park, CA, Sage.

Yin, R. K. (1994). Case Study Research: Design and Methods (2nd ed), Newbury Park: Sage.

Yin, R. K. (2002). Case Study Research: Design and Methods, Prentice Hall.

Yin, R. K. (2003). Applications of Case Study Research. USA, Sage.

Yu, C.-S. (2005). "Causes influencing the effectiveness of the post-implementation ERP system." Industrial Management & Data Systems **105**(1): 115-132.

Zahra, S. and G. George (2002). "Absorptive capacity:A review, re-conceptualization and extension." Academy of Management Review **27**(2): 128-156.

Zheng, Y. and G. Walsham (2008). "Inequality of what? Social exclusion in the e-society as capability deprivation." Information Technology and People **21**(3): 222-243.

Zhu, K., K. Kraemer and S. Xu (2003). "Electronic business adoption by European firms: a cross-country assessment of the facilitators and inhibitors." European Journal of Information System **12**: 251-268.

Zhu, K. and K. L. Kraemer (2005). "Post-adoption variations in usage and value of e-business by organizations: Cross-country evidence from the retail industry." Information Systems Research **16**(1): 61-84.

Zhu, K., K. L. Kraemer and S. Xu (2006). "The Process of Innovation Assimilation by Firms in Different Countries: A Technology Diffusion Perspective on E-Business." Management Science **52**(10): 1557-1576.

Zhu, K., K. L. Kraemer, S. Xu and J. Dedrick (2004). "Information technology payoff in e-business environments: An international perspective on value creation of e-business in the financial services industry." Journal of Management Information Systems **21**(1): 17-54.