INVESTIGATION INTO THE CHANGE MANAGEMENT INFLUENCES ON USER ADOPTION OF ERP SYSTEMS

A thesis submitted for the degree of Doctor of Philosophy

By

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DECLARATION

I, Olubusola Tejumola, declare that this thesis is the result of my own independent work / investigation, except where otherwise stated. Other sources are acknowledged by explicit references. The views expressed are my own. This work has not been submitted in substance for any other degree or award at this or any other university or place of learning, nor is being submitted concurrently in candidature for any other degree or award.

DEDICATION

I dedicate this research to God for the strength and resilience to see this journey through.

To my husband, Adeola, who has been a constant source of encouragement, strength, and support both financially and emotionally. I am truly thankful for having you in my life. Also to my kids, Ife and Olamipo, who have been understanding and for giving me the motivation to work hard and make them proud.

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ABSTRACT

As organizations strive to remain competitive despite economic pressures and the rapid pace of technology innovation, Enterprise Resource Planning (ERP) systems provide businesses with the functional best practices and customisable capabilities they need to adapt to these changes. However, the high rate of failure of these Enterprise Resource Planning (ERP) systems remain a challenge for the managers who are usually tasked with ensuring the huge investments achieve its purpose and yield a return on investment.

In attempting to explain the reasons behind these Enterprise Resource Planning (ERP) implementation failures, previous research has identified user adoption as one of the main drivers of ERP implementation success. An abundance of technology adoption theories and change management models have been proposed as solutions to user adoption, by measuring different factors they consider are important to the adoption of these systems. However, ERP systems still fail to achieve their intended purpose because these theories have not been able to explicitly explain how these factors impact on adoption. To address this gap, this research takes a comprehensive approach to identifying the change management influences on user adoption by integrating change management and technology adoption constructs.

The main contribution of this research is a common-sense perspective of the realities of user resistance. The study provides a causal model derived from Structural equation modelling, which explains the multiple influence relationships between the measured constructs. An adoption tool is also developed for managers to use as a yardstick to benchmark the effectiveness of an implementation strategy.

Using a structural equation modelling approach, a theory was developed from a survey of 616 ERP users across 6 organizations. Six constructs were identified as the key influences of user adoption – Trust, Communication and Engagement, System Qualities, Training, Organizational Benefits and Resistance. The theory explains the multiple influence relationships between these constructs and Adoption, and assists in the pinpointing of failure points that need to be addressed by Enterprise Resource Planning project managers. The resulting theory developed indicates the multiple influence relationships between these constructs as determinants of Adoption of ERP systems. In addition, the theory assists in the pinpointing of failure points that need to be addressed by Enterprise Resource Planning (ERP) project managers.

Table of Contents

List of Figures

List of tables

List of abbreviations

AGFI	Adjusted Goodness-of-Fit Index
AMOS	Analysis of Moment Structures
ASV	Average Shared Squared Variance
AVE	Average Variance Extracted
CFA	Confirmatory Factor Analysis
CFI	Comparative Fit Index
Df	Degree of Freedom
DOI	Diffusion of Innovation
EFA	Exploratory Factor Analysis
ERP	Enterprise Resource Planning
GFI	Goodness-of-Fit Index
ICT	Information and Communication Technology
IS	Information System
KMO	Kaiser-Mayer-Olkin
MRL	Multiple Linear Regression
MSV	Maximum Shared Squared Variance
NFI	Normed Fit Index
PEOU	Perceived Ease of Use
PU	Perceived Usefulness
R2	Coefficient of Determination
RMSEA	Root Mean Square Error of Approximation
ROI	Return on Investment
SEM	Structure Equation Modeling
TAM	Technology Adoption Model
TPB	Theory of Planned Behaviour
TRA	Theory of Reasoned Action
UTAUT	Unified Theory of Acceptance and Use of Technology
X2	Chi Square
X2/df	Normed Chi-Square

Chapter 1: Introduction

1.1 Background and Motivation for the study

Information Technology (IT) project failures are an unfortunate reality for many organizations, and Enterprise Resource Planning (ERP) projects are no exception.

Enterprise Resource Planning systems, commonly referred to as ERP systems, have been defined as systems which “collect, record, integrate, manage and deliver data and information across all functional units of the enterprise” (Ali *et al.,*2017). Evolving from materials resource planning packages majorly used for efficiency in the manufacturing industry, ERP systems offer more sophisticated and robust business solutions across industries. These ERP systems are also designed to seamlessly incorporate external and internal processes across the organizations that implement them. To fully understand the commercialization and value placed on ERP systems in the market place, financial data was culled from consulting and analyst firms’ reports. These journals also provide up-to-date reports in organizational settings. ERP investment decisions have been made by more than 87% of the Forbes Global 2000 companies, who have either installed, or are in the process of implementing commercial off-the-shelf packaged ERP software to support their back-end business activities, instead of proprietary software developed or customized to one company (Gartner, 2015; SAP, 2016). Recording a global spend of $337.2 billion, ERP systems were estimated to account for 64% of the software market in 2015, showing a growth of 6.4% over 2014 (Gartner, 2015). This share that ERP systems occupy in organizations strengthens the value placed by management of organizations, making ERPs a necessary evil.

