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GHANA

Enterprise Resource Planning (ERP) Implementation in a Sub-Saharan African Nation: An  
Empirical Test of Competing Models and Theories

KNUST

by

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of Business, College of Art and Social Sciences  
in partial fulfillment of the requirements for the degree of

DOCTOR OF PHILOSOPHY

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## DECLARATION

I hereby declare that this submission is my own work towards the award of PhD. and that, to the best of my knowledge, it contains no material previously published by another person nor material which has been accepted for the award of any other degree of the University, except where due acknowledgement has been made in the text.

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## ABSTRACT

In this study, the researcher developed a modified research model to examine the antecedents and impact of extent of Enterprise Resource Planning (ERP) systems implementation on Process Management Capability, and its subsequent impact on firm performance. The existing model was extended by the addition of the following constructs: Ethical Factors, Data Culture, Organizational Integration, and Organizational Performance. In exploring ERP implementation in Ghana, a Sub-Saharan African (SSA) nation, two competing theories, the Institutional theory and the Panoptic theory, were tested using empirical data collected from a survey involving 115 respondents from organizations in Ghana that had implemented ERP systems. The data was analyzed using structural equation modeling-partial least squares. The findings indicate that the Panoptic theory explains the relationships between the constructs better and confirms the positive impact of higher extent of ERP implementation on process management capabilities. Theoretical implications of the study include (1) the emergence of the Panoptic theory as a strong predictor of ERP implementation in SSA (2) the mediating effect of the Ethical factors and Organizational Integration (3) the panoptic theory has more predictability and can be more easily generalized than institutional theory, allowing the research to have a more global impact beyond SSA and (4) Contextual factors such as industry type, employee size, and ERP type influence ERP implementations in SSA. Practical Implications are: (1) ERP systems create information visibility which checks the ethical behaviour of employees and causes them to behave in a socially responsible manner (2) Organizations can achieve greater organizational integration by increasing their extent of ERP implementation and (3) Governments and regulatory bodies must institute policies and protocols that encourage ERP adoption.

## **DEDICATION**

Special dedications to GOD, ALMIGHTY for the Wisdom, Strength and Grace bestowed to me throughout the research period.

This work is dedicated to my beloved wife Mrs. Adjoa Asamoah, my children Abena Ohemaa Adowaa Asamoah, David Asamoah Jnr. and Jeremiah Ampofo Asamoah for their love, prayer, encouragement, sacrifice and guidance during the research period.



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## LIST OF ABBREVIATIONS

AVE	Average variance extracted
BBC	British Broadcasting Corporation
BPI	Business Process Improvement
BPO	Business Process Outcomes
BPP	Business Process Performance
CFA	Confirmatory Factor Analysis
CIOs	Chief Information Officers
CSF	Critical Success Factor
DOI	Diffusion of Innovation
ERP	Enterprise Resource Planning
GDP	Gross Domestic Product
GNI	Gross National Income
ICT4AD	ICT for Accelerated Development
IS	Information Systems
IT	Information Technology
MR	Multiple Regression
MRP II	Manufacturing Resource Planning
MRP	Material Requirements Planning
PLS	Partial least square
PMC	Process Management Capabilities
PNBF	Perceived Net Benefit Flow

RBV	Resource Based View
ROI	Return on Investment
SAP	Systems, Applications and Products in Data Processing
SEM	Structural equation modeling
SSA	Sub-Saharan Africa
VIF	Variance Inflation Factor

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## CHAPTER ONE

### INTRODUCTION

#### 1.1 Background of the Study

Enterprise Resource Planning (ERP) systems have acquired diverse definitions and meanings in various disciplines (Nazemi et al., 2012). Jacobs and Bendoly (2003, p233) succinctly put it as:

“Enterprise resource planning has come to mean many things over last several decades. Divergent applications by practitioners and academics, as well as by researchers in alternative fields of studies, has allowed for considerable proliferation on the topic and for a considerable confusion regarding the meaning of the term”.

According to Deloitte (1998), an ERP system is a “packaged business software system that allows a company to automate and integrate the majority of its business processes, share common data and practices across the entire enterprise, and produce and access information in a real-time environment. Organizations employ ERP systems to enhance the visibility and accessibility of information in an integrated environment (Ignatiadis and Nandhakumar, 2007). The benefits that accrue from the implementation of ERP systems are both tangible and intangible (Murphy and Simon, 2002), and could be replicated at operational, managerial, strategic, infrastructural, and organizational levels of a business (Shang and Seddon, 2002). Escalle et al. (1999 cited in Yusef et al., 2004, p253) summarized the definition and benefits of ERP systems as follows:

“Enterprise resource planning, when successfully implemented, links all areas of a company including order management, manufacturing, human resources, financial systems, and distribution with external suppliers and customers into a tightly integrated system with shared data and visibility. Potential benefits include drastic declines in inventory, breakthrough reductions in working capital, abundant information about customer wants and needs, along with the ability to view and manage the extended enterprise of suppliers, alliances, and customers as an integrated whole”.

Even though an effective ERP implementation is expected to improve business process outcomes (BPO) (Karimi et al., 2007; Shang and Seddon, 2002), some studies argue that not all organizations experience the expected benefits and or the objectives for implementing ERP systems (Alshawhi et al., 2004; Kim et al., 2005; Scot and Vessey, 2002; Sia and Soh, 2002; Voordijk et al., 2005). Much of the work on the potential benefits from ERP implementation used the technology diffusion theory and the resource-based view of the firm (Al-Mashari et al., 2003; Cooper and Zmud, 1990; Elbashir et al., 2008; Hitt et al., 2002; Holland and Light, 1999; Su and Yang, 2010). Researchers have noted that ERP implementations, when well-managed, are associated with higher benefits to organizations (Karimi et al., 2007; Ranganathan and Brown, 2006). The benefits from ERP implementation are usually in the form of improved business processes which often translate into improved business performance (Karimi et al., 2007; Elbashir et al., 2008). Karimi et al. (2007) noted that the relationship between the extent of ERP implementation and business process outcomes is influenced by the ERP delivery systems within the organization and the radicalness of the ERP systems implementation.

Management scholars also acknowledge that ethics has a powerful effect on firm performance. This is epitomized in the decision to devote a special issue in the Academy of Management Review to understanding ethical behaviour and how it affects multinational firms (Ashforth et al., 2008). Given the substantial number of multinational organizations operating in the Sub-Saharan Africa (SSA) region, and considering how rampant corruption is perceived to be in SSA region, obtaining a good understanding of how ethical issues, including ethical behaviour, impact ERP implementation in SSA is not only timely but worth examining. The issue of corruption amongst organizations in SSA has been identified as a very significant emerging challenge in the region (Transparency International, 2012), and the government of Ghana has placed a high priority on fighting and mitigating this menace (Owusu, 2014; Ghana News Agency, 2014). In order to stem the tide of corruption within SSA institutions, many firms and industries have set out to establish stringent control systems, strong business ethics and an overall sense of corporate social responsibility within their firms and operations. Effectively combating organizational corruption in SSA businesses requires the concerted effort of important stakeholders like employees, managers, regulatory institutions, and government (Freeman, 1984). Issues of corruption, ethics, and corporate social responsibility are perceived by the researcher to impact ERP adoption and benefits.

Most of the existing studies on ERP impact have tended to focus on developed nations, particularly North America and Europe where there is massive adoption of ERP systems (Huang et al., 2004; Huang and Palvia, 2001). This is not entirely surprising as the level of IT adoption and implementation is directly related to the economic and technological status of individual countries, with a greater percentage of the adoption and implementation of IT applications and ERP studies occurring in developed economies (Abdelghaffar and AbdelAzim, 2010). The above

reality is also confirmed by statistics from Advanced Marketing Research (AMR) which indicate that 88% of the ERP market is in North American and European countries while the remaining market goes to the rest of the world (AMR, 2008). However, as a result of the recent economic growth in many developing countries, such economies have increasingly become targets for major ERP vendors, leading to a rise in ERP systems implementation (Huang and Palvia, 2001; Avgerou, 2008; Otieno, 2010). Exploring the impact of ERP systems on firms in developing nations should be of interest to both practitioners and academics as they represent a very different context to ERP implementation in developed countries (Roztock and Weistroffer, 2009; 2011).

Developing countries are usually characterized by low gross national income per capita, which translates into general unemployment, poverty, low standards of living, modest personal savings and little capital accumulation. These conditions, coupled with other socio-economic frailties, make conducting business in SSA and other less developed countries precarious relative to the developed countries (Roztock and Weistroffer, 2008). Also, most small and medium enterprises (SMEs) are usually managed by their owners, who may not have the requisite expertise to drive operational excellence. Other social, cultural, behavioural, and attitudinal characteristics further debilitate smooth operation of businesses in developing countries. The impact of the business environment as well as the organization's work culture on ERP implementations have been noted by researchers (Huang and Palvia, 2001). This study would consider ERP implementation in a typical SSA country and focus on the basic functionalities of the varied ERP products and their impact on the process management capabilities and firm performance. Ethical factors, data culture, and organizational integration would also be proposed as important variables that interact to shape ERP implementation in SSA in different ways.

Karimi et al.'s (2007) study focused on the impact of the extent of ERP implementation on business process outcomes (BPO). But from literature, and based on the researcher's anecdotal evidence on SSA, it is believed that ethical behaviour, organizational integration and data culture may influence BPO, and subsequently the overall firm performance. For these reasons the researcher investigated how these factors advance our understanding of ERP implementation in the SSA region, and in particular in the Ghanaian environment. Furthermore, according to Liang et al. (2007), institutions can have an important effect on ERP system implementation. Campbell (2007) reiterated Liang et al. (2007) assertion by arguing that institutional pressures coerce employees and the organization as a whole to behave in an ethically and socially responsible manner. On the other hand, Elmes (2005) using the panoptic theory stress that when an organization implements an ERP system, it becomes a tool or mechanism which can be used to control employees' behaviour. Thus either the institutional or panoptic theory can be a useful theoretical lens to explain the outcome of this study. Thus the researcher used competing theory approach to empirically determine which of the two theories may better explain ERP implementation in SSA.

## **1.2 Statement of the Problem**

The research is directed at addressing three main deficiencies identified from information systems (IS) literature: (i) the limited studies on ERP implementations in SSA, a developing region, (ii) the limited research on the impact of ERP process management capabilities on organizational performance and (iii) lack of research that examines ethical behaviour on process management capabilities.

Existing literature has suggested that business environment exerts an influence on the successful adoption and use of IT (Chou and Chang, 2008; Gargeya and Brady, 2005; Ragowsky et al., 2000; Roztocki and Weistroffer, 2008; 2011; Soh and Sia, 2004; Zhang et al., 2002). Thus the factors that impact successes and failures of IT implementation in developed countries could be significantly different from those of the developing economies. Even though ERP adoption and implementation is greater in developed countries, studies indicate that developing and emerging economies are witnessing massive upsurge in ERP adoption in several industries (Huang and Palvia, 2001; Avgerou, 2008; Otieno, 2010). Despite this rapid growth of ERP use in developing economies, academic and research interest has not grown at the same rate. Much of the research conducted in the area of IT and for that matter ERP, are more focused on developed economies, leading to relatively limited academic publications in ERP, particularly in the area of ERP benefits and its impact on firm performance in developing countries (Huang and Palvia, 2001; Roztocki and Weistroffer, 2011). Furthermore, the literature indicates that majority of the scanty studies of ERP in developing countries are focused on the Asian and Middle East regions with a relatively insignificant percentage concentrating on Africa, and in particular the SSA region (Moohebat et al., 2010). Huang and Palvia (2001) and Otieno (2010) have also suggested that more research needs to be undertaken to compare ERP implementation practices and issues pertaining in developed and developing nations. This work goes some way in addressing these research gaps.

Roztocki and Weistroffer (2011) assert that majority of the limited work on IS research including ERP studies in developing countries are conducted with the assumption that best practices emerging from developed countries exhibit universality and can, with some little

modifications, be successfully adopted in the very different business environments of developing economies. But this usually is not the case because poor management practices in the SSA region such as the negative business attitudes, corrupt employees, poor data culture, and poorly set out functional divisions within most SSA businesses, raise peculiar issues with regard to ERP implementation in the region that have to be strategically managed. Furthermore, IS researchers use theories and models that presume a predictable business environment, stressing on long term strategic planning based on hard data, which are the direct opposite of the situation in developing economies (Roztock and Weistroffer, 2011). Roztock and Weistroffer (2011) believe that such broad presumptions are made only because of lack of theory to explain the research outcomes in developing countries, making all such work unreliable. Generalizations for firms in the SSA region based on the environmental conditions of developed countries can be inaccurate and paint a wrong and misleading picture of ERP implementation, which can be detrimental for the organizations. The context of developing or developed country has been identified as a primary factor in ERP assimilation (Kouki et al., 2009). Also, factors such as training and education, IT support, organizational culture, stakeholder involvement, and strategic alignment were further identified as possible influencers of ERP assimilation and success. The study presented here focused specifically on the SSA environment bearing in mind that its unique characteristics influence ERP implementations within the region.

Almost all organizations that do implement ERP systems do not seek to gain only intermediary gains in business processes, but also to obtain some financial and non-financial benefits at the organizational level (Abdelghaffar and AbdelAzim, 2010; Elbashir et al., 2008; Matolcsya et al., 2005; Mithas et al., 2011). Even though much work has been done detailing how ERP implementation results in more effective, efficient, and flexible business processes, the

effect of these improved processes on organizational performance has not been adequately investigated. This research consequently extends Karimi et al.'s (2007) study by investigating the impact of improved business process outcomes on organizational performance in a developing country.

ERP implementations have been studied with several theories and from several, sometimes conflicting perspectives, with varying results (Karimi et al., 2007; Wu, 2011; Zhu et al., 2010; Jiwat and Malcolm, 2009). In considering ERP implementation in the SSA region, issues such as organizational corruption, data culture, organizational control, and organizational integration play an important role, and these issues must be considered before, during, and after the ERP implementation in order to achieve smooth and successful implementation. Lapointe and Rivard (2005) and Mahdavian et al. (2012) have noted that fear of information transparency due to corrupt practices and fear of losing autonomy lead to the resistance of ERP implementation. This negatively influences the data culture that is formed in the organization, and potentially limits the extent of ERP implementation. ERP implementation in SSA however continues to grow strongly despite the apparently corrupt and delimiting SSA business environment (Ghana News Agency, 2014; Otieno, 2010; Transparency International, 2012; Owusu, 2014). This perhaps can be explained from the perspective of the Institutional theory as institutional pressure and structures coerce organizations to act in ethical ways and drive organizations towards higher extents of implementation. Concomitantly, ERP implementation in SSA can also be explained from the angle of the panoptic theory, which suggests that ERP implementation arising from good organizational data culture creates the organizational visibility that allows management to achieve better ethical behaviour and higher organizational integration. These two competing theories may separately explain ERP implementation in the

SSA region, and we set out to empirically test and deduce which theory better does this in terms of explanatory power and path significance. This, we believe, will throw more light on the nature of ERP implementation in SSA.

### **1.3 Objectives of the Study**

The objective of this research is to study the unique nature of ERP implementation in SSA and to assess its impact on business processes and on organizational performance. Specific objectives include:

1. To examine the environmental factors which influence ERP implementation in the SSA region
2. To investigate the influence of improved business processes on firm performance
3. To explore how ethical factors influence extent of ERP implementation and performance from the Institutional Theory perspective (research model 1)
4. To further examine ERP implementation in SSA by investigating how extent of ERP implementation impacts ethical behaviour and organizational integration using the Panoptic Theory perspective (research model 2)
5. To test the two models associated with the two competing theories above (Institutional Theory and Panoptic Theory) in terms of explanatory power and path significance

### **1.4 Significance of the Study**

The research seeks to make several theoretical and practical contributions. From theoretical perspective, two theoretical models resulting from this research were developed and presented to explain ERP implementation in SSA. Both models were tested empirically in order to explore the one that is better placed to explain ERP implementation in the sub-region. This

research thus provides an enhanced, multi-faceted understanding of ERP implementation in the region.

ERP systems are gaining popularity among multinational organizations and local companies in the SSA region, and they have been implemented across various industries such as telecommunications, financial, mining and mineral and manufacturing (Huang and Palvia, 2001). Both large and small companies have implemented relevant modules of ERP software such as SAP, Oracle, JD Edwards, as well as lesser known brands. ERP systems have the potential to significantly improve the performance of organizations, and as such, a study on ERP implementation and its impact is very relevant. Insight into ERP implementations and their impact on the firm performance is also critical because ERP systems are expensive and implementation failures could have negative financial implications on companies especially those in developing nations. Even though researchers agree that the environment within which the information systems (IS) is implemented has an impact on the success of the systems implementation (Huang and Palvia, 2001), there has been limited study to explore the effect of the SSA business environment on ERP implementation (Mbarika et al., 2005). This study addresses the gap in research. Novel constructs such as Data Culture, Organizational Integration, and Ethical factors are introduced in this research, and how these factors interact to shape the ERP implementation in the SSA environment are also detailed.

The research also specifically forges a good understanding of the effect of corruption on ERP implementation. The role of corruption within the context of ERP implementation in SSA is also a hitherto unexplored subject. This study makes a case for the strong mediating effect of ethical factors (corruption and organizational control) for ERP implementations in SSA.

Finally, while this study is largely exploratory, it could provide a roadmap on the impact of ERP implementation in an SSA nation from which further research can be made to enhance the generalizability of a model across SSA. The findings of this research will also help IS researchers gain further knowledge from comparing and contrasting ERP implementations issues from developed, developing, and emerging economies (Huang and Palvia, 2001). The identification and exploration of the gap between processes management capabilities and firm performance is one of the major contributions of this work to IS literature. The influence of the contextual factors also provide insights into how firm size, ERP type and industry influence ethical behaviour and business process management capabilities.

From the practical perspective, first of all, suggestions are offered, based on the findings on how ERP implementation in SSA can be optimized, and how challenges that are identified in the SSA economic and business environment could be mitigated. Companies in SSA that have implemented ERP systems, or are seeking to do so, stand to benefit greatly from the findings of this study.

The work also identifies and expatiates on the relationship between a firm's business processes and its eventual firm performance. Every ERP implementation will necessarily result in some changes at the business process level, but most firms measure the success of ERP implementation based on the overall performance improvements at the organizational level. It may be possible for a firm to reap improved process management capabilities which fail to translate into significant improvement in organizational performance.

## 1.5 Methodology

Research hypotheses from the two theoretical models were formulated and tested using data collected via survey methodology. Existing items were used for some of the construct items proposed in the study's research models. Some of the items were developed by the researcher using MacKenzie et al's (2011) scale development techniques.

Given that this is an exploratory study, the researcher worked with ERP consultants and agents of ERP vendors to obtain the list of organizations that have implemented the ERP systems in Ghana. Data collection was executed through a paper-based survey. Data was collected from ERP users in organizations located in Ghana. Since the study is analyzed at the organizational level, prospective respondents included top management, consisting of both IS and non-IS executives (Liang et al., 2007). The latter included the CEO and the Heads of Departments of Finance and Accounting, Operations or Supply Chain Management and IT/IS. For organizations where access to the CEO was difficult, another suitable high-ranking official who we deemed able to offer relevant and objective knowledge and opinions of the system was engaged (Armstrong and Sambamurthy, 1999; Jiwat and Malcolm, 2009; Karimi et al., 2007; Wu, 2011). Thus, based on the size of the firm, the researcher collected data from an average of three (3) high-ranking officials per firm. Data and information received from users was analyzed using SmartPLS, a structural equation modeling-partial least square system and SPSS.

Two research models both explaining ERP implementation in SSA were developed based on two different theories – the institutional theory and the panoptic theory. Analysis using SmartPLS (Ringle et al., 2005) provided results on the loadings and path significance. Based on these dimensions, the model that better explains ERP implementation in SSA was determined.

## 1.6 Scope of the Research

The scope of a research refers to the delimitation of the study. It sets the boundaries, exceptions, reservations in a research (Creswell, 2003). This section delineates the scope and context of this research.

The study focuses on both private and public organizations in Ghana, a SSA country. In Ghana ERP adoption and implementation is more prevalent in private entities than in public ones, a fact attributable to the need for private firms to focus more on the efficient management of their limited and scarce resources. Studying both public and private entities affords the researcher the opportunity to compare ERP implementation practices in the two slightly different environments where there are potential differences arising from cultural, managerial and governmental practices (Rai et al., 2009). Both local and multinational organizations are also considered in this study. Given the exploratory nature of the research, coupled with limited or no official information on ERP users in Ghana, no boundaries were set with regard to the size of the organization – it incorporates large, medium and small size organizations. In terms of the sectors to be covered, the study includes firms in the manufacturing and service sectors. Thus firms in industries such as banking, oil and gas, health, construction, retail, mining and minerals and telecommunication sectors are considered.

The study looked at all types of ERP products - from top and expensive brands to generic and low priced ones. The focus of ERP discussion in this research centered on the basic functionalities of ERP systems and their impact on the process management capabilities and firm performance. The inclusion of all the various types of ERP products on the Ghanaian markets, as against selecting specific ERP systems creates an opportunity for the IS community to know the

kinds of ERP products being used. Moreover, taking this approach of using varied ERP products affords the study the opportunity to generalize some of its theoretical and practical implications.

This research was limited to firms at the post-implementation stage of ERP systems implementation, similar to the approach of several researchers (Chou and Chang, 2008; Davenport, 2004; Olhager and Selldin, 2003; Zhu et al., 2010; Liang et al., 2007).

## **1.7 Organization of the Thesis**

This introductory chapter builds an argument for the need to understand ERP implementation in nations south of the Sahara given that the environment has been found to influence success and benefits of ERP system implementation. Chapter 2 is a comprehensive review of related studies which form the basis of the research model. The best practices from the review of literature in related domains helped the researcher identify some key issues and concepts addressed later in the thesis. Chapter 3 presents the research framework.

Chapter 4 describes the design of the study and presents the research methodology. Chapter 5 chronicles both the pilot and final surveys conducted and presents the results obtained. Finally, discussion of the results and the implications of this study to theory and practice as well as possible extensions of the study conclude this thesis in Chapter 6.

## **CHAPTER TWO**

### **LITERATURE REVIEW**

#### **2.1 Introduction**

This chapter reviews extant literature and establishes gaps with regard to studies on ERP benefits and impacts on organizational performance and related theories in SSA.

There are critical gaps in ERP system implementation that need to be studied and these include (i) the limited studies on ERP implementations in SSA, a developing region, (ii) the limited research on the impact of ERP process management capabilities on organizational performance, and (iii) the lack of studies on influence of ethical factors on ERP implementations. This research proposes to fill these gaps in the literature by assessing the impact of ERP implementation on process management capabilities and exploring its resultant influence on organizational performance in Ghana. The study examines the antecedents of the extent of ERP implementation in organizations and also attempts to discover which competing theory better explains ERP implementation in SSA. Relevant extant literature reviewed have been classified into various ERP subtopics including ERP evolution and definitions, Varied ERP Studies in developed and developing nations, the Impact of ERP implementation, ERP benefits, ERP Implementation Issues, and ERP and Organizational Performance. This review will broaden our understanding of the environmental factors that influence the impact and benefits of ERP system implementation.

While this review is by no means exhaustive, it aims to provide enough depth to form a basis for the research outlined in this thesis. With the exception of the sub-topic “Evolution and Definition of ERP” at Section 2.2, the rest of the literature review begins with a summarized

table of related papers for each of the sub-topics, which is immediately followed by an expanded discussion of the relevant papers in the summarized tables.

## 2.2 Evolution and Definitions of ERP

The term Enterprise Resource Planning (ERP) was developed from the evolution and expansion of Material Requirements Planning (MRP) and Manufacturing Resource Planning (MRP II) to include more business functions and processes (Elmes et al., 2005). In the 1980's MRP expanded from a material planning and control system to a firm-wide system with the capabilities for the planning and control of almost all the firm's resources (Chen, 2001; Soja, 2008; Yusuf et al., 2004). In the 1990s, MRP was further expanded to ERP, a term coined by the Gartner Group (Akkermans et al., 2003; Chen, 2001). Flowing from this evolution, several definitions have been provided for the term (Nazemi et al., 2012). Differences in definitions have developed because ERP studies have emerged from diverse areas of studies, leading to different applications by practitioners and academics (Jacobs and Bendoly, 2003).

Jacobs and Bendoly (2003) looked at ERP as both a concept and a system. Conceptually, ERP is seen as the integration of various business processes in an organization leading to a better order management and control, accurate inventory management information, better workflow and supply chain management and improved industry best practices. As a system, ERP is viewed as a technological tool with the requisite functional capabilities to convert the concept into a reality. ERP systems integrate cross-functional applications in most large and medium-sized organizations across the world and are also used in the retrieval and processing of data emanating from the various functional areas across the firm (Gore, 2008). ERP is referred to as a

‘cross-functional’ system in that it integrates the different business processes of various functional areas in an organization, eventually promoting efficient decision making.

Table 2.1 provides several definitions from various authors (Akkermans et al., 2003; Botta-Genoulaz and Millet, 2006; Davenport, 1998; Gulla, 2004; Kumar and Hillegersberg, 2000; Laughlin, 1999; Nah et al., 2001; Sammon and Adam, 2007; Slater, 1999).

**Table 2.1      Various ERP Definitions**

Author and Year	Definition
Davenport (1998)	Comprehensive system that lumps together and automate many of the business processes that deal with the operations/production and distribution aspects of an organization
Deloitte (1998)	ERP system is a packaged business software system that allows a company to (i) automate and integrate the majority of its business processes (ii) share common data and practices across the entire enterprise (iii) produce and access information in a real-time environment
Laughlin (1999)	ERP which was born out of the need to plan, manage and account for resources in a majorly manufacturing sector is defined as “software packages that affect everything from order capturing to accounting and procurement to warehousing”
Slater (1999)	ERP combines key business and management processes in order to create visibility for managers with regards to what is going on in the organization
Kumar and Hillegersberg (2000)	It is an arrangement of parts of information systems packages that put together information and information-based processes within and across functional areas in an organization
Nah et al. (2001)	A business software system that is used to manage the resources of

	organization in an efficient and effective manner (materials, human resources, finance, etc.) by offering a complete integrated solution for the information-processing needs of the organization, via a process-oriented perspective standardized across the organization
Simon and Murphy (2001)	ERP is recognized as business software whose scope is multifunctional; with an amalgamated nature and a modular structure
Akkermans et al. (2003)	ERP is a composite transaction information system that lumped together various types of information processing abilities and put data into one database to ensure the effective management of the organization's day to day activities
Gulla (2004)	ERP is large sophisticated information system that amalgamates and coordinates the organization's business process within and across the organization
Botta-Genoulaza and Millet (2006)	ERP, an amalgamated software system, is a combination of standard functional modules (Production, Sales, Human Resources, Finance, etc.), developed by an organization, and could be used for the specific needs of each customer
Sammon and Adam (2007)	Sophisticated software system developed to integrate and automate important functional areas of an organization

Deloitte Consulting (1998) offers a comprehensive definition that seeks to use functionality to identify ERP systems. According to Deloitte Consulting (1998), an ERP system is a packaged business software system that allows a company to:

- automate and integrate the majority of its business processes
- share common data and practices across the entire enterprise
- produce and access information in a real-time environment

Davenport (1998) in keeping with Deloitte's functionality-style definition describes an ERP as any comprehensive system that lumps together and automates many of the business practices in the various departments of the firm including accounting, financial, human resource supply chain, and customer service. This line of thinking was also employed and expanded by Botta-Genoulaza and Millet (2006) who defined ERP system as an amalgamated software package, which combines a set of standard functional modules (Production, Sales, Human Resources, Finance, etc.), developed or put together by an organization, and which could be used for the specific needs of each customer.

One often quoted definition by Akkermans et al. (2003) describes ERP as a composite transactional information system that lumps various types of information processing abilities and puts data into one database to ensure the effective management of the organization's day to day activities. Another recurring theme that runs through most definitions of ERP is the concept of firm-wide integration and inter-firm coordination and integration. Gulla (2004) offers his definition of ERP as large sophisticated information systems that amalgamate and coordinate the organization's business processes within and across the organization. Davenport (1998) further defines an ERP system as a packaged software product that can be bought 'off-the-shelf' by an organization in order to integrate and share its information and related business processes within and across functional areas.

Others defined ERP as a packaged business software system that helps organizations to manage their resources (materials, human resources, finance, etc.) efficiently and effectively by providing a complete integrated solution for the organization's information-processing needs, via a process-oriented view standardized across the organization (Kumar and Hillegersberg, 2000; Nah et al., 2001). The integration and coordination also creates new visibility or greatly

improves existing visibility across and beyond the structures and processes of the organization (Ignatiadis and Nandhakumar, 2007). This capability of ERP was earlier on mentioned in Slater's (1999) definition, which describes ERP as an integrated system that provides management with an unrestricted overall view of much of what is going on in the organization. Umble et al. (2003) also defined ERP as a comprehensive view of the organization and a common database in which business transactions are recorded and stored.

Some authors believe that ERP is not only a software solution customized to suit an organization but that, it is an organization's business blueprint that impacts on how employees work by enforcing its own way of reasoning on a company's strategy, organization, and culture (Lee and Lee, 2002; Davenport, 1998). This is because ERPs come pre-programmed with best practices, which are supposedly established effective ways of doing business (Arif et al., 2005; Boersma and Kingma, 2005; Soh et al., 2000; Soh and Sia, 2004). Most ERP systems, for example, are programmed with philosophies and best practices such as full integration and generic processes in-built into them. This may however generate issues of incompatibility when a firm, for instance, sees customized processes and slightly differentiated operations or autonomous business units as a source of competitive advantage (Davenport, 1998). So while ERP vendors try to structure their systems to reflect best practices, it is the vendor not the client, who defines what is best (Lee and Lee, 2002). Buying an ERP package is therefore buying not just software but buying into the manufacturer's philosophy on management and best-practices of how business should be done (Umble et al., 2003). Studies such as Kosalge (2005) have argued that there is no single best way of doing business and that the context of the organization also plays a major role in the way business is to be carried out.

**Table 2.2 Varied ERP Studies in Developed and Developing Nations**

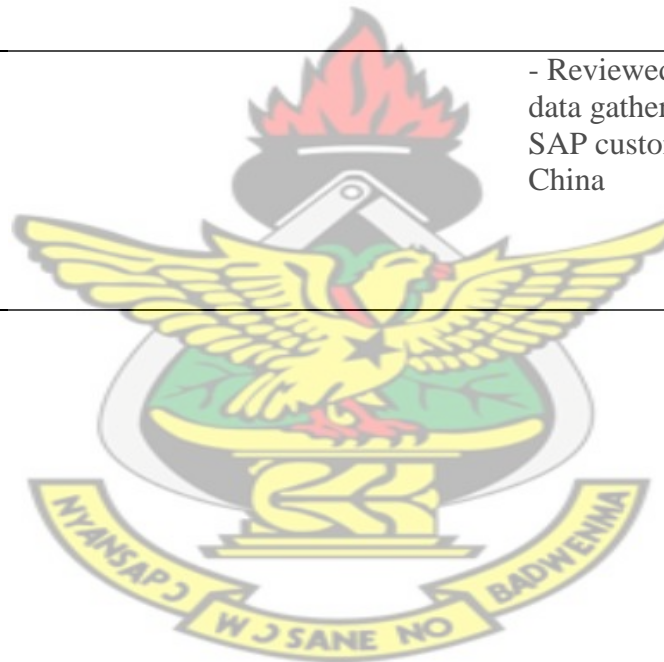
Author(s) and Year	Country	Purpose of the Study/Research Objectives	Construct(s) Used	Underlying Theoretical Framework	Methodology	Findings
Moohebat et al. (2010)	Worldwide	Examined if there is any difference between ERP CSFs in developed and developing nations			<ul style="list-style-type: none"> <li>- Searched for ERP CSFs studies in various scientific databases.</li> <li>- Obtained 400 studies which were eventually pruned down to 85 sources grouped into “Developing and Developed” nations</li> <li>- Information analyzed with SPSS 16</li> </ul>	<ul style="list-style-type: none"> <li>- “Change Management” was the most important factor in both nation categories</li> <li>- National culture has a visible impact on ERP implementation in developing countries</li> <li>- Developing nations depend more on ERP vendors.</li> <li>- Developing countries underrate the reengineering of their business processes</li> </ul>
Huang and Palvia, (2001)	Developed (USA, Canada, European, Japan) Developing (China, India, Brazil)	Compared implementation practices of ERP in developed and developing countries		ERP Implementation Framework	<ul style="list-style-type: none"> <li>- Used the framework to discuss the various ERP implementations and implication in developed and developing countries</li> </ul>	<ul style="list-style-type: none"> <li>- Developing countries in implementing ERP are confronted with some key challenges which include economic, cultural and infrastructural issues</li> </ul>
Rajapakse and Seddon, (2005)	Asia- Sri Lanka	Examined CSFs that impact successful ERP implementation in large firms		Hofstede’s (2001) dimensions of national culture	<ul style="list-style-type: none"> <li>- Used six Case studies</li> <li>- Data collection through Interview and questionnaire from managers</li> </ul>	<ul style="list-style-type: none"> <li>- Opposing cultural forces kicks against the ERP adoptions in developing countries in Asia</li> </ul>

Abdelghaffar and AbdelAzim, (2010)	Egypt	Investigated factors that will stimulate successful ERP assimilation and the differences in impact between developed and developing countries		Huang and Palvia (2001) Framework	<ul style="list-style-type: none"> <li>- Data collected from large firms through managers and CIOs interviews.</li> <li>- The organizations included manufacturing, service delivery, banking, trading (Government)</li> </ul>	<ul style="list-style-type: none"> <li>- Organizations with successful ERP implementation largely impacted by key organizational factors, and National or Environmental factors.</li> <li>- Successful ERP implementation had a significant (indirect) impact on gaining competitive advantages for organizations</li> </ul>
Kouki et al. (2009)	Canada and Tunisia	Developed theoretical perspective of how leadership affects ERP implementation through fostering the right organizational culture	Technological, Organizational and Environmental context impact ERP Assimilation	Diffusion of innovation theory	<ul style="list-style-type: none"> <li>- Exploratory and multiple case study approach</li> <li>- Compared six firms in developed and developing countries.</li> <li>- Minimum of 5 managers were interviewed in each company</li> <li>- In-depth Semi structured interviews</li> </ul>	<ul style="list-style-type: none"> <li>- The context of developing or developed country is a primary factor in ERP assimilation</li> <li>- Developing countries main problem was high power distance</li> <li>- Technological complexities of ERP systems and the strong believe in human judgment hamper ERP assimilation</li> </ul>
Ke and Wei (2008)	Hong Kong	Examined the impact of various enterprise system characteristics on the SMEs.	ERP implementation success impacts positively on firm culture		<ul style="list-style-type: none"> <li>- Developed hypotheses from the proposed constructs</li> </ul>	<ul style="list-style-type: none"> <li>- Inability to close gaps between requirements of ERP system design and actual reality of client's organization during</li> </ul>

				implementation could lead to project failure. other resources
Seethamraju (2008)	Australia	Focused on an understanding of why ERP failures occur	<ul style="list-style-type: none"> <li>- Case Study</li> <li>- Semi-structured in-depth interviews</li> </ul>	<ul style="list-style-type: none"> <li>- Misfits were worse in Asia as compared to that of USA and Europe whose business model form the bedrock for ERP systems.</li> <li>- Country specific factors (regulation, social practices across nations and cultures) varied across functional modules.</li> <li>- Functional areas with international standardization regulations have fewer misfits (e.g. Accounting)</li> </ul>
Haware and Heeks (2010)	Jordan	Examined misfits detected in ERP implementation – the various strategies employed in resolving them and related impact on the organization	<p>Used DeLone &amp; McLean's model; before applying “design-reality gap” model beyond the factor list approach</p> <ul style="list-style-type: none"> <li>- Case Study</li> <li>- Viewed situation before and during ERP implementation</li> </ul>	<ul style="list-style-type: none"> <li>- Showed strong impact of CIOs, business and IT knowledge on IT assimilation.</li> <li>- Diffusion and strong relationship of IT knowledge and business knowledge were observed in firms that have CIO's as part of Top-Management</li> </ul>

Soh et al. (2000)	Asia (Singapore hospitals)	Examined the impacts of senior leadership and IT infrastructures on firms' assimilation of IT into their value-chain activities and business strategies		<ul style="list-style-type: none"> <li>- Reviewed ERP implementation documents and interviews</li> </ul>	<ul style="list-style-type: none"> <li>- Some CSF were likely to be important irrespective of national culture while others were culturally dependent.</li> <li>- The two main CSF common to both countries during implementation were top management support and formation of balanced project team.</li> <li>- Power-distance and collectivist nature played an important role in the Chinese implementation process</li> </ul>
Armstrong and Sambamurthy (1999)	USA	Synthesized an ERP systems implementation process model and set of CSFs, derived the most important factors, and explain the differences between the cultures	Resource-based and knowledge based theories of the firm	<ul style="list-style-type: none"> <li>- Survey.</li> <li>- Used a sample frame of 1120 medium to large firms from 8 industries</li> <li>- Responses were obtained from CIOs and senior business executives</li> </ul>	<ul style="list-style-type: none"> <li>- Awareness of cultural differences is key to ERP success even within the same type of company ownership</li> </ul>

Shanks et al. (2000)	China and Australia	Examined the fundamental differences between ERP implementations in China's State Owned Enterprises (SOEs) and Private Ventures (PVs)	Critical Success Factor	Hofstede's model	<ul style="list-style-type: none"> <li>- Two case studies;</li> <li>- Supplemented primary data with project documents and other company literature</li> </ul>	<ul style="list-style-type: none"> <li>- The results indicate that some CSF were likely to be important irrespective of national culture while others were culturally dependent</li> </ul>
Martinsons (2004)	China				<ul style="list-style-type: none"> <li>- Reviewed users survey data gathered from 189 SAP customers across China</li> </ul>	<ul style="list-style-type: none"> <li>- Concluded that awareness of cultural differences is key to ERP success even within the same type of company ownership</li> </ul>



## **2.3 Varied ERP Studies in Developed and Developing Nations**

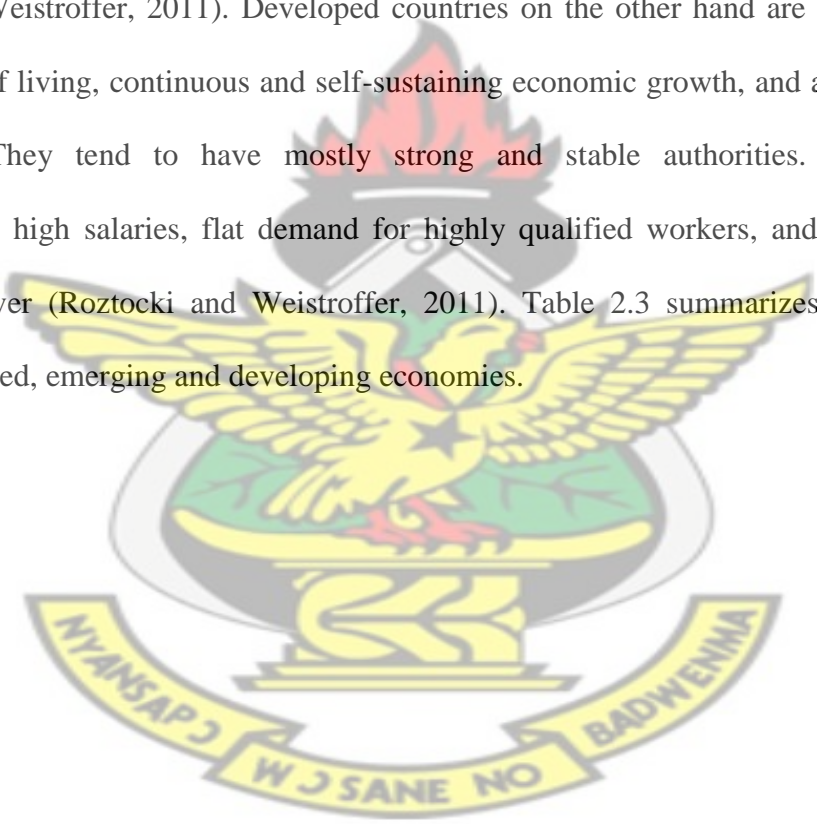
### **2.3.1 Introduction**

As has been stated in the previous chapter, this work explores ERP implementation in a relatively unexplored environment of the SSA region. ERP implementation in developing countries leads to a different experience compared to implementation in developed countries (Moohebat et al., 2010; Huang and Palvia, 2001). In this section, we explore the context of developing and developed countries and consider research on ERP implementation within these two contexts. Table 2.2 presents some ERP studies conducted in developed and developing countries.