However, despite promising benefits and huge investments, an estimated 55% to 75% of ERP system implementations fail to meet their objectives (Gartner, 2015). Given that ERP is one of the biggest IT investments large and mid-sized organizations make, it is critical to further explore why these projects fail, wasting billions of dollars yearly.

To mitigate the risks of failure of such high investment costs, understanding the factors that influence ERP systems adoption is a significant process that requires attention. These factors must be controlled and continuously evaluated throughout the change process to avoid significant threats including budget overruns, missed timelines, breakdown in business processes and most importantly, significant employee resistance (CHAOS report, 2015; Altamony *et al.,*2016).

As a growing area of concern, a plethora of theories and frameworks have been developed and evaluated over the past two decades to identify the factors responsible for ERP failure, and consequently determine the Critical Success Factors (CSF) during the implementation lifespan. Some foundational theories focusing on ERP CSFs, adoption and change management have cited communication process, usability, social cognitive factors, system quality, behavioural intentions, lack of training, lack of perceived usefulness of the system, human and organizational aspects as reasons for ERP systems implementation failure (Venkatesh *et al.,*2003).

However, one area that bears exploring is the response to change by the intended users of these new ERP systems. The intention to use a new ERP system is rarely solely about usefulness, technical integration, the type of ERP or benefits. Business process re-engineering and organizational change management are pertinent to the success of the intending ERP implementation. Implementing an ERP system changes the way people perform their functions within an organization, as consequent business process re-engineering may bring about fear of change, loss of skills, rationalisation of responsibilities leading to perceived redundancy and job cuts. These change management factors can evoke resistance to change, but are rarely considered or integrated with technology adoption in the body of knowledge. These theories will be reviewed in the proceeding chapter.

1.2 Why Nigeria?

While there has been a wide acceptance and penetration of ERP system implementations in developed countries such as the US, UK, Canada and China, developing countries have lagged with this technology trend. The acceptance and implementation of these ERP systems is largely dependent on key enabling variables which include “infrastructure, economy and economic growth, government policies, computer culture, regional environment/culture and IT maturity (Huang and Palvia, 2003). These increase the challenges ERP systems implementations face in developing countries. Nigeria, with the largest GDP growth in Africa, is one of such emerging markets.

Promising a mandate to deliver infrastructure, broadband and technology integration as key focus areas, the National Information Technology Development Agency (NITDA) perceives

Information Systems (IS) to be a cornerstone and catalyst to accelerate the growth of the Nigerian economy. Through the formulation and implementation of the enabling policies, Information and Communication Technology (ICT) has become the fourth pillar of the Nigerian economy contributing 11.6% to the country's GDP from 5.4% in 2011 (NITDA report, 2015). However, the IT maturity is still far behind developed markets such as the US and the UK.

Given the plans for infrastructural growth, Nigeria has become a hub for investors playing a critical role in the development of the economy. These Multinationals which have offices in other countries, have increased the demand for ERP systems to integrate their business processes and remain competitive. In addition, the Nigerian government, in a bid to close the digital divide, has introduced digital policies that require ERP systems to operate nationally. Despite this progressive move and thinking towards a streamlined IT economy, detrimental change management influences that are detractors to national ICT policy implementation are not considered and can be hidden obstacles to delivering that strategy. The National strategy should address change management influences on implementation of strategy and policy development where ICTs are concerned. Even though the application is broad, attention of this thesis is on ERP systems.

1.3 Aim of the study

The main aim of this study is to investigate the change management factors that influence the adoption of ERP systems by its end users. The successful technical integration of ERP modules does not guarantee its adoption by the end users. This seemingly successful change can be resisted by the end users for various reasons leading to a negative impact on adoption and eventually system sabotage. Further to investigating the change management factors, this study also aims to develop an integrated model that will provide a holistic view on why ERP systems fail and how to avoid ERP failure pitfalls. Given this context, this study aims to answer the following questions:

1. Why do ERP systems fail?
2. Do change management factors affect the adoption of ERP systems?
3. How can organizations design policies that mitigate against ERP implementation failures?

To achieve the aim of this study, a series of objectives with measurable outcomes are outlined in the next section

1.4 Objectives of the study

The objectives of this research are to:

1. Identify the change management factors that influence ERP systems adoption
2. Develop and validate a theoretical framework which reflect and relate these factors
3. Evaluate the application of the model to the case study organizations
4. Identify the implications for decision makers in organizations and government in change policy decisions concerned with ERP systems

1.5 Contribution of study

Practical - The model developed in this research is grounded in reality by managers from the sample frame. After reviewing the model, the managers acknowledged they could precisely identify the failure points that led to resistance during their ERP implementations. Even though the concept of technology adoption and change management are not new, the integration of both to produce a practical model explaining the cause and effects of the factors that influence adoption is novel. The model and adoption index tool developed in this research should be used to assess failed implementations and during new implementation plans for effectiveness. This will save organizations from the cost associated with failed ERP implementations. In addition to identifying the points of failure, the tool developed from this research will help managers further drill down to the variables associated with the identified factors to inform better decision making.

Theoretical – Firstly, this research provides a new way of approaching ERP user adoption by integrating technology adoption and change management factors. This identifies key points of failure that lead to resistance. Secondly, this novel approach and model adds to existing literature by exploring the underpinning change management factors that influence the adoption of ERP systems, by identifying the underlying constructs and explicitly showing the consequences of deviating from addressing these constructs. Thirdly, the integrated approach and model provides a basis for extensive future research that is not within the scope of the study, which ultimately adds to the body of knowledge.

Economic – This study has produced a model with an economic value because it highlights the opportunity cost of failed ERP implementations. To maximise the potentials and benefits of ERP systems, this study offers a model and an adoption index tool to guide managers during their ERP implementation strategy formulation. Also, because resistance to change is applicable to other areas other than Information Systems, these research findings will also guide Nigeria ICT policy makers in the implementation of their strategy.

1.6 Layout of the Thesis

In seeking to identify the reasons for ERP implementation failure, how to mitigate these failures and the role change management plays, this introductory chapter has set the context, scope and structure of the study. The proceeding chapters will answer the research questions and achieve the overall aim of the study by addressing each set objective in detail. The chapters will be structured as follows:

Chapter Two – Literature Review

A systematic review of literature is conducted and presented as position papers. It critically reviews a combination of adoption theories and Information System success framework studies, highlighting contributions and gaps with respect to change management and resistance to change. Finally, a conceptual framework is developed which presents the variables and conceptual model.

Chapter Three – Methodological Review

This chapter reviews the different research approaches considered and justifies the methodology adopted in pursuing the overall aim and objectives of the study. The strategies of inquiry, types of research approaches, and philosophical viewpoints are discussed. Candidate methodologies are considered and evaluated to formulate and justify the research methodology to be employed.

Chapter Four – Research Methodology

This chapter presents the research methodology and design implemented in this study. The research method, data collection methods, sample size, design of the measurement instrument and sample frame are discussed in detail. The results from the pilot study and data reliability are also presented. The chapter ends with a summary of the methodology implemented for this research.

Chapter Five – Findings, Analysis and Discussion

In this chapter, the research findings of the analysis conducted on the data collected are presented. The results obtained from the 616 respondents are presented, measuring them against threshold for goodness of fit. In this chapter, the data collected was prepared for data suitability for analysis. An Exploratory Factor Analysis (EFA) was conducted for data reduction and to understand the underlying structure of the factors generated. Based on these Factors, a measurement model was developed. To complete the implementation of the data analysis techniques, the measurement model was validated and evaluated using the Confirmatory Factor Analysis (CFA) and Structural Equation Model (SEM) techniques. The chapter end with a summary of the techniques and the key outcomes.

Chapter Six – Conclusion

This is the last chapter of this study and reflects on the study and how well the objectives have been addressed. These outcomes are linked with the research objectives of the study, and the aim of the study. The theoretical, practical and economic contributions of this study are discussed. Lastly, the limitations of the research, recommendations are proposed.

Chapter 2: Literature review and conceptual framework

2.1 Introduction

When compared to the implementation of simpler Information Systems previously researched on the individual-level, the implementation of ERP systems is more complex, broader and have greater impacts on the organization, the processes, work flows and the employees (Liang *et al.,*2007). Therefore, when an organization makes a strategic decision to undergo a Business Process Re-engineering (BPR), it must, in addition to addressing technological factors such as software, hardware, compatibility, usability and overall integration of the systems, take into consideration the end user complexities that arise from such technology driven change.

As outlined in the preceding chapter, the objectives of this study are to:

1. Identify the change management factors that influence ERP systems adoption
2. Develop and validate a theoretical framework which reflect and relate these factors
3. Evaluate the application of the model to the case study organizations
4. Identify the implications for decision makers in organizations and government in change policy decisions concerned with ERP systems

This chapter will address the first and second objectives and is divided into three sections. The first section provides a background on ERP systems, their benefits and usability in organizations. This provides more insight into ERP systems, their importance in the market place, their benefits and reasons for the high implementation failures recorded. The second section conducts a systematic literature review of foundation technology adoption theories and highlights contributions and gaps of these studies in the present-day context. In addition, this section reviews change management as an IS success measure and how it affects ERPs and their imminent adoption. The final section presents the conceptual framework by integrating change management and technology adoption factors as contributed by reviewed existing studies. By taking this integrated approach, the conceptual framework for a balanced theory of user adoption is proposed.

Keywords - ERP adoption, user adoption, user resistance, change management, technology adoption, IS success, ERP implementation

2.2 Section One: ERP systems, their benefits and usability in organizations

ERP system Definition: An ERP system is defined as a system which "collects, records, integrates, manages and delivers data and information across all functional units of the enterprise" (Ali et al.,2017).

With this definition as context, this section reviews the evolution of ERP systems, their benefits and failures, reason for using ERP systems and their application.