The World Bank uses gross national income (GNI) as the metric for classifying economies. Under its classification module, economies with per capita income below \$13,460 are categorized as non-high income countries with some 72% of the world population falling under this group as at 2012 (Worldbank, 2014).

The term “developing” is synonymous with the word “poor” or “economically underperforming” (Roztocki and Weistroffer, 2008). Developing countries can be identified with low gross national income per capita, which translates into general unemployment, poverty, low standards of living, modest personal savings and little capital accumulation. Governmental control, laws and regulations tend to be weak, slow and there is usually an unstable regulatory environment. The combined effects of all these is the lack of skilled labour, underdeveloped capital markets, poor infrastructure as well as a weak industrial and commercial base (Hoskisson et al., 2000).

Roztocki and Weistroffer (2008) noted that researchers often use the terms developing and emerging market interchangeably since there has not been any formally agreed definition of the latter. However, some developing countries demonstrate vigorous, persistent economic expansion, leading to fast growing per-capita income regions, and such economies are broadly referred to as emerging market economies, which is in consonance with the description by van Agtmael (1984). Developing economies have mostly strong and determined authorities, and the demand for highly qualified workers is usually high, with salaries being low but constantly rising (Roztocki and Weistroffer, 2011). Developed countries on the other hand are characterized by high standards of living, continuous and self-sustaining economic growth, and a well-developed infrastructure. They tend to have mostly strong and stable authorities. They are also characterized by high salaries, flat demand for highly qualified workers, and experience low employee turnover (Roztocki and Weistroffer, 2011). Table 2.3 summarizes the differences between developed, emerging and developing economies.



**Table 2.3      Characteristics of developed and developing economies**

<b>Business environment</b>	<b>Developing economies</b>	<b>Emerging economies</b>	<b>Developed economies</b>
Laws and regulations	Comparatively sluggish, and the changes in the regulatory environment are erratic	Fast rate of growth and difficult to predict	Comparatively sluggish and to some extent changes in the regulatory environment are not erratic
Governmental control	Authorities are generally unresolved and fragile	Largely, authorities are tough and resolved	Authorities are largely tough and firm
Workforce Characteristics	Little demand for highly skilled labour and small wages	Wages are small but constantly increasing, with an increasing need for highly skilled labour, with labour turnover being high	Fat wages, with a level need for highly skilled labour constant and labour turnover being low
Management style	Associated with the level of economic growth and decline and skilled at quick resource reallocation	Associated with rapid growth and new products and services development	Maintaining culture and standardization and concentrating on optimizing the existing products and services
Customer Characteristics	Small per capita income	Small per capita income, with emerging middle class and fast high consumer demands	Per capita income is high, but only an appreciable growth in income

Economic conditions	Unpredictable economic growth	Continuous and rapid economic growth	Continuous but appreciable economic growth
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Source: Adapted from Roztocki and Weistroffer (2011)

### 2.3.2 Implication of the Business Environment on Businesses

Conducting business in less developed countries tend to be more difficult than developed countries. Low per capita income and general poverty, for instance, mean companies must offer their products at lower unit prices, or make them smaller, or of lesser quality. Poor infrastructure and little capital also mean that it is more difficult for local businesses to emerge and survive (Roztocki and Weistroffer, 2008).

Emerging economies also exhibit fast growth rates, and are driven by economic liberalization. Doing business in emerging economies tends to be more erratic than in either developed or developing countries. This is because these countries experience much faster economic and regulatory changes than other economies and the environment is thus less steady (Roztocki and Weistroffer, 2004). Demand for goods and services in these countries is however very high as they have a significantly rising middle class population with rapidly growing personal income. This usually attracts giant multinational companies to invest in emerging economies in order to capture newly opened markets as well as creating many domestic startups. On the whole, businesses in emerging economies differ from those in developed countries in that they are relatively newer than their counterparts from developed countries. They are usually startups, or recently privatized state-owned enterprises. This also means that these relatively newer startups have relatively fewer resources to fall on (Roztocki and Weistroffer, 2011).

Furthermore, the impact of globalization and other political and economic changes on firms in developing and emerging economies has led to a significant swing in the customer and supplier bases of many businesses, which in turn creates a business environment that is highly robust and less predictable.

The style of management in developing and emerging economies is different from what exist in developed economies (Roztock and Weistroffer, 2008; McDade and Spring, 2005; Roztock and Weistroffer, 2011). Until some few decades ago, most of the firms in developing economies were state-owned firms with a weak private business sector. The governments' central planners were dictating the business activities of state owned enterprises and the responsibilities of the executive management were generally to accomplish the state's centrally stipulated production goals (Filatotchev et al., 2000). As a result of budget constraints, mandated quotas and financial subsidies, the executive management of the state owned enterprises had little or no motivation to increase the fortunes of the firm and most non-performing firms were fully sustained by the state (Kornai, 1986). Adopting the state governance of firms marked by dependence on political guidance coupled with a weak private sector led to a management style characterized by indecisiveness, maladministration and inefficiencies and financial liability (Aharoni, 1981).

Africa, after decades of economic decline, went into a major process of economic reforms. Privatization of the state-owned enterprises was one of the economic reforms measures to solve some of the continent's economic malaise. However, African leaders hardly adopted the option with keenness. For most of the leaders, political considerations take precedence over economic rationality, making privatization on the large scale in Africa unlikely (Tangri, 1991).

### 2.3.3 ERP Studies in Developing Countries

Added to the wide disparity in IT related research between developed and developing countries, few researchers have specifically focused on ERP implementation, adoption and assimilation. Huang and Palvia (2001) compared the various implementation practices of ERP between developed and developing countries and noted that developing countries are confronted with some key unique challenges: economic, cultural and infrastructure. Also, Rajapakse and Seddon (2005) explained that opposing cultural forces, centralization, low accountability and discipline, and low level of change impact ERP adoptions in developing countries. Abdelghaffar and AbdelAzim et al. (2010) using adapted Huang and Palvia's (2001) framework outlined some specific pre-implementation success factors for Egyptian organizations. These included IT Maturity, Computer Culture and Business Size (key organizational factors), Regional Economy and Economic Growth, Government regulations and IT infrastructure (National or Environmental factors). They suggested that successful ERP implementation had significant (indirect) impact on gaining competitive advantages for organizations with favourable national and organizational factors.

Although some researchers look at these factors as impediments to successful ERP implementation in developing countries, others look at them as specific and unique characteristics which must be taken into consideration before ERP projects are undertaken. Some of these factors are examined as control variables in this study. Kouki et al. (2009) investigated factors that will stimulate successful ERP assimilation and the differences in impact between developed and developing countries. They broadly concluded that the context of developing or

developed country remains a primary factor in ERP assimilation. Other factors they identified included training and education, IT support, organizational culture, managers and user involvement, and finally strategic alignment. According to the authors, developing countries' main problem – high power distance, also presents its own peculiar issues with IT and ERP assimilation.

#### **2.3.4 ERP and Culture**

ERP, just like all other information systems, is implemented within various cultural contexts of the individual, organisation and society. When ERP is adopted and assimilated within these diverse and dynamic contexts, conflicts are inevitable. The management of these evolving cultures is important. Awareness of cultural differences is therefore key to ERP success (Martinsons, 2004). Martinson's (2004) study reinforced that of Cooper (1994), which also acknowledged the possible importance of cultural inertia both in IT research and practice. Cooper's (1994) study reveals that managers should consider evaluating the chances of cultural conflicts when embarking on IT facility changes. The study further asserts that implementation of IT alone does not solve all problems within an organisation and the possibility of ethical issues surrounding managerial cultural change was also highlighted.

The role of culture in ERP implementation success was further explored by Soh et al. (2000) when they examined the different ERP implementation success rates of organizations in Asia, USA and Europe. They identified different kinds of misfits – gaps between the functionality offered by the package and that required by the adopting organization – and grouped them into three broad categories: data, process, and output misfits. These misfits, they noted, arose either from company-specific, public sector-specific, or country-specific

requirements that did not match the capabilities of the ERP package. They concluded that misfits were worse in Asia as compared to that of USA and Europe whose business model form the bedrock for ERP systems.

Shanks and Seddon (2000), in studying the individual elements of culture that impact ERP implementation employed the Hofstede's model, and indicated that for ERP implementation, there are some critical success factors that are likely to be important irrespective of national culture whilst others were culturally dependent. The two main critical success factors during ERP implementation that are common among the countries that were studied were top management Support and formation of balance project team. They further realized that power-distance and collectivist culture played an important role only in the Chinese implementation process.

Another important cultural factor that impacts ERP implementation is leadership. Ke and Wei (2008) explored this factor when they developed a theoretical perspective of how leadership affects ERP implementation through fostering the right organizational culture. They posited that ERP implementation success has positive impacts on organizational culture through learning and development, participative decision making, power sharing, support and collaboration, and tolerance for risk and conflicts dimensions. Their study also contends that in spite of the different organizational cultural underpinnings, the ability of top management to influence firm culture is crucial to the success of ERP implementation. Thus, top management behaviour can transform followers from an individual-oriented, hedonistic, rational-economic attitude to a collective, moral and value-oriented attitude.

Several studies have associated negative outcomes in the organization to culture at the national, organizational and sub-unit levels (Helmreich, 1994; Kohn et al., 2000; Vaughn, 1996). Most of these studies strongly emphasized that culture at those three levels put a faintly yet potent control on people and organizations, with information flow and IT having a close link with culture. For instance, Tufte (2003) blamed the use of IT on failings of organizational culture leading to a situation where attempts by management to introduce IT in organizations are fiercely resisted by a section of the staff (Coombs et al., 1992).

Theoretically, culture has been used to explain many social behaviours and outcomes in organizational settings (Keesing, 1974; Nadler and Tushman, 1988), including but not limited to firm effectiveness (Denison and Mishra, 1995; Duncan, 1989), and firm performance (Gordon, 1985; Gordon and DiTomaso, 1992; Kotter and Heskett, 1992).

Research on the relationship between culture and information and IT has investigated the impact of national and organizational culture on various IT issues. At the national level, research question posed seeks to look at the results of implementing the same IT in similar ways across cultures and the impact of national culture on the development and use of IT (Myers and Tan, 2002; Straub, 1994; Walsham, 2002). At the organizational level, the studies examined organizational cultural theories that explain the different outcomes of IT implementation within firms (Robey and Azevedo, 1994; Robey and Boudreau, 1999). In consonance with the popular approach of studying culture in organizational contexts, the paper used a value-based approach to achieve three key set objectives of (i) reviewing IS-Culture literature using the previous cultural theories as the base (ii) striking differences and similarities across national, organizational, and

subunit levels and (iii) developing a theory of the various cultural conflicts that might emerge from the development, adoption, use and management of IT.

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**Table 2.4     Impact of ERP Systems Implementation**

<b>Author(s) and Year</b>	<b>Country</b>	<b>Purpose of the Study/Research Objectives</b>	<b>Construct(s) Used</b>	<b>Underlying Theoretical Framework</b>	<b>Methodology</b>	<b>Findings</b>
Dehning and Richardson (2002)	USA	Reviewed literature on IT investment returns and developed a model to guide future studies in the assessment of IT investment	Proposed a model to examine the impact of IT on firm performance. Posited that IT directly or indirectly impacts on Business Processes which in turn impact overall firm performance		<ul style="list-style-type: none"><li>- Focused on archival studies that used accounting or market measures of firm performance.</li><li>- Categorized the review and discussion into 3 areas: IT Spending, IT Strategy, and IT Management/ Capability.</li></ul>	<ul style="list-style-type: none"><li>- Relation between IT and firm performance can be grouped into 3 paths: a direct relationship between IT and Overall firm performance; the relationship between IT and business process performance; and the interaction between processes and overall firm performance.</li><li>- Furthermore, added Path 4 which looked at the other Contextual factors that influence the relations between business process and overall firm performance.</li></ul>
Gelderman (1998)	The Netherlands	Examined the validity of two commonly used measures for the success of information systems (IS): usage and user Satisfaction			<ul style="list-style-type: none"><li>- Survey of 1024 Dutch managers, information managers, and controllers.</li></ul>	<ul style="list-style-type: none"><li>- Usage Satisfaction significantly related to performance</li><li>- However the relation between usage and performance was not significant.</li><li>- A partial correlation after correction for US was not significant either</li></ul>

Singla (2005)	India	Investigated the impact of ERP systems in 2 mid-sized Indian public sector organizations	Suggested that there are differences in opinion across the two organizations	<ul style="list-style-type: none"> <li>- Primary and secondary data</li> <li>- 115 staff responded to a 46 variable-instrument which were categorized into tangible, non-tangible benefits and impact on business performance (obtained from literature).</li> <li>- An independent level t-test and one way ANOVA were used in the analyses to test the difference in opinions at the three levels.</li> </ul>	<ul style="list-style-type: none"> <li>- ERP implementation yields great benefits across a wide variety of measures to adopters than non-adopters</li> <li>- Expected ERP benefits exceeded the risk of the ERP adoption.</li> <li>- ERP had a peak level of functional integration after which benefits begin to decline.</li> </ul>
Carton & Adam (2005)	Ireland and USA	To gain an insight of the impact of enterprise integration on the capability of the firm and the managers' ability to make decisions		<ul style="list-style-type: none"> <li>- Case Study, single Multinational Corporation (MNC).</li> <li>- Used the managers' own description of their goals as a lens,</li> <li>- 50 interviews were carried out with middle and senior managers in all functional areas that were impacted by ERP</li> </ul>	<ul style="list-style-type: none"> <li>- ERP system improved the visibility and system control for the support functions of the firm through standardization of transaction processes.</li> <li>- Little benefits realized for the supply chain managers with respect to the supply and demand activities.</li> <li>- Inability to easily customize the ERP system to suit changes in market condition affected output</li> </ul>
Poston & Grabski (2001)	USA	Examined the impact of ERP implementation on firm performance	Used economic and industrial organization theories	<ul style="list-style-type: none"> <li>- Questionnaire based survey for 237 Greek firms</li> <li>- Data obtained from firms' research dataset</li> </ul>	<ul style="list-style-type: none"> <li>- For each of the three years after the ERP system implementation, there was no significant improvement linked to the residual income</li> </ul>

Loukis, Sapounas, & Milionis (2009)	Greece	Examined the effect of ICT investments on Greek firms' business performance using value added and labour productivity measures			<ul style="list-style-type: none"> <li>- Survey methodology</li> <li>- Pilot study was used for instrument validation and refinement</li> <li>- Respondents were high ranking IS executives</li> <li>- PLS was used for the data analyses.</li> </ul>	<ul style="list-style-type: none"> <li>- Investments in ICT in Greece offer a positive and statistically significant contribution to both firm output and labour productivity</li> <li>- Firms with a high degree of alignment between ICT Plan and the overall Business Strategy performed better</li> </ul>
Karimi et al. (2007)	USA	Examined under what contextual conditions the extent of ERP implementation has the greatest effect on BPOs.	Extent of ERP Implementation, ERP Radicalness, ERP Delivery System, and Business Process Outcomes.	Technological diffusion perspective	<ul style="list-style-type: none"> <li>- The Delphi study was conducted with 23 Dutch supply chain executives of European multi-nationals.</li> </ul>	<ul style="list-style-type: none"> <li>- Results confirmed that the extent of ERP implementation impacts BPO, and both ERP radicalness and delivery system play moderating roles</li> </ul>
Akkermans et al. (2003)	The Netherlands	Examined the future impact of ERP on SCM		Delphi technique	<ul style="list-style-type: none"> <li>- Case Study Approach for a single successful firm</li> <li>- Interviewed the IT manager who was the ERP implementation Project Manager, and had three interviews with the finance, operations and logistics managers.</li> </ul>	<ul style="list-style-type: none"> <li>- Findings revealed that even though there is a close interrelation between SCM and ERP, not all of the relationships are positive.</li> <li>- Current ERP systems can limit progress in SCM from a strategic perspective because of their low flexibility and their typical single-company scope.</li> </ul>

Elragal and Al-Serafi (2011)	Egypt	Investigated the essential contributing factors for the relationship between ERP and business performance		<ul style="list-style-type: none"> <li>- Survey</li> <li>- Used financial and SCOR model to measure the impact on organizational performance for organizations that use ERP with SCM packaged systems.</li> <li>- 102 companies from all sectors of the economy</li> <li>- Mailed questionnaire to CIOs</li> </ul>	<ul style="list-style-type: none"> <li>- Findings generally reflect the firm deriving numerous benefits in their performance from ERP implementations according to business users.</li> <li>- A few well acclaimed benefits from ERP systems were not fully realized.</li> </ul>
Wieder et al. (2006)	Australia	Examined the claim of ERP vendors on the benefits of ERP with SCM packaged systems and its impact on organizational performance	Perception-based measures were used to capture both financial and non-financial performance indicators	<ul style="list-style-type: none"> <li>- Combined new data on ERP adoption by large firms and existing data from Brynjolfsson and Hitt (2000) on IT and productivity growth. Used both cross-section and time series component of the data, to examine the difference in performance of two set of firms - those using the ERP systems versus those without it.</li> </ul>	<ul style="list-style-type: none"> <li>- Findings revealed that there is no significant difference between adopters and non-adopters on the impact of the system at both the overall firm level and the business process level and this contradicted the vendors' claims.</li> <li>- The longer the use of ERP, the higher the organizational performance.</li> <li>- Higher performance by firms that adopt such systems</li> </ul>
Hitt (2002)	USA	Focused on the productivity and business performance effect of ERP implementation	Model showed effect of ERP adoption on productivity, firm performance	<ul style="list-style-type: none"> <li>- Representatives from four industrial sectors (oil &amp; service, manufacturing, telecommunication, automotive) were engaged</li> </ul>	<ul style="list-style-type: none"> <li>- Findings indicated that larger firms and slightly better performing firms most often adopt ERP systems.</li> <li>- ERP adopters mostly attain higher market value - Tobin's q.</li> </ul>

Dantes et al. (2011)	Indonesia	<p>Investigated the strategic and tactical impact of ERP implementation and examined the correlation between ERP implementation success and the strategic and tactical impact</p>	<ul style="list-style-type: none"> <li>- ERP implementation had more impact on tactical level than the strategic level because the adoption of the system by the firms is influenced by outside forces</li> <li>- Adoption support the core operations of the firm as against using it to achieve competitive advantage</li> </ul>
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## 2.4 Impact of ERP Systems Implementation

The impact and effect of IT implementation on organizations has been more exhaustively studied. Table 2.4 presents some of the studies on the impact of ERP systems implementation. Dehning and Richardson (2002) proposed that the relation between IT and firm performance can be categorized into 3 paths; path 1 - is a direct relationship between IT and Overall firm performance; Path 2 - focuses on the relationship between IT and business process performance; and Path 3 looks at how the processes interact to influence the overall firm performance. They suggested that a fourth path, which looked at the other contextual factors that influence the relationship between business process and overall firm performance (size, IT intensity, financial health, industry) could be considered. Gelderman (1998) conducted further investigations into these paths and examined the validity of two commonly used measures of success of information systems. He concluded that user satisfaction is significantly related to performance. However the relationship between usage and performance was not as significant. He also observed that a partial correlation after correction for user satisfaction was not significant either.

Research into ERP implementations reveal that the impact of ERP on performance may not always be positive (Seethamraju and Seethamraju, 2008; Umble et al., 2003). ERP systems implementation is not an inexpensive or risk-free venture. According to Seethamraju and Seethamraju (2008), up to 65% of executives sampled believed that ERP systems have at least a moderate chance of hurting their businesses because of potential implementation problems. It is thus worthwhile to examine factors that determine whether the implementation will be successful or not as part of ERP impact studies (Umble et al., 2003). Numerous authors have identified a variety of factors that can be considered to be critical to the success of an ERP implementation

including (i) a clear understanding of strategic goals, (ii) commitment by top management, (iii) excellent project management, (iv) organizational change management, (v) an excellent implementation team, (vi) data accuracy, (vii) extensive education and training, (viii) focused performance measures, (ix) multi-site issues (Umble et al., 2003). They concluded that a well-structured and disciplined approach towards ERP implementation can greatly lead to a successful implementation. Their findings further stipulated that the success of ERP implementation by the case study firms was based largely on how extensive they adhered to critical success factors (CSFs), among other factors (Umble et al., 2003).

Even though there remained evidence implying that firms perceived ERP projects as risky, adopters on the whole realized that the expected benefits exceeded the risk of adoption. Singla (2005) indicated that ERP implementation offers great multi-dimensional benefits to its adopters in their operations which are not available to non-adopters. In addition, Carton and Adam (2003b) noted that ERP systems improve the visibility and system control for the support functions of the firm, that is Finance, Quality and IS by standardizing their transaction processes. It was also revealed that with ERPs, there is a peak level of functional integration after which benefits begin to decline. Also, Poston and Grabski (2001) indicated that for each of the three years after an ERP system implementation, there was no significant improvement linked to the residual income or the ratio of selling, and administrative expenses. It was however revealed that the ratio of employees to revenue for each of the 3 years examined showed significant reduction and on the third year after the implementation, there was a decrease in the ratio of cost of goods sold to revenues, all demonstrating a significant improvement in firm performance. Loukis et al. (2009) researched and concluded that investments in ICT in Greece offered positive and

statistically significant contributions to both firm output and labour productivity. Further findings indicated that firms with high degree of alignment between their IT plan, the source of ERP strategy, and the overall business strategy experienced even greater benefits from their investments in ICT.

ERP however should not be brandished as the answer to all the challenges an organization faces. The study by Carton and Adam (2005) for example showed that there was hardly any benefits realized for supply chain managers with respect to supply and demand activities. The inability to easily customize the ERP system to suit changes in market conditions also affected the output of basic performance information and as a result managers lost confidence in the well acclaimed promise of ERP integration efficiency (Carton and Adam, 2005). Moreover, Karimi et al. (2007) examined ERP implementation from both the technological diffusion and resource based theory perspectives, which argue that the business process provides a context within which one can examine IT business value. The authors examined the contextual conditions under which the extent of ERP implementation has the greatest effect on business process outcomes. The study had four constructs – extent of ERP Implementation, ERP Radicalness, ERP Delivery System, and Business Process Outcomes. The authors argued that the extent of ERP Implementation impacts Business Process Outcomes and that the relationship is moderated by ERP Delivery System and ERP Radicalness. The BPO was measured by three dimensions - the Process Efficiency, Process Effectiveness and Process Flexibility. Various studies have argued that IT benefits can be grouped into operational, tactical, strategic, infrastructural and organizational components (Barua et al., 1995; Dantes and Hasibuan, 2011; Mooney et al., 1995; Shang and Seddon, 2002; Weill and Broadbent, 1998).

Shang and Seddon (2002) further discussed that even though these classified benefits stand separately, they however interact in the sense that operational benefits may yield increased managerial effectiveness; strategic benefits depend on process efficiency, infrastructural benefits lead to business flexibility and organizational benefits can be realized with managerial benefits. Thus, Karimi et al. (2007) chose to replace the operational, tactical, strategic, infrastructural and organizational benefits with BPO because of the process-oriented perspective of their study.

Akkermans et al. (2003) survey of 23 Dutch supply chain executives also revealed that even though there is a close interrelation between SCM and ERP, not all of the relationships were positive. Thus ERP systems can be seen as merely supporting SCM, and cannot by themselves ensure effective SCM. Also for technical areas such as standardization, transparency, and globalization, ERP offers at best only limited capability. The study's authors also observed that current ERP systems can limit progress in SCM from a strategic perspective because of their low flexibility and their typical single-company scope.

Thus in summary much of the work into ERP point to the fact that firms eventually record varying degrees of improvements in their performance which can be directly attributed to their ERP implementations. In some cases however, acclaimed benefits ERP systems are to offer were not fully realized (Elragal and Al-Serafi, 2011).

**Table 2.5 ERP Benefits**

<b>Author(s) and Year</b>	<b>Country</b>	<b>Purpose of the Study/Research Objectives</b>	<b>Construct(s) Used</b>	<b>Underlying Theoretical Framework</b>	<b>Methodology</b>	<b>Findings</b>
Shang and Seddon (2002)	Australia	Explored the benefits that firms may derive from their ERP investments		ES benefit framework for summarizing post implementation benefits was introduced	<ul style="list-style-type: none"> <li>- Primary and secondary data used</li> <li>- Data was obtained from 233 enterprise systems vendor-reports published on the Web and through interviews with business managers of 34 organizations using ES</li> <li>- Level of analyses was organizational and sub-unit levels</li> </ul>	<ul style="list-style-type: none"> <li>- ERP benefits categorized into five dimensions: operational, managerial, strategic, IT infrastructure and organizational.</li> <li>- Perceived net benefit flow (PNBF) graphs were used to illustrate the benefits</li> </ul>
Matolcsya, Booth, & Wiedera (2005)	Australia	Investigated the economic benefits of ERP systems	A modified value chain model		<ul style="list-style-type: none"> <li>- Survey for 35 companies</li> <li>- Developed several ratios to measure improvements as a result of the adoption of ERP systems</li> <li>- Tracked ratios for 2 years for adopters versus non-adopters</li> <li>- Both univariate and multivariate statistics are used to test for differences</li> </ul>	<ul style="list-style-type: none"> <li>- Adoption of ERP systems result in sustained operational efficiencies and improved overall liquidity</li> <li>- Some support was found for increased profitability 2 years after the adoption of ERP and for improvements in accounts receivable management.</li> </ul>
O'Leary (2004)	USA	Analysis of ERP system benefits			<ul style="list-style-type: none"> <li>- Used database from large data repository (oracle at work).</li> <li>- Content analysis was used to derive firm gains</li> </ul>	<ul style="list-style-type: none"> <li>- Some benefits (tangible) are key to firms irrespective of industry</li> <li>- Other benefits were industry specific (intangible) benefits</li> </ul>

Chou and Chang (2008)	Taiwan	Examined post-implementation performance of ERP from the managerial point of view	Model suggests that customization and organizational mechanisms affect intermediate benefits, which in turn impact on overall benefits	Organizational information processing theory (OIPT), which serves as an analytical lens to understand how alignment can be handled appropriately	<ul style="list-style-type: none"> <li>- A firm-level cross-sectional survey was used to collect data.</li> <li>- PLS was used for the analyses</li> </ul>	<ul style="list-style-type: none"> <li>- Results support the proposed hypotheses i.e. customization and organizational mechanism impact the intermediate benefits which in turn impact the overall benefits.</li> <li>- The customization effect yielded greater benefits than the organizational acceptance</li> </ul>
Yang & Su (2009)	Taiwan	Focused on the relationship between the benefits of ERP systems implementation and the impacts on firm performance of SCM	ERP benefits made up of three constructs, operational benefits, tactical benefits, and strategic benefits.		<ul style="list-style-type: none"> <li>- Structural equation modeling (SEM) used to analyze the relationship between ERP benefits and SCM performance</li> <li>- Hypotheses proposed</li> <li>- Survey used to gather data from Taiwanese IT companies listed in the Taiwan Stock Exchanges</li> </ul>	<ul style="list-style-type: none"> <li>- Results indicated that the operational, tactical, and strategic benefits of ERP for the firm impact the performance of SCM</li> <li>- The strategic benefits of ERP however are not significant predictors of SCM performance in the external business process</li> </ul>
Kamhawi (2008)	Canada	Examined the CSFs of ERP implementation for SMEs		Strauss and Corbin (1990) Grounded Theory	<ul style="list-style-type: none"> <li>- Exploratory survey research</li> <li>- Collected and reviewed data from 310 and 197 manufacturing firms from Israel and USA respectively</li> </ul>	<ul style="list-style-type: none"> <li>- Findings revealed factors that seek to explain variation between successful and unsuccessful implementations at SMEs,</li> </ul>

Davenport, Harris, & Cantrell (2004)	USA, Europe and Australia	Evaluated organizations' post-implementation dealings with business process change	Research model posits that three factors moderating realization of ES perceived value in organizations are Integration, Optimization and Information.	<ul style="list-style-type: none"> <li>- Qualitative methodology</li> <li>- Data collected from 126 customer presentations from SAP's 2003 and 2005 Sapphire U.S. conferences</li> </ul>	<ul style="list-style-type: none"> <li>- Findings revealed that implementation and process change of ERP systems were being done on an on-going basis for even initial adopters.</li> <li>- Features most related with achieving value from enterprise systems were integration, process optimization, and use of enterprise-systems data in decision making, after considering the prerequisites of time, critical mass of functionality, and significant expenditures</li> </ul>
Ragowsky et al. (2000)	Israel and the USA	Put forward a theoretical foundation for the need of ERP system implementations for effective utilization of up-and-coming technologies		<ul style="list-style-type: none"> <li>- An investigation of 61 B2B success cases</li> </ul>	<ul style="list-style-type: none"> <li>- Found significant relationship between firm's operating characteristics and the benefit the firm derives from using individual IS applications</li> <li>- Weak relationship - firm's operating factors and IS apps</li> </ul>
Seddon et al. (2010)	U.S.A	Strengthened users' perceived ERP benefits which will promote ERP implementations		<ul style="list-style-type: none"> <li>- Survey via mail</li> <li>- Chinese translated questionnaire</li> <li>- IT/MIS managers with wealth of experiences in ERP implementation participated in the study</li> </ul>	<ul style="list-style-type: none"> <li>- Findings supported the proposed hypotheses since from senior management viewpoint, all six factors were crucial in the explanation of variance in organizational benefits from ES implementation</li> </ul>

Bendoly and Schoenherr (2005)	USA	Developed a measure of an organization's performance attributable to BI and examined the relationship between the benefits of implementing BI systems and Organizational Performance	<p>Swift theory Even Flow</p> <p>Theory of Resource Dependency</p>	<p>- Dillman (2000) survey strategy guided the methodology</p> <p>- Senior business and IT executives, middle managers and IT users</p> <p>- PLS was used for the data analyses</p>	- Results indicated that the extent to which firms witness savings through such procurement is dependent not only on the presence of an implemented ERP system but also on the length of time such systems have been present and active
Wu (2011)	China	Focused on preliminary findings from a research project that examined how firms are generating benefits from their investments in ERP systems.	<p>Herzberg's Motivation-Hygiene theory</p> <p>Rough Set Theory</p>	<p>- Used multiple case study approach (15 firms)</p> <p>- Telephone interviews from 3 main individuals</p> <p>- Used three main ERP systems - SAP, Baan and Peoplesoft</p>	<p>- Segmented ERP benefits under motivation and hygiene categories</p> <p>- The results of this study advance the knowledge and scope of ERP implementations</p>
Elbashir, Collier, Davern (2008)		BI impacts on the Business Process Performance (BPP), and BPP in turn impacts Organizational Performance	Porter's Value Chain Activities Framework		<p>- Results confirm a significant relationship between BPP and organizational performance for both service and non-service sectors.</p> <p>- Significant difference in the strength of the relationship between the different sectors</p>

Ross and  
Vitale  
(2000)

Australia

KNUST



- Results indicated that the major reason why the firms implemented ERP was to obtain a common platform for all the units, which create data visibility and process improvement, which in turn yields some valued business benefits.
- Major obstacles to ERP implementations success include: failing to establish metrics; resourcing the post implementation stage inadequately; ignoring management reporting requirements; and addressing resistance to change slowly or not at all

## 2.5 ERP Benefits

Generally IS researchers argue that adoption of IS brings tremendous benefits to an organization and as such studies have been conducted to investigate the type of benefits derived from ERP implementation. With the use of perceived net benefit flow (PNBF) graphs, Shang and Seddon (2002) categorized ERP benefits into five dimensions, namely operational benefits, managerial benefits, strategic benefits, IT infrastructure benefits and organizational benefits. Matolcsya et al. (2005) in their investigations into the economic benefits of ERP systems examined how adoption resulted in sustained operational efficiency and improved overall liquidity. An analysis of ERP system benefits conducted by O’Leary (2004) grouped benefits into two categories; tangible, which he claimed was vital to all firms irrespective of industry, and then intangible, whose importance was more industry specific.

Ranganathan and Samarah (2001) also examined the business value of ERPs in terms of “market value”, “stock market response in relation to manufacturing”, and “service achieved by firms through the announcement of ERP systems adoption or completion of system implementation”. Their findings confirmed the positive impact ERPs have on firms and noted manufacturing firms were found to exhibit more positive excess returns than the service firms. They also identified a positive and significant excess returns for firms that broadcast ERP related announcements, particularly announcements relating to ERP adoption.

The benefits ERPs offer are present and significant irrespective of industry, culture, or the socio-economic status within which they are deployed. Chou and Chang (2008) confirmed that ERPs enhance performance of firms when they examined the post-implementation performance of ERPs from the managerial point of view in Taiwan, a developing country. Their

findings supported their initial hypotheses that “customization” and “organizational mechanism” impact the “intermediate benefits” which in turn impact the “overall benefits” with the “customization effect” yielding greater benefits than the “organizational acceptance”. Still in Taiwan, Yang and Su (2009) focused on the relationship between the benefits of ERP systems implementation and the impacts on firm performance of SCM. Their results indicated that the operational, tactical, and strategic benefits of ERP for the firm impact the performance of SCM in the internal and external business processes, customer service, and cost management. However, the strategic benefits of ERP were not significant predictors of SCM performance in the external business process. The study also showed that ERP implementations in these Taiwanese companies have a significant impact on other SME companies within the global supply chain. Additionally, Kamhawi (2008) examined the ERP adoption and non-adoption practices in Bahrain and found that ERP implementations in Bahrain have yielded various benefits (Strategic, transactional, technical and decision making) to the firms.

Much effort has been directed towards understanding the implementation and post implementation phases of ERP adoption. Davenport (2004) after evaluating organizations’ post-implementation dealings with business process change outlined three factors moderating the realization of Enterprise Systems’ perceived value in organizations as “Integration”, “Optimization” and “Information”. Studies into the implication of benefits derived from implementation of IS by Ragowsky et al. (2000) concluded that a significant relationship existed between firm’s operating characteristics and the benefit the firm derives from using individual IS applications. They however noted that the relationship between the firm’s operating characteristics and the entire IS application portfolio was weak. Some studies also concentrated

on the period of time after implementation of ERP that the benefits become observable. Matolcsya et al. (2005) found some support for increased profitability two years after the adoption of ERP and for improvements in accounts receivable management. Moreover, Seddon et al. (2010), hypothesized that in the short term only two factors, namely “functional fit” and “overcoming organizational inertia” drive organizational benefits accruing from ERP systems implementation. In the long-term however, it is hypothesized that additional four factors, namely “integration”, “process optimization”, “improved access to information”, and “on-going major ES business improvement projects” further drive organizational benefits. The findings supported the proposed hypotheses that from senior management viewpoint, all six factors were important in the explanation of variance in organizational benefits from ES implementation.

Bendoly and Schoenherr (2005) underscored the need to provide a theoretical support for alleged ERP benefits. Thus they used “Swift theory even flow” to illustrate the potential impact that both the product and process of ERP implementation can have on overall operational effectiveness. They then used the “Theory of Resource Dependency” to ascertain the impact that the firm’s newly realized improved effectiveness might have on the ability of a firm to take advantage of B2B e-procurement technologies. Their findings indicate that the extent to which firms witness savings is dependent not only on the presence of an implemented ERP system but also on the length of time such systems have been present and active.

Other authors have contributed to further advancing current literature on the scope of ERP implementations. Wu (2011) used “Herzberg’s Motivation-Hygiene theory” to segment and mine the various ERP users’ perceived benefits, and explored the perceived benefits using the “Rough Set Theory”. He segmented ERP users into two groups in an attempt to provide better

understanding of strategic implications of ERP decisions for both ERP system adopters and vendors. Elbashir et al. (2008) developed a measure of an organization's performance attributable to Business Intelligence (BI) and examined the relationship between the benefits of implementing BI systems and organizational performance. Their findings showed a significant relationship between Business Process Performance (BPP) and organizational performance for both service and non-service sectors. However, there is a significant difference in the strength of the relationship between the different sectors. They also suggest that organizations are now able to create a broad range of operational benefits along their value chain activities.



**Table 2.6 ERP Implementation Issues**

Author(s)	Country	Purpose of the Study/Research Objectives	Construct used	Underlying Theoretical Framework	Methodology	Findings
Umble, et al. (2003)	USA	Examined the success factors, software selection steps, and implementation procedures critical to a successful implementation of ERP			<ul style="list-style-type: none"><li>- Elicited key steps for software selection, CSFs and implementation procedures for ERP implementations from prior researches.</li><li>- Examined the processes of a largely successful ERP implementation within a firm against identified benchmarks</li></ul>	<ul style="list-style-type: none"><li>- The success of ERP implementation by case study firm was based largely on how extensive they adhered to critical success factors, systems selection guidelines and implementation procedures they outlined</li></ul>
Snider, da Silveira, & Balakrishnan, (2009)	Canada	Examines the CSFs of ERP system implementation for five Canadian SMEs.		Strauss and Corbin (1990) Grounded Theory	<ul style="list-style-type: none"><li>- Used qualitative and case study approaches SMEs.</li><li>- Interviewed staff (CEO, Accounting, Operations, Internal Project Leader managers) at each organization.</li></ul>	<ul style="list-style-type: none"><li>- Findings revealed factors that seek to explain variation between successful and unsuccessful implementations for SMEs.</li></ul>

Zhu, Li, Wang, & Chena (2010)	China	Studied the factors promoting post-implementation success of ERP systems	Hypothesized that ERP implementation quality, organizational readiness, and external support will positively impact the post-implementation success of ERP	Developed an integrative model to explain the post-implementation success of ERP, based on the TOE theory	Conducted an empirical test on 139 Chinese retail industry by designing a questionnaire for CIOs and manager of IT departments	- Both ERP implementation quality and organizational readiness considerably influence post-implementation success, whereas external support did not
Grabski & Leech (2007)	Australia	Investigated the control procedures vital for the successful Implementation of ERP systems.	Posited that successful ERP system implementation are related to multiple controls, and the controls could be used in a variety of modes	Control theory and economic theory of complementarity	- Survey and quantitative research and the respondents include CIOs and Internal Auditors (IA). - Existing instrument was used with some modifications.	An alternative theoretical foundation from economics, complementarity, provides a more robust explanation of the use of the various control modes. - Successful ERP system implementations are linked to multiple controls, and that these controls could be used in a variety of modes

Reimers (2003)	China	Critically identified various implementation processes and context variables	CSFs	<ul style="list-style-type: none"> <li>- Exploratory study</li> <li>- Survey questionnaire</li> <li>- Population limited to SAP's R/3 users;</li> <li>- Interviewed 80 project managers</li> </ul>	<ul style="list-style-type: none"> <li>- Found that the motivation for ERP implementation is a change to modernize the operations of the organization</li> <li>- Observed that ownership is strongly related to implementation process characteristics</li> </ul>
Liang et al. (2004)	China	Investigated some of the barriers faced by foreign software vendors in implementing ERP systems		<ul style="list-style-type: none"> <li>- Case Study</li> <li>- conducted telephone interview with vice presidents and CIOs of five companies from different industries and regions</li> </ul>	<ul style="list-style-type: none"> <li>- Identified seven problems faced by foreign software vendors: language, report format and content, cost control module, price, business process redesign, customer support, and consulting partner.</li> </ul>
Hong and Kim (2002)	South Korea	Investigated the relationship between ERP organizational fit and ERP implementation success	Model argued that ERP Organizational fit positively impact on ERP implementation success and it is moderated by some Contingency Variables	<ul style="list-style-type: none"> <li>- Target respondents were firms that had implemented ERP</li> <li>- 106 responses from 34 firms were taken, an average of 3/4 responses per firm</li> </ul>	<ul style="list-style-type: none"> <li>- Organizational fit positively impact on ERP implementation success</li> <li>- ERP process adaptation effective if firm fit for ERP is</li> </ul>

						relatively low
Bradford & Florin (2003)	USA	Tested the relationship between innovative, organizational, and environmental characteristics and two dimensions of ERP systems implementation success	Model argues that the three (3) DOI characteristics impact positively on ERP Implementation Success	DOI and IS Success Theories	<ul style="list-style-type: none"> <li>- Survey</li> <li>- Key informants were functional managers within their firms</li> </ul>	<ul style="list-style-type: none"> <li>- Findings indicated that top management support and training are positively associated with user satisfaction, while perceived complexity of ERP and competitive pressure revealed a negative relationship</li> </ul>
Olhager and Selldin (2003)	Sweden	Assess ERP implementation in Swedish manufacturing firm			<ul style="list-style-type: none"> <li>- Survey</li> <li>- Design and instrument used was adopted from that of Mabert et al. (2000)</li> <li>- Postal mail was used for the 511 firms</li> </ul>	<ul style="list-style-type: none"> <li>- Findings indicate that manufacturing firms highly adopt ERP systems</li> <li>- ERP systems primarily support the material and information flows, followed by financial flows</li> <li>- ERP improvements focused on information access and improved intra-firm interaction.</li> </ul>

Barki & Pinsonneault (2002)		To present a theoretical underpinning for ERP implementation research	- Model to predict ERP Implementation Efforts and Benefits		- Content analysis from prior researches	- Organizational integration influences organizational benefits, with IT and ERP being the channels through which the benefits are achieved
Irani and Love (2001)	UK	Examined the technology management taxonomies that led to the failure and success of a UK firm that implemented MRP II system			- Case study - Primary data was mainly obtained through interview with managing director, production director, production manager, and shop floor employees	- The firm's way of evaluating benefits of technologies were inappropriate and thus it did not support deployment of new technologies
Rajagopal (2002)	USA	Examined various contextual factors related to the innovation and diffusion of various types of ERP systems	Model posits that Antecedents to IT integration impacts on ERP implementation and moderated by facilitators and barriers to implementation	Innovation of diffusion theory	- Used exploratory to comprehend the ERP systems' characteristics through interviews with the information systems executives. - Used case study approach for six manufacturing firms that use ERP systems	- The findings from the qualitative and quantitative studies were found to be equivalent, indicating fair assessment of the validity and reliability of the instrument developed to test the causal model

Liang et al. (2007)	China	Examined the assimilation of enterprise systems in the post-implementation phase in Chinese organizations.	<ul style="list-style-type: none"> <li>- Posit that institutional forces influence Assimilation and it is mediated by Top management.</li> <li>- The model also has five (5) control variables that affect the Assimilation construct.</li> </ul>	Institutional Theory	<ul style="list-style-type: none"> <li>- Survey</li> <li>- The measuring instrument was obtained from existing measures with little modifications to suit the Chinese context</li> <li>- Questionnaires were eventually distributed to 100 randomly selected project managers</li> </ul>	<ul style="list-style-type: none"> <li>- Findings indicated that mimetic pressures positively affected top management beliefs (TMB)</li> <li>- TMB leads to a positive influence on top management participation (TMP) in the ERP assimilation process.</li> <li>- Consequently, TMP positively impacted on the degree of ERP usage</li> </ul>
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## 2.6 ERP Implementation Issues

As have already been established, ERP systems are extremely complex, which implies that ERP implementation projects have to be carefully planned, executed and monitored if they are to be successful and reap expected benefits to organizations. There have been varying suggestions as to the CSFs that need to be in place before, during and after rolling out the ERP system. Umble et al. (2003) examined the success factors, software selection steps, and implementation procedures critical to a successful implementation of ERP.

Snider et al. (2009) in an attempt to identify the CSFs of ERP system implementation instigated an investigation of Small and Medium sized Enterprises in Canada. Their findings revealed factors that seek to explain variation between successful and unsuccessful implementations in SMEs. These exhibited factors for companies that were successful in their ERP system implementation included operational process discipline, small internal team, project management capabilities, external end user training, management support, and qualified consultants.

Studies have also been performed on the factors promoting post-implementation success of ERP systems. Zhu et al. (2010) hypothesized and proved that both ERP implementation quality and organizational readiness considerably influence post-implementation success. They also revealed that external support is not an important player in ERP post-implementation success. Grabski and Leech (2007) suggested that successful ERP system implementations are linked to multiple controls, and these controls could be used in a variety of modes. They insisted that for any ERP implementation to be successful, there was the need for a strong theoretical foundation which draws from other academic disciplines such as economics. They further

reiterated that there must be complementarity between the five control factors critical for ERP implementation success. These factors are project management, change management, alignment of business and new information system, internal audit activities and consultancy and planning activities.

Additionally, Reimers (2003) observed that ownership is strongly related to implementation process characteristics, even though the relationship between ownership structures and implementation results was less significant. “Thus, ownership possibly affects the way a company is implementing an ERP system but does not predict the outcome of the ERP implementation project” (Reimers, 2003, p18). He further outlined the necessity of ensuring effective project governance. Reimers (2003) also critically assert that the motivation for ERP implementation is to change and modernize the operations of the organization.

It is worth noting that it is not just organizational factors that affect ERP implementation. Huang and Palvia (2001) noted that in addition to organizational/internal factors, there are national/environmental factors that are at play and impact ERP implementation. These environmental issues include level of infrastructure, economy and economic growth, manufacturing strengths, regional environment, and government regulations. For several reasons, ERP adoption and implementation in developing countries have proven to be more difficult relative to their implementation in the more developed countries. Huang and Palvia (2001) after comparing implementation practices of ERP in developed and developing countries concluded that developing countries in implementing ERP are confronted with some key challenges which include economic, cultural and infrastructural issues. Furthermore, most ERP software designers, manufacturers and vendors are from western countries and as such there are issues of cultural

and organizational fit when local firms in developing countries try to implement the ERP systems in their vastly different culture.

Liang et al. (2004) investigated some of the barriers faced by foreign software vendors in implementing ERP systems when they examined the cases of failed ERP implementations in China. They identified seven problems faced by foreign software vendors. The problems identified were language, report format and content, cost control module, price, business process redesign, customer support, and consulting partner. They suggested the need for localized strategy development for global ERP leaders.

Hong and Kim (2002) in a bid to explore the cause of high failure rate from an “organizational fit of ERP” angle, investigated the relationship between ERP organizational fit and ERP implementation success by conducting a field survey of 34 organizations. Their results confirmed that organizational fit – a function of data fit, process fit and user fit – positively impacts ERP implementation success – measured by cost, time, performance and benefits. They also noted that ERP and process adaptation are effective if organizational fit of ERP is relatively low. In other words, more adaptation will only lead to implementation failure beyond a certain level of organizational fit. Hong and Kim (2002) concluded by stressing the important place of governance during project implementation, which ensures successful ERP implementation.

Bradford et al. (2003) have also utilized the Diffusion of Innovation theory and Information Systems Success theory to develop and test a model of ERP implementation success. They tested the relationship between innovative, organizational, and environmental characteristics versus two dimensions of ERP systems implementation success: user satisfaction and perceived organizational performance. Their findings indicated that top management support

and training are positively related to user satisfaction, whereas the perceived complexity of ERP together with competitive pressure shows a negative relationship.

Despite the high failure rate of ERP implementations and all the complexities involved, research done by Hayes et al. (2001) reflect a positive response of the capital markets to a firm's announcement of its plans to implement ERP systems. Results indicated an overall positive reaction to initial ERP announcement. They noted that small and healthy organizations received the most positive reaction, and the response to implementation of large ERP suites like SAP received more positive reactions than that of smaller vendors. Investors still perceive ERP implementations as good news which was reflected by increased market shares for the companies announcing ERP implementation plans.

Olhager and Selldin (2003) studied the immediate post-implementation benefits of ERPs. A survey of implementation of ERP systems in Swedish manufacturing firms revealed that ERP systems mainly support the material and information flows, followed by financial flows, and improvements related to ERP systems focused on information access and improved intra-organizational interaction. Thus, improvements in the flow of information and material are what the organization should first look out for not necessarily financial or monetary rewards.

Liang et al (2007) employed the institutional theory in their survey of 77 Chinese firms that had implemented ERP systems as they studied assimilation of enterprise systems within organizations. They suggested that top management influenced the impact that institutional forces exert on ERP assimilation by firms. Their findings confirmed the important role of top management in mediating the effect of institutional pressures on ERP usage. They also noted that

institutional pressures contribute to post-implementation assimilation when the integration processes are prolonged and outcomes are dynamic and uncertain.

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**Table 2.7 ERP And Performance**

Author(s)	Country	Purpose of the Study/Research Objectives	Construct used	Underlying Theoretical Framework	Methodology	Findings
Law and Ngai (2007)	Hong Kong	Investigated the association between the success of ERP system adoption, extent of business process improvement (BPI), and organizational performance.	Seven constructs: Organizational performance, ERP Success, The extent of Business BPI, Senior Management supporting IT initiatives, CEO-IT Distance, Senior Management supporting BPI initiatives, and Strategic Intent. Proposed several positive and negative relationships between these constructs		<ul style="list-style-type: none"> <li>- Postal survey</li> <li>- structured questionnaires using a 5 point Likert Scale</li> <li>- MDs of 1000 randomly selected companies were used</li> <li>- A series of non-parametric tests (Spearman's rho and Kruskal-Wallis) were used to test the hypothesis</li> </ul>	<ul style="list-style-type: none"> <li>- CEO-IT distance may have little direct bearing on the outcomes of ERP and BPI initiatives.</li> <li>- A closer CEO-IT reporting relationship was found to be associated with higher levels of senior management support for both types of enterprise projects. the influence of the organizational variables such as Senior Management Support –IT</li> </ul>
Hunton, Lippincott, & Reck (2003)	USA	Examined the longitudinal impact of ERP adoption on firm performance			<ul style="list-style-type: none"> <li>- Mixed method (cross-sectional survey and semi-structured interview, web based)</li> </ul>	<ul style="list-style-type: none"> <li>- Findings yet to be known but the study is expected to contribute to the development of theory on innovation process</li> </ul>

Jiwat & Malcolm (2009)	Australia	Examined the antecedents critical to the success of the adoption stage of ERP innovation process and their effect on organizational performance	- Adoption success impacts firm Performance which is measured by overall firm performance and competitive advantage. Furthermore, implementation success mediates the relationship between adoption success and firm performance.	Diffusion of Innovation and IS Success Theories
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## 2.7 ERP and Performance

Bakos and Treacy (1986) characterization of opportunities arising from IT, suggest that the business value of ERP systems, can be defined and operationalized not only as performance at business process level, but also at organizational level. Business process performance includes the operational efficiency enhancement in various business processes that are enabled by ERP systems such as cost reduction and productivity enhancement. Business process performance also includes operational effectiveness which relates to the benefits that arise as a result of the use of ERP systems to support various value chain activities (Porter, 1985).

Some of the business process benefits are expected to translate into organizational performance (Melville et al., 2004). Organizational performance aggregates the ERP-enabled performance across the organization (Melville et al., 2004; Tallon et al., 2000). Metrics used to capture organizational performance (such as ROI, sales growth) represent organizational objectives and competitive advantage that strengthen the organization in relation to its competitors (Mahmood and Soon, 1991; Tallon et al., 2000; Melville et al., 2004; Porter, 1985; Sethi and King, 1994).

The researcher acknowledges that the benefits that ERP offer organizations should not be limited to just the minor benefits that can be measured at the business process level of the organization. ERP benefits should be real and tangible to the organization's overall performance. Ideally, ERP implementation should result in improvement in individual performance (Loukis et al., 2009). Business process gains should also reflect on the tangible organizational performance measures such as increased revenue, and improved productivity. Hence the researcher adopted and maintained Elbashir et al. (2008)'s Organizational Performance construct and its dimensions.

## **CHAPTER THREE**

### **RESEARCH FRAMEWORK**

#### **3.1 Introduction**

This chapter presents the research model for investigating the questions posed in this thesis. The research approach used in this study is a mixture of exploratory and confirmatory as the researcher seeks to confirm existing relationships and constructs, while exploring new constructs, dimensions and relationships (Stebbins, 2001).

The chapter begins with an introduction on Ghana and discusses the challenges associated with ERP adoption and implementation in Ghana and SSA. It then discusses relevant models that have been employed in IS literature to examine related issues in developed nations. The paper then argues for the expansion of existing theoretical models to enhance the understanding of ERP implementation in Sub-Saharan African firms leading to the proposed theoretical models. It discusses the theories for investigating the research questions. Using the underlying theories, a set of hypotheses is developed to test the relationships between the constructs in the research models.

#### **3.2 ERP Adoption Challenges in Ghana**

Even though Ghana is a rather small SSA developing nation, its presence is increasingly being felt on the global stage. The country is blessed with abundant natural resources like gold, diamonds, timber, and other mineral resources, coupled with the recent oil discovery. Successive governments have sought to chart a faster development of Ghana through diverse economic reforms and liberalization programs aimed at building infrastructure and capacity, accelerating economic growth, and increasing the social welfare of Ghanaians (Amoako-Gyampah and

Acquaah, 2008). Ghana has also enjoyed an extended period of political stability which has led to recognition and praise from several bodies (Langdon, 2011).

The government of Ghana have also in recent years played major roles in ensuring Ghana's place as not only an emerging IT developer and consumer, but a technological giant in the SSA region, and one of the pioneers in IT development in Africa. These roles are demonstrated through the enactment of ICT policies (for example Ghana's ICT for Accelerated Development, ICT4AD) and infrastructural development in the country. The latest of such IT infrastructural development was the sod cutting for the multi-million dollar ICT Park to be known as the Hope City in Accra in March 2013. The Hope City project will be "an integrated village with facilities for housing, ICT, recreation, business and much more, and is expected to create jobs for about 50,000 people, directly and indirectly" (BBC, 2013). With all the existing and on-going infrastructural development in place, the current government of Ghana believes that ICT would soon be applied extensively in every facet of the country's development (myjoyonline, 2014)

The Ghanaian market is rapidly becoming a preferred destination and hub for ICT and IS developers, outsourcers, assemblers and distributors from all over the globe. Ghana's credentials as an emerging ICT market and developer was further enhanced when Microsoft Corporation's Senior Vice President in charge of Corporate Business, Ali Famamwy, visited Ghana in March 2013. His working visit followed the signing of an agreement between Microsoft and rlg Communications Ltd, a Ghana-based leading devices assembler in Africa, which allows rlg phones and computers to run on Microsoft Windows, a deal described by Forbes Magazine as "a partnership of the future" (BBC, 2013). The deal also granted rlg an Original Equipment

Manufacturing (OEM) status. The visit by the senior official of Microsoft is being seen as a testament of the growing trust and confidence the international community is reposing in Ghana (myjoyonline, 2013b).

In the area of enterprise development, ICT has contributed to the rapid growth of SMEs throughout the country. There has been an acknowledgement in the SME sector that ICT solutions have lowered overheads and improve efficiencies, resulting in services outgrowing agriculture as Ghana's primary national income earner (SGER, 2007). ICT service providers, in realizing the strategic role SMEs play in emerging countries like Ghana have begun providing tailor-made solutions for SMEs, further boosting productivity (Khan, 2013). ERP systems adoption and use in Ghana is growing rapidly in Ghana and most of SSA. However there are some major challenges that confront local firms as they set out to implement ERP systems. Extant literature indicate that poor business ethics of SSA owners and managers, poor organizational data culture, and poorly set out functional divisions within most SSA businesses usually raise peculiar challenges with IT implementation in SSA (Otieno, 2005; Laudon and Laudon, 2007; Heeks, 2007). Some of the challenges associated with ERP adoption and implementation in the SSA region, and Ghana in particular, are discussed in more detail shortly.

In the context of this study, the owner manager is the entrepreneur who is actively involved in the running of a business. In the SSA region, the majority of the local business owners appear to be personally involved in the running of their businesses at the highest level. Unfortunately, there is a general perception that owner managers in SSA have poor business attitudes and behaviours (Ogbor, 2009). The typical business owner manager in SSA is perceived to be short-sighted with little or no interest in making long-term investments, reluctant to open

up his or her business operations to potential stakeholders, unwilling to be constrained by the ERP system or organizational rules, desirous of operating autonomously in order to run the business as best suits him or her, and harbouring a desire to take total control over his or her organization (Agboli and Ukaegbu, 2006; Kallon, 1990; McDade and Spring, 2005). These attitudes negatively affect the performance of firms (Al-Jabri and Roztock, 2010). In SSA, the business owners are the main source of direction and final approving authorities for their firms including the funding for initiatives such as ERP and other IS projects. Further, most of the firms with such owner managers do not have any comprehensive business plan, and lack organizational goals (Beugré and Offodile, 2001; McDade and Spring, 2005). Business process goals, which lead to business process outcomes, are in most cases non-existent. What matters most to these owner managers is making reasonably good turnover. There are also ignorant and mischievous owners who attempt to thwart laid down processes for personal gains. These owners perceive the implementation of integrated information systems as a threat in that the system will expose their deeds (Erat et al., 2006; Mahdavian et al., 2012). These attitudes and activities of business owners in SSA militate against ERP adoption and use which are in sharp contrast to attitudes observed in multinational firms who are motivated to demonstrate high standards of ethics and social responsibility. The business ethics shown in these multinational firms also tend to be positive, healthier, and transparent, with a general passion for excellence (Koh et al., 2006).

Directly related to the challenge of poor business owner attitude is the challenge of corrupt employees. It is believed that the attitudes and culture of the business owners and top management have a strong and direct impact on the attitudes and culture of their employees (Stebbins, 2001; Campbell, 2007; Ashforth et al., 2008). Poor leadership of owner managers often translates into inappropriate attitudes towards the work of the enterprise and corruption

within the enterprise (Olomi, 1999). Since ERPs are integrated end-to-end systems software, their successful implementation in a firm will be dependent on the behaviour and attitude of everyone in the firm who uses the system (Freeman, 1984). So where employees of the firm tend to misconstrue business processes, circumvent laid down procedure, use the system for their personal gain, steal from the firm, willfully commit errors in their work, or perform any such unethical and corrupt practices, the success of the ERP implementation is likely to suffer (Beugré and Offodile, 2001; McDade and Spring, 2005). According to Transparency International (2012), the prevalence of corruption across the public and private sectors of Ghana over the last five years has been very high and is still on the ascendancy. This suggests that the threat posed by the challenge of corruption is also growing. Corruption within organizations not only has the ability to harm the success of ERP implementation, but is also able to result in huge losses to firms, and on the broader scale, scupper Ghana's development efforts and gains.

ERP systems are programmed to streamline the whole range of activities of the firm and promote coordination and collaboration between all the key functional areas of the firm. However many firms, especially those within the SSA region and other developing countries, usually do not have fully operational functional areas (Abdelghaffar and AbdelAzim, 2010) so ERP implementation appears unnecessary to owners of small businesses in developing countries (Lusby, 2009). This, coupled with the mismatch in the environmental, infrastructural and economic setting between foreign ERP developers and the potential ERP users in SSA, results in several users of ERP systems in developing countries failing to really appreciate these systems. Some entrepreneurs in SSA may envision ERP systems as theoretical tools and techniques, which are impractical to their needs and unreal to their operations (Soh et al., 2000). This may

result in limited adoption and success of their ERP systems in SSA settings (Hawari and Heeks, 2010; Soh et al., 2000).

Poor data culture of local firms is another challenge to ERP adoption in Ghana. Being data-driven is key to enhancing organizational performance (McAfee and Brynjolfsson, 2012). McAfee and Brynjolfsson (2012 p. 6) further noted that “the more companies characterized themselves as data-driven, the better they performed on objective measures of financial and operational results”. Unfortunately, the data usage culture of SMEs in the SSA region appears to be very poor. Generally, the organizations, their owners, managers, employees, and even government institutions do not place much value on data as a strategic tool in their operations and decision making (Baldwin, 2009). Some organizations rarely conduct market surveys, or analyze past data trends to predict future growth patterns, or use data as the basis for decision making. Rather, most entrepreneurs and managers in SSA tend to make major decisions based on intuition, with very little data support (Erat et al., 2006; McDade and Spring, 2005). The culture of effective data-driven decision making is just not developed among SMEs in SSA as compared to the developed nations. These deficiencies are usually non-existent in the large multinationals and firms of developed countries who relatively tend to better understand the need for data, information, knowledge management, and ERP systems implementation (Koh et al., 2000). This underdeveloped data usage culture of indigenous SMEs serves as a barrier to ERP implementation, acceptance and usage in SSA.

One of the problems that organizations in general face as they embark on ERP implementation is the incompatibility of standardized ERP systems with operations, workloads and organizational goals (Davis, 1989). Most ERP systems come pre-programmed with the

vendor's pre-determined standards, protocols, objectives, and goals, leaving little room for customization (Davenport and Thomas, 2000). In most cases, these pre-installed processes are the best-in-industry practices, techniques, goals, and processes and are helpful in raising performance and increasing efficiency (Kremers and Dissel, 2000). But in some cases, they are incompatible with the firm's plans, processes and goals and call for extensive business process reengineering in the implementing organization (Davis, 1989; Hawari and Heeks, 2010). Incompatibility may also stem from variances in the context of the business environment conditions (Roztock and Weistroffer, 2011). Special environmental and social conditions prevailing in the host country (like corruption, work culture, culture of remembrance) may not be recognized, captured and catered for in designing the ERP system. This mismatch between ERP pre-programmed processes and the actual conditions prevailing in the diverse markets of their use makes ERP system adoption complicated, and even in some cases unsuccessful (Soh et al., 2000).

There also appears to be a general concession that ERP systems are very complicated. This leads to a situation where most owner managers and other executives are scared off at the prospect of adopting and implementing some of these integrated information systems. This perceived complication of ERP systems may be due to the low educational level of the business owner (normally having little or no formal education) or a general lack of awareness and understanding of ERP systems (Davis et al., 1989; McDade and Spring, 2005). It appears that only a small proportion of business owner managers in developing countries are privy to the potential benefits of IT systems, and by extension ERP systems, to their operations and fewer still know how to fully operationalize these ERP systems (McDade and Spring, 2005). The perceived complication of ERPs, coupled with little or no formal education of the owner

manager and a strong resistance to change in SSA countries give rise to another challenge, i.e., unwillingness/inability to utilize the full functionality of ERP modules. Most managers in SSA seem more interested in using only some specific parts of the system, usually the financial reports generation tools, invoicing, and inventory replenishment functions (McDade and Spring, 2005). This may be partly because of lack of knowledge and training to fully operationalize the ERP systems, and partly because they are unwilling to make the wholesale changes to their business operations that ERP implementation may require (Seethamraju and Seethamraju, 2008). Most managers faced with this conundrum just opt to implement specific modules of the ERP so as to merely adjust the ERP systems as best as possible to fit their current operations, and by so doing avoiding the reengineering of their business process. This leads to the inability to fully achieve ERP's business process outcomes (Karimi et al., 2007).

There is also a lack of management commitment to ERP projects when they are eventually rolled out (Huang and Palvia, 2001). This distinct lack of managerial support for ERP projects manifest in diverse ways. Business owners and managers, especially when they are compelled to adopt ERP by external forces, would normally spearhead the procurement aspect, but take little or no responsibility for ensuring that the ERP implementation project becomes successful. They fail to effectively drive the implementation project and rather relegate the role of the 'champion' to another lower level staff in the organization who sometimes struggle to champion the IS implementation. Furthermore, during implementation, management sometimes fails to appreciate project management issues like team work and consider the implementation project as the sole responsibility of their IT departments instead of securing a companywide commitment from all the employees (Lewis et al., 2003). Training of workers, maintenance of the system, business process redesign, monitoring and control are usually neglected, or at best,

shifted to IS employees (Lewis et al., 2003). This lack of management commitment hampers successful ERP implementation in SSA (Abdelghaffar and AbdelAzim, 2010; Wickramasinghe and Gunawardena, 2010).

On the external front, another identified mitigating factor to the wide-spread adoption and use of ERP systems in SSA is the lack of vital government support for ERP adoption and use. It has been noted that governments can play a major role in propelling widespread ERP adoption and use by initiating and enforcing policies that promote ERP usage (Abdelghaffar and AbdelAzim, 2010; Huang and Palvia, 2001). One way of achieving this goal is by requiring and enforcing the timely collection of vital organizational data like tax information and financial records and employee social welfare of public and large private institutions. Governments can also set mandatory data and information standards and protocols for specific industries. The major players in huge industries like banking, oil and gas, mining, and telecommunications for instance can be required by government or industry regulations to implement IS before they are offered with the requisite operational licenses. Such policies will also go a long way in helping regulatory organizations in their duties. This would invariably improve the data culture in the SSA region, and see entire industries standardized on the best-practices in-built into ERP systems resulting in greater efficiency and higher performance of local SSA businesses.

All these environmental, behavioural, and cultural factors hamper and negatively influence successful ERP implementations in Ghana and other SSA countries. These factors could erode much of the gains SSA businesses expect from ERP systems implementation. These may result in ERP implementation failure and poor performance of firms in SSA and other developing countries. There is a genuine case for SSA countries to learn how to reposition their

private firms, said to be the engine of growth, so as to take advantage of the best practices that the ERP systems offer in order to grow their businesses and compete favourably with their high ranking international competitors. This is one of the motivations for this work.

### **3.3 Theoretical Framework**

Karimi et al. (2007) applied the Diffusion of Innovation (DOI) and Resource based view of the firm (RBV) theories to explain how ERP delivery systems and ERP radicalness interact with the extent of ERP implementation to influence Business process outcome (BPO). In this dissertation, the researcher extends the model of (Karimi et al., 2007) to consider the impact of BPO on organizational performance. More importantly factors that influence success of ERP implementation in SSA using two competing theories – the institutional theory and the panoptic theory were identified and explored.

What follows is a description of the major theories employed in this work, followed by a presentation of the research model and discussion of the relevant constructs and sub-constructs used. Four major theories lend credence to the arguments and relationships between the constructs stipulated in this work.

#### **3.3.1 Diffusion of Innovation (DOI) Theory**

The DOI theory was developed and popularized by Rogers (1995, 1962) and has since been applied successfully in several disciplines and fields, including IT implementation. Also, the arguments of the DOI theory have been at the core of several other theories (Baas, 1969; Moore, 1995; Rogers, 1976).

Rogers (1962) defined diffusion as the process through which an innovation is communicated through certain channels over time among members of a social system. DOI advocates for the identification and distinction of five different types of adopters of innovation, namely (i) innovators (ii) early adopters (iii) early majority (iv) late majority, and (v) laggards. The “innovators” are the first to embrace and accept an innovation and are characterized by being venturesome, technically-adept, able to deal with high uncertainty concerning innovations, and control substantial financial resources which helps them absorb possible losses from unsuccessful innovations (Aharoni, 1981). The laggards on the other hand have a lengthy innovation-decision time, are usually skeptical and suspicious of innovations, possess no opinion leadership, and are usually limited in terms of resources. This theory identifies four factors as determinants of the level of diffusion – the innovation itself, social systems, communication channels, and time (Orlikowski, 1993 ).

The perspective of DOI theory in explaining the level of IT adoption within firms in the SSA region was explored. In the research framework however, the technological diffusion perspective of IT implementation which suggests that mere adoption is insufficient to measure IT assimilation is stressed. According to this perspective, “extent of ERP implementation” is a better measure of IT assimilation. In the technological diffusion perspective, IT implementation is defined as an organizational effort to diffuse an appropriate IT innovation within a user community (Cooper and Zmud, 1990). This is to emphasize the fact that adopting ERPs will not necessarily mean that the ERP will be successfully assimilated. The impact of an ERP implementation on an organization therefore depends on the extent to which ERP was implemented, i.e., how many functional areas are integrated via the implementation, and how the members of the organizations have embraced the system.

### 3.3.2 Resource-Based View Theory of Competitive Advantage

In the resource-based view (RBV) of competitive advantage, the resources that a firm has developed (capabilities) are used as the basis for competitive advantage.

The RBV of competitive advantage operates on the assumption that the desired outcome of managerial effort within the firm is a sustainable competitive advantage which allows the firm to make economic rents or above-average returns (Amoako-Gyampa and Salam, 2004). According to the RBV theory, firms achieve and sustain competitive advantage by possessing resources with certain key properties; rare or hard to imitate, have no direct substitutes, and enable companies to pursue opportunities or avoid threats (Barney, 1991). According to Wernerfelt et al. (1987, p.172), resources include “anything that might be thought of as a strength or weakness of a given firm” and so “could be defined as those (tangible and intangible assets) which are tied semi permanently to the firm”.