2.2.1 Background

The journey of ERP systems can be segmented into 3 phases:

Phase 1: ERP systems can be traced back to the 1960's when inventory control was a challenge. The software of systems was designed to process inventory centred around traditional inventory concepts. In the 1970's the focus shifted inventory towards Material Requirement Planning (MRP) systems. These new systems helped translate the master production schedule into requirements for individual units like sub-assemblies, components and other raw material planning and procurement. The MRP systems were involved mainly in planning the raw material requirements. In the 1980's came the concept of MRP-II, which involved optimizing the entire plant production process. Though MRP-II was an extension of MRP to include shop floor and distribution management activities, it was further extended to include areas like Finance, Human Resource, Engineering, and Project Management etc. This gave birth to Client server based ERP (Enterprise Resource Planning) systems in the 1990's, which covered the cross-functional coordination and integration in support of the production process. The ERP system, as compared to its antecedents, included the entire range of a company's activities, proving that the basic concept of an ERP system evolved over the past 30 years. An ERP system differs from the MRPII system in technical requirements such as graphical user interface, relational database, use of fourth generation language, computer-aided software engineering tools in development, client/server architecture, and open-systems portability" (APICS, 1998). "ERP systems were developed into a single vendor firm, and many functional applications were then developed into an integrated logic, and engineered in an integrated fashion across the different functional areas of an organization" (Kumar *et al.,*2011). This allowed for intra-organizational communication and integration of functions. When fully implemented, an ERP system's appeal is its cross-functional integration of business processes, which provides a comprehensive and timely view for the managerial decision-making process (Bradford *et* *al.,*2003). In terms of purpose, ERP systems are information systems that help manage business processes such as sales, purchasing, logistics, human resources, customer relations, performance measurement and management (Davenport, 1998).

Phase 2: ERP II or the Extended ERP was coined in the 2000's after the Y2k issues that saw the introduction of Euro disrupting legacy systems. During this period, many companies replaced their legacy systems with ERP II. The demand for additional functionalities by customers led to the development of various additional modules. However, the ERP systems were not flexible as there were too many dependencies within the systems. This led to a break-up of the ERP systems into smaller more customized modules, each covering only a small part of the functionality. While the foundation ERP systems were initially focused on backend/ back office automation of functions that did not directly affect the consumer, the Extended ERP systems extended the original ERP system's functionalities such as finance, manufacturing, distribution HR, Payroll, to automated front office functions like the Customer Relationship Management (CRM) - which focused directly on the customers; Supplier Relationship Management suppliers – which focused on the supply chain, e-commerce systems and e-business as a whole (Gartner, 2000; InfoSci, 2015).

Phase 3: The modular nature of the ERP systems led to the concept of the Service Oriented Architecture (SOA) and Software as a Service (SaaS) (Kumar *et al.,*2011). This simply put, is a "Set of services that a business wants to offer its customers, an Architectural style that requires a service provider, mediator and service requestor with a service description, with a Set of architectural principles and criteria that address characteristics such as modularity, loose coupling, reuse and composability." (IBM, 2008). This architectural pattern allows application components provide services to other components through communication protocols, independent of any vendor product or technology, as this is usually done over a network. In this Internet-enabled age, which has facilitated the convergence of cloud, mobile, social and big data analytics, SOA integrates the back office, front office and the Internet of Things.

Some commercial ERP software includes SAP, Oracle, PeopleSoft J.D. Edward, Epicor, Infor, and Microsoft Dynamics, amongst others. However, the most commonly implemented ERP software packages are SAP, Oracle, Microsoft and SAGE (Ruivo *et al.,*2015). These four ERP packages as suggested by these authors improve the ease of use of these ERP systems. Based on the result from their work, Microsoft Dynamics and SAGE provide a more user friendly systems when compared to Oracle and SAP. However, SAP remains the ERP software with the largest market share and the most realized expected benefits over (Panorama, 2016).

2.2.2 Reasons for Implementing ERP systems

Market pressures such as the globalization of the economy, changing consumer demands and rapid advances in technology, are some of the reasons organizations are investing in ERP systems to support their growth strategies. These organizations need access to better information that is integrated across the enterprise, which allows managers to make better risk assessments and decisions about commitments to the global markets.

As the application of ERP systems cut across both manufacturing and service industries, there are various reasons why businesses decide to implementing ERP systems. These reasons can be viewed from an operational and strategic business viewpoint. The operational reasons are usually based on the technology and business processes being utilized in an organization. Some of these technical reasons, per the work of Botta-Genoulaz and Millet (2006) include "

- poor quality or visibility of information
- uncompetitive organizational performance
- business processes or systems not integrated
- difficulty in integration acquisitions
- obsolete or disparate systems
- complex ineffective or inconsistent business processes
- inability of legacy systems to support new business strategies
- cost structures of current systems too high"

However, the overarching reasons which forms the drivers for ERP systems implementation have been identified as productivity, evolving customer demands, gaining strategic competitive advantage and improved return on investment (Scott and Shepherd, 2002; Nwankpa 2015).