The RBV theory posits that firms possess resources, parts of which enable them to achieve competitive advantage, and some other parts lead to superior long-term performance (Anderson, 1991; AMR, 2008). When firms take advantage of the benefits created by the valuable and rare resources, they are said to have enjoyed temporary competitive advantage. That advantage can be sustained over longer time periods to the extent that the firm is able to protect against resource imitation, transfer, or substitution.

Assets and capabilities define the set of resources available to the firm. From IS perspective, assets can be either tangible (e.g., information systems hardware, network infrastructure) or intangible (e.g., software patents, strong vendor relationships) (Andoh-Baidoo and Ngwenyama, 2005). Capabilities on the other hand include skills, such as technical or

managerial ability, or processes, such as systems development or integration. In ERP implementation, the various resources that firms possess must be properly combined to reap the expected benefits.

### 3.3.3 Institutional Theory

Work arrangements are not preordained solely by natural economic laws, but are shaped as well by cultural, social, and political processes. Institutional theory attends to the deeper and more resilient aspects of social structure (Scott and Kaindl, 2000). It considers the processes by which structures, including schemas, rules, norms, and routines, become established as authoritative guidelines for social behaviour. Institutional theory enquires into how these elements are created, diffused, adopted, and adapted over space and time; and how they fall into decline and disuse (Scott and Kaindl, 2000). The institutional theory will be used to accentuate and elaborate on the special context of ERP implementation in SSA and other developing countries. The theory is used in two ways to study ERP implementation in SSA.

First, organizations are recognized to be “rationalized” systems (Scott, 2004) — sets of roles and associated activities laid out to reflect means-ends relationships oriented to the pursuit of specified goals. Norms of rationality play a causal role in the creation of formal organizations (Meyer and Rowan, 1977). Thus the organization is also a social institution with its rules, norms, routines, systems of controls, and code of ethics that have developed over time. This to a large extent shapes the attitude and behaviour of employees and managers, and usually informs how the organization relates with its internal and external stakeholders. An alternative view to institutionalism suggests that organizations adopt practices not necessarily for rational reasons but to achieve legitimacy that facilitate the acquisition of resources needed for the survival of the

firm. Such urge to achieve legitimacy is the result of coercive, mimetic, and normative forces exerted by the government, successful organizations, or professional organizations (Teo et al., 2003). From the perspective of institutional theory the researcher notices that the “norms” within institutions in SSA are significantly different from those in the more developed countries. Organizations in most developing countries, for instance, are riddled with corruption, poor work ethics, etc., which usually have negative effects on performance (McDade and Spring, 2005; Transparency International, 2012).

Secondly, the researcher uses institutional theory to explore the possible effect of regulatory and governmental institutions (coercive forces) on organizations in SSA. DiMaggio and Powell (1983) have earlier stressed the importance of palpable network connections (normative forces) that transmit coercive or normative pressures from institutional agents, such as the state and professional bodies, and influences stemming from similar or related organizations (mimetic forces) (Campbell, 2007). The possible effect of such regulatory bodies on firms, especially in their decisions to implement and use IS and how this further impacts on performance were also explored. The institutional theory is helpful in explaining why despite all the challenges identified with ERP implementation in SSA (see section 3.1), ERP implementation keeps growing. Institutional forces and systems like fierce competition, government regulations, industry benchmarking, and franchising commitments (Seethamraju and Seethamraju, 2008) can propel ERP implementation in spite of debilitating environmental conditions. Also, professional, institutional and industrial associations do exert institutional pressure for ERP adoption (Al-Jabri and Roztock, 2010).

### 3.3.4 Panoptic Theory

Foucault (1977) developed the panoptic theory by observing Bentham's panopticon. The panopticon was a proposed prison structure that ensured constant surveillance of inmates. The panopticon was designed in such a way as to allow wardens to observe prisoners who were unable to tell when and if they were under observation. This caused prisoners to behave as if they were under constant surveillance, ensuring control and self-discipline. This effect of panopticism allows for lesser observation and supervision of prisoners (Foucault 1977).

The concept of panopticism has been applied in IT research by Elmes et al. (2005), who borrow the concept of Foucauldian disciplinary power to provide the two theoretical perspectives of *Panoptic Empowerment* and *Reflective Conformity*. Zuboff (1988) also applies the panoptic concept to IT by suggesting that the IT, and not a physical structure, provides the gaze. In so doing, IT systems can ensure organizational control. Thus, modern surveillance systems can impose a panoptic relationship and introduce "compartmentalization" of the workers without the need for walls or borders (Botan, 1990; Botan, 1996). This "information panopticon" frees management control from the constraints of time and space (Zuboff, 1988).

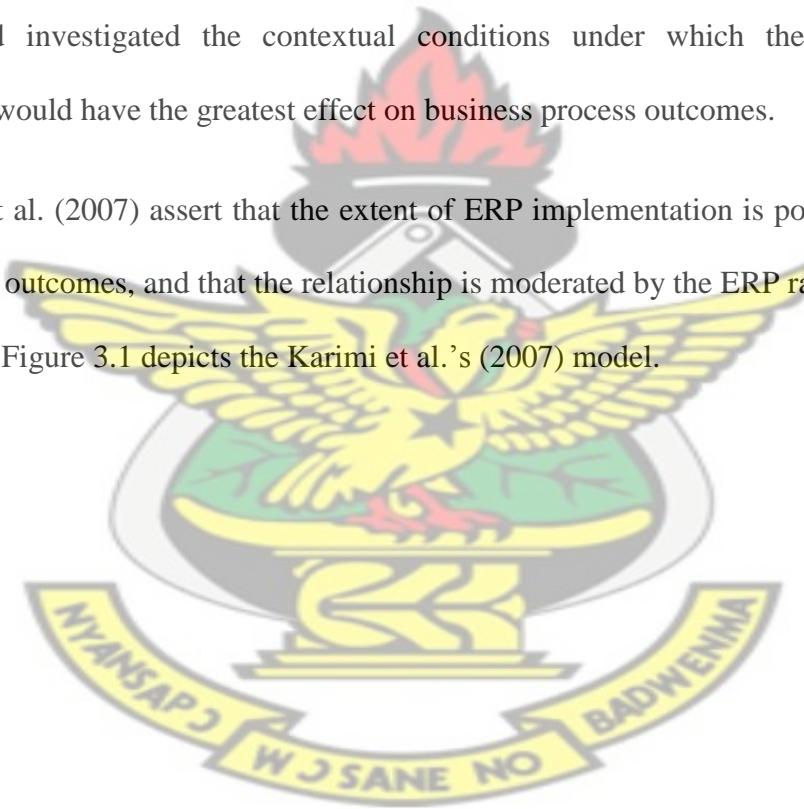
Large scale IT implementations such as ERP systems increase information visibility across different strata within organizations. Enterprise-wide information visibility has been compared to the concept of panopticism as they render worker activities transparent to the employer, much like the open cells visible in Bentham's original design, and in so doing exert a panoptic control on employees to behave in acceptable ways. Also, information visibility is known to everyone thereby enabling greater control of processes and outcomes (Elmes et al., 2005). Botan (1996) has conceived a continuum upon which individual workers either have control of, or are controlled by, the information technology they utilize. The point at which the

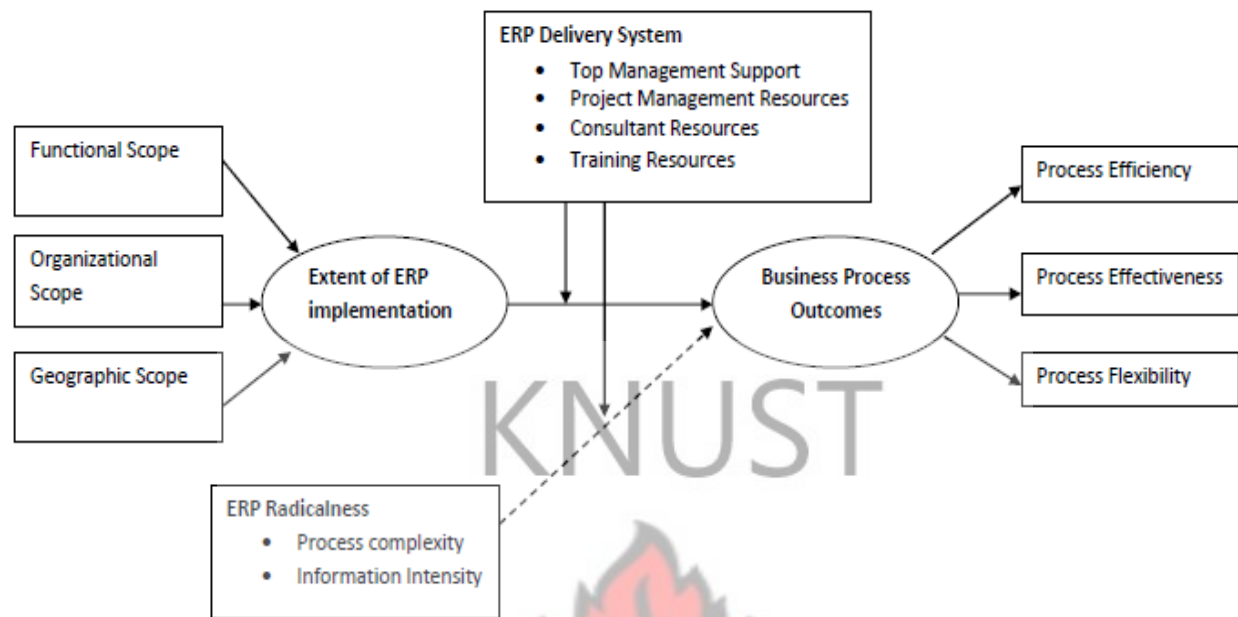
individuals become controlled is referred to as the *panoptic threshold*. This threshold is the point where the information technology becomes a surveillance technology. Botan (1996) posits this threshold is unique to each situation, but is determined by the same four factors: panoptic potential of the technology, management policy, employee perception, and maturation.

### 3.4 Research Models

The research models developed in this study are based on Karimi et al. (2007) and Mithas et al. (2011). Karimi et al. (2007) explored ERP implementation from a technological diffusion perspective, and investigated the contextual conditions under which the extent of ERP implementation would have the greatest effect on business process outcomes.

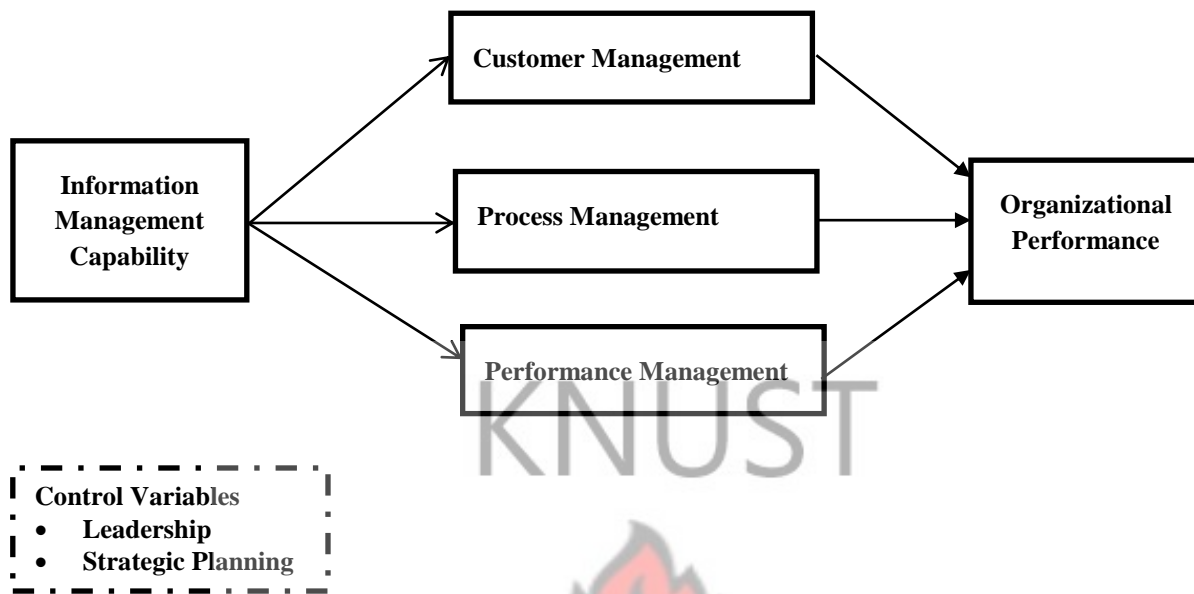
Karimi et al. (2007) assert that the extent of ERP implementation is positively related to business process outcomes, and that the relationship is moderated by the ERP radicalness and the delivery system. Figure 3.1 depicts the Karimi et al.'s (2007) model.





**Figure 3.1: Karimi et al. (2007) model**

Mithas et al. (2011) in their study of how IT capabilities contribute to firm performance developed a conceptual model which linked IT-enabled information management capability with organizational capabilities (customer management capability, process management capability, and performance management capability). Mithas et al. (2011) further argued that organizational capabilities mediate the relationship between information management capability and firm performance. Figure 3.2 depicts Mithas et al.'s (2011) model.

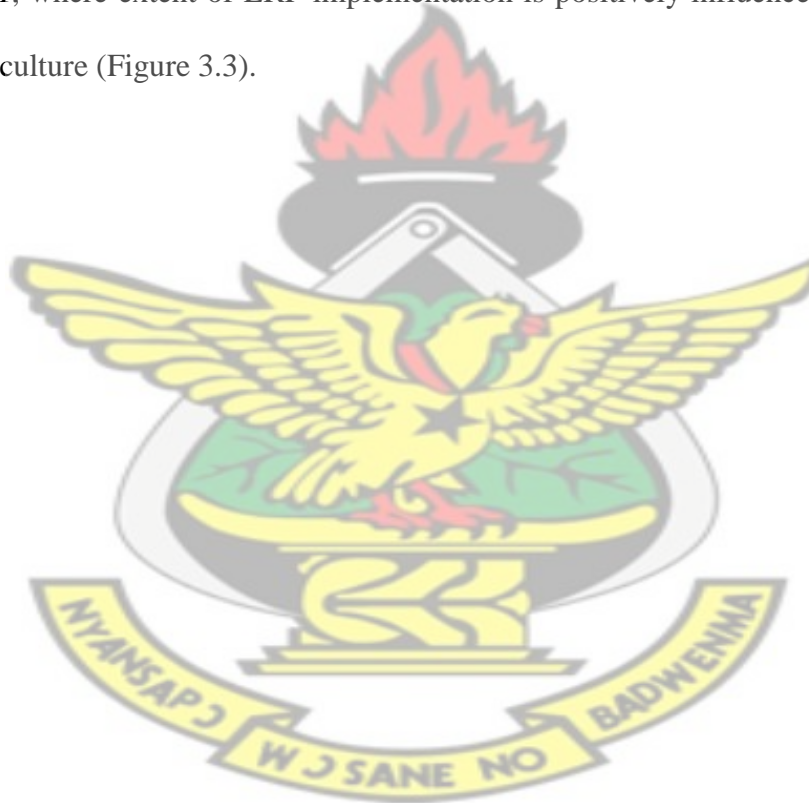


**Figure 3.2: Mithas et al. (2011) model**

In this study's research models, the researcher adopted the stand of Karimi et al. (2007) that ERP implementation results in benefits at the business process level. The researcher further believes that the benefits at the business process level should finally result in improved overall firm performance. Thus, in the research models, the researcher proposes a two-tier view of ERP benefits; an initial increase in business process outcomes, which results in an increase in organizational performance. Mithas et al. (2011) also ascribe to this two-tier view of IT benefits when they suggested that information management capability first results in the development of three significant organizational capabilities, which, in turn, are antecedents of superior organizational performance.

The researcher identifies factors that influence ERP implementation success in SSA as Data Culture, Ethical factors, level of organizational integration and explores how these factors

influence ERP implementation from the perspective of two competing theories – the institutional theory and the panoptic theory. From the perspective of the institutional theory, the researcher develops Model 1 and argues that the prevalence of corruption and other ethical issues is expected to restrict the extent of ERP implementation in SSA firms. However, the presence of certain internal systems and pressure from certain external institutions forces organizations to strive for high levels of ERP implementation. The extent of ERP implementation is also informed by the prevailing data culture within the organization. This leads to the development of research model 1, where extent of ERP implementation is positively influenced by both Ethical factors and data culture (Figure 3.3).



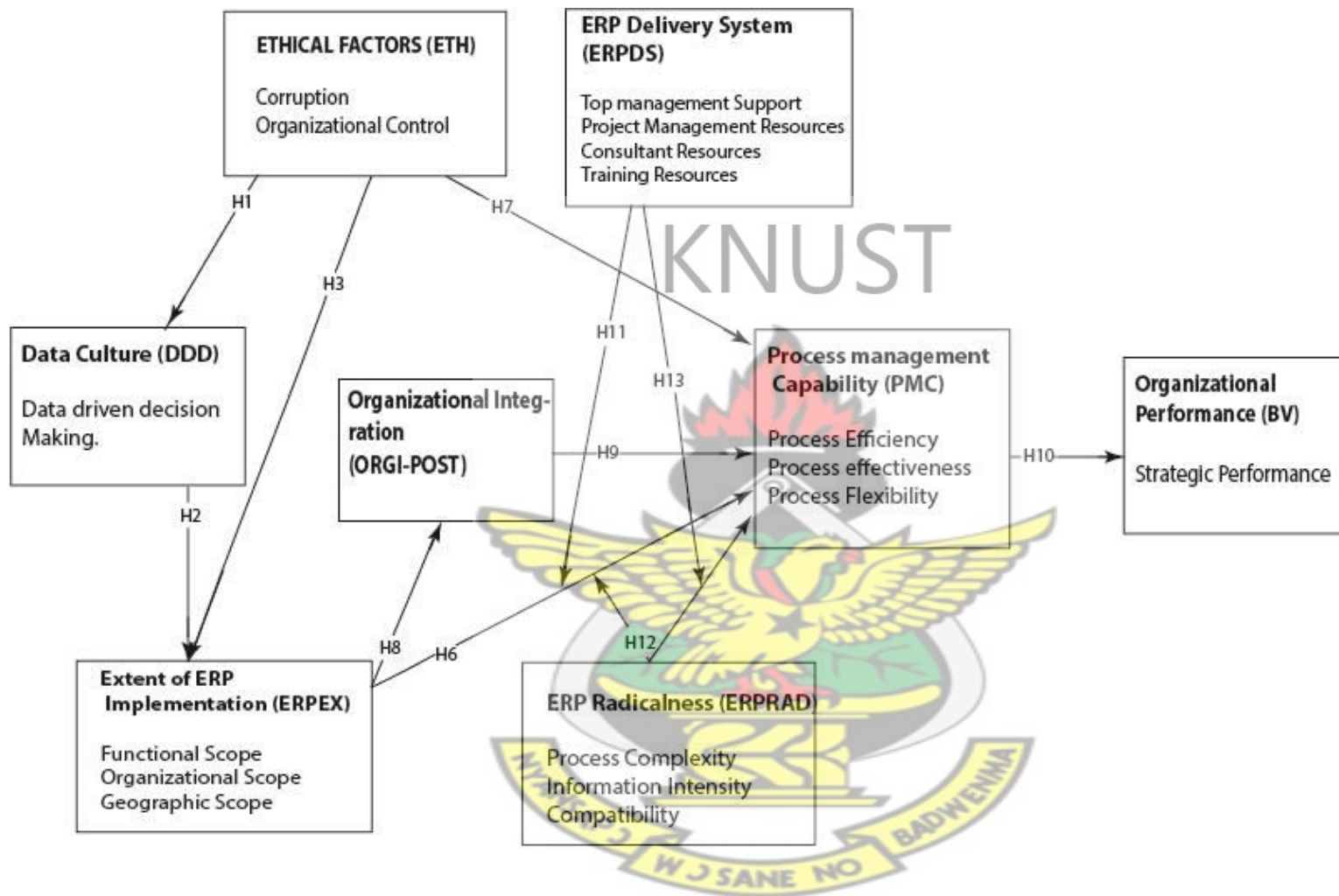


Figure 3.3: Research Model 1 (Institutional Model)

ERP implementation in SSA can alternatively be explained using the panoptic theory. Here, in Model 2, the ERP systems enable organizational visibility and in so doing enforce sound ethical behaviour among employees of the organization. Hence, in this case, it is the extent of ERP implementation that influences Ethical factors. The extent of ERP implementation is influenced by only the organization's present data culture (Figure 3.4).



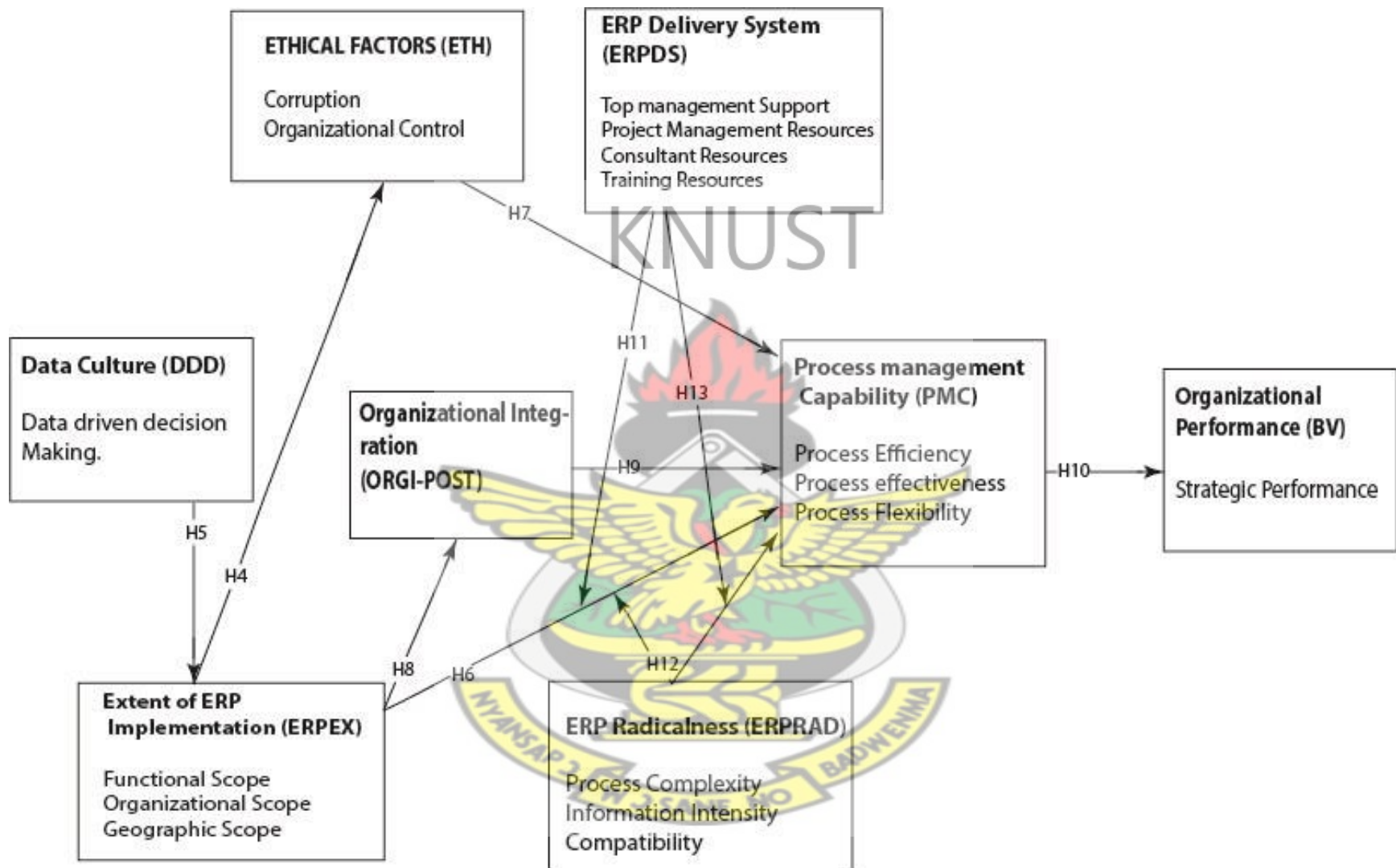


Figure 3.4: Research Model 2 (Panoptic Model)

In both models, the researcher applies the two-step benefits of ERP implementation, i.e. the extent of ERP implementation influences the business process benefits that can be obtained, and this in turn influences the level of organizational performance achieved. Mithas et al. (2011) defined the initial gains that arise from ERP implementation with a multi-dimensional “*Organizational Capabilities*” construct, comprising “*Process Management Capabilities*”, “*Performance Management Capabilities*” and “*Customer Management Capabilities*”. Since the ability of ERP systems to effect improvements in the business processes of a firm is being explored, the process management capabilities construct proposed by Mithas et al. (2011) is adopted. These process management capabilities, which are similar to Karimi et al.’s (2007) “business process outcomes”, then result in improved organizational performance. The benefits that will arise from the ERP implementation will be influenced by contextual factors such as ERP type, size of the organization, industry type, financial health of the firm, and legal form of entity (Dehning and Richardson, 2002; Roztock and Weistroffer, 2011). These factors have been categorized as *Control Variables* in the research framework and their influence on the success of the ERP implementation were explored.

The extent of ERP implementation construct has *functional scope*, *organizational scope*, and *geographical scope* as first order constructs. Process Management Capabilities is represented by *process efficiency*, *process effectiveness* and *process flexibility*. The Ethical factors construct is represented by *perceived corruption* and *organizational control*. Data Culture is represented by data-driven decision making. The ERP Radicalness construct has *process complexity*, *information intensity* and *compatibility* as first order constructs. ERP Delivery System has *top management support*, *project management resources*, *consultant resources* and *training resources* as first order constructs. There are also unidimensional second order constructs such as

“*Organizational Integration*”, and “*Organizational Performance*”. Table 3.1 presents all the constructs in the models and their acronyms, dimensions and sources.

**Table 3.1**      **Constructs, Dimensions and their sources**

Construct	Acronym	Dimensions	Acronym	Source
Extent of ERP Implementation	ERPEX	Functional Scope	ESC1	Karimi et al. (2007)
		Organizational Scope	ESC2	Karimi et al. (2007)
		Geographical Scope	ESC3	Karimi et al. (2007)
Process Management Capability	PMC	Process Efficiency	EFCO	Karimi et al. (2007)
		Process Effectiveness	EFTO	Karimi et al. (2007)
		Process Flexibility	FLEXO	Karimi et al. (2007)
Organizational Performance	BV	Organizational Performance-Strategic Performance	BV	El-bashir et al. (2008)
ERP Delivery System	ERPDS	Top Management Support	DSTM	Karimi et al. (2007)
		Project Management Resources	DSPM	Karimi et al. (2007)
		Consultant Resources	DSCO	Karimi et al. (2007)
		Training Resources	DSTR	Karimi et al. (2007)
ERP Radicalness	ERPRAD	Process Complexity	BPC	Karimi et al. (2007)
		Information Intensity	BPII	Karimi et al. (2007)
		Compatibility	COMP	Present Study
Ethical Factors	ETH	Corruption	COR	Present Study
		Organizational Control	ORGC	Present Study
Organizational Integration	ORGI	Organizational Integration	ORGI	Present Study

Data Culture	DDD	Data-Driven Decision Making	DDD	McAfee and Brynjolfsson (2012b)
Control Variable		Size (number of employees)  Financial Health Owner type (foreign/local) Organizational type Organizational Maturity/Years implemented		Karimi et al. (2007)/ Dehning et al. (2002) Dehning et al. (2002) Reimers (2003) Reimers (2003) Matolcsya, et al. (2005)/Poston et al.(2001)

### 3.5 Adopted Constructs

Five pre-existing constructs were adopted into the research model. These constructs are (i) extent of ERP implementation, (ii) ERP Delivery System, (iii) ERP Radicalness, (iv) Process Management Capabilities, and (v) Organizational Performance.

#### 3.5.1 Extent of ERP Implementation

Karimi et al. (2007) explored the impact of ERP implementation on business process outcomes. Even though majority of the models underlining ERP implementation studies were based on the DOI theory, Karimi et al. (2007) chose to conduct their study from a technological diffusion perspective (Karimi et al., 2007; Moore, 1995). Since ERP implementation is divisible to the extent that it can be divided up for sequential or incremental implementation by functions, departments, the entire company, multiple companies, locations, or regions, the term extent of ERP implementation was used by Karimi et al. (2007) to reflect and measure the extent to which firms have actually implemented their ERP systems. They argue that a greater extent of ERP implementation will result in increasing levels of innovation adoption in the firm, which

potentially leads to greater benefits to the firm (Karimi et al., 2007). Even though the phased nature of some ERP implementations may also result in lower extents of ERP implementation, this study focuses the discussion of extent of ERP implementation as an impact of external antecedent factors like corruption and organizational control as posited by authors like Mahdavian et al. (2012) and Lapointe and Rivard (2005). Thus in addition to Karimi et al. (2007)'s use of DOI and technological diffusion perspective to define extent of ERP implementation, this study further emphasized the fact that other factors aside phased implementation influence the extent of ERP implementation.

The extent of ERP Implementation is adopted into this research framework along with its three dimensions as developed by Karimi et al. (2007). Functional Scope refers to the range of business functions (accounting, manufacturing, sales, etc.) that share ERP implementation. Organizational Scope refers to the organizational locations that the ERP implementation can reach, such as departments, divisions, entire company, and multiple companies. Geographical Scope of the ERP implementation describes the regional, national, and global reach of the ERP implementation.

### **3.5.2 ERP Delivery System**

The ERP Delivery System construct refers to the means by which the new IT innovation is supported, managed, and nurtured within the organization (Karimi et al., 2007). The dimensions for the ERP Delivery System construct are: *top management support*, *project management resources*, *training resources*, and *consultant resources*. The ERP Delivery System construct and its original dimensions in Karimi et al. (2007) are maintained in the study's research models.

### 3.5.3 ERP Radicalness

Radical innovations are fundamental and revolutionary changes in technology that are clear departures from existing practices (Dewar and Dutton, 1986). ERP Radicalness describes the extent to which an innovation represents technological changes and thus implies new behaviours for organizational subsystems or members (Lusby, 2009; Karimi et al., 2007). ERP systems are classified as amongst the most radical type of innovations as they facilitate organizational data and process integration, and results in fundamental improvements in business processes (Grover and Teng., 1997). Karimi et al. (2007) measured ERP Radicalness with two dimensions - *Business Process Complexity* and *Business Process Information Intensity*. These two factors of ERP Radicalness are adopted and maintained in this study, but a choice is made to also explore issues of *Compatibility* as an additional dimension of ERP. The compatibility dimension of Radicalness is especially significant and crucial in the context of SSA businesses because ERP systems are created and developed by foreigners for an environment that is very different from the SSA environment. This gives rise to issues of varying degrees of incompatibility between the ERP system and local businesses (Roztock and Weistroffer, 2011; Soh et al., 2000).

### 3.5.4 Process Management Capabilities

The literature on the business value of IT suggests that the initial effects of IT should occur at the level of organizational processes that use the IT assets and resources (Melville et al., 2004; Tallon et al., 2000). In other words, IT-enabled information management capability enables higher-order business capabilities, which in turn influence firm performance (Kohli, 2003; Lewis et al., 2003). Process management capability is a firm's ability to attain flexibility,

speed, and cost economy through the design and management of higher-order business processes.

Karimi et al. (2007) also similarly argued that the first-order effects of IT investments occur at the business operations level. They claim that IT creates business value by having three separate, but related, effects on business processes: (i) automational effects, which result in process efficiency by reducing inventory costs, increasing throughput, reducing labour costs, and increasing reliability, (ii) informational effects, which result in process effectiveness by increasing resource utilization, reducing waste, increasing responsiveness, and improving quality, and (iii) transformational effects, which result in process flexibility by enabling product and service innovation, reducing cycle times, and improving customer relationships.

### **3.5.5 Organizational Performance**

The Organizational Performance construct is yet another contribution in this study as it extends the model of Karimi et al. (2007). In characterizing opportunities that arise from IT, it has been suggested that the business value of IS can be defined and operationalized not only as higher business process performance, but also as organizational performance (Bakos and Treacy, 1986).

Prior research has shown that improving process efficiency, process effectiveness, and process flexibility leads to improved profitability and earnings valuation (Tang and Tikoo, 1999). This view is further supported by Dehning and Richardson (2002) who proposed an alternative relationship between IT implementation and firm performance through its impact on business process outcomes. Metrics used to capture organizational performance (such as ROI, sales growth) represent organizational objectives and competitive advantage that strengthen the

organization in relation to its competitors (Mahmood and Soon, 1991; Melville et al., 2004; Porter, 1985; Sethi and King, 1994; Tallon et al., 2000). Even though Karimi et al. (2007) did not explore the relationship between BPOs and organizational performance in their work, this researcher deems it necessary as a measure of ERP implementation success (Mithas et al., 2007). Organizational performance will be measured by one dimension - Strategic Performance, which incorporates measures of *Increased Revenue, Reduction of lost sales, Increased Geographic Distribution, Enhanced Profit Margin, Increased ROI, and Improved Competitive Advantage* (Elbashir et al., 2008).

### 3.6 Additional constructs

The research framework includes three new constructs and control factors that may directly and or indirectly influence BPO. These constructs are (i) Ethical factors, (ii) Data culture, and (iii) Organizational Integration. MacKenzie et al.'s (2011) elaborate instrument development and validation process – *Conceptualization, Development of Measures, Model Specification, Scale Evaluation and Refinement, Validation, Norm Development* – was used to develop these constructs. The three constructs are discussed in detail below.

#### 3.6.1 Ethical Factors

Both research models proposed in this study recognize the fact that ethical forces play a significant role in ERP adoption, implementation and use in SSA firms. The ethical factors identified and explored in this thesis are *Corruption and Organizational Control*.

Organizational control has been defined as the process by which managers direct attention, motivate, and encourage organizational members to act in desired ways to meet the firm's objectives (Cardinal, 2001). Organizational control is thus intended to check deviance that

will interfere with cooperation among members and efficiency in work processes (Lange, 2008). The effectiveness of Organizational Control that business owners and top managers employ can have a telling effect on the organization's performance (Sarin et al., 2003). Other organizational control issues may also include information sharing and how open or closed the organization is to its major stakeholders.

The second ethical factor under consideration is corruption. Transparency International (2007) has defined corruption as “the abuse of entrusted power for private gain”. The SSA region has been classified as amongst the most corrupt regions in the world, with an estimated 90% of its countries scoring below 50 points based on the perceived Corruption Index developed by Transparency International. According to Transparency International (2007), Ghana ranks as the 64<sup>th</sup> most corrupt country and corruption is perceived to permeate governments, private and public institutions. In recent times, there have been so many reported corruption related cases in the Ghanaian media and these have prompted social commentators and the Ghanaian public at large to call for a fight against the menace (Owusu, 2014; Citifm, 2014; Myjoyonline, 2013; Mordy, 2013; Ghana News Agency, 2014; Daily Graphic, 2014). For instance one of Ghana's leading companies has been banned from receiving World Bank projects due to its alleged corrupt dealings in Liberia (Worldbank, 2013). The current government of Ghana has therefore placed a high priority on the fight against corruption, with the President of Ghana recently attributing its cause to “institutional weakness” and “lack of systems” (Ghana News Agency, 2014; Owusu, 2014). High levels of institutional corruption in SSA countries may have a negative impact on business financial and non-financial performance.

The combined effect of corruption and organizational control is explored by the “Ethical factors” construct. Low levels of institutional corruption coupled with high levels of organizational control constitute positive institutional forces that can yield a positive influence on firms whilst high institutional corruption and low organizational control constitutes negative institutional forces.

### **3.6.2 Data Culture**

As part of our contribution to the model presented by Karimi et al. (2007), the researcher identifies the need to explore data usage culture as an important factor in ERP projects adoption and implementation. According to a study by the Economic Intelligence Unit (2013) of The Economist, an organization’s use of data influences its financial performance. Data Culture, as stipulated in the framework refers to the usefulness and importance placed on the data generated within an organization. The researcher postulates that the demand for data, appreciation of data, and use of data within the organization will directly influence the extent of ERP Implementation.

Data appreciation refers to the importance management places on data gathering, data storage and data use in the organization (Economist, 2013). Organizations, managers, business owners, institutions and governments that see data as an opportunity to increase productivity by utilizing tools such as data mining and strategic forecasting are more likely to push for higher extent of ERP implementation than organizations that see no use for them. This is because having a unified view of the data and single database will facilitate the use of the data for decision making purposes through data warehousing, data mining and other business intelligence and business analytics applications. Data expectancy refers to the level of demand of data by top management and supply chain partners to inform their decisions. This also affects extent of ERP

implementation and attainment of process goals. Business planning here refers to how effectively top management is able to use data and trends to make strategic business decisions which directly increases BPO and organizational performance. Huang and Palvia (2001) explored ‘Computer culture’ in reference to the organization's employees and their attitude towards new systems and resistance to change. However, it is known that any prior study in ERP implementation has adequately examined the importance of Data Usage Culture.

McAfee and Brynjolfsson (2012) have researched into the advantages of measuring and using large volumes of operational data and concluded that decisions based on large volumes of data collected yield better results. They advocate for a management revolution where data-driven decision making becomes the culture of organizations.

In the proposed research models presented in this paper, Data Culture is introduced as a construct because that is postulated to influence the extent of ERP system implementation and the subsequent gains reaped from the implementation.

### **3.6.3 Organizational Integration**

The use of the term integration and its effect on various management concepts has been largely associated with Lawrence and Lorsch (1967, p. 34) who defined integration as “... the process of achieving unity of effort among the various subsystems in the accomplishment of the organization’s tasks...”. The authors’ definition effectively highlights the coordinated and synchronized manner in which the different departments of an organization must work together. The research framework recognizes the need for integration of all business processes of the organization and ERP implementation helps firms achieve this. ERP vendors such as SAP have developed new systems such as SAP HANA that enable organizations provide real-time business

intelligence bypassing warehousing and using big data technologies. Hence the need for the organization to appreciate the integration of its systems is critical in ensuring that the benefits provided by the recent Enterprise systems are achieved. For the purposes of this study, we adopted Barki and Pinsonneault (2002) definition of organizational integration –“the extent to which all processes and technologies of the entire value chain of an organization constitute a unified whole”.

### 3.7 Control Variables

The control variables to be explored in the research are: size of the organization (number of employees), type of industry, ERP type, financial health of the organization (revenue generated), and legal form of entity (Dehning and Richardson, 2002; Karimi et al., 2007).

### 3.8 Hypothesis Development

The hypotheses that are developed and tested in this work are presented in this subsection. In all thirteen (13) hypotheses are developed from the two research models. The first three hypotheses are unique to the institutional model (Model 1) whilst the fourth and the fifth hypotheses are unique to the panoptic model (Model 2). The remaining hypotheses are common to both models.

The institutional theory stresses the importance that internal and external institutional forces exert on individuals, firms, and other institutions. The SSA institutional forces identified in this work like high corruption, lax public and private regulations, and ineffective organizational control have implications on SSA organizations, their structure, and operations. For instance, organizations combating corruption have been known to resort to adopting IS

systems which have the ability to monitor activities of workers (Shim and Eom, 2009; Bertot et al., 2010).

The organization's data culture is shaped as it positions itself to respond to ethical issues such as the need for putting in place anti-corruption systems to check corruption, achieving transparency, managing information sharing with stakeholders, and achieving high organizational control (Campbell, 2007; Ashforth et al., 2008). Corporate social responsibility, another ethical issue, and the need for data-driven decision-making can inform an organization's IS and data culture (Carr and Outhwaite, 2011; Dimitriadis, 2007; McAfee and Brynjolfsson, 2012). Other ethical issues like privacy and information protection also drives organizations to go to great lengths to install the latest IT systems that will protect vital information and grant access to only authorized persons (Laudon and Laudon, 2007).

From model 1, it is hypothesized that the greater an organization's emphasis on ethical issues, the greater will be its data culture.

*Hypothesis 1 (H1): Higher Ethical behaviour (low corruption and high organizational control) is positively associated with higher Data culture*

The institutional theory stresses how structures, schemas, rules and norms become established over time and become guidelines for future behaviour and decisions (Scott and Kaindl, 2000). Organizations that develop excellent data culture will be more predisposed to fuller implementations of ERP systems than organizations with poor data culture. Learning organizations and other excellence-driven firms that strive for continuous improvement, for example, are known to operate and make decisions based on gathered data, and this would

usually drive them to adopting integrated IS that enables data-driven decision making (McAfee and Brynjolfsson, 2012) at a high degree. Thus a high data culture would serve as an internal institutional force that drives high ERP implementation. It is therefore conceptualized that a high data culture would translate into a higher extent of IS implementation, leading to the following hypothesis:

*Hypothesis 2 (H2): Greater Data culture is positively associated with greater extent of ERP implementation*

The extent of ERP implementation in SSA firms is also expected to be influenced by ethical factors. From the institutional theory perspective, external institutional forces such as corruption can exert strong influences on organizations (Campbell, 2007; Ashforth et al., 2008). The firm's IS policies, including ERP adoption and extent of ERP implementation, are usually set in response to such environmental issues. The high prevalence of corruption in SSA business environments may thus be a major factor that is considered when decisions relating to extent of ERP implementation are being made. Also, it has been noted that corruption initially emanates from the individual level and amplified by individuals' interactions to manifest itself as an organization-level behavioural phenomenon (Kozlowski and Klein, 2000). It is therefore conceptualized that ingrained corruption in SSA business owners, managers, and workers can cause employees to act in ways that would undermine the extent of ERP adoption since full scale employment of ERP systems would restrict their corrupt activities (Lapointe and Rivard, 2005; Mahdavian et al., 2012).

Organizational control is another ethical factor that we posit will have an influence on extent of ERP implementation. The extent to which an organization seeks to control and manage its operations, managers, employees, and external stakeholders will influence the extent to which the organization seeks to rollout ERP systems. Institutions that have developed values, philosophies, and status quo that stress adherence to established protocols, processes, reporting rules and standards as per the institutional theory are more likely to view ERP systems implementations favourably as such IS systems can serve as monitoring and control mechanisms to check and correct task and process deviations (Campbell, 2007). Management teams of such organizations, as part of their strict organizational control, are also more likely to seek to control and protect information sharing within and across the organization. It is hypothesized that higher ethical behaviour such as low corruption and high organizational control are positively associated with greater extent of ERP implementation.

*Hypothesis 3 (H3): Higher Ethical behaviour is positively associated with higher extent of ERP Implementation*

From Model 2, we hypothesize that a greater extent of ERP implementation would result in greater ethical behaviour in SSA organizations. This is explained from the perspective of the panoptic theory, where the ERP systems provide firm-wide visibility, rendering worker activities transparent to employers. This imposes a measure of panoptic control over a worker's behaviour (Elmes et al., 2005; Zuboff, 1988). The ability of IT systems to enforce control has also been confirmed by other researchers (Shim and Eom, 2009; Bertot et al., 2010). A greater extent of ERP implementation would eventually cause the IS to cross the panoptic threshold and become a surveillance system. It is believed that greater extent of ERP implementation results in higher

organizational control. Also, the “gaze” provided by these ERP systems would discourage corruption and other unethical acts. Higher ERP implementation increases ability to detect and punish corruption and enforce organizational control (Elmes et al., 2005). Thus, it is hypothesized that:

*Hypothesis 4 (H4): Greater extent of ERP Implementation is positively associated with greater Ethical behaviour*

The data culture that has developed within an organization determines to a large degree the extent of ERP implementation that the organization will embark on. First, ERP systems provide panoptic organizational control by integrating the organization’s IS infrastructure and creating firm-wide gaze (Ravachindran, 2005). A stronger data and IS infrastructure would support larger extent of ERP implementations, and a weak data infrastructure would be debilitating of ERP implementation (Ravachindran, 2005). Second, firms with an excellent existing data culture should experience smoother ERP implementations than firms with poor data culture. The extent to which the ERP system can be implemented is thus influenced by the current data infrastructure, IT platform and information processing needs, and must also be in line with the organization’s IS policies. In this way, the data culture of organizations influences the extent of ERP implementation. Following the above argument, we present the following hypothesis:

*Hypothesis 5 (H5): Greater Data culture is positively associated with greater extent of ERP implementation*

Research suggests that organizations reap significant benefits from the IS initiatives when the IS implementation is integrated with the organization's value-chain activities (Bharadwaj, 2000; Karimi et al., 2007; Santhanam and Hartono, 2003). In implementing ERP systems, most organizations are able to streamline all the core value-chain activities, and reap significant business process improvements in the process. By automating business processes and facilitating business process change, ERP systems have the ability to help organizations reduce cycle times, as well as increase productivity and improve quality and customer service (Rajagopal, 2002). The DOI theory suggests that it is possible to monitor and evaluate the extent of innovation adoption in a firm due to the divisible and phased nature of some of the new technologies like ERP systems (Markus, 2000; Fichman, 2004). Researchers have shown that a greater extent of ERP implementation is likely to result in firms reaping better results in terms of business process outcomes (Fichman., 2004; Karimi et al., 2007; Loukis et al., 2009). This leads to the hypothesis that:

*Hypothesis 6 (H6): Greater extent of ERP implementation has a positive association with greater business process management capabilities.*

Negative behaviours, attitudes and actions of a firm's stakeholders can have a direct negative impact on the performance of the organization. The negative effects of corruption on organizations have been widely acknowledged. Corruption is associated with inefficiency, reduced financial performance, reduced economic growth, and increased rates of poverty and inequality (Campbell, 2007; Doh et al., 2003; Mauro, 1996; Kaufmann et al., 1999). Even though the institutional theory affirms the importance of regulatory and normative institutions on firms, the corruption menace still persists in many countries despite the presence of these institutions,

and is especially high in developing countries (Scott 2004; Transparency International, 2007). In SSA firms, widespread corruption, negative work ethics, and poor Organizational Control by business owners, managers, and employees scupper the success of ERP implementations and reduce the bottom-line gains organizations finally realize from their ERP implementations (Sarin et al., 2003). This leads to the hypothesis that:

*Hypothesis 7 (H7): Higher Ethical behaviour is positively associated with greater business process management capabilities.*

The researcher conceptualizes that the extent of ERP implementation has an influence on the level of organizational integration that is achieved in the firm. Some authors have noted that ERP implementation ensures organizational integration, and results in greater coordination, collaboration and communication among individuals, teams, and departments within an organization (Barki and Pinsonneault, 2002; Barki and Pinsonneault, 2005; Turkulainen, 2008; Koufteros et al., 2010). The DOI theory suggests that ERP implementation when broken down into smaller components for phased implementation results in incremental innovation adoption. The researcher postulates that the extent to which the ERP is implemented informs the level of organizational integration that the organization achieves. The higher the extent of ERP implementation, the greater the organizational integration that will be achieved in the firm. It is therefore hypothesized that:

*Hypothesis 8 (H8): Greater extent of ERP Implementation has a positive association with greater Organizational Integration.*

Researchers have suggested that organizations reap significant benefits from their IS initiatives when the IS implementation is integrated with the organization's value-chain activities (Bharadwaj, 2000; Karimi et al., 2007; Santhanam and Hartono, 2003). In implementing ERP systems, most organizations are able to streamline all their core value-chain activities, and reap significant business process improvements. By automating business processes and facilitating business process change, ERP systems have the ability to help organizations reduce cycle times, as well as increase productivity and improve quality and customer service (Rajagopal, 2002). We conceptualize that the improved process and functional integration would result in greater process management capabilities, leading to the hypothesis that:

*Hypothesis 9 (H9): Greater Organizational Integration is positively associated with greater process management capabilities.*

The study further explores the relationship that exists between the organization's process management capabilities and actual firm performance. The researcher conceptualizes process management capabilities as the initial, first-tier benefits of ERP implementation, which serve as resources to be managed properly in order for the firm to reap organizational performance benefits (second-tier benefits). The RBV theory of the firm is important here. The researcher postulates that effective management of the process management capabilities that arise from an ERP implementation would result in the reaping of significant organizational performance results. The process management capabilities thus serve as the inputs and resources for the firm which can be combined to create sustained competitive advantage as proposed by the resource based view of the firm (Anderson, 1991; AMR, 2008). Other ERP implementation studies support the reaping of "intermediate benefits" which in turn impacts the "overall benefits" (Chou

and Chang, 2008). The researcher postulates that the benefits that arise from ERP implementation (process management capabilities) would, if properly managed, result in greater organizational performance.

*Hypothesis 10 (H10): Greater process management capabilities have a positive relationship with greater organizational performance*

There are several technical and managerial decisions and challenges that arise during ERP systems implementation. These challenges are usually more complex for large, structurally complex and geographically dispersed organizations (Al-Mashari and Al-Mudimigh, 2003; Markus, 2000). Effective ERP delivery systems are important to all ERP systems implementation since they result in increased expected value of returns by increasing managerial flexibility, enabling greater innovations, and ensuring smooth implementations (Fichman, 2004). Karimi et al. (2007) note that the components of an effective ERP delivery system (top management support, project management resources, training resources, and consultant resources) may be viewed as important resources. The resource based view theory indicates that these resources when combined effectively by the organization would likely result in the firm gaining better competitive advantage. Thus even though greater extent of ERP implementation results in greater business process outcomes, firms with better delivery systems are going to perform better than firms with poor delivery systems (Karimi et al., 2007).

This view is supported by the Technology-Organization-Environment theory which stresses that IS implementation success is not just based on the “technological context”, that is the technological aspects of the new innovation, but also “the organizational context” which includes all factors relating to the characteristics and resources of the firm such as the firm’s

size, degree of centralization, degree of formalization, managerial structure, human resources, amount of slack resources, and linkages among employees (Tornatzky and Fleischer, 1990). The socio-technical theory further buttresses this by suggesting that there should be a fit between the “technical sub-system” (devices, tools and techniques) and the “social sub-system” (employees at all levels, knowledge, skills, values, reward system, and authority structures that exist in the organization) (Avegerou et al., 2004). Based on these arguments, it is hypothesized that:

*Hypothesis 11 (H11): Greater extent of ERP implementation in conjunction with greater delivery system support is positively associated with higher business process management capabilities.*

Again, various researchers have suggested that the radicalness of an IT innovation has an impact on the adoption, implementation, and outcomes of the IT implementation (Karimi et al., 2007; Fichman, 2004). Incremental implementation of an innovation usually results in better organizational outcomes (Leonard-Barton and Deschamps, 1988) than speedy, big bang-style ERP implementations, which tend to be more error-prone (Markus et al., 2000; Umble et al., 2003). Generally, highly radical innovations like ERP systems impose greater implementation challenges but also have a greater potential to result in higher business process gains (Orlikowski, 1993; Rai et al., 2009). The degree of change that the ERP system calls for in an organization is an indication of the extent of potential benefits that the ERP implementation can generate such that higher ERP radicalness results in higher business process outcomes. ERP radicalness thus has a moderating influence on the relationship between the extent of ERP implementation and business process outcomes. Greater ERP radicalness coupled with greater extent of ERP implementation should result in greater ERP process outcomes (Karimi et al., 2007). Hence it is hypothesized that:

*Hypothesis 12 (H12): Greater extent of ERP implementation in conjunction with greater ERP radicalness is positively associated with higher business process management capabilities.*

The RBV theory of the firm calls for the effective management of all the firm's resources if competitive advantage is to be achieved. As mentioned earlier, higher radicalness of an innovation results in greater implementation challenges and calls for an effective delivery system to manage them (Lusby, 2009; Karimi et al., 2007). Fichman et al. (2004) also note that there appears to be a relationship between radicalness and innovation-related endowments, suggesting that increasing radicalness would increase the variance of potential benefits from the IS implementation.

The presence of an effective delivery system helps the firm manage and control the challenges associated with ERP radicalness so that the higher the firm's delivery system support, the higher will be the expected business process outcomes. Thus, the association between ERP radicalness and business process outcomes is moderated by the delivery system in place (Karimi et al., 2007). The researcher therefore proposes that:

*Hypothesis 13 (H13): Greater ERP radicalness in conjunction with greater ERP delivery system support is positively associated with higher business process management capabilities.*

## **CHAPTER 4**

### **METHODOLOGY**

#### **4.1 Introduction**

This chapter presents the methodology that was employed in testing the hypotheses formulated in chapter three. A description of the instrument development, the survey frame as well as the reliability and validity of the instrument are provided below.

#### **4.2. Research Method**

This research aims to assess the impact of ERP implementation on business processes and their resultant influence on organizational performance. Furthermore, the study seeks to determine the antecedents of ERP implementation in SSA and explores their effects on the extent of ERP implementation. This study utilizes a quantitative based approach to investigate its assertions. Quantitative research allows an objective and formal process in which numerical data are used to measure phenomena and produce findings (Leach, 1990). This approach permits the specification of dependent and independent variables associated with the problem allowing researchers to gain sufficient information about the relationship between these variables under investigation. In addition, using the quantitative method allows the research problem to be distinctively defined and conducted in very specific terms (Cooper and Schindler, 1998).

According to Kealey and Protheroe (1996), a quantitative study can be used to reduce subjectivity associated with research procedures as its processes are clearly defined with the research goals and test hypotheses properly articulated. Such a well-defined process enables the researcher to arrive at a more objective conclusion. In addition, quantitative research can produce

factual and reliable results that can be generalizable to some larger population (Maxwell, 1992) while providing the possibility of direct replication of the findings.

Robson (2002) and Bhattacharjee (2012) noted three research methods for examining a research question. These are the experimental, the survey and case study approach. Indeed, a researcher is at liberty to select any or even all the three options combined depending on the research requirement and on the type of study. This study used both paper-based and web-based (electronic mail) survey to collect data and the reasons for choosing web based survey are as outlined below. First, the cost in terms of both time and money associated with web survey are low compared with those of other conventional methods. Secondly, with the constant growth of internet users, web surveys offer access to groups and individuals who might be impossible to reach through more conventional forms of survey research. Finally, web survey makes it easier to correct problems during survey administration. Although web surveys do have potential limitations such as duplicate submissions, missing data and respondent misuse, measures can be taken to mitigate these concerns (Schmidt, 1997). According to Andrews et al. (2003), web surveys have become advantageous relative to mail surveys in many aspects. They further argued that with the growth of internet usage, web surveys have evolved as a more efficient means of data collection capable of handling complex survey questionnaire.

#### **4.3 Analytic Method**

Structural equation modeling (SEM) was used to assess and investigate the hypothesized causal paths among the constructs. SEM is a family of statistical procedures that depicts multiple relationships among latent constructs through the use of equations quite similar to multiple regression equations (Hair et al., 2014). In contrast with simple regression, SEM can

model multiple relationships among independent (exogenous latent variable) and dependent (endogenous latent variable) constructs simultaneously with great speed (Hair et al., 2014). SEM is a preferred choice among analytic methods where research designs include complex models similar to the proposed model in this research (Hair et al., 2014).

- (i) Two distinct approaches are mostly used within the family of SEM methods- The covariance-based technique minimizes the difference between the covariance of the sample collected and those predicted by the predicted model (Haenlein and Kaplan, 2004). Thus, a covariance-based SEM (CB-SEM) reproduces the covariance matrix of the observed variables (Chin and Newsted, 1999).
- (ii) The variance-based SEM – Partial Least Square (PLS) “focuses on maximizing the variance of the dependent variables explained by the independent variables instead of reproducing the empirical covariance matrix” (Hair et al., 2014).

A summary of the differences between both techniques as presented by (Hair et al., 2014) are highlighted below:

- Variance-based SEM is more appropriate for small to medium sample size; whereas covariance-based SEM requires large sample size.
- Variance-based SEM has the ability to handle model complexity with little restrictions compared to CB-SEM.
- Variance-based SEM requires only “soft” assumptions about the distributional characteristics of the data; however, covariance-based SEM requires assumption such as

normality of data.

- Variance-based SEM focuses on theory development and explanation of variance (prediction of the constructs); however, covariance-based SEM focuses on the explanation of covariance (explanation of the relationships between items).
- In certain cases, especially when there is little *a priori* knowledge on structural model relationships or the measurement of the constructs or when the emphasis is more on exploration than confirmation, PLS-SEM is an attractive alternative to CB-SEM.
- Variance-based SEM can easily handle reflective and formative measurement models, as well as single-item constructs, with no identification problems. Formative measures can also be used with CB-SEM, but doing so requires construct specification modifications (e.g. the construct must include both formative and reflective indicators to meet identification requirements).
- Variance-based SEM benefit from high efficiency in parameter estimation, which is manifested in the method's greater statistical power than that of CB-SEM.

Based on the above differences and or rule of thumb for selecting between the two main techniques, we opted for the PLS-SEM for our data analysis. The decision for the selection was informed by our research purpose, research models and data characteristics - exploratory, complex model with both formative and reflective constructs and many indicators.

#### 4.4 Population and Sampling

Given the exploratory nature of the study, all organizations that have implemented ERP systems in Ghana were targeted with no definitive boundaries set on size of the organization, type of ERP system implemented, or extent of implementation. In terms of the sectors to be covered, the study considered the manufacturing and service sectors. The sampling involved selecting population units so that the results can be credibly generalized to the target population (Trochim and Donnelly, 2008). The following sampling methods were relevant to this research:

- (i) Simple random sampling. In this method, each population unit (organization) has an equal and non-zero probability of being chosen. Simple random sampling includes the whole population in the sampling frame making it the preferred type of sampling. The benefit of employing random sampling is that the findings can be generalized to the whole population with greater confidence. However, this method of sampling is practically impossible to achieve because a list of all population units is usually not accessible, as is in the case of this research.
- (ii) Cluster sampling. This method divides a population in groups and subjects in each group are randomly selected (Bhattacharjee, 2012; Trochim and Donnelly, 2008). Given the difficulties associated with using the simple random sampling, this research made use of cluster sampling by creating clusters of firms based on specific characteristics such as size, type of ownership, and industry while ensuring that each of cluster is well adequately represented in the population.
- (iii) Convenience sampling targets a small sample of a population, typically chosen by

researchers because they can easily get access to the data sources (Trochim and Donnelly, 2008; Bhattacharjee, 2012). This sampling method is inexpensive and fast in comparison with simple random sampling but suffers from the limitation of inability to confidently generalize the findings to the target population. In many situations, this may be the only method available to the researcher because of practical considerations.

(iv) Snowball sampling method identifies subjects who meet the criteria of the study for inclusion in the study and ask these subjects to recommend others they know who meet the criteria. This method suffers from the limitation of inability to confidently generalize the findings to the target population. Snowballing sampling was helpful in tracking down several users of ERP systems in Ghana.

(v) Quota sampling involves the use of quotas in selecting samples from the population. In quota sampling, a quota or specific number is assigned to each group of units in the population. Once the quota for each sub-division is fixed, selection of the units to be studied can be done randomly by the researchers.

According to Dillman (2007), three steps are involved in the sampling process. The first step involves identifying the target population in a way that reflects the purpose of the study, the second step involves putting together a list of the target population and finally the third step is the actual selection of the sample.

The sampling process used in this research included a combination of the cluster, convenience, quota, and snowball sampling approaches. As there was no pre-existing database of organizations that have implemented ERP systems in Ghana, it was not feasible to obtain a

list of all organizations in Ghana using ERP systems. The researcher obtained the population for this research by collaborating with consultants of ERP vendors in Ghana. The consultants made available to the researcher an initial list of firms that have implemented ERP systems in Ghana. Snowballing techniques were used to further identify and target other consultants and implementing firms. Additionally, the researcher after a number of interactions with bank officials and executives came to the conclusion that quite a number of the financial institutions in the country have implemented integrated IS system because of the nature of their operations.

#### **4.5. Respondents of the Study**

The “intellectual puzzle” of this research focused on interactions of management with IS implementations in organizations. The goal was to examine various factors that directly or indirectly affect the benefits organizations achieve from ERP implementations and the impact of these benefits on firm performance. All the constructs included in the research models (Fig. 3.3 and 3.4) tap into experiences or perceptions of senior-level executives interacting with the ERP. The unit of analysis is therefore the organization and thus the CEOs of various organizations, senior IS executives, and selected functional heads who use the systems were the most appropriate data source for this research.

To the best of the researcher’s knowledge, the estimated targeted firms that have implemented ERP systems amounts to 150 across 15 industries in Ghana. Partial Least Squares (PLS) was used for data analysis. It is suggested that the use of PLS requires a sample size of at least ten times the number of paths that connect with the endogenous variable with the most paths originating at exogenous variables (Chin, 1998b; Barclay et al., 1995). Since the endogenous variables have at the most three (3) incoming paths, a minimum sample of 30 is

needed. Furthermore, the researcher used Cohen's (1988) power table for multiple regression (MR) analysis to calculate power values for the partial least squares (PLS) models. Since PLS is performed by iterative regression analysis (Chin 1998), power analysis on MR is applicable for PLS. The researcher employed the use of the repeated indicator approach to model the construct with the most incoming path PMC with 13 indicators, and then tested it with a conservative approach. The power for the sample size of 115 using a two tail test is 0.80 and that meets the suggested threshold by Cohen (1998).

A pilot survey was conducted for the purpose of construct and instrument validation and cleaning. Firms were selected pro rata based on the total number of firms for each industry. As suggested by Johanson and Brooks (2009), a suitable pilot testing sample size for instrument development is between 25 to 30 respondents as there are no substantial changes in confidence interval value, even when the number of measured items increases. Therefore, this study used 30 organizations for the pilot survey (one respondent from each organization) out of the estimated 150 firms. Table 4.1 details the composition of the estimated firms that have implemented ERPs in each industry and the pro rata sample size for the pilot survey.

**Table 4.1 Composition of Selected Firms by Industries**

<b>Industry</b>	<b>Estimated Firms in each industry that use ERP</b>	<b>Sample size for pilot</b>
Rural Banks	50	10
Commercial Banks	15	3
Savings and Loans	12	2
Oil and Gas	6	1
Manufacturing	15	3
Retail	6	1
Construction	2	0
Telecommunication	6	1
Minerals & Mines	10	2
Auto mobile and Heavy Equipment	6	1
Technological Services	11	2
Agriculture	3	1
Media	2	1
Hospitality	3	1
Freight & Transport	3	1
<b>Total</b>	<b>150</b>	<b>30</b>

For each target organization for the main survey, at least one senior IS executive and one senior non-IS executive were targeted. For selected large organizations, functional heads (Finance/Accounting, Operations, Information Technology and Marketing) were additionally targeted. Hence, the number of questionnaires to be delivered to target organizations ranged from a minimum of two to a maximum of four based on the size of the organization (Hong and Kim, 2002).

#### **4.6. Research Instruments**

To derive the measures for this study, whenever possible, existing literature was adapted.

When the existing instruments were not available, relevant studies provided a useful framework

and information to develop new items. Hatch (2002) noted that existing studies can provide the foundation needed to design an instrument as it allows the research to recognize the gaps in the literature. For some constructs, instruments were self-developed in this research using MacKenzie's (2011) elaborate scale development process. For instance, the first order "organizational control" sub-construct under the second order construct of "Ethical factors" as well as the "ERP compatibility" sub-constructs (under the second order construct of "ERP Radicalness") were developed using these techniques.

Prior to administering the survey instrument, it was necessary to first have the survey reviewed by experts in the context area to ensure that the adaptations used fit within the context proposed. Following this, two individuals in Ghana (ERP consultant and an academician) reviewed the instrument. The response from these individuals was that the questionnaire was readable and understandable to an average Ghanaian and to the target sample in particular.

The questionnaire was structured in such a way to ensure ease of understanding and to generate valid results. The questionnaire was structured using a seven-point Likert scale. A Likert scale is a common psychometric scale used in empirical research that requires the subject to respond to a series of statements about a topic in terms of the extent to which they agree or disagree with them (Bhattacharjee, 2012). The seven-point Likert scale allows respondents to give response choices ranging from strongly disagree (1) to strongly agree (7). Table 4.2 contains the constructs used in this study, whether they are formative or reflective, the number of items in the scale, and where they were adapted from. Appendix 1 contains the items used to measure the constructs in this study.

**Table 4.2 Measurement Items**

<b>Construct (Acronym)</b>	<b>Reflective or Formative</b>	<b>Number of Items</b>	<b>Source</b>
Extent of ERP Implementation (ERPEX)	Formative 2 <sup>nd</sup> order		Karimi et al. (2007)
Functional Scope (ESC1)	Formative 1 <sup>st</sup> order	1	Karimi et al. (2007)
Organizational Scope (ESC2)	Formative 1 <sup>st</sup> order	1	Karimi et al. (2007)
Geographic Scope (ESC3)	Formative 1 <sup>st</sup> order	1	Karimi et al. (2007)
ERP Radicalness (ERPRAD)	Reflective 2 <sup>nd</sup> order		Karimi et al. (2007)
Business Process Information Intensity (BPPI)	Reflective 1 <sup>st</sup> order	4	Karimi et al. (2007)
Business Process Complexity (BPC)	Reflective 1 <sup>st</sup> order	4	Karimi et al. (2007)
Compatibility (COMP)	Reflective 1 <sup>st</sup> order	3	New
ERP Delivery System (ERPDS)	Formative 2 <sup>nd</sup> order		Karimi et al. (2007)
Top Management Support (DSTM)	Reflective 1 <sup>st</sup> order	3	Karimi et al. (2007)
Project Management Resources (DSPM)	Reflective 1 <sup>st</sup> order	3	Karimi et al. (2007)
Training Resources (DSTR)	Reflective 1 <sup>st</sup> order	3	Karimi et al. (2007)
Consultant Resources (DSTR)	Reflective 1 <sup>st</sup> order	3	Karimi et al. (2007)
Process Management Capability (PMC)	Reflective 2 <sup>nd</sup> order		Karimi et al. (2007)
Process Efficiency (EFCO)	Reflective 1 <sup>st</sup> order	4	Karimi et al. (2007)
Process Effectiveness (EFTO)	Reflective 1 <sup>st</sup> order	6	Karimi et al. (2007)
Process Flexibility (FLXO)	Reflective 1 <sup>st</sup> order	4	Karimi et al. (2007)

Organizational (Strategic) Performance (BV)	Reflective 2 <sup>nd</sup> order	6	El-bashir et al. (2008)
Ethical Factors (ETH)	Reflective 2 <sup>nd</sup> order		New
Corruption (COR)	Reflective 1 <sup>st</sup> order	5	New
Organizational Control (ORGC)	Reflective 1 <sup>st</sup> order	4	New
Organizational integration (ORGI)	Reflective 1 <sup>st</sup> order	7	New
Data Culture (DDD)	Reflective 1 <sup>st</sup> order	4	Brynjolfsson et al. (2011)

#### 4.7. Validity

In order to test the validity of the measurement instrument, a pilot test was conducted. A pilot was administered to examine item loadings via confirmatory factor analysis (CFA). The pilot data was collected using manufacturing and service firms in the Ashanti Region. According to Alreck and Settle (1995), pilot testing is a brief preliminary survey using a small convenient sample. The aim of the pilot testing is to identify and eliminate problems inherent with the developed instrument before collecting the data from the target population. Pilot testing can assist in eliminating irrelevant and ambiguous questions and based on the assessments and suggestions from the respondents, the content of the questionnaire can be modified to improve its quality. Pilot testing enhances the face validity of the survey instrument by ensuring that the wordings of the items are consistent with hypothesized constructs while also ensuring that measurement scales possessed adequate content validity (Clark and Watson, 1995).

The convergent and discriminant validation of the perceptual measures was accomplished by conducting a confirmatory factor analysis. Each factor loading and cross-loading was used to measure the convergent and discriminant validity respectively. As recommended by Hair et al.

(2014), all item loadings greater than 0.60 were viewed as representative of their respective constructs. In addition, establishing the reliability of the developed instrument is a critical step in any survey study. According to Boudreau et al. (2001), reliability refers to the extent to which an instrument produces consistent or error free result. Boudreau et al. (2001) lists internal consistency, split halves, test-retest, alternative or equivalent forms and inter-rater reliability as five techniques used to assess reliability. In this study, the reliability of each construct was examined using Cronbach's (1951) alpha. An alpha score of above 0.70 indicated internal consistency and was considered reliable (Nunnally, 1978).

Another potential challenge to the study was common methods bias which could be a primary threat to construct validity (Doty and Glick, 1998). Common methods bias refers to the extent to which correlations are misrepresented due to a methods effect (Meade et al., 2007). Thus, common method bias may occur because the instrument applied by the researcher affects the measures being generated. Common method bias can either inflate or deflate the observed relationship between measured constructs thus, leading to Type 1 or Type 2 error (Podsakoff et al., 2003). Consistency motif which refers to the propensity for respondents to try to maintain consistency in their responses is the most common source of common method bias and in this study this concern was addressed during instrument development. According to Bhattacharjee (2012) people generally tend to maintain consistency between their attitude and behaviour and this might lead to similarities in their answers that are at odds with their real-life behaviour. To reduce this source of bias, different measures were placed at different sections of the survey thus limiting respondents from using prior responses to answer subsequent questions.

#### 4.8 Competing Theories

The use of theoretical models to understand new IT acceptance and benefits is a well-established approach (Hung and Chang, 2005). Multiple models have been used to explore similar phenomena in IS literature. Hung and Chang (2005) used three theoretical models – Technology Acceptance Model, Theory of Planned Behaviour model, and the Decomposed Theory of Planned Behaviour model – to examine the acceptance of new IT services and its suitability for WAP services. Premkumar and Bhattacharjee (2008) also conducted a test of competing models – the Technology Acceptance Model and the expectation-disconfirmation theory (EDT) to discover which model better explained IT continuance intention.

Sometimes the definition of a "best" model may depend on the purpose to which the model is put (Taylor and Todd, 1995). Typically, fit statistics and explanatory power are used to determine which model is "best". In a situation where all models exhibit a reasonable fit to the data and explain similar amounts of the target behaviour, other criteria such as which model is most parsimonious can be used to determine which model is better (Bagozzi, 1981). An in-depth discussion of parsimony in the history of science and its relationship to structural equation modelling is provided by Mulaik et al. (1989) who maintain that the model that provides good prediction while using the fewest predictors is preferable. Others however contend that parsimony in itself is not desirable but rather is desirable only to the extent that it facilitates understanding (Browne and Cudeck, 1993; McDonald and Marsh, 1990).

This study develops two theoretical models – an institutional model and a panoptic model – for explaining adoption and benefits of ERP implementation in SSA. Each model is empirically tested with data collected from the research survey which involved 150 SSA firms

who have implemented ERP systems. Since both models presented in this study are equally parsimonious with regards to predicting PMC, the basis for comparing and selecting the models were path significance and explanatory power.

# KNUST



## CHAPTER 5

### ANALYSIS AND RESULTS

#### 5.1 Introduction

The objective of this study is to assess the impact of ERP implementation on business processes and to examine the resultant effect on organizational performance in an SSA nation. This chapter describes the details of the analytical procedures adopted, the methodological implementations and the results of the data analysis. The designed instrument contains 50 items measuring factors associated with ethical factors, data culture, organizational integration, extent of ERP implementation, process management capabilities, ERP delivery systems, ERP radicalness, and organizational performance.

#### 5.2 Content Validity

The instrument that was used in the survey went through three stages of content validation. First, ERP consultants and representatives of vendors were contacted to review the survey questionnaire and indicate if they sufficiently tackled the major issues associated with ERP implementation in the country. Secondly, the instrument was pre-tested by administering it to business executives, departmental heads, and other high-level employees to ascertain if the questionnaire was clear and understandable enough. The feedbacks from these preliminary content validations were incorporated into the design of the final instrument.

The final stage of the content validation was a pilot study based on the proposed final instrument. A final draft survey instrument was administered to a sample size of thirty (30) Chief Information Officers (CIOs) of selected firms in the Ashanti Region. Data from the pilot study were subjected to confirmatory factor analysis (CFA) to gain insights as to the multidimensionality of the items using SmartPLS (Ringle et al., 2005). The results are presented

in Table 5.1. High loadings provide evidence for convergent validity. The confirmatory factor analysis indicated acceptable factor loading on the hypothesized dimensions with the exception of BPC2, BPC3, BPII1, COR1, COR2, DDD2, and ORGI1 (see Table 5.1). The affected items were cleaned by removing, rephrasing, and adding some items to the affected constructs.