These reasons force system managers to seek a single software solution that integrates the different functions and activities of an organization into a seamless whole, where information needed for decision-making is accessible across different functions, and the action taken by one function results in the appropriate follow-up action up and down the line. This system provides automation of tasks and processes, more integration resulting in lower long term costs and support for one centralized system rather than several small and different systems (Turbit, 2005).

2.2.3 ERP Systems - Ambitious Benefits, Alarming Failures

When successfully integrated and adopted, ERP systems promise ambitious benefits and can enhance the processes, interactions and information sharing between the functions in an organization (Sadrzadehrafie *et al.,*2013). In the face of global competition, financial pressures and striving to remain digitally relevant, a successful adoption of an ERP system can have benefits like customer responsiveness, enhanced data integrity and accuracy, improved flexibility, cost reduction, reduced complexity by eliminating delays, administrative intermediaries and redundant steps in transactions (Grover *et al.,*1993). As with the reasons for implementing ERP systems, the expected ERP systems benefits can be divided into five dimensions, summarized in table 2.1 below with their sub-dimensions (Shang and Seddon, 2000).

Table 2.1: ERP business benefits (Source: Shang and Seddon, 2000)

Dimensions	**Sub dimensions**
1. **Operational**	1.1 Cost reduction 1.2 Cycle time reduction 1.3 Productivity improvement 1.4 Quality improvement 1.5 Customer services improvement
2. **Managerial**	2.1 Better resource management 2.2 Improved decision making and planning 2.3 Performance improvement
3. **Strategic**	3.1 Support business growth 3.2 Support business alliance 3.3 Build business innovations 3.4 Build cost leadership 3.5 Generate product differentiation 3.6 Build external linkages (customers and suppliers
4. **IT infrastructure**	4.1 Build business flexibility for current and future changes 4.2 IT costs reduction 4.3 Increased IT infrastructure
5.**Organizational benefit**	5.1 Support organizational changes 5.2 Facilitate business learning 5.3 Empowerment 5.4 Built common visions

It is important to note that even though these are potential benefits that can derived from ERP usage, actual benefits from these dimensions, or any other benefit, vary based on the organization. To realise these benefits, some factors that have been cited as contributors to the successful implementation and adoption of ERP systems include time and budgetary control, change management, top management support, user involvement technical integration, amongst others. Some organizations have been successful with their ERP implementation, driving down costs and realizing substantive organization-wide change. One such company is British American Tobacco (BAT) whose management ensured that communication and user involvement were focused on (Panorama, 2015).

However, the ratio of the failed and aborted projects to the success stories like BAT has been recorded to be marginally greater. Many other organizations have been unable to realize the expected benefits from their ERP investments even after a successful configuration and installation (Barker and Frolick, 2003). Having successfully installed a system does not ensure that assimilation success will occur (Fichman and Kemerer, 1999). As established in the preceding chapter, 55% - 75% of the organizations that invest in these costly and complex enterprise resource planning systems do not enjoy these benefits (Gartner, 2015).

In exploring the reasons for failure, a large but fragmented repository of research literature on ERP adoption exists. While a considerable number of studies have justified the need for ERP implementation, many more have attributed its high failure rates to issues surrounding the pre-implementation readiness (Ahmadi *et al.,* 2015), implementation (Ram *et al*., 2013); post implementation (Galy and Sauceda, 2014; Hsu *et al.,* 2015) and ERP Critical Success Factors (CSFs). Despite the wide penetration and experience acquired, the type of changes implementing ERP systems require have increasingly become unmanageable in organizations, leading to ERP implementation failures (Maguire *et al.,* 2010). As reviewed by Wong *et al. (*2005), some unsuccessful ERP implementations within businesses, include accounts of the inability of Hershey to ship candy at Halloween, Nike losing shoe orders, and FoxMeyer's failure to process orders. In other studies, the percentage of ERP implementations that can be classified as "failures" ranges from 40% to 60%, and failures of ERP system implementation projects have been known to lead to problems as serious as organizational bankruptcy (Davenport, 1998; Markus *et al.,*2000). Furthermore, ERP implementations in developing countries is plagued with specific challenges like industrialisation, IT infrastructure and economic nuances, beyond those faced by developed countries (Xue *et al.,* 2005).

2.2.4 Summary

Technology adoption has become a mature field. Scholars and practitioners have investigated ERP systems usage behaviour in various sectors like telecommunication, oil and gas, manufacturing, finance and government (Al-Jabri and Al-Hadab, 2008).

One area that has been discussed extensively as a key driver for adoption is the users. To this end, success measures focusing on different aspects of user adoption abound in literature. Studies have debated the success measures that lead to ERP adoption by conceptualising dependent variables separately for different reasons. Some of the areas researched include System quality (Ram *et al.,* 2013; Delone and McLean, 1992), supporting high level (top) management, strong business vision and rationalization for the project (Holland and Light, 1999), training of employees, explicitly distinct roles for every employee and managers (Willcocks and Sykes, 2000), user involvement (Amaoko-Gyampah, 2007), failed deadlines, overrun costs, total replacement of existing systems, vendor dependence (Rashid *et al.,* 2005), and contextual factors (Markus *et al.,* 2000). The degree of user acceptance and the performance of the ERP system implemented have become popular and have been highlighted in literature. The acceptance of the ERP systems by the end users have been identified as going a long way in determining if it will be used. Due to resistance by the end users, many organizations have confined ERP systems to performing basic transactional functions. (Ross and Vitale, 2000). However, even though Ross and Vitale (2000) have rightly identified the problem of user resistance, they have not offered a framework for a solution to this growing challenge. Because of these issues, there is an increasing number of academic research examining the causes of IS acceptance and utilization among users (Taylor and Todd, 1995). The following section reviews foundation technology adoption theories and highlights their contributions and gaps.

2.3 Section Two: Review of technology adoption theories

Various scholars have measured user adoption from differing perspectives. These perspectives broadly fall under three categories – People, Technology and Process. However, even though the technology is successfully integrated through well set out processes, the people dimension plays the largest role in the adoption of the ERP system. This study supports the work of Venkatesh *et al.* (2003) whose basic concept defines user acceptance as the actual use of an information system being dependent on the users' reactions to using the system.

Researchers, as feasible explanations for the adoption of technology, have made several contributions. However, none have proffered a comprehensive model as a coping strategy that considers user resistance to change in organizations. To develop a practical and comprehensive framework that will be beneficial to both the body of knowledge and industry practitioners, existing theories are reviewed, with their contributions and limitations noted. Based on these theories, key factors are identified and form the basis for the conceptual framework.

2.3.1 Theory of Reasoned Action (TRA) / Theory of Planned Behaviour(TPB)

Behavioural intentions can predict likelihood of performing behaviours, but there are discrepancies between intentions and actual behaviour. These discrepancies are based on the low intention-behaviour correlations. Several factors such as intention, behaviour incompatibility, stability of intentions, literal inconsistency, internal and external factors, control factors, amongst others, have been seen to cause these discrepancies (Ajzen, 2005). In trying to estimate these discrepancies, the Theory of Reasoned Action (TRA) was formulated. The theory, formulated by Ajzen and Fishbein (1980), suggests that the fact that behaviour is often predicted by intentions does not in itself suffice, as it does not provide information about the reasons for the behaviour. Thus, based on the theory of Dulany (1968), Fishbein defined the Theory of Reasoned Action as "a person's intention to perform a given behaviour being a function of two basic determinants - attitudinal and normative" (Ajzen, 2005). The TRA is thus concerned with volitional behaviour, that is, "the causal antecedents of intentions to perform behaviours over which people have sufficient control" (Ajzen, 2005). However, some limitations of the TRA are identified. One to importantly note is that the fact that a user has an intention to perform a behaviour does not mean he is free to act without limitation, which could be in different forms. The limitations in the TRA does not adequately address any change management factors on intention and behaviour.

To improve the predictive power of the TRA, the perceived behavioural control construct was added. This model extension led to the Theory of Planned Behaviour (TPB). The aim was to determine an individual's intention to engage in a behaviour at a specific time and place and to address the issue of partial volitional control. Theory of Planned Behaviour postulates that "a person's intention to perform (or not to perform) a behaviour is the most important immediate determinant of that action" (Ajzen, 2005). Thus, TPB links behaviour and belief. Ajzen (2006) further suggested that many behaviours are volitional and that people can choose to perform a behaviour or refrain from it if they decided against it i.e. exert self-control. He goes on to suggest that “a person forms an intention to engage in a certain behaviour, and that this intention remains a behavioural disposition until, at the appropriate time and opportunity, an attempt is made to translate the intention into action i.e. barring unforeseen events, people are expected to do what they intend to do” (Ajzen, 2005). However, this model does not measure or explain the causes or antecedents to the unforeseen events referred to as seen in figure 2.1.

TPB is governed by six constructs that represent a person’s actual control over the behaviour: Attitudes, Subjective norms, Behavioural Intentions, Social Norms, Perceived Power and Perceived behavioural control