This strategy facilitated the achievement of adequate content validity of the measurement scales, while allowing us to test their psychometric properties (i.e. scale reliability and construct validity). The revised instrument was then employed in the main survey.



**Table 5.1 Confirmatory Factor Analysis of Pilot Test Data**

	BPC	BPII	COMP	ORGC	COR	DDD	DSCO	DSPM	DSTM	DSTR	EFCO	EFTO	FLXCO	ORGI	BV
BPC1	0.6171	0.4005	0.0561	-0.1685	0.0806	0.1673	0.0377	-0.0387	0.2044	0.0429	0.2046	0.1879	0.0895	-0.0752	0.0849
BPC2	0.4975	0.1092	-0.0296	0.0126	0.0161	-0.1138	-0.0455	-0.1492	-0.065	0.0107	-0.1174	-0.0982	-0.0979	0.0557	-0.0992
BPC3	0.4562	-0.0595	0.03	-0.0211	0.0302	0.0251	0.1246	-0.0688	-0.0766	0.1599	0.0182	0.1161	-0.0154	0.369	-0.0484
BPC4	0.7786	0.2197	0.2395	-0.0872	0.0031	0.1623	0.0752	0.1974	0.2009	0.1857	0.1517	0.1199	0.1274	0.2128	0.1188
BPII1	0.1661	0.5842	-0.1289	-0.2397	-0.1362	0.1387	-0.0308	0.0213	0.1695	0.0525	0.1808	0.1381	0.0563	0.0272	0.0428
BPII2	0.2786	0.8104	0.1153	-0.1484	-0.1448	0.2578	0.1467	0.2272	0.3028	0.0994	0.3281	0.3373	0.3244	-0.0329	0.2341
BPII3	0.2932	0.7238	0.0653	-0.1904	-0.0807	0.2126	0.0165	-0.0418	0.1364	-0.0024	0.1687	0.1323	0.1879	0.0377	0.0893
BPII4	0.2728	0.7518	0.1989	-0.0788	-0.1707	0.1307	0.0284	0.0819	0.2664	0.1663	0.0687	0.1091	0.1298	-0.0026	0.1248
COMP1	0.2872	0.0655	0.6632	-0.126	-0.0849	0.2362	0.15	0.073	0.3875	0.0947	0.3374	0.3957	0.3152	-0.0748	0.235
COMP2	0.0893	0.1588	0.8478	0.0273	-0.1087	0.1107	0.2231	0.167	0.2962	0.0554	0.1622	0.2781	0.3334	0.0841	0.2519
COMP3	-0.0262	0.0311	0.7808	0.0091	-0.0928	0.1417	0.2131	0.2344	0.1812	0.1015	0.1637	0.2273	0.3263	0.1347	0.2629
ORGC1	-0.1978	-0.1037	-0.2459	0.6517	0.1072	-0.1937	-0.0361	-0.0496	0.0376	0.0028	-0.055	-0.1368	-0.0683	0.1275	0.0479
ORGC2	-0.1364	-0.2003	0.1125	0.7629	0.0743	-0.2578	0.111	0.1321	-0.0231	0.1039	-0.0248	-0.0332	-0.0123	0.2646	0.1688
ORGC3	0.0076	-0.1466	0.0078	0.7591	0.1249	-0.0939	0.0593	-0.0088	-0.0459	-0.1005	-0.0019	0.0382	0.0612	0.2724	0.2184
COR1	-0.0671	0.1844	0.1225	-0.1182	-0.9678	0.1489	0.0709	0.1014	0.0412	-0.0175	0.1149	0.0926	0.1744	-0.1734	0.1158
COR2	-0.045	0.0011	-0.0175	0.0914	0.1691	0.0327	-0.0706	0.0633	-0.1917	-0.0246	0.0891	0.1924	0.2451	-0.1193	0.2323
DDD1	0.165	0.2067	0.065	-0.0938	-0.3232	0.71	0.1374	0.1592	0.2931	0.1134	0.3571	0.4129	0.3522	0.0004	0.3497
DDD2	0.0589	0.1906	-0.0111	0.1214	-0.1161	0.0263	0.125	0.1155	0.2362	0.1787	0.1901	0.2801	0.2742	-0.0319	0.266
DDD3	0.1107	0.3324	0.2612	-0.1802	0.0826	0.7547	0.2152	0.2174	0.3858	0.2793	0.3692	0.4083	0.3326	0.0665	0.273
DSCO1	0.0552	0.0042	0.1745	0.0792	0.0121	0.1637	0.8685	0.5024	0.3596	0.713	0.2811	0.331	0.3287	0.1363	0.2581
DSCO2	0.048	0.0859	0.1991	0.1341	-0.1931	0.1675	0.8765	0.4845	0.2763	0.5006	0.4035	0.5233	0.4218	0.0921	0.4042
DSCO3	0.1047	0.0985	0.2926	-0.0284	-0.06	0.1223	0.8932	0.5938	0.4487	0.5287	0.4068	0.4467	0.4502	-0.0593	0.3268
DSPM1	0.0297	0.1879	0.1855	-0.0123	-0.1041	0.1566	0.4249	0.8511	0.5136	0.3123	0.1735	0.2979	0.3627	-0.1448	0.3671
DSPM2	0.0302	0.1689	0.149	-0.064	-0.0752	0.2049	0.5248	0.842	0.4437	0.4328	0.309	0.32	0.378	-0.0575	0.2826
DSPM3	0.0581	-0.0575	0.1643	0.1692	-0.0353	0.1269	0.5552	0.8216	0.3564	0.5495	0.2181	0.3091	0.3069	0.0069	0.356
DSTM1	0.1835	0.2723	0.4323	-0.0357	-0.1049	0.2835	0.4189	0.5221	0.8978	0.3724	0.2116	0.3432	0.3459	-0.0655	0.2298

DSTM2	0.2238	0.2689	0.223	0.0507	-0.007	0.3316	0.3327	0.3949	0.8852	0.36	0.2332	0.3403	0.319	-0.0173	0.2539
DSTM3	0.1268	0.2942	0.3849	-0.0567	-0.1213	0.2923	0.3583	0.474	0.9042	0.354	0.2939	0.4142	0.417	-0.0913	0.3211
DSTR1	0.1287	0.1396	0.0674	-0.0161	0.0366	0.198	0.5577	0.4916	0.3712	0.8782	0.2141	0.3073	0.209	-0.0053	0.2506
DSTR2	0.1466	0.0243	0.1001	-0.0432	0.0622	0.2425	0.5926	0.4484	0.2967	0.9184	0.2765	0.2754	0.2076	0.1158	0.3312
DSTR3	0.1629	0.1357	0.1137	0.0711	-0.0768	-0.0328	0.5665	0.4027	0.3837	0.7933	0.1377	0.1762	0.1829	0.0244	0.142
EFCO1	0.0813	0.2859	0.298	-0.1703	-0.0729	0.4537	0.4051	0.2817	0.3623	0.2665	0.8441	0.6919	0.6232	-0.0302	0.4298
EFCO2	0.2362	0.2202	0.1955	0.0427	-0.0779	0.1503	0.2293	0.2863	0.0707	0.1959	0.6375	0.3272	0.3351	0.1996	0.4306
EFCO3	0.1443	0.1063	0.1907	0.0915	-0.0684	0.2738	0.3052	0.1117	0.1486	0.108	0.8439	0.564	0.4911	0.0493	0.3658
EFTO1	0.0509	0.0492	0.251	-0.0901	-0.0039	0.2532	0.367	0.2414	0.281	0.1077	0.5409	0.7837	0.6819	-0.1701	0.4369
EFTO2	0.2023	0.2919	0.2204	-0.0599	0.0057	0.3485	0.3153	0.2613	0.3963	0.2253	0.6252	0.7395	0.5888	-0.059	0.4639
EFTO3	0.2019	0.315	0.4471	-0.0267	-0.0808	0.3102	0.4044	0.3401	0.3332	0.2156	0.5757	0.7716	0.6951	0.0306	0.6099
EFTO4	0.1773	0.2276	0.3724	0.1182	0.0004	0.2628	0.4483	0.3391	0.3245	0.3099	0.391	0.7442	0.5924	0.1985	0.5835
EFTO5	0.1018	0.1671	0.3173	-0.1689	0.046	0.4126	0.3989	0.2507	0.2752	0.3069	0.583	0.8287	0.6784	-0.0183	0.5636
EFTO6	0.0962	0.1796	0.3004	-0.0106	-0.1555	0.3859	0.3917	0.3168	0.3304	0.235	0.6045	0.8527	0.7612	-0.1017	0.5922
FLXO1	-0.0465	0.1168	0.497	0.0095	-0.1765	0.0932	0.3369	0.4508	0.2836	0.1012	0.3792	0.617	0.7624	-0.0844	0.6068
FLXO2	0.1006	0.1994	0.188	0.1466	-0.0803	0.171	0.2737	0.2509	0.2498	0.0544	0.4325	0.6765	0.7721	-0.1063	0.5872
FLXO3	0.0611	0.2771	0.2735	-0.1511	-0.0645	0.3549	0.4198	0.2862	0.3553	0.2185	0.601	0.6427	0.797	-0.0289	0.5042
FLXO4	0.1745	0.2378	0.4107	-0.0117	-0.0476	0.4024	0.4196	0.3553	0.3927	0.3371	0.6154	0.7747	0.8699	-0.0079	0.6618
ORGI1	0.0078	0.0736	0.3277	0.0285	-0.1458	0.2987	0.1697	0.3083	0.2447	0.1626	0.298	0.4994	0.4844	-0.2197	0.4925
ORGI2	0.0986	0.0083	0.1076	0.3258	0.1171	0.0508	0.0846	0.0168	0.0259	0.13	-0.0125	-0.0018	-0.0306	0.8629	0.0861
ORGI3	0.2128	0.0138	0.0384	0.1956	0.0928	0.1136	0.0498	-0.0964	-0.1043	-0.0253	0.2054	0.0526	0.016	0.7914	0.133
BV17	0.1207	0.189	0.3315	0.168	0.071	0.2338	0.2824	0.2488	0.2375	0.2293	0.4194	0.5462	0.6427	0.0996	0.8298
BV18	0.0443	0.0571	0.2756	0.246	0.0087	0.2169	0.2381	0.3116	0.1495	0.1838	0.3716	0.4741	0.5806	0.1609	0.8407
BV19	0.0777	0.1748	0.355	0.0847	-0.0586	0.1941	0.2644	0.3188	0.2563	0.2316	0.3866	0.616	0.6126	0.0716	0.7586
BV20	0.04	0.0822	0.2037	0.2091	-0.0712	0.1784	0.328	0.2988	0.1743	0.1853	0.4161	0.5666	0.5598	0.0521	0.866
BV21	0.1074	0.1739	0.2126	0.1903	-0.0714	0.2654	0.346	0.3982	0.2484	0.2723	0.4638	0.5452	0.5866	0.0021	0.8629
BV22	0.0106	0.2114	0.205	0.1179	-0.1439	0.3463	0.3501	0.3654	0.3757	0.2626	0.4327	0.5877	0.5983	-0.0396	0.7181

### 5.3 The Final Sample

The researcher identified a total of 150 firms across fifteen industries who had implemented ERP systems. Thirty (30) of the firms were used for the pilot study, and the remaining 120 firms were used in the main survey. A total of four hundred (400) questionnaires were administered to the remaining firms, with an average of three (3) questionnaires per organization contacted (Hong and Kim, 2002). Care was taken to ensure that all fifteen industries were represented in the chosen sample in order to make the sample as representative of the population as possible. After about three follow-ups of reminders through telephone calls, a total of 130 responses were returned, representing a response rate of 32.5%. However, 10 respondent questionnaires were discarded due to incompleteness of the questionnaire while additional 5 responses were unusable because they were not answered well. Thus, the final number of usable responses was 115, representing a 28.8% response rate.

### 5.4 Demographics of the Respondents

A summary of the analysis of the demographics of the respondents using SPSS is presented in Table 5.2.

**Table 5.2 Demographics of Respondents**

	Frequency	Percent	Valid Percent	Cumulative Percent
<b>Nationality</b>				
Ghanaian	113	98.3	98.3	98.3
Foreigner	2	1.7	1.7	100.0
Total	115	100.0	100.0	
<b>State Run Enterprise</b>				
Yes	16	13.9	13.9	13.9
No	99	86.1	86.1	100.0
Total	115	100.0	100.00	
<b>Number of Employees</b>				
6-29	2	1.7	1.8	1.8
30-59	10	8.7	8.8	10.5
60-99	11	9.6	9.6	20.2
100+	91	79.1	79.8	100.0
Total	114	99.1	100.0	
Missing	1	0.9		
Total	115	100.0		
<b>Company's Corresponding Industry</b>				
Manufacturing	9	7.8	7.8	7.8
Financial Services (banking & investments)	80	69.6	69.6	77.4
Oil and Gas	1	0.9	0.9	78.3
Health	2	1.7	1.7	80.0
Transportation	2	1.7	1.7	81.7
Mining and Minerals	10	8.7	8.7	90.4
Automobile and Heavy Equipment	4	3.5	3.5	93.9
Other (specify)	7	6.1	6.1	100.0

Total	115	100.0	100.0	
<b>Company's Annual Revenue (in Ghana Cedis)</b>				
80,000-120,000	3	2.6	2.6	2.6
120,000-160,000	4	3.5	3.5	6.1
160,000-200,000	7	6.1	6.1	12.2
200,000-500,000	4	3.5	3.5	15.7
500,000-1,000,000	7	6.1	6.1	21.7
>1,000,000	90	78.3	78.3	100.0
Total	115	100.0	100.0	
<b>Ownership of Company</b>				
Solely Ghanaian Owned	75	65.2	65.2	65.2
Foreign Owned	33	28.7	28.7	93.9
Joint Ventureship	5	4.3	4.3	98.3
Other ( specify)	2	1.7	1.7	100.0
Total	115	100.0	100.0	
<b>Legal form of Entity</b>				
Not Registered	1	.9	.9	.9
Limited Liability	91	79.1	79.1	80.0
Partnership	4	3.5	3.5	83.5
Public Limited Liability	16	13.9	13.9	97.4
Other (specify)	3	2.6	2.6	100.0
Total	115	100.0	100.0	

Data was analyzed in order to identify the characteristics of the respondents. Analysis of the nationality of the respondents revealed that the vast majority of the respondents were Ghanaians – about 98.3%. Again, 65.2% of the firms were solely Ghanaian owned, with some 28.7% being foreign owned, and 4.3% reported as being joint ventures. Interestingly, the

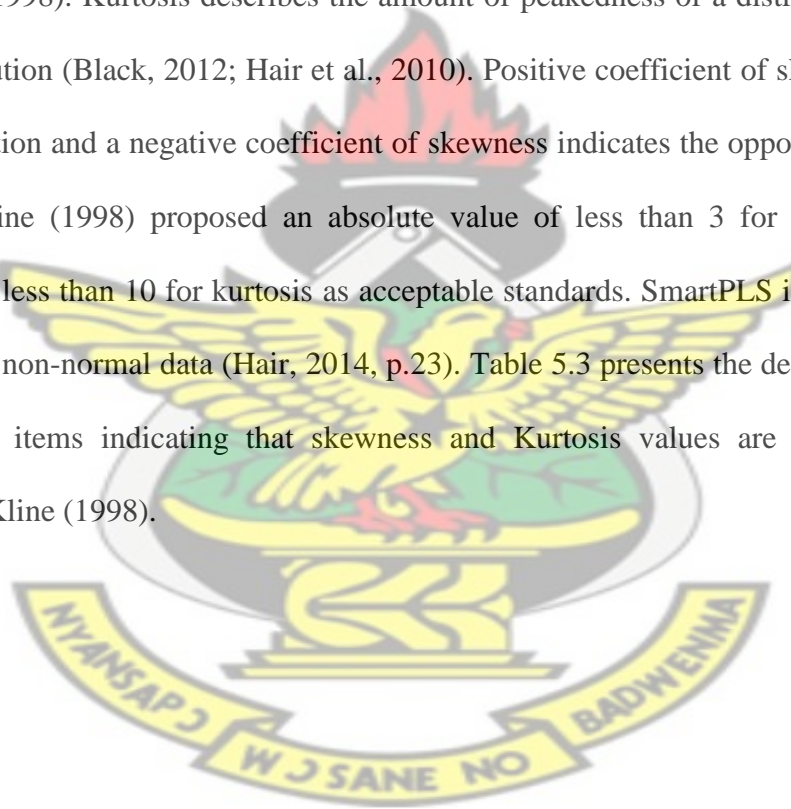
majority of the firms in the study were private organizations – 86.1%. This supports the previously noted view of the importance of Ghana’s private sector. When the respondents were analyzed by number of employees, it was revealed that 79.1% of respondents reported having over 100 employees in their organization, falling under large organizations according to NBSSI’s classification of Ghanaian industries. Again, analysis by firm's revenue indicated that the vast majority (about 78.3%) of the respondents reported annual revenue of more than one million Ghana cedis. This comes as no surprise as ERP systems are typically expensive to purchase and deploy and as such smaller firms usually cannot afford to use them.

Analysis of the composition of respondents by industry revealed a good representation among the core industries. Moreover, some respondents opted for “other” to describe their industry. Usually, such a need arises when respondents feel that the listed industry types do not adequately represent the nature of their firms or sector. However careful checks always indicate that the description of their industry could fit into one of the listed industries. For instance some respondents selected “other” and wrote “Shipping” to describe their industry, and these were reclassified under the “Transportation” industry. “Financial services” was the most-predominant category. This could be a result of the rapid proliferation of financial service providers in the country as well as the fact that an integrated software system appears to be a must have for these business who have to record, monitor and coordinate within and across several branches all over the country.

## **5.5 Descriptive Statistics of Measures**

The data was checked for assumption of normality because SEM is sensitive to data distribution and normal data (Hair et al., 2010). Normality refers to “the shape of the data

distribution for an individual metric variable and its correspondence to the normal distribution” (Hair et al., 2010, p.71). Significant variations from normal distribution can render statistical results invalid because normality is required for F and t statistics (Hair et al., 2010). Hair et al. (2010) suggested that to check for normality, researchers should use the skewness and kurtosis tests. Skewness refers to the shape of the distribution; that is it shows whether the distribution is symmetrical or not (Black, 2012; Hair et al., 2010). Positive coefficient of skewness indicates that most of the values are below the mean and negative coefficient of skewness indicates the opposite (Kline, 1998). Kurtosis describes the amount of peakedness of a distribution compared to normal distribution (Black, 2012; Hair et al., 2010). Positive coefficient of skewness indicates a peaked distribution and a negative coefficient of skewness indicates the opposite (Black, 2012; Kline, 1998). Kline (1998) proposed an absolute value of less than 3 for skewness and an absolute value of less than 10 for kurtosis as acceptable standards. SmartPLS is however able to handle extremely non-normal data (Hair, 2014, p.23). Table 5.3 presents the descriptive statistics for measurement items indicating that skewness and Kurtosis values are all less than the standards set by Kline (1998).



**Table 5.3 Descriptive Statistics of Measures**

	N	Sum	Mean	Std. Deviation	Variance	Skewness		Kurtosis	
	Statistic	Statistic	Statistic	Statistic	Statistic	Statistic	Std. Error	Statistic	Std. Error
ESC1	115	484	4.21	1.360	1.851	.230	.226	.802	.447
ESC2	115	332	2.89	.589	.347	-2.074	.226	5.571	.447
ESC3	115	276	2.40	.846	.716	.453	.226	-.381	.447
BPII1	115	747	6.50	.831	.691	-1.152	.226	-.544	.447
BPII2	115	716	6.23	.946	.896	-.849	.226	-.255	.447
BPII3	115	726	6.31	.912	.831	-1.019	.226	.153	.447
BPII4	115	736	6.40	.867	.751	-1.044	.226	-.381	.447
BPC1	115	707	6.15	.881	.776	-.374	.226	-1.419	.447
BPC2	115	479	4.17	1.376	1.894	.355	.226	-.927	.447
BPC3	115	469	4.08	1.299	1.687	.488	.226	-.337	.447
BPC4	115	544	4.73	1.366	1.865	.039	.226	-.796	.447
COMP1	115	651	5.66	1.107	1.226	-.397	.226	-.441	.447
COMP2	115	603	5.24	1.167	1.361	-.152	.226	-.622	.447
COMP3	115	578	5.03	1.294	1.675	.000	.226	-.871	.447
DSTM1	115	664	5.77	1.193	1.422	-.530	.226	-.599	.447
DSTM2	115	668	5.81	1.228	1.507	-1.016	.226	1.223	.447
DSTM3	115	653	5.68	1.174	1.378	-.505	.226	-.449	.447
DSPM1	115	616	5.36	1.133	1.284	-.189	.226	-.617	.447
DSPM2	115	643	5.59	1.059	1.121	-.154	.226	-.827	.447
DSPM3	115	606	5.27	1.037	1.076	-.419	.226	.574	.447
DSTR1	115	667	5.80	1.010	1.021	-.314	.226	-.598	.447
DSTR2	115	662	5.76	1.005	1.010	-.389	.226	-.241	.447
DSTR3	115	642	5.58	1.059	1.123	-.491	.226	.864	.447
DSCO1	115	642	5.58	1.199	1.438	-.540	.226	-.010	.447
DSCO2	115	604	5.25	1.220	1.488	-.232	.226	-.562	.447
DSCO3	115	599	5.21	1.158	1.342	-.074	.226	-.326	.447
EFCO1	115	670	5.83	1.102	1.215	-.567	.226	-.240	.447
EFCO2	115	564	4.90	1.318	1.736	-.078	.226	-.650	.447
EFCO3	115	637	5.54	1.300	1.689	-.502	.226	-.350	.447
EFTO1	115	669	5.82	1.097	1.203	-.603	.226	.140	.447

EFTO2	115	674	5.86	1.042	1.086	-.568	.226	.116	.447
EFTO3	115	641	5.57	1.148	1.317	-.415	.226	-.180	.447
EFTO4	115	609	5.30	1.026	1.052	.171	.226	-.727	.447
EFTO5	115	619	5.38	1.073	1.151	-.340	.226	.232	.447
EFTO6	115	648	5.63	1.111	1.234	-.249	.226	-.691	.447
FLXO1	115	621	5.40	1.083	1.172	-.476	.226	.616	.447
FLXO2	115	604	5.25	1.130	1.278	-.291	.226	.183	.447
FLXO3	115	646	5.62	1.022	1.045	-.224	.226	-.645	.447
FLXO4	115	626	5.44	1.156	1.337	-.241	.226	-.634	.447
BV17	115	575	5.00	1.298	1.684	-.098	.226	-.577	.447
BV18	115	582	5.06	1.164	1.356	.117	.226	-.714	.447
BV19	115	553	4.81	1.131	1.279	.200	.226	-.442	.447
BV20	115	581	5.05	1.269	1.611	-.152	.226	-.444	.447
BV21	115	596	5.18	1.189	1.414	-.106	.226	-.512	.447
BV22	115	607	5.28	1.203	1.448	-.063	.226	-.478	.447
COR1	115	649	5.64	.938	.881	-1.560	.226	2.341	.447
COR2	115	666	5.79	.570	.324	-.859	.226	1.596	.447
COR3	115	569	4.95	.711	.506	-.520	.226	4.021	.447
ORGI5	115	663	5.77	.653	.427	-2.024	.226	9.259	.447
ORGI6	115	669	5.82	.629	.396	-.915	.226	1.701	.447
ORGI7	115	669	5.82	.615	.379	-1.251	.226	4.038	.447
DDD2	115	698	6.07	.998	.995	-.627	.226	-.633	.447
DDD4	115	722	6.28	1.031	1.062	-1.317	.226	1.057	.447
ORGC1	115	472	4.10	.821	.673	-1.748	.226	6.183	.447
ORGC2	115	466	4.05	1.115	1.243	-.646	.226	.035	.447

## 5.6 Measurement Validation

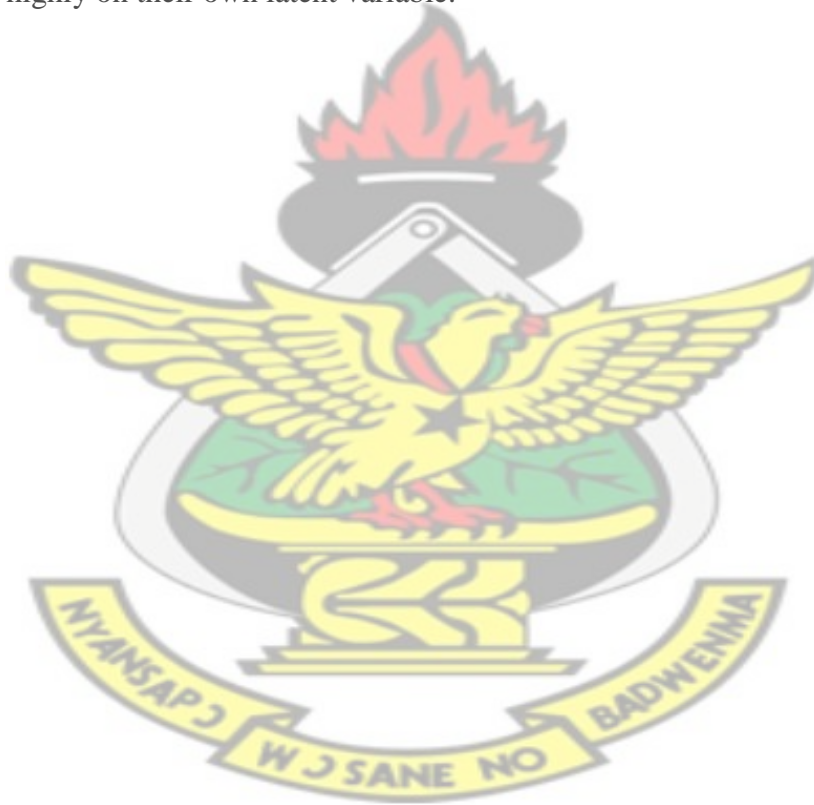
Several procedures were used to mitigate the effect of common method biases. Common method bias occurs when the instruments which the researcher employs affect the scores or

measures that are being gathered (Campbell and Fiske, 1959; Podsakoff et al., 2003; Straub et al., 2004; Su and Yang, 2010). While common method bias can be a significant concern in some study designs, Spector (2006) notes that concerns about common method bias, particularly for survey questionnaire based studies are overstated. However, in this study some key steps were taken to alleviate the concerns of common method bias. Podsakoff et al. (2003) provide guidance to reduce common sources of this bias. The two key ones are to ensure anonymity in survey administration and improve measurement items for the constructs. First, anonymity was maintained in the questionnaire and respondents were asked to be as honest as possible while reassuring them that there is no right or wrong answer (Podsakoff et al., 2003). Second, the pilot test improved the scale items by removing vague concepts, ambiguous and unfamiliar terms as well as double-barreled questions (Podsakoff et al., 2003). Also in measuring some of the study constructs, we relied on previously tested scales. According to Podsakoff et al. (2003), a well-tested and validated scale helps to reduce item ambiguity. Finally, counterbalancing the question order was also used to control for priming effect and other item-context induced mood states (Podsakoff et al., 2003).

## **5.7 Test for Convergent and Divergent Validity of Scales**

Table 5.3 shows the factor loading pattern for the items comprising the independent variables of our analysis. Convergent validity is achieved when scores of items used to measure a construct correlate with or are related to scores of other items that are designed to measure the same construct (Campbell and Fiske, 1959). Convergent validity can be assessed by measuring the reliability of survey items - composite reliability of constructs, average variance extracted (AVE) and factor analysis (Komiak and Benbasat, 2006). Initially there was some cross-loading.

Some of the reflective items that had inadequate loadings or had significant loadings across constructs were removed from the analysis, whilst others were reverse coded. Because of their reflective nature, items capturing a reflective construct can be removed from data analysis without changing the meaning of the construct (Bollen and Lennox, 1991). Table 5.1 offers further description of the specific items that were removed from the analysis. After analyzing these results and removing items, each item loaded on its own construct, and cross loadings were not significant across constructs. The result of the factor loading in Table 5.3 shows that all of the items loaded highly on their own latent variable.



**Table 5.4 Attributes Of Constructs**

	<b>AVE</b>	<b>Composite Reliability</b>	<b>R Square</b>	<b>Cronbach's Alpha</b>
BPC	0.622	0.7668	0.6416	0.3933
BPII	0.5716	0.8421	0.7529	0.7502
BV	0.6502	0.9173	0.5402	0.8908
COMP	0.5774	0.8015	0.2609	0.6829
COR	0.7481	0.899	0.9524	0.8309
DDD	0.6751	0.803	0.0015	0.5528
DSCO	0.7721	0.9104	0	0.8524
DSPM	0.641	0.8425	0	0.7192
DSTM	0.7821	0.9149	0	0.8601
DSTR	0.6689	0.8579	0	0.7501
EFCO	0.6978	0.8737	0.6481	0.7880
EFTO	0.6296	0.9103	0.9205	0.8810
FLXO	0.6428	0.8778	0.8322	0.8142
ORGC	0.6089	0.7529	0.1462	0.3789
ORGI-Post	0.6866	0.8676	0.1449	0.7699

The parameter “Cronbach alpha” measures the correlation among the indicators of a latent variable. This measure assumes all indicators to be equally weighted (Chin, 1998b). The unidimensionality expectation is that the individual indicators strongly correlate with other indicators of the same dimensional block. A rule of thumb benchmark of 0.7 is used as the acceptance criteria for unidimensionality of a latent variable’s dimensional block (Robinson et al., 1991, Nunnally, 1978, Hair et al., 2010). The results in Table 5.3 show that three (3) (i.e. BPC, DDD and ORGC) out of the fifteen (15) latent constructs, fell below this benchmark. However, given the assumption of equal item weight, Cronbach alpha has been suggested not to be the best measure of reliability because it underestimates internal consistency (Chin, 1998b, Henseler et al., 2009).

Composite reliability measures the ability of the indicators to explain the variance of their latent variable and is considered a better test of unidimensionality than Cronbach alpha because it considers the actual loading of the items (Chin, 1998b). A rule of thumb benchmark of values of minimum 0.7 is used to assess acceptability of unidimensionality of a latent variable. The results in Table 5.3 show that all latent constructs passed this test. Further, average variance extracted (AVE) suggested by Fornell and Larcker (1981) measures the amount that a latent variable component captures from its indicators as opposed to the amount due to measurement error. Typically, a value greater than 0.50 is recommended (Fornell and Larcker, 1981), and the AVEs for the all constructs in the research model meet this requirement as well.

The square root of a construct average variance extracted (AVE) is used to measure discriminant validity. Discriminant validity examines the extent to which a measure correlates with measures of constructs that are different from the construct the measure is intended to assess (Barclay et al. 1995). This would imply that the construct does not share much variance with other constructs, but rather with its own measures. Thus, an adequate discriminant validity will be achieved in a model when a construct shares more variance with its scale items than it shares with another construct within the model (Barclay et al. 1995). As indicated in Table 5.5, the factor loading for all the constructs indicate good discriminant validity because the loading of each measurement item on its latent variable is larger than its loading on any other construct.

Furthermore, discriminant validity can be assessed by comparing the AVE for each factor against the squared correlation of each constructs. Discriminant validity is achieved if the AVE for each construct is greater than 0.50 and the square root of the AVE for a construct is greater than the correlation of that construct with other constructs (Fornell and Larcker, 1981). In Table 5.4 the bold numbers on the diagonals are the square root of the AVEs. Off-diagonal elements

are the correlations among constructs. All diagonal numbers are greater than the corresponding off-diagonal ones, indicating satisfactory discriminant validity of all the constructs.