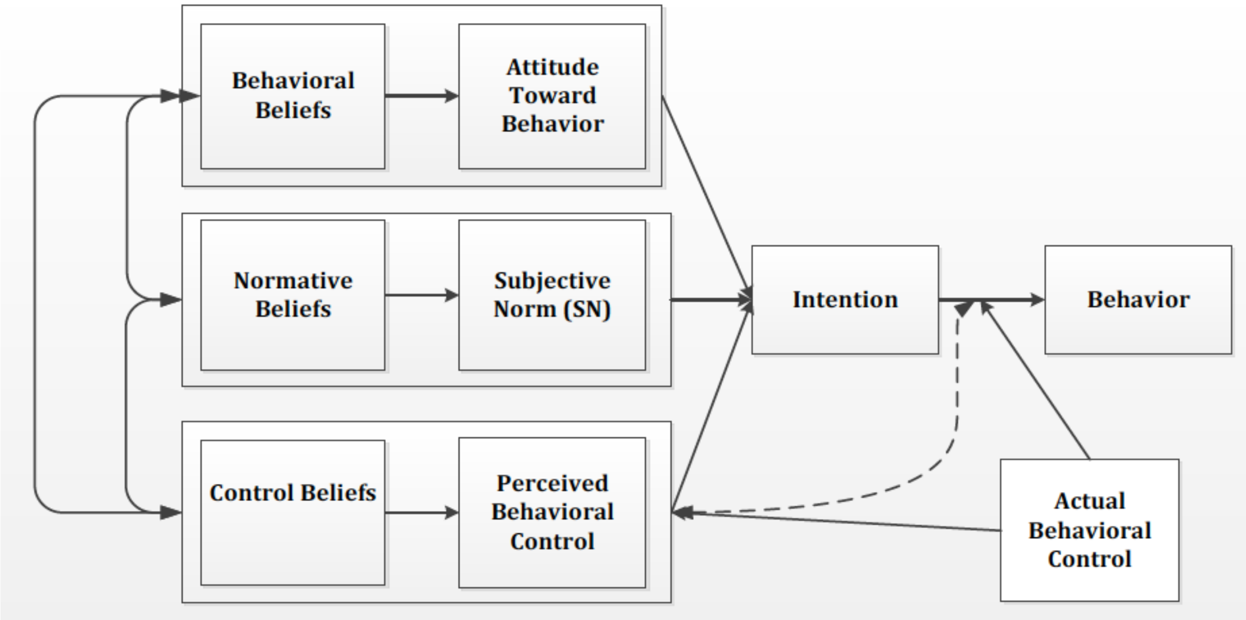

Figure 2.1: Theory of Planned behaviour (Source: Ajzen, 1991)

This extension is like TRA in the sense that it only provides a top-level explanation to a user’s intention to use a system and does not address adoption. Also, the scope of the behavioural control construct measured in TRA is limited as it does not include the behavioural control exerted by a user’s resistance to change which impacts directly on the intention to engage. Even though the TPB assumes that behaviours are predicted by corresponding intentions, the intention-behaviour relation may break down if performing a behaviour depends on team work (the cooperation of other people), or on other change management factors (fear, abilities, skills or resources the person does not possess). Although several studies have suggested that perceived behavioural control can improve prediction of behaviour, it does not show in all clarity what constitutes actual control over a behaviour or how to assess it. Amaoko-Gyampah (2005) in his research on ERP implementation identified the key construct of TRA and suggested that for a successful ERP implementation, top management need to clearly articulate the business vision, quantifiable objectives and adequate information about the ERP system and its impact. Even though some aspects of control can be measured, information about factors that may improve or restrict performance of a behaviour is still largely insufficient from a change management perspective.

2.3.2 The Diffusion of Innovation (DOI) Theory

The theory of innovation as re-invented by Rogers (2003), suggests that innovations within a given system can be communicated through different channels, and that these innovations are adopted by individuals at different rates as they possess different degrees of willingness to adopt these innovations. According to the Diffusion of Innovation (DOI) theory, a "technological innovation is communicated through particular channels, over time, among the members of a social system" (Clarke, 1999). Communication was identified as a key means of diffusion of innovation from which several factors have been further developed by various researchers and authors. It further explains the channels through which technological innovations are passed, the characteristics of an innovation, the different adopter categories and the change agent functions required for a positive perception of the innovation. Rogers (2003) defined adoption as a "decision to fully use an innovation". In the context of ERP implementation, studies have drawn upon the DOI theory and IS literature to better examine contextual factors that can influence user satisfaction and achieved benefits from ERP implementations (Bradford and Florin, 2003). They tested the relationships between innovation, environmental and organizational characteristics, and two measures of system success – Perceived organizational performance and user satisfaction. Their results show a relationship between user satisfaction and DOI antecedents. While factors such as top management support, training and system complexity were related to satisfaction, degree of consensus in organizational objectives and competitive pressure were found to have a strong relation to perceived performance.

One weakness of this this theory is that it highlights communication as a predictor to adoption, but treats resistance in a simplistic manner. As an example, a user might fit the profile of an adopter but resist the innovation for other reasons besides the ones addressed in the theory.