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**Table 5.5 Intercorrelations of the Latent Variables for First-Order Constructs**

	C. Rel.	AVE	BPC	BPII	BV	COMP	COR	DDD	DSCO	DSPM	DSTM	DSTR	EFCO	EFTO	FLXO	ORGC	ORGI-Post
<b>BPC</b>	0.7668	0.622	<b>0.7887</b>	0	<b>0</b>	0	0	0	0	0	0	0	0	0	0	0	0
<b>BPII</b>	0.8421	0.5716	0.531	<b>0.7560</b>	0	<b>0</b>	0	0	0	0	0	0	0	0	0	0	0
<b>BV</b>	0.9173	0.6502	0.2263	0.2167	<b>0.8063</b>	0	<b>0</b>	0	0	0	0	0	0	0	0	0	0
<b>COMP</b>	0.8015	0.5774	0.3131	0.1581	0.2879	<b>0.7599</b>	0	<b>0</b>	0	0	0	0	0	0	0	0	0
<b>COR</b>	0.899	0.7481	0.0402	0.029	0.1455	0.0097	<b>0.8649</b>	0	<b>0</b>	0	0	0	0	0	0	0	0
<b>DDD</b>	0.803	0.6751	0.3317	0.3285	0.3076	0.1576	0.0426	<b>0.8216</b>	0	<b>0</b>	0	0	0	0	0	0	0
<b>DSCO</b>	0.9104	0.7721	0.1774	0.1209	0.4622	0.2836	0.1859	0.1957	<b>0.8787</b>	0	<b>0</b>	0	0	0	0	0	0
<b>DSPM</b>	0.8425	0.641	0.2095	0.194	0.5302	0.2957	0.0665	0.3459	0.6066	<b>0.8006</b>	0	<b>0</b>	0	0	0	0	0
<b>DSTM</b>	0.9149	0.7821	0.3304	0.3393	0.3889	0.3833	0.1648	0.4054	0.4811	0.6147	<b>0.8844</b>	0	<b>0</b>	0	0	0	0
<b>DSTR</b>	0.8579	0.6689	0.2903	0.1701	0.4156	0.1709	0.0293	0.3241	0.6193	0.4409	0.3568	<b>0.8179</b>	0	<b>0</b>	0	0	0
<b>EFCO</b>	0.8737	0.6978	0.2424	0.148	0.4996	0.2419	-0.018	0.2899	0.3868	0.3397	0.2307	0.357	<b>0.8353</b>	0	0	0	0
<b>EFTO</b>	0.9103	0.6296	0.282	0.2488	0.7066	0.3671	0.0562	0.3684	0.4375	0.4932	0.4385	0.4199	0.6876	<b>0.7935</b>	0	0	0
<b>FLXO</b>	0.8778	0.6428	0.206	0.1599	0.7263	0.3984	0.1194	0.3211	0.3906	0.5331	0.441	0.4012	0.6223	0.0814	<b>0.8017</b>	0	<b>0</b>
<b>ORGC</b>	0.7529	0.6089	-0.055	-0.048	-0.1	0.0826	-0.172	0.0029	0.0153	-0.0422	-0.0009	-0.0435	0.0944	0.1011	-0.028	<b>0.7803</b>	0
<b>ORGI-Post</b>	0.8676	0.6866	0.0171	-0.014	0.1604	0.0961	0.5272	0.2661	0.0908	0.1004	0.128	0.1176	0.0525	0.1276	0.2826	-0.0355	<b>0.8286</b>

*Bold numbers depict the square root of AVE. Off-diagonal numbers show the correlations among constructs. There is discriminant validity when AVE of a column is greater than off diagonal numbers below.*

**Table 5.6 Items Loading And Cross-Loadings**

	BPC	BPII	BV	COMP	COR	DDD	DSCO	DSPM	DSTM	DSTR	EFCO	EFTO	FLXO	ORGC	ORGI- Post
BPC1	0.8125	0.4846	0.1269	0.2163	-0.002	0.3409	0.1065	0.2002	0.3048	0.2617	0.1499	0.2368	0.1474	-0.057	0.0136
BPC4	0.7641	0.347	0.2359	0.2814	0.069	0.1744	0.1772	0.1269	0.2123	0.1932	0.2373	0.2071	0.1796	-0.029	0.0133
BPII1	0.3443	0.7695	0.1225	0.0353	0.0199	0.2522	0.0926	0.165	0.2639	0.1085	0.1669	0.2014	0.1081	-0.042	0.0087
BPII2	0.4227	0.7619	0.1648	0.0646	-0.077	0.3077	0.0979	0.2288	0.2621	0.0501	0.1427	0.2502	0.1521	0.0567	-0.133
BPII3	0.3978	0.7659	0.1693	0.1976	0.034	0.2236	0.0669	0.0661	0.2553	0.1054	0.1238	0.1506	0.0892	-0.065	-0.02
BPII4	0.4364	0.7261	0.1947	0.1682	0.1072	0.2128	0.1093	0.1341	0.2451	0.247	0.0189	0.1545	0.1352	-0.091	0.1001
BV17	0.2011	0.2151	0.8241	0.2755	0.1333	0.2485	0.3597	0.389	0.3235	0.3463	0.4143	0.5701	0.6508	-0.05	0.1853
BV18	0.1567	0.1255	0.8197	0.197	0.1794	0.2266	0.3938	0.3773	0.2442	0.3126	0.4249	0.5097	0.5717	-0.041	0.1164
BV19	0.0813	0.1418	0.7244	0.2547	0.0564	0.1834	0.3065	0.4339	0.2838	0.3102	0.2391	0.5523	0.5217	-0.096	0.056
BV20	0.1972	0.15	0.8797	0.2133	0.112	0.2114	0.3779	0.3977	0.2541	0.2746	0.4234	0.5815	0.5433	-0.132	0.1273
BV21	0.2136	0.2176	0.8589	0.2491	0.1735	0.2451	0.3928	0.4719	0.3366	0.3374	0.4448	0.5449	0.5358	-0.106	0.183
BV22	0.2236	0.1866	0.7169	0.2012	0.0512	0.3476	0.3902	0.4814	0.4145	0.4095	0.4408	0.6348	0.6574	-0.06	0.0988
COMP1	0.4379	0.1907	0.2367	0.8812	-0.052	0.1786	0.1756	0.2465	0.324	0.1823	0.2744	0.3713	0.3742	0.0468	0.067
COMP2	0.0592	0.0945	0.2029	0.7202	0.0666	0.0645	0.285	0.1677	0.2859	0.047	0.0638	0.1431	0.1888	0.0882	0.0805
COMP3	-0.01	-0.018	0.248	0.6611	0.0899	0.0644	0.2799	0.3095	0.2783	0.1401	0.1536	0.2938	0.3511	0.0863	0.0983
COR1	0.0396	0.013	0.0813	-0.008	0.9102	0.0397	0.1087	0.0537	0.1009	-0.017	-0.053	0.0079	0.0963	-0.127	0.5515
COR2	-0.034	0.0291	0.0789	-0.019	0.8379	0.0957	0.1309	0.0064	0.1461	0.0152	-0.016	0.0142	0.0369	-0.061	0.4535
COR3	0.0941	0.0339	0.2161	0.051	0.8449	-0.021	0.2433	0.1096	0.1826	0.0792	0.0239	0.1233	0.1729	-0.253	0.3601
DDD2	0.3778	0.2981	0.302	0.0959	0.1028	0.7004	0.188	0.2403	0.2998	0.2272	0.3737	0.3643	0.3671	-0.009	0.1899
DDD4	0.2311	0.2689	0.2397	0.1538	0.0012	0.9272	0.1547	0.3217	0.3676	0.3004	0.1792	0.2858	0.223	0.0086	0.2449
DSCO1	0.153	0.0647	0.3447	0.2016	0.1816	0.1656	0.8578	0.522	0.4352	0.6082	0.2784	0.306	0.2873	-0.072	0.0684
DSCO2	0.1308	0.0834	0.4768	0.2657	0.1719	0.1631	0.8887	0.4862	0.3324	0.4996	0.4015	0.4596	0.3548	0.0545	0.0899
DSCO3	0.1818	0.1657	0.3974	0.278	0.1389	0.1861	0.8892	0.5868	0.4952	0.5269	0.3397	0.3874	0.3842	0.054	0.081
DSPM1	0.2375	0.2905	0.3911	0.3162	0.0609	0.3194	0.4832	0.7823	0.5897	0.2583	0.1736	0.3679	0.3867	0.0607	0.0773
DSPM2	0.1515	0.1911	0.4071	0.2017	0.0192	0.2679	0.4743	0.8437	0.4853	0.4082	0.3195	0.391	0.4638	-0.05	0.1199

DSPM3	0.1189	-0.011	0.4755	0.1987	0.0822	0.2467	0.4992	0.7741	0.4078	0.3853	0.3155	0.4252	0.4265	-0.107	0.0417
DSTM1	0.1999	0.1865	0.2881	0.4218	0.1486	0.3169	0.4454	0.5335	0.845	0.2758	0.1692	0.3858	0.355	0.1576	0.1532
DSTM2	0.3743	0.394	0.3099	0.2238	0.1382	0.4109	0.3812	0.5417	0.8834	0.3206	0.1933	0.3352	0.3402	-0.104	0.0827
DSTM3	0.3017	0.318	0.425	0.3693	0.1504	0.35	0.4488	0.5561	0.923	0.3472	0.2451	0.4376	0.4667	-0.049	0.1055
DSTR1	0.2329	0.2092	0.3514	0.1331	0.1211	0.3555	0.4411	0.36	0.3396	0.7952	0.2842	0.4095	0.3314	-0.093	0.1347
DSTR2	0.2925	0.1279	0.3988	0.1315	-0.029	0.3035	0.5222	0.3616	0.2044	0.8841	0.3667	0.3732	0.3496	-0.014	0.0527
DSTR3	0.1816	0.0759	0.2628	0.1561	-0.023	0.1249	0.5604	0.3604	0.3366	0.7697	0.2182	0.2391	0.301	0.0032	0.1025
EFCO1	0.2507	0.1385	0.4829	0.3601	0.0091	0.297	0.3866	0.4122	0.4022	0.3333	0.8681	0.7082	0.6789	0.052	0.0267
EFCO2	0.0962	0.0637	0.337	0.0896	-0.073	0.1542	0.2506	0.1809	-0.01	0.2705	0.799	0.4007	0.3271	0.2053	-0.049
EFCO3	0.2297	0.1543	0.4063	0.0977	0.0002	0.2473	0.3069	0.2099	0.095	0.2816	0.8375	0.5546	0.4827	0.0144	0.1387
EFTO1	0.1815	0.0715	0.5172	0.2084	0.0524	0.3495	0.3074	0.3505	0.2784	0.3076	0.6038	0.8107	0.6833	0.0588	0.1102
EFTO2	0.3189	0.2726	0.4576	0.2909	-0.072	0.2383	0.3318	0.3765	0.3602	0.3533	0.5966	0.7531	0.565	0.1058	0.0028
EFTO3	0.2777	0.3441	0.6183	0.3938	0.0762	0.196	0.3447	0.4078	0.341	0.3046	0.4962	0.7388	0.6125	0.0924	0.0625
EFTO4	0.0876	0.1937	0.625	0.2349	0.126	0.2498	0.4287	0.3844	0.3644	0.3187	0.413	0.7256	0.5645	-0.007	0.1833
EFTO5	0.2192	0.1474	0.5368	0.3923	0.0771	0.3464	0.3102	0.3526	0.3758	0.3411	0.4998	0.8345	0.6584	0.1125	0.1281
EFTO6	0.252	0.1806	0.6202	0.242	0.0182	0.3536	0.3745	0.4739	0.3754	0.3731	0.643	0.8858	0.769	0.1079	0.1214
FLXO1	0.1234	0.1133	0.5971	0.3703	0.1197	0.1446	0.3416	0.4509	0.317	0.2655	0.4482	0.6346	0.7615	-0.076	0.1695
FLXO2	0.1852	0.1555	0.5353	0.2918	0.0507	0.3619	0.271	0.4162	0.2671	0.2726	0.4236	0.6337	0.778	-0.018	0.2717
FLXO3	0.1528	0.132	0.536	0.3324	0.0785	0.239	0.2987	0.4356	0.4076	0.2914	0.5421	0.6237	0.8311	-0.03	0.2762
FLXO4	0.1965	0.1142	0.6558	0.288	0.1305	0.2833	0.3397	0.4104	0.4126	0.4433	0.5714	0.7144	0.8338	0.0268	0.1922
ORGC1_R1	-0.131	-0.036	-0.025	0.0054	-0.172	-0.019	0.0292	0.0003	0.0362	-0.037	0.105	0.1238	-0.011	0.8863	-0.047
ORGC2_R1	0.0973	-0.042	-0.168	0.1647	-0.08	0.0365	-0.015	-0.089	-0.061	-0.032	0.0274	0.0108	-0.041	0.6575	0.0025
ORGI5	-0.062	-0.038	0.0266	0.0634	0.3129	0.189	-0.004	0.0456	0.0086	-0.008	-0.015	0.0161	0.2014	0.0127	0.8298
ORG16	0.1338	0.0097	0.1916	0.1567	0.3679	0.2521	0.0657	0.1137	0.1286	0.1433	0.0674	0.1328	0.277	-0.025	0.8786
ORGI7	-0.026	-0.006	0.1817	0.0204	0.626	0.2201	0.1633	0.0908	0.1815	0.1576	0.0789	0.1689	0.2243	-0.076	0.7742

**Table 5.7 Intercorrelations Among Latent Constructs**

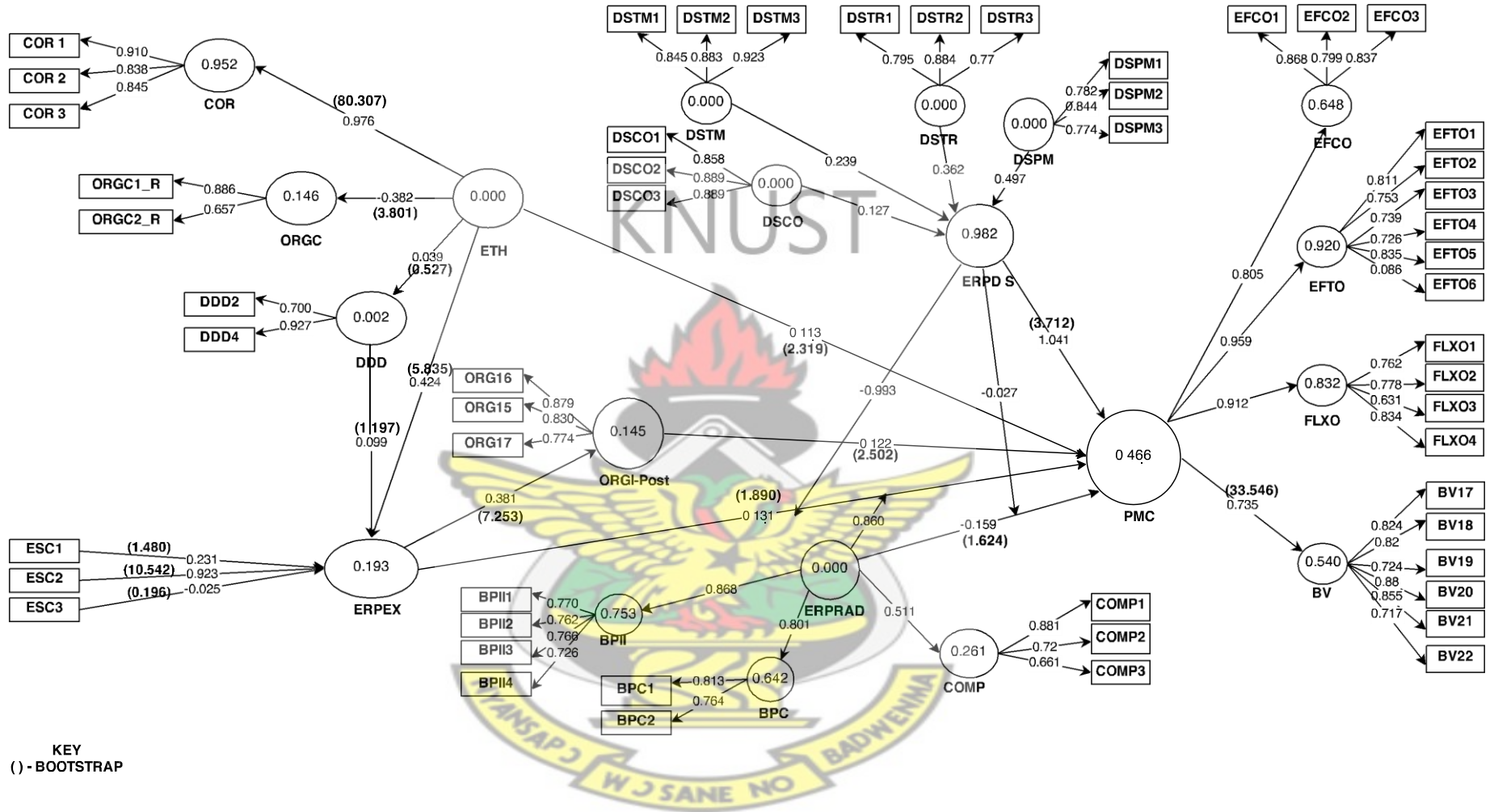
Latent Construct	Inter-factor Correlations					
	BV	ERPDS	ERPEX	ERPRAD	ETH	PMC
<b>BV</b>	1	0	0	0	0	0
<b>ERPDS</b>	0.609	1	0	0	0	0
<b>ERPEX</b>	0.1127	0.0466	1	0	0	0
<b>ERPRAD</b>	0.3127	0.3822	-0.0404	1	0	0
<b>ETH</b>	0.1595	0.1119	0.4283	0.0504	1	0
<b>PMC</b>	0.735	0.6195	0.1149	0.3606	0.0487	1

### 5.7. Survey Results

Analysis and empirical validation of our hypotheses was done using partial least square (PLS) analysis. SmartPLS (Ringle et al., 2005) was used for the analysis. As an extension of multiple regression analysis, PLS is well suited for complex models involving latent variables. In addition, it also requires fewer data points to estimate loadings (Chin, 1998a). PLS provides the magnitude and significance of the hypothesized causal relationships as standardized path coefficients. The parameter estimate of the hypothesized structural path should be statistically significant with the hypothesized direction of the effect. Estimates of the path coefficients and the values for the institutional model (Model 1) are shown in Figure 5.1. The path coefficients depict the strength of the relationships between the constructs.

SmartPLS 2.0 performs bootstrapping analysis to assess the statistical significance of the loadings and of the path coefficients (Ringle et al., 2005). Bootstrapping analysis is a non-

parametric approach for estimating the precision of the PLS estimates. Bootstrapping analysis works by re-sampling the original data with replacement to obtain an estimate for each parameter in the PLS model (Chin, 1998a, 2001). This sampling procedure is repeated until the numbers of cases are the same with the original sample dataset. While the sampling distribution in parametric inferential statistics is restricted by the normality assumption, bootstrapping analysis is free of such an assumption and restriction (Zhu, 1997). In essence, bootstrapping provides an approach to addressing situations where assumption of multivariate normality cannot be established (Yung and Bentler, 1996). A path is considered to be statistically significant if its p value is less than the 0.05 significance level. The significance of the hypothesized relations in this study were calculated using SmartPLS bootstrap with  $n=115$  and 500 iterations following Hair et al. (2013). Higher values indicate stronger relationships. The results of the PLS analysis with bootstrapping reveals that not all the paths in the research model are statistically significant (see Figure 5.1 and Table 5.8). The  $R^2$  values, shown inside the circles, represent the variance explained by the latent variables. The combined effect of extent of implementation, ERP delivery systems, ERP radicalness, ethical factors, data culture, and organizational integration together account for 46.6% of the variance in process management capabilities in both models.



**Figure 5.1 Model 1 Depicting Factor Loadings and Bootstrapping**

### 5.8.1 Test for Multicollinearity

After finally computing the parameter estimates for extent of ERP Implementation using SmartPLS software, two outer weights were positive with one being negative. According to Hair et al., (2014), this may demonstrate a situation where high collinearity reverses the signs of the weaker indicator. This further drove the researcher to conduct a multicollinearity test using the Variance Inflation Factor (VIF).

The VIF was generated for the formative indicators of extent of ERP Implementation construct using IBM SPSS software. From the table below, ESC 2 has the highest VIF factor of (1.08). Hence, VIF values are uniformly below the recommended threshold value of 5. We conclude, therefore, that collinearity among the indicators has not reached critical levels for the formative construct and is not an issue for the estimation of the PLS path model.

**Table 5.8 Results from Multicollinearity Test**

Extent of Implementation Construct	
Indicators	VIF
Esc 1	1.06
Esc 2	1.08
Esc 3	1.02

VIF < 5\*

Next, we examined ERP implementation from the perspective of the panoptic theory by exploring the effect of extent of ERP implementation on ethical behaviour (Model 2). The factor loadings, path significance and bootstrapping results are presented in Figure 5.2. Details on the

AVE, Composite Reliability, Cronbach Alpha, and  $R^2$  for constructs of the Panoptic model (Model 2) are presented in Appendix 2(a) whilst details on intercorrelations and discriminant validity are presented in Appendix 2(b), and finally Items Loading and Cross-Loadings can be seen in Appendix 2(c).

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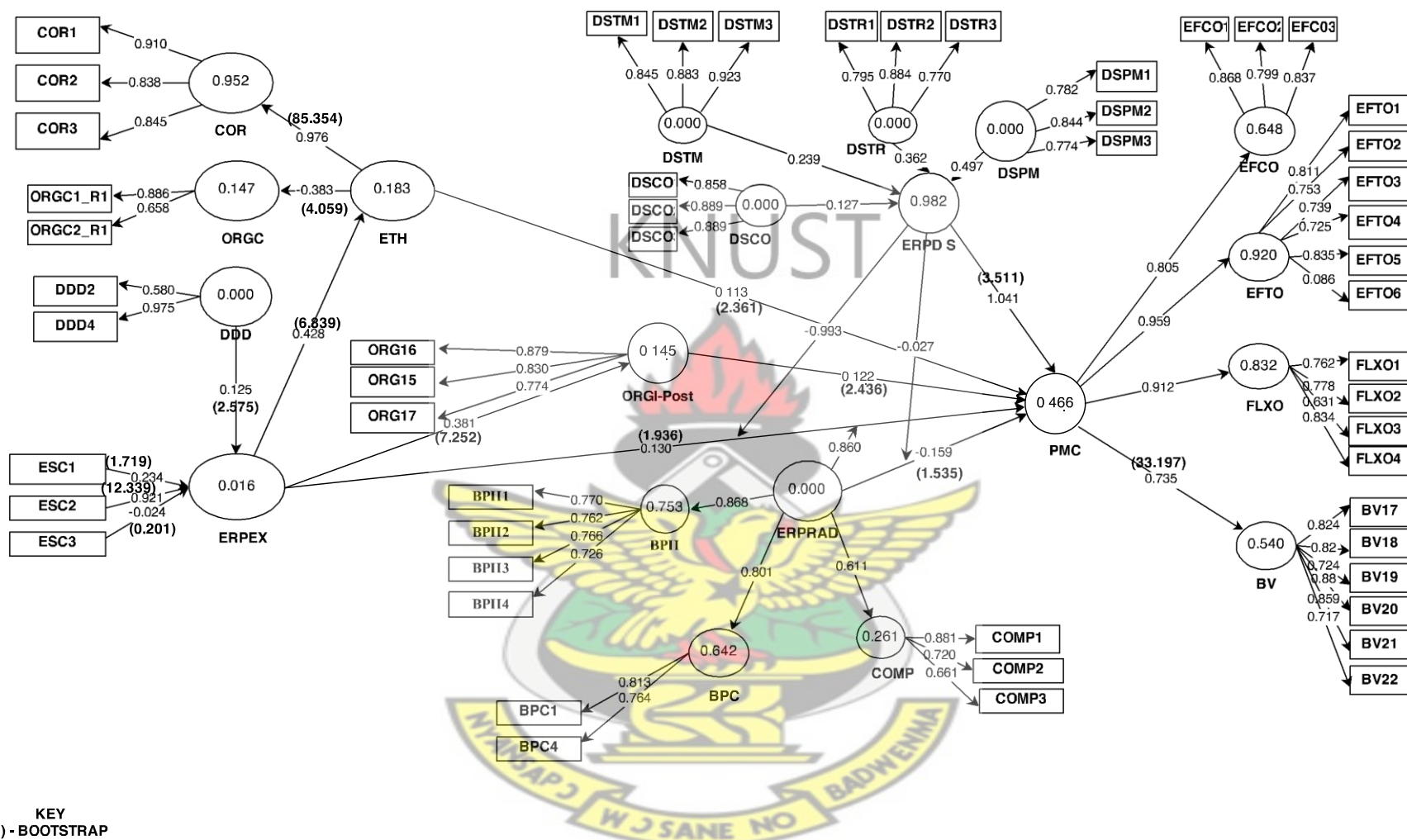


Figure 5.2: Model 2 Depicting Factor Loadings and Bootstrapping

### 5.8.2 Test of Competing Theories

Analysis of the two competing theories reveals that the main premises of both the institutional theory and the panoptic theory were supported. From model 1, the data supported the argument that ethical behaviour exerted a significant influence on extent of ERP implementation, with a path coefficient of 0.424. The explanatory power ( $R^2$ ) obtained from this model for extent of ERP implementation is 0.193 suggesting that ethical factors explains about 19.3% of the variation in extent of ERP implementation. From model 2, we also obtained significant support for the influence of extent of ERP implementation on ethical factors, obtaining a path coefficient significance of 0.428, with the  $R^2$  of the ethical factors construct being 18.3%.

However, with regards to exploring the relationship between the organization's data culture and the extent of ERP implementation, the institutional theory driven model 1 failed to establish this relationship. The panoptic theory employed in model 2 however revealed a significant impact of data culture on extent of ERP implementation, with a path coefficient of 0.125. Thus when taken as a whole, the panoptic theory appears to better explain ERP implementation in SSA.

### 5.8.3 Test of Research Hypotheses

The hypotheses developed earlier in chapter three are evaluated and examined based on the results obtained in the PLS analysis.

**Table 5.9 Hypothesis Test of Survey Variables**

Hs	Hypothesis	Path Coefficient (Critical Ratio)		Hypothesis Supported	
		Model One (Institutional Theory)	Model Two (Panoptic Theory)	Model One (Institutional Theory)	Model Two (Panoptic Theory)
Model One					
H1	ETH→DDD	0.039 (0.527)	-	Not Supported	-
H2	DDD→ERPEX	0.099 (1.187)	-	Not Supported	-
H3	ETH→ERPEX	0.424 (5.885)***	-	Supported	-
Model Two					
H4	ERPEX→ETH	-	0.428 (6.839)***	-	Supported
H5	DDD→ERPEX	-	0.125 (2.575)***	-	Supported
Common to Models One and Two					
H6	ERPEX→PMC	0.131 (1.890)*	0.130 (1.936)*	Supported	Supported
H7	ETH→ PMC	0.113 (2.319)**	0.113 (2.361)**	Supported	Supported
H8	ERPEX →ORGIPOST	0.381 (7.253)***	0.381 (7.252)***	Supported	Supported
H9	ORGIPOST→PMC	0.122 (2.582)***	0.122 (2.496)**	Supported	Supported
H10	PMC → BV	0.735 (33.546)***	0.735 (33.197)***	Supported	Supported
Interactions					
H11	ERPEX × ERPDS→PMC	-0.993 (4.087)***	-0.993 (4.078)***	Supported	Supported
H12	ERPEX × ERPRAD→PMC	0.860 (4.590)***	0.860 (4.589)***	Supported	Supported
H13	ERPRAD × ERPDS→PMC	-0.027 (0.099)	-0.027 (0.095)	Not Supported	Not Supported
*P <0.10;    ** P <0.05;    ***P <0.01					

H1, H2, and H3 are all driven by the institutional theory. Results from the PLS analysis yielded no support for H1 (ETH→DDD) and H2 (DDD→ERPEX). H3, which suggested that ethical factors positively impacted extent of implementation, was however significantly supported ( $\beta = 0.424$ ;  $t = 5.885$ ;  $p < 0.01$ ). H4 (ERPEX→ETH) and H5 (DDD→ERPEX), both driven by the panoptic theory, also found significant support at ( $\beta = 0.428$ ;  $t = 6.839$ ;  $p < 0.01$ ) and ( $\beta = 0.125$ ;  $t = 2.575$ ;  $p < 0.01$ ) respectively. Five hypotheses (H6, H7, H8, H9, and H10) were common to both models and indicated direct single relationships which were significant on both models.

In both models ERPEX→PMC is only marginally significant at  $p < 0.10$  ( $t = 1.890$  for model 1 and  $t = 1.936$  for model 2) although model was at  $p = 0.053$ , which is close to 0.05. These figures are low compared to the results of Karimi et al. (2007) where ERPEX→BPO was significant at  $p < 0.01$ . This can be attributable to the mediating factors that are additionally explored in this study necessitated by the specific environmental influences in SSA. Furthermore Karimi et al.'s (2007) work considered only manufacturing firms whilst this study considered both manufacturing and service firms across fifteen different industries.

There were also three hypotheses (H11, H12, and H13) that indicated moderating relationships between two constructs. H11 (ERPEX  $\times$  ERPDS→PMC) was significant with  $\beta = -0.993$  for both models at  $p < 0.01$ . H12 (ERPEX  $\times$  ERPRAD→PMC) similarly had equal path significance of  $\beta = 0.860$  for both models at  $p < 0.01$ . There were however infinitesimal differences in the  $t$  values for H11 and H12. The final hypothesis, H13 (ERPRAD  $\times$  ERPDS→PMC), however was not supported on either models.

## 5.9 Effects of Mediating Factors

The study also explored the effects of the mediating constructs (ethical factors and organizational integration) on the relationship between extent of ERP implementation and PMC for both models.

First the strength of the relationship between extent of ERP implementation and PMC was tested with no mediator(s) present. This was followed by testing the relationship with the mediator(s) one at a time. The results of the tests are presented in Table 5.9.

**Table 5.10 Results from Test of Mediating Factors**

Relationship	Mediating Factors	Path Coefficient	t- value	R-Square
<b>Institutional theory (Model 1)</b>				
ERPEX→PMC	No factor	0.139	1.666	0.452
ERPEX →PMC	ORGI	0.130	1.890	0.466
<b>Panoptic theory (Model 2)</b>				
ERPEX →PMC	No factor	-0.543	1.666	0.473
ERPEX→PMC	ETH	0.142	2.137	0.452
ERPEX→PMC	ORGI	0.061	0.768	0.456
ERPEX→PMC	ETH AND ORGI	0.130	1.936	0.466

For the institutional theory (model 1), the relationship was tested without the mediating construct (organizational integration) and yielded a slightly higher path coefficient of 0.139 compared to 0.130 when the mediating construct is present. However, both the  $R^2$  and the bootstrapping figures were lower when the mediating factor is ignored. Both models are marginally significant at  $p < 0.10\%$ . The mediation factor of organizational integration had a

variance accounted for of 26% indicating a partial mediating effect on the interaction between extent of ERP implementation and performance management capability (Hair et al., 2014)

For the panoptic theory (model 2), the relationship between extent of ERP implementation and PMC has its highest path co-efficient of 0.142 when the ethical factors construct mediates the relationship. Also, the relationship is significant at  $p < 0.05\%$ . The next highest path coefficient is when both ethical factors and organizational integration mediate the relationship (0.130) and this relationship is marginally significant at  $p = 0.053$ . This suggests that ethical behaviour is a very important influencer of the benefits that arise from the extent of ERP implementation. When there is no mediation, the path coefficient is not significant. In fact it does not make academic sense as it would imply a negative relationship between extent of ERP implementation and PMC (even though  $R^2$  is highest at 0.473). In the situation where only organizational integration mediates the relationship between extent of ERP implementation and PMC, the path coefficient is also not significant. The introduction of only ethical factors and both ethical factors and organizational integration changes the negative sign of the path coefficient to positive and makes the relationship between extent of ERP implementation and PMC significant. This indicates that they are full mediators of the interaction between extent of ERP implementation and PMC, and exert a suppressing effect on the said interaction (Hair et al., 2014).

## 5.10 ANOVA Findings for Contextual Factors

One-way between groups analysis of variance tests were further conducted to explore the extent to which the control variables – industry type, employee size, ownership type, ERP type, Revenue level, and Legal form – impact on each dependent factors: ethical factors, extent of ERP implementation, process management capabilities and organization performance. For each level of analysis, a preliminary test for homogeneity of variance (using Levene's-test) was conducted to make sure that the data is suitable for the ANOVA test. Only variables that had significant results were reported.

### 5.10.1 Industry type

For the purposes of this study, seven types of industry were considered: manufacturing, financial, health, transport, mining, automobile, and others. The results indicated that statistically significant differences existed at  $p < .01$  level for the seven groups,  $F(6, 107) = 9.85$ ,  $p = .00$ . The automobile and heavy equipment industry reported the highest level of influence on extent of ERP implementation ( $N=4$ ;  $\bar{x} = 10.75$ ;  $SD=0.500$ ), followed by the manufacturing industry ( $N=9$ ;  $\bar{x} = 10.2$ ;  $SD=1.716$ ), then the financial industry ( $N=80$ ;  $\bar{x} = 9.86$ ;  $SD=1.403$ ). Further tests for the extent to which industry type predicts Extent of ERP implementation was conducted using *eta squared*. It was revealed that about 35.6% of the mean variations in Extent of ERP implementation could be explained by industry type, which is a very large effect (Cohen, 1988). A post-hoc comparison (Bonferroni) test was performed which indicated that the mean score for each industry was statistically significant from each other except for the transport industry [refer to Appendix 3: Table 1]. This supports the researcher's proposition that the level

of competition, the level and effectiveness of regulation, and other institutional factors within industries influence the extent of ERP implementation uniquely.

Also, the type of industry variable exerted statistically significant differences on the ethical performance of the firms, i.e.  $F(6, 107) = 5.530, p = .00$ , with a very large effect size ( $\eta^2 = 23.7\%$ ) [refer to appendix 3: table 2]. It was revealed that, the mining and minerals industry exerted the highest influence on ethical performance ( $N=10; \bar{x} = 4.568; SD=0.433$ ), and closely followed by the financial industry ( $N=80; \bar{x} = 4.562; SD=0.400$ ). This may be as a result of the strict control in these industries resulting from the activities of regulatory bodies such as Minerals Commission and Bank of Ghana. This also suggests that level of corruption and organizational control varies significantly with the type of industry. This is also not surprising as there are varying degrees of normative, mimetic and coercive forces within industries. The mean scores test revealed statistical significant differences for the transport, health and other industries but not for the manufacturing and financial industries.

### 5.10.2 Employee Size

An ANOVA was used to explore how the employee size of firms influences its Ethical performance. The employee sizes were grouped into five categories ( $< 6, 6 - 29, 30 - 59, 60 - 99$  and  $100+$ ). There was statistically significant difference at the  $p < .01$  level for four groups:  $F(3, 109) = 6.186, p = .00$  [refer to appendix 3: table 3]. The results indicated that firms with more employee size exert high level of Ethical behaviour than firms with less employee size. Specifically, all firms with employee size 100 and above tend to exercise high level of ethical performance ( $N=90; \bar{x} = 4.541; SD=0.404$ ). A further test for the extent to which employee size type predicts Ethical factors was conducted using *eta squared*. It was revealed that about 14.6%

of the mean variations at Ethical factors level could be explained by employee size, which is a very significant effect (Cohen, 1988). This seems to suggest that organizations with larger employee size performed better on ethical factors. Larger companies, who have larger employee sizes, usually have established systems, ethical codes, control systems, etc. and this could help improve their ethical performance. Post-hoc comparison (Bonferroni) was further used to assess if the categories of employee size reported levels of ethical performance that are significantly different from each other. The test indicated the mean score for each employee size was statistically significant from the others except for employee size range 6 – 29.

### 5.10.3 Ownership type

An independent samples t-test was used to investigate the Extent to which ERP has been implemented in state-owned firms compared to implementation in private firms. The test indicated that there is a significant difference in the extent to which ERP has been implemented in state firm ( $M=8.44$ ,  $SD=2.159$ ) and private firms ( $M=9.70$ ,  $SD=1.736$ );  $t(112) = -2.612$ ,  $p=0.01$ . The magnitude of the difference in terms of the means (mean difference =  $-1.267$ , 95%, CI:  $-2.228$  to  $-.306$ ) was however very low [refer to appendix 3: table 4]. An *eta squared* of  $0.057$  also indicates that ownership (private or state) explain only 5.7% of the Extent of ERP implementation (refer to independent t-test table in Appendix 3; table 4). This suggests that there are more important factors that determine the extent of implementation than ownership type (whether state-run or private-owned).

### 5.10.4 ERP Type

ANOVA was further used to investigate how the type of ERP used by firms influences the Extent of ERP implementation. The ERP type was grouped into four (SAP, Oracle, JD

Edwards and Others). There was statistically significant difference at the  $p < .05$  level for the four groups:  $F(3, 110) = 4.695$ ,  $p = .005$  [refer to appendix 3: table 5]. The results also indicated that JD-Edward exerted the highest influence on the extent of ERP implementation. ( $N = 2$ ;  $\bar{x} = 11.50$ ;  $SD = 2.2121$ ) followed by Oracle, ( $N = 16$ ;  $\bar{x} = 10.63$ ;  $SD = 2.579$ ). Majority of the type were classified as others which were made up of mainly small scale ERP platforms. A further test for the extent to which ERP type predicts the Extent of ERP Implementation was conducted using *eta squared*. It was revealed that about 11.4% of the mean variations in Extent of ERP Implementation level could be explained by ERP type. According to Cohen (1988) this is a medium effect size. Also, the resulting levels of extent of ERP implementation were tested using a Post-hoc comparison (Bonferroni). The test indicated the mean score for each ERP type was statistically significant from each other for Oracle and other types but not for SAP and JD Edwards when it comes to extent of ERP Implementation.

#### 5.10.5 Revenue

ANOVA was further used to investigate how the financial health of firms in terms of revenue generated influenced the performance management capability. The revenue levels were categorized into 8 groups ( $< 40,000$ ,  $40,000 - 80,000$ ,  $80,000 - 120,000$ ,  $120,000 - 160,000$ ,  $160,000 - 200,000$ ,  $200,000 - 500,000$ ,  $500,000 - 1,000,000$ ,  $1,000,000 >$ ). There was statistically significant difference at the  $p < .05$  level for six groups:  $F(5, 108) = 2.335$ ,  $p = .005$  [refer to appendix 3: table 6]. Also, revenue levels ranging from  $120,000 - 160,000$ , exerted more influence on the performance management capability ( $N = 4$ ;  $\bar{x} = 6.326$   $SD = 0.794$ ) followed by revenue levels above  $1,000,000$  ( $N = 89$ ;  $\bar{x} = 5.538$ ;  $SD = 0.786$ ). A further test for the extent to which revenue level predicts performance management capability was conducted

using *eta squared*. It was revealed that about 9.8% of the mean variations in performance management capability level could be explained by level of revenue, which is a medium effect size (Cohen, 1988). In order to assess which revenue's level of performance management capability significantly differs from the other(s), a Post-hoc comparison was conducted. The Bonferroni test indicated that the mean score for each revenue level was statistically significant from other each other for only 120,000 –160,000 and 160,000 – 200,000 when it comes to performance management capability.

#### **5.10.6 Legal form of Entity**

Finally, ANOVA was used to investigate how the legal form of entity influences the extent of ERP implementation. The type of legal entity an organization falls under was grouped into six (Not Registered, Sole Proprietorship, Limited Liability, Partnership, Public Limited Liability and others). There was statistically significant difference at the  $p < .05$  level for five groups:  $F(4, 109) = 3.021$ ,  $p = .005$  [refer to appendix 3: table 7]. A further test for the extent to which the legal form of entity factor predicts the extent of ERP implementation was conducted using *eta squared*. It was revealed that about 9.8% of the mean variations in Extent of ERP implementation level could be explained by the legal form of entity, which is a medium effect size (Cohen, 1988). A post hoc test was not conducted to assess whether the legal form of entity's level of extent of ERP implementation significantly differs from each other.

## CHAPTER SIX

### CONCLUSION AND RECOMMENDATIONS

#### 6.1 Introduction

This chapter begins with a discussion of insights gained from the findings that resulted from this research. First, the evidence gathered from each of the key findings is summarized and the strength of the findings is explained and elaborated. Next, the implications for research and practice are analyzed in the context of the findings. Finally, limitations of the study are presented and suggestions for future research directions are offered.

#### 6.2 Summary of Findings

Several findings were made in the course of this research. The major findings are presented below under the subheadings antecedents of extent of ERP implementation, effects on performance, and moderating effects, test of competing theories, and contextual influences.

##### 6.2.1 Antecedents of Extent of ERP Implementation

Existing literature suggests that business environment has influence on the successful adoption and use of IT (Chou and Chang, 2008; Gargeya and Brady, 2005; Ragowsky et al., 2000; Roztocky and Weistroffer, 2008, 2011; Soh and Sia, 2004b; Zhang et al., 2002) and the social and economic context of developing countries has been identified as a primary factor in ERP assimilation (Kouki et al., 2009). This research extended the study of Karimi et al. (2007) by examining the peculiar socio-economic context of ERP implementation in a SSA country and the benefits that can be obtained in terms of improved business process management capabilities and organizational performance.

The organization's data culture and ethical considerations were identified among the antecedents of the extent of ERP implementation in SSA. There was significant support for the hypothesis that greater ethical factors (low corruption and high organizational control) is significantly associated with greater extent of ERP implementation within the organization. The argument that these ethical factors shaped the data culture of the organization, was however not supported. This is most probably because the eventual data culture of the firm would be determined by several other factors internal and external to the firm.

Interestingly the test of hypotheses also revealed that the influence of the organization's data culture on the extent of ERP implementation was not significant for the institutional model (Model 1). This seems to indicate that the organization's attitude to data and its actual usage of information are not the main institutional forces that determine the extent to which organizations implement ERP systems. Other factors (for example availability of financial and non-financial resources) are likely to be equally, or even, more important here. For the panoptic model (Model 2) however, the influence of data culture on extent of ERP implementation was significant. The extent to which organizations can achieve panoptic control by varying their extent of ERP implementation is dependent on the existing data culture.

The data analysis also supported the hypothesized positive relationship between greater extent of ERP implementation and greater post implementation integration, affirming the results of several studies (Barki and Pinsonneault, 2002; Barki and Pinsonneault, 2005; Turkulainen, 2008; Koufteros et al., 2010).

### **6.2.2 Effects on Performance**

Several researchers (Elbashir et al., 2008; Mithas et al., 2011) have noted that information systems implementation is associated with higher organizational performance. The

research confirmed that higher extents of ERP implementation are significantly related to both higher business process management capabilities and higher organizational performance as indicated by the RBV of the firm.

This research supported the hypothesis that the process management capabilities obtained from ERP implementation was positively affected by favourable ethical behaviour (low corruption and high organizational control). Contrary to the perception that firms in SSA are generally corrupt because of the reported high rates of corruption in the local and global media (Daily Graphic, 2014; Owusu, 2014; Citifm, 2014; myjoyonline, 2013a; Mordy, 2013; Ghana News Agency, 2014), the research revealed that several firms performed creditably on the corruption indicators, indicating low levels of organizational corruption. This may be due to the fact that these firms have developed ethical, professional, and corporate socially responsible behaviours and cultures regarding operations and behaviour within their institutions, which is separate from what prevails in the wider social environment of SSA countries. Again, institutional forces and regulations from external bodies may account for this rather surprising development. Some firms have institutionalized anti-corruption systems to ensure an efficient running and performance of their firms and most of such organizations implement ERP systems to check corruption in the first place.

### **6.2.3 Moderating Effects on Performance**

The research work also sought to determine whether ERP delivery systems were significant influencers of the success of ERP implementations. It was hypothesized that delivery systems acted as a moderating factor for the relationship between extent of ERP implementation and process management capabilities. This is because effective top management support, project

management resources, training resources, and consultant resources are in essence important resources that the organization combines to reap higher process management capabilities as stipulated by the RBV of the firm (Karimi et al., 2007). Findings supported this moderating influence of ERP delivery systems in ERP implementations.

The role of ERP radicalness was similarly tested as a moderator of the impact of extent of ERP implementation on process management capabilities. The results supported the assertions of DOI theory that higher innovation adoption result in incremental business process gains. This also confirms the results of Karimi et al. (2007) who likewise obtained a significant effect of ERP radicalness on ERP process outcomes.

It was finally hypothesized that ERP delivery systems moderated the impact of ERP radicalness on process management capabilities, but just like Karimi et al.'s (2007) study, this moderating effect was not supported from our research survey.

#### **6.2.4 Test of Competing Theories**

The test of competing institutional and panoptic theories revealed that both models fairly explain ERP implementation in SSA, but the panoptic theory was a better overall predictor of ERP implementation. Both of the hypotheses founded on the panoptic theory were supported whilst two of the three institutional hypotheses were not supported.

### **6.3 Implications for Research**

Even though research works on ERP systems abound, very little research exist that focus on the specific environment of the SSA region. This research has a long way in addressing this

identified research gap in IS literature by studying in-depth ERP implementation in a SSA nation, taking into account important environmental, contextual and institutional influences.

The findings of this research also lends empirical support for the assertions of Zuboff (1988), Botan (1996), and Elmes et al. (2005) that IT and surveillance systems have the capability to enforce firm-wide information visibility and in so doing enforce panoptic organizational control.

From this study, the panoptic theory has emerged as a new and robust view to explaining and predicting acceptance and success of ERP implementations in SSA. This can serve as a new alternative and/or complement regularly used theories. The panoptic theory relationships are also more easily generalizable to regions beyond SSA as the panoptic organizational control that ERPs create in SSA firms can be replicated in other environments.

The study also provided insight into the importance of mediating roles, especially ethical factors, in ensuring successful ERP implication in SSA. The proposed positive relationship between extent of ERP implementation and PMC is confirmed and significant only when ethical factors are taken into consideration. When the ethical factors construct is removed, the relationship between extent of ERP implementation and PMC becomes insignificant, and when both ethical factors and organizational integration are removed, the positive relationship between extent of implementation and PMC is non-existent.

#### **6.4 Implications for Practice**

ERP systems implementation usually comes at huge costs to organizations and represents substantial investments for most firms. Failure in ERP implementation can therefore have serious

repercussions on organizations. Considering the already noted impact of the environment on ERP implementation, this research would be invaluable to managers and project teams of companies implementing ERP systems in SSA.

The impact of corruption has been explored in this research, with the findings confirming that high corruption negatively impacts benefits arising from ERP implementation. This provides more impetus for management to fight to minimize organizational corruption in their businesses. Interestingly, the data analysis suggests that institutional pressure from regulatory bodies is one way to minimize corruption and can cause firms to behave in ethical and corporate socially responsible ways.

It was further noted that ERP systems can in themselves enforce firm-wide organizational control through panopticism. The information visibility that ERP systems enable would compel employees to act ethically and in ways coherent to the organizations norms, even when they are not being monitored. This can be very important in organizations that demand strict compliance with organizational rules and protocols.

Finally, regulatory bodies, government agencies, professional associations, and other control institutions have been identified as significant influencers of ERP implementations in SSA. These bodies can further serve as catalysts of higher ERP adoption and implication by instituting regulations and protocols that encourage IS and ERP adoption and use.

## **6.5 Limitations**

The scope of the research and its subsequent data collection was restricted to Ghana because of time and resource constraints. The findings are generalized to include other countries

in the SSA region since the conditions prevailing in Ghana is fairly representative of the conditions prevailing in other SSA countries. Actual data collection from other SSA countries may however churn out slightly different results.

This research also used survey methodology which depended on the responses of executives on their organizations. The likelihood of respondent bias is present.

The researcher was able to determine that significant differences existed between extent of ERP implementation among public firms and private firms in SSA, which is a very interesting finding. However, analysis to further explore this finding could not be performed. This was because the data collected was considerably skewed towards private firms, with very little data from public sector. The snowballing technique that was used identified mostly firms in the private sector. This also means that the results of this research may be skewed more towards the private sector of SSA countries. There was also a very large representation of financial institutions relative to other industries.

## **6.6 Future Research Directions**

Even though the influence of data culture on ERP implementation is real, this research was not successful in fully identifying the specific role of data culture in ERP implementation in the SSA region. Future research can be directed at identifying how data culture influences ERP implementation in the SSA region as well as other regions.

Also, the panoptic theory emerged as a strong predictor of ERP implementation in this research work. Future research on ERP implementations in SSA using the panoptic theory could provide greater insight into ERP implementations in SSA and beyond.

Studies can be directed at exploring the differences between ERP implementation practices and results for public sector firms against those of private sector firms. Also, the findings pointed to the fact that industry type influenced the extent of ERP implementation. Research should be directed towards identifying the particular institutional forces that cause these variations in ERP implementation and how they can be managed.

From the institutional model, it was noted that ethical factors significantly informed the extent of ERP implementation whilst the panoptic model revealed that extent of ERP implementation also significantly influenced ethical factors. This alternating cause-and-effect relationship existing between ethical factors and extent of ERP implementation would be the subject of future research.

This study employed institutional theory to explain the construct relationships without directly using its three sub-constructs (i.e. mimetic, normative and coercive pressures). These three dimensions as captured in the study as proxies by specific environmental factors and institutional forces. Future research could use the sub-constructs in testing the relationships in the model.

Due to the small sample sizes of some of the subcategories, future research should be directed towards using a large sample to enhance the validity of the ANOVA analyses for exploring the impact of the contextual factors on ERP implementation.

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# KNUST



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## APPENDIX 1

### SURVEY QUESTIONNAIRE

My name is David Asamoah. I am a Lecturer at Kwame Nkrumah University of Science and Technology School of Business, Department of Information Systems and Decision Sciences. This survey instrument has been designed to enable me carry out a research on *The Impact of Enterprise Resource Planning (ERP) systems on Organizational Performance in Ghana*. The purpose of the research is to provide an understanding of the environmental factors which influence successful ERP implementations, and explore the impacts of ERP systems in developing nations south of the Sahara using data from Ghana. Any information provided will ONLY be used for general information, and it will be treated as **HIGHLY CONFIDENTIAL**.

**INSTRUCTIONS:** Please kindly write in ink in the box which corresponds to the statement, which in your opinion is the most appropriate answer to the related question. For the following questions, kindly select by checking (✓) all that apply.

Name of Company:	Title or Job Position in the Company:		
Nationality: <input type="checkbox"/> Ghanaian <input type="checkbox"/> Foreigner	State run Enterprise: <input type="checkbox"/> Yes <input type="checkbox"/> No	How long have you worked in this company_____	
Number of Employees [ ] <6; [ ] 6-29; [ ] 30-59; [ ] 60-99; [ ] 100+	When was the company incorporated in Ghana? _____		
Please place a check in your company's corresponding industry	<input type="checkbox"/> Manufacturing; <input type="checkbox"/> Financial Services (banking & investments); <input type="checkbox"/> Oil & Gas; <input type="checkbox"/> Health; <input type="checkbox"/> Retail; <input type="checkbox"/> Construction; <input type="checkbox"/> Transportation; <input type="checkbox"/> Telecommunication; <input type="checkbox"/> Electronics and Computing Machinery; <input type="checkbox"/> Mining & Minerals; <input type="checkbox"/> Pharmaceuticals; <input type="checkbox"/> Automobile and Heavy Equipment; <input type="checkbox"/> Other (specify)_____		
Please indicate the Revenue of the Company in New Ghana Cedis	<input type="checkbox"/> <40,000; <input type="checkbox"/> 40,000-80,000; <input type="checkbox"/> 80,000-120,000; <input type="checkbox"/> 120,000-160,000; <input type="checkbox"/> 160,000-200,000; <input type="checkbox"/> 200,000-500,000; <input type="checkbox"/> 500,000-1,000,000; <input type="checkbox"/> >1,000,000		
Ownership of company <input type="checkbox"/> Solely Ghanaian Owned; <input type="checkbox"/> Foreign Owned; <input type="checkbox"/> Joint Ventureship; <input type="checkbox"/> Other (specify)_____			
Legal form of Entity <input type="checkbox"/> Sole Proprietorship; <input type="checkbox"/> Limited Liability; <input type="checkbox"/> Partnership; <input type="checkbox"/> Public Limited Liability; <input type="checkbox"/> Other (specify)_____			
Which ERP System(s) is your company using? <input type="checkbox"/> SAP; <input type="checkbox"/> Oracle; <input type="checkbox"/> JD Edwards; <input type="checkbox"/> Other (specify)_____			
How many years has your Company been using ERP Systems? _____			

**Instructions:** For the following Statements, (*Functional, Organizational, Geographical Scopes*), select by checking (✓) all that apply

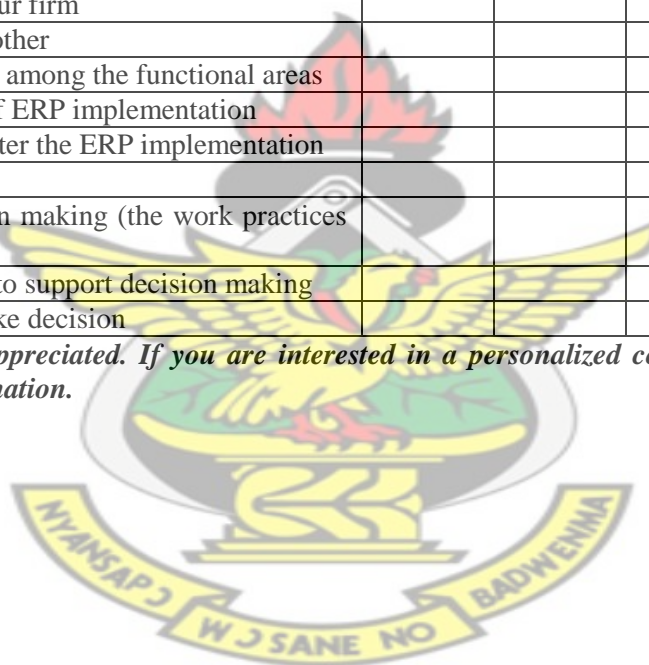
Functional Scope	Select the functional extent of the implementation of your selected ERP	Functional Scope	ERP Software Vendors			
			SAP	Oracle	JD Edwards	Other (specify)
		Accounting/Finance				
		Manufacturing				
		Planning/Schedule				
		Sales/Distribution				
		Human Resource				
		Logistics/Inventory Control				
		Retail Banking				
		Corporate Banking				
		Investment Services				

		Internet Banking					
		Others (specify)					
Organizational Scope	Select the organizational extent for the implementation of your selected ERP	<input type="checkbox"/> Department; <input type="checkbox"/> Division; <input type="checkbox"/> Entire company; <input type="checkbox"/> Multiple companies; <input type="checkbox"/> Other(please specify) _____					
Geographical Scope	Select the geographical extent for the implementation of your selected ERP	<input type="checkbox"/> Single site; <input type="checkbox"/> Multiple sites; <input type="checkbox"/> National; <input type="checkbox"/> Worldwide					
Instructions: Indicate your opinion for the following statement by placing a checkmark (✓) in the right column under the 7-point Likert Scale.							
		7-point Likert Scale					
		Strongly Disagree	Moderately Disagree	Disagree	Neither Agree nor Disagree	Agree	Strongly Agree
Our operations require a significant amount of information processing							
There are many steps in our value chain that require frequent use of information							
Information used in our operations needs frequent updating							
Information constitutes a large component of our product/service to customers							
The business processes we deal with often cut across multiple functional areas							
We frequently deal with ad-hoc, non-routine business processes							
We generally have a high degree of uncertainty in our business processes							
A majority of our business processes are quite complex							
Our business processes are compatible with the ERP processes							
It is easy to customize the organization's business processes to suit ERP system							
It is easy to reconfigure the ERP to fit the organization's processes							
Senior executive demonstrated a lot of enthusiasm and interest throughout the implementation of the ERP project							
The overall level of management support in this project was quite high							
Upper-level managers were personally involved in the project							
Formal project management tools and techniques were employed for this project							
Project managers in charge of the project were highly capable and experienced							
The implementation schedule was realistic							
Much time and resources were invested in training employees on using the new system							
Adequate on-the-job training was provided to internal user groups to use the new system							
Both technology and process training were provided to employees using the system							
Experienced consultants guided us throughout the course of the project							

	Strongly Disagree	Moderately Disagree	Disagree	Neither Agree nor Disagree	Agree	Moderately Agree	Strongly Agree
External consultants were experienced in our business processes							
External consultants brought considerable expertise and experience to the implementation of the ERP project							
ERP implementation has improved the efficiency of our operations							
ERP implementation has lowered our cost of operations							
ERP implementation has reduced the amount of rework needed for data entry errors							
Data provided by ERP add value to our operations							
ERP implementation has improved timely access to corporate data							
The ERP system provides a high level of enterprise wide data integration							
ERP implementation helps us make better revenue forecasts than before							
The functionalities of ERP adequately meet the requirements of our jobs							
ERP implementation has improved our quality of operations							
ERP implementation has given us more ways to customize our processes							
ERP implementation has made our company more agile							
ERP implementation has made us more adaptive to changing business environment							
ERP implementation has improved the flexibility of our operations							
ERP implementation has helped us increased our revenue							
ERP implementation has helped us in the reduction of our lost revenue							
ERP implementation has helped us increased our geographic distribution of revenue							
ERP implementation has helped us enhance our profit margin							
ERP implementation has helped us increase our return on investment (ROI)							
ERP implementation has helped us improve our competitive advantage							
There are clear systems in place to prevent management from abusing their position for personal interests							
There are clear systems in place to check employees who go against organizational and professional ethics							
Our organization has implemented effective anti-corruption initiatives							
Our organization is free from excessive bureaucratic regulations and controls							
Information that can expose our organization to scrutiny by government institutions is not recorded							
Our firm does not allow government institutions to have access to operational data							

External stakeholders' activities that may improve organizational control interfere with the firm's operations							
	Strongly Disagree	Moderately Disagree	Disagree	Neither Agree nor Disagree	Agree	Moderately Agree	Strongly Agree
Important operational information is often withheld by top managers and owners							
External stakeholders influence control of our organization							
There is generally a high level of inter-departmental communication in our organization							
Departments prioritize their own success over the organization's success							
Unclear roles, goals, or leadership cause uncertainty in our firm							
Departments in our organization are dependent on each other							
ERP implementation has resulted in greater coordination among the functional areas							
Inter-departmental interaction has increased as a result of ERP implementation							
Problems between functional areas are easily resolved after the ERP implementation							
Our organization has the data it needs to make decisions							
Our organization depends on data to support its decision making (the work practices and environment of the entire company)							
Our organization spends significant time analyzing data to support decision making							
Our organization uses data rather than guess work to make decision							

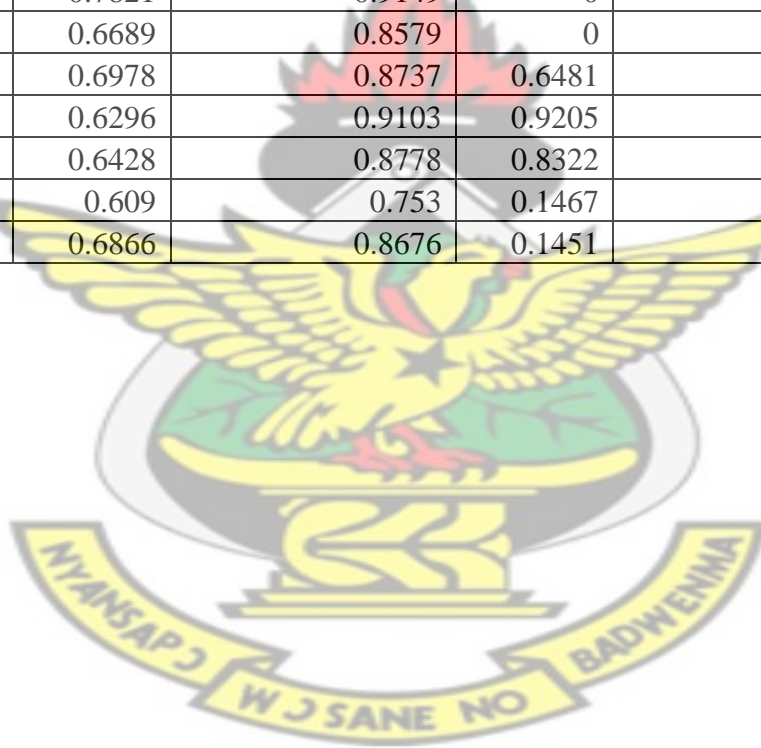
***Thank you. Your participation is greatly appreciated. If you are interested in a personalized copy of the analyzed results, please attach a business card or provide your contact information.***



## APPENDIX 2 (a)

### Attributes of Panoptic Constructs (Model 2)

	AVE	Composite Reliability	R Square	Cronbachs Alpha
BPC	0.622	0.7668	0.6416	0.3933
BPII	0.5716	0.8421	0.7529	0.7502
BV	0.6502	0.9173	0.5402	0.8908
COMP	0.5774	0.8015	0.2609	0.6829
COR	0.7481	0.899	0.9521	0.8309
DDD	0.6428	0.7717	0	0.5528
DSCO	0.7721	0.9104	0	0.8524
DSPM	0.641	0.8425	0	0.7192
DSTM	0.7821	0.9149	0	0.8601
DSTR	0.6689	0.8579	0	0.7501
EFCO	0.6978	0.8737	0.6481	0.788
EFTO	0.6296	0.9103	0.9205	0.881
FLXO	0.6428	0.8778	0.8322	0.8142
ORGC	0.609	0.753	0.1467	0.3789
ORGI-Post	0.6866	0.8676	0.1451	0.7699



## APPENDIX 2 (b)

### Intercorrelations of the latent variables for first-order constructs for Model 2

	C. Rel.	AVE	BPC	BPII	BV	COMP	COR	DDD	DSCO	DSPM	DSTM	DSTR	EFCO	EFTO	FLXO	ORGC	ORGI-Post
<b>BPC</b>	0.7668	0.622	<b>0.7887</b>	0	0	0	0	0	0	0	0	0	0	0	0	0	0
<b>BPII</b>	0.8421	0.5716	0.531	<b>0.7560</b>	0	0	0	0	0	0	0	0	0	0	0	0	0
<b>BV</b>	0.9173	0.6502	0.2263	0.2167	<b>0.8063</b>	0	0	0	0	0	0	0	0	0	0	0	0
<b>COMP</b>	0.8015	0.5774	0.3131	0.1581	0.2879	<b>0.7599</b>	0	0	0	0	0	0	0	0	0	0	0
<b>COR</b>	0.899	0.7481	0.0403	0.029	0.1455	0.0097	<b>0.8649</b>	0	0	0	0	0	0	0	0	0	0
<b>DDD</b>	0.7717	0.6428	0.2955	0.3095	0.2847	0.1589	0.026	<b>0.8017</b>	0	0	0	0	0	0	0	0	0
<b>DSCO</b>	0.9104	0.7721	0.1774	0.1209	0.4622	0.2836	0.186	0.1821	<b>0.8787</b>	0	0	0	0	0	0	0	0
<b>DSPM</b>	0.8425	0.641	0.2095	0.194	0.5302	0.2957	0.0666	0.342	0.6066	<b>0.8006</b>	0	0	0	0	0	0	0
<b>DSTM</b>	0.9149	0.7821	0.3304	0.3393	0.3889	0.3833	0.1648	0.3969	0.4811	0.6147	<b>0.8844</b>	0	0	0	0	0	0
<b>DSTR</b>	0.8579	0.6689	0.2903	0.1701	0.4156	0.1709	0.0293	0.32	0.6193	0.4409	0.3568	<b>0.8179</b>	0	0	0	0	0
<b>EFCO</b>	0.8737	0.6978	0.2424	0.148	0.4996	0.2419	-0.0181	0.2487	0.3868	0.3397	0.2307	0.357	<b>0.8353</b>	0	0	0	0
<b>EFTO</b>	0.9103	0.6296	0.282	0.2488	0.7066	0.3671	0.0562	0.3405	0.4375	0.4932	0.4385	0.4199	0.6876	<b>0.7935</b>	0	0	0
<b>FLXO</b>	0.8778	0.6428	0.206	0.1599	0.7263	0.3984	0.1194	0.2858	0.3906	0.5331	0.441	0.4012	0.6223	0.0814	<b>0.8017</b>	0	0
<b>ORGC</b>	0.753	0.609	-0.0549	-0.0479	-0.0997	0.0828	-0.1717	0.0054	0.0153	-0.0423	-0.001	-0.0435	0.0944	0.101	-0.0282	<b>0.7804</b>	0
<b>ORGI-Post</b>	0.8676	0.6866	0.0171	-0.0138	0.1605	0.0961	0.5273	0.262	0.0909	0.1004	0.1281	0.1177	0.0526	0.1277	0.2827	-0.0355	<b>0.8286</b>

*Bold numbers depict the square root of AVE. Off-diagonal numbers show the correlations among constructs. There is discriminant validity when AVE of a column is greater than off diagonal numbers below.*

## APPENDIX 2 (c) Items Loading and Cross-Loadings for Model 2

	BPC	BPII	BV	COMP	COR	DDD	DSCO	DSPM	DSTM	DSTR	EFCO	EFTO	FLXO	ORGC	ORGI- Post
BPC1	0.8125	0.4846	0.1269	0.2163	-0.0018	0.3105	0.1065	0.2002	0.3048	0.2617	0.1499	0.2368	0.1474	-0.0564	0.0136
BPC4	0.7641	0.347	0.2359	0.2814	0.069	0.1479	0.1772	0.1269	0.2123	0.1932	0.2373	0.2071	0.1796	-0.0289	0.0133
BPII1	0.3443	0.7695	0.1225	0.0353	0.0199	0.2203	0.0926	0.165	0.2639	0.1085	0.1669	0.2014	0.1081	-0.0419	0.0088
BPII2	0.4227	0.7619	0.1648	0.0646	-0.0774	0.2814	0.0979	0.2288	0.2621	0.0501	0.1427	0.2502	0.1521	0.0567	-0.1325
BPII3	0.3978	0.7659	0.1693	0.1976	0.034	0.2161	0.0669	0.0661	0.2553	0.1054	0.1238	0.1506	0.0892	-0.0649	-0.0202
BPII4	0.4364	0.7261	0.1947	0.1682	0.1072	0.2189	0.1093	0.1341	0.2451	0.247	0.0189	0.1545	0.1352	-0.091	0.1001
BV17	0.2011	0.2151	0.8241	0.2755	0.1333	0.2286	0.3597	0.389	0.3235	0.3463	0.4143	0.5701	0.6508	-0.0498	0.1853
BV18	0.1567	0.1255	0.8197	0.197	0.1795	0.2063	0.3938	0.3773	0.2442	0.3126	0.4249	0.5097	0.5717	-0.0412	0.1165
BV19	0.0813	0.1418	0.7244	0.2547	0.0564	0.1828	0.3065	0.4339	0.2838	0.3102	0.2391	0.5523	0.5217	-0.0964	0.0561
BV20	0.1972	0.15	0.8797	0.2133	0.112	0.1978	0.3779	0.3977	0.2541	0.2746	0.4234	0.5815	0.5433	-0.1323	0.1273
BV21	0.2136	0.2176	0.8589	0.2491	0.1735	0.2253	0.3928	0.4719	0.3366	0.3374	0.4448	0.5449	0.5358	-0.1059	0.1831
BV22	0.2236	0.1866	0.7169	0.2012	0.0512	0.3152	0.3902	0.4814	0.4145	0.4095	0.4408	0.6348	0.6574	-0.06	0.0989
COMP1	0.4379	0.1907	0.2367	0.8812	-0.0515	0.1677	0.1756	0.2465	0.324	0.1823	0.2744	0.3713	0.3742	0.0468	0.067
COMP2	0.0592	0.0945	0.2029	0.7202	0.0666	0.0851	0.285	0.1677	0.2859	0.047	0.0638	0.1431	0.1888	0.0885	0.0805
COMP3	-0.0097	-0.0175	0.248	0.6611	0.09	0.0694	0.2799	0.3095	0.2783	0.1401	0.1536	0.2938	0.3511	0.0864	0.0983
COR1	0.0396	0.013	0.0813	-0.0084	0.9102	0.0291	0.1087	0.0537	0.1009	-0.0174	-0.0531	0.0079	0.0963	-0.1269	0.5516
COR2	-0.0336	0.0291	0.0789	-0.0185	0.8378	0.0866	0.1309	0.0064	0.1461	0.0152	-0.0163	0.0142	0.0369	-0.061	0.4536
COR3	0.0941	0.0339	0.2161	0.051	0.845	-0.0445	0.2433	0.1096	0.1826	0.0792	0.0239	0.1233	0.1729	-0.2533	0.3602
DDD2	0.3778	0.2981	0.302	0.0959	0.1027	0.5795	0.188	0.2403	0.2998	0.2272	0.3737	0.3643	0.3671	-0.0093	0.1899
DDD4	0.2311	0.2689	0.2397	0.1538	0.0012	0.9745	0.1547	0.3217	0.3676	0.3004	0.1792	0.2858	0.223	0.0087	0.2449
DSCO1	0.153	0.0647	0.3447	0.2016	0.1816	0.1627	0.8578	0.522	0.4352	0.6082	0.2784	0.306	0.2873	-0.0717	0.0685
DSCO2	0.1308	0.0834	0.4768	0.2657	0.1719	0.1355	0.8887	0.4862	0.3324	0.4996	0.4015	0.4596	0.3548	0.0544	0.09
DSCO3	0.1818	0.1657	0.3974	0.278	0.1389	0.1802	0.8892	0.5868	0.4952	0.5269	0.3397	0.3874	0.3842	0.054	0.0811
DSPM1	0.2375	0.2905	0.3911	0.3162	0.061	0.3285	0.4832	0.7823	0.5897	0.2583	0.1736	0.3679	0.3867	0.0606	0.0773
DSPM2	0.1515	0.1911	0.4071	0.2017	0.0192	0.2652	0.476	0.8437	0.4853	0.4082	0.3195	0.391	0.4638	-0.0495	0.1199

DSPM3	0.1189	-0.0107	0.4755	0.1987	0.0822	0.2316	0.4992	0.7741	0.4078	0.3853	0.3155	0.4252	0.4265	-0.107	0.0417
DSTM1	0.1999	0.1865	0.2881	0.4218	0.1486	0.3101	0.4454	0.5335	0.845	0.2758	0.1692	0.3858	0.355	0.1575	0.1532
DSTM2	0.3743	0.394	0.3099	0.2238	0.1382	0.4005	0.3812	0.5417	0.8834	0.3206	0.1933	0.3352	0.3402	-0.1041	0.0827
DSTM3	0.3017	0.318	0.425	0.3693	0.1504	0.3442	0.4488	0.5561	0.923	0.3472	0.2451	0.4376	0.4667	-0.0493	0.1055
DSTR1	0.2329	0.2092	0.3514	0.1331	0.1211	0.3627	0.4411	0.36	0.3396	0.7952	0.2842	0.4095	0.3314	-0.0934	0.1348
DSTR2	0.2925	0.1279	0.3988	0.1315	-0.0289	0.2946	0.5222	0.3616	0.2044	0.8841	0.3667	0.3732	0.3496	-0.0139	0.0527
DSTR3	0.1816	0.0759	0.2628	0.1561	-0.0229	0.1164	0.5604	0.3604	0.3366	0.7697	0.2182	0.2391	0.301	0.0032	0.1026
EFCO1	0.2507	0.1385	0.4829	0.3601	0.0091	0.2541	0.3866	0.4122	0.4022	0.3333	0.8681	0.7082	0.6789	0.052	0.0268
EFCO2	0.0962	0.0637	0.337	0.0896	-0.0732	0.125	0.2506	0.1809	-0.0095	0.2705	0.799	0.4007	0.3271	0.2052	-0.0489
EFCO3	0.2297	0.1543	0.4063	0.0977	0.0002	0.2188	0.3069	0.2099	0.095	0.2816	0.8375	0.5546	0.4827	0.0143	0.1387
EFTO1	0.1815	0.0715	0.5172	0.2084	0.0524	0.3259	0.3074	0.3505	0.2784	0.3076	0.6038	0.8107	0.6833	0.0587	0.1103
EFTO2	0.3189	0.2726	0.4576	0.2909	-0.0724	0.2162	0.3318	0.3765	0.3602	0.3533	0.5966	0.7531	0.565	0.1058	0.0029
EFTO3	0.2777	0.3441	0.6183	0.3938	0.0762	0.1691	0.3447	0.4078	0.341	0.3046	0.4962	0.7388	0.6125	0.0924	0.0626
EFTO4	0.0876	0.1937	0.625	0.2349	0.126	0.235	0.4287	0.3844	0.3644	0.3187	0.413	0.7256	0.5645	-0.0065	0.1833
EFTO5	0.2192	0.1474	0.5368	0.3923	0.0771	0.3397	0.3102	0.3526	0.3758	0.3411	0.4998	0.8345	0.6584	0.1123	0.1282
EFTO6	0.252	0.1806	0.6202	0.242	0.0183	0.3168	0.3745	0.4739	0.3754	0.3731	0.643	0.8858	0.769	0.1078	0.1215
FLXO1	0.1234	0.1133	0.5971	0.3703	0.1197	0.1136	0.3416	0.4509	0.317	0.2655	0.4482	0.6346	0.7615	-0.0755	0.1696
FLXO2	0.1852	0.1555	0.5353	0.2918	0.0507	0.3396	0.271	0.4162	0.2671	0.2726	0.4236	0.6337	0.778	-0.0178	0.2717
FLXO3	0.1528	0.132	0.536	0.3324	0.0785	0.2103	0.2987	0.4356	0.4076	0.2914	0.5421	0.6237	0.8311	-0.0302	0.2762
FLXO4	0.1965	0.1142	0.6558	0.288	0.1305	0.2524	0.3397	0.4104	0.4126	0.4433	0.5714	0.7144	0.8338	0.0268	0.1922
ORGC1_R1	-0.1309	-0.0363	-0.0253	0.0054	-0.1723	-0.017	0.0292	0.0003	0.0362	-0.0366	0.105	0.1238	-0.0113	0.8858	-0.0474
ORGC2_R1	0.0973	-0.0416	-0.1679	0.1647	-0.0803	0.0389	-0.0153	-0.0891	-0.0608	-0.0318	0.0274	0.0108	-0.0408	0.6582	0.0025
ORGI5	-0.0617	-0.0377	0.0266	0.0634	0.3129	0.1925	-0.0037	0.0456	0.0086	-0.0076	-0.0151	0.0161	0.2014	0.0127	0.8295
ORG16	0.1338	0.0097	0.1916	0.1567	0.3679	0.2465	0.0657	0.1137	0.1286	0.1433	0.0674	0.1328	0.277	-0.0244	0.8786
ORGI7	-0.0263	-0.0057	0.1817	0.0204	0.6259	0.2121	0.1633	0.0908	0.1815	0.1576	0.0789	0.1689	0.2243	-0.0763	0.7745

## Appendix 3

### ANOVA RESULTS TABLES

#### Industry type

Table 1: Extent of ERP Implementation

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	136.814	6	22.802	9.854	.000
Within Groups	247.607	107	2.314		
Total	384.421	113			

Table 2: Ethical Factors

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	5.579	6	.930	5.530	.000
Within Groups	17.992	107	.168		
Total	23.572	113			

#### Employee Size

Table 3: Ethical Factors

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	3.269	3	1.090	6.186	.001
Within Groups	19.198	109	.176		
Total	22.467	112			

## Ownership type

Table 4: Extent of ERP implementation

		Levene's Test Equality Variance		t-test for equality of Means				
		F	Sig.	T	df	Sig. (2- tailed)	Mean Difference	Std. Error Difference
ESCTOTAL	Equal variances assumed			-2.612	112	.010	-1.267	.485
	Equal variances not assumed	2.566	.112	-2.231	18.302	.038	-1.267	.568

## ERP Type

Table 5: Extent of ERP Implementation

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	43.636	3	14.545	4.695	.004
Within Groups	340.785	110	3.098		
Total	384.421	113			

## Revenue

Table 6: Performance Management Capability

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	7.448	5	1.490	2.335	.047
Within Groups	68.887	108	.638		
Total	76.335	113			

# KNUST

## Legal form of entity

Table 7: Extent of ERP Implementation

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	38.361	4	9.590	3.021	.021
Within Groups	346.060	109	3.175		
Total	384.421	113			