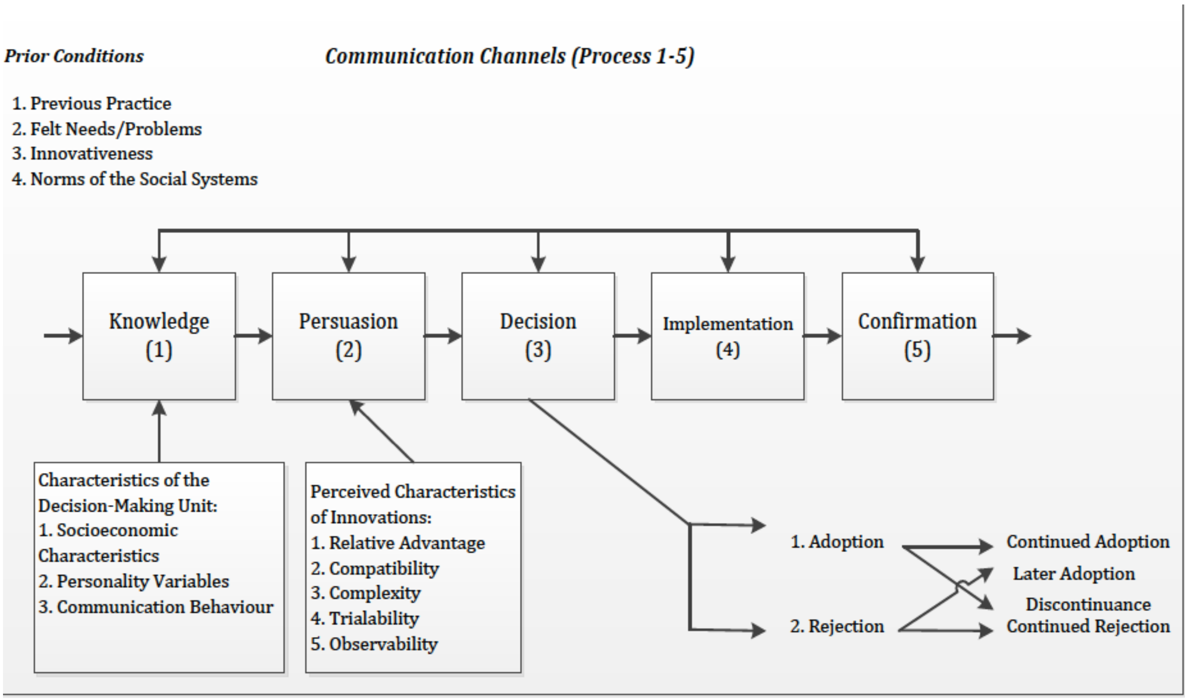

Figure 2.2: Diffusion of Innovation Theory (Source: Rogers, 1995)

Diffusion of Innovation theory relies on communication and persuasion which isolated from other factors, has no direct impact on adoption. As much as these factors (voluntariness, image, ease of use, visibility, trialability, result demonstrability and relative advantage) affect the intention to use a system, they do not guarantee adoption. While innovation might have been successfully communicated, and diffused via different channels over time, the users may still resist the system due to unaddressed change management factors which casts a doubt on the ability of the model to predict or evaluate adoption. This is because they do not explicitly outline the consequences of the adoption.

Positioned as one of the most powerful communication theories, the diffusion of innovation theory is predominantly focused on the way by which information about an innovation is disseminated (Chang, 2010). As such, the operational construct to be measured from the DOI theory will be communication. Within the context of this study, the relationship between communication of the innovation – the ERP system, and user adoption will be measured. Also, the interactions between communication and other constructs from the hypothesised model will be explored to develop a robust framework.

2.3.3 Technology Acceptance Model (TAM)

One of the important measures of a successful ERP implementation is the degree to which the system is used. The Technology Adoption Model (TAM) widely used in IS literature and proposed by Davis (1989), posits that cognitive beliefs - Perceived Ease of Use (PEOU) and Perceived Usefulness (PU) of an IS are key determinants of its usage (see Figure 2.3). PEOU refers to what extent the user feels or believes the system is user friendly and easy to use i.e. "the degree to which the intended user expects the system to be free of effort". In contrast, PU refers to the degree to which the user feels or believes the system will be useful to complete his job and improve efficiency i.e. the user's "subjective probability that using a specific application system will increase his or her job performance within an organizational context" (Davis, 1989). The TAM postulates that depending on external variables, the PEOU and PU of an IS influences the attitude of a user towards using the system. This attitude (either positive or negative) subsequently determines the user's behavioural intention to use the system, ultimately leading to the usage (or the lack of usage) of the system. The model was developed to improve the prediction of a user's acceptance of an IS, by tracing how external variables influence belief, norms, attitude and the intention to use (Davis, 1989). The aim of TAM is to predict users' acceptance, specifically acceptability studies, and identify any modifications which should be made to the system to make it acceptable to the users. The model ranks PEOU as a precedent to PU, because a system that is perceived as easy to use can be perceived as becoming useful (Moenaert *et al*., 2005). However, PEOU and the PU are oriented towards the system and do not give a strong prediction of adoption, as the intention to use a system is not solely about the perception of the system's usefulness or ease of use. These factors should therefore be considered as part of a wider framework that incorporates change management factors. These PEOU and PU factors are key in the adoption process and will be included as operational constructs.

Another weakness of the TAM is self-reportage (Lee *et al.,* 2003). The TAM is far from being a causal model and should not be generalised as such. TAM does not measure actual usage but depends on the user to imply usage (Bradley, 2009). If proposed users of a new ERP system perceived a threat to their jobs, skills, power, or even a reason as simple as workgroups formed over time being broken or geographically moved by using the system, they simply would resist the change. Therefore, using the TAM alone as a fundamental model to predict a user's acceptance of a new information system will not suffice. Theoretically, the TAM and TPB possess strong behavioural elements and assume that when a user forms an intention to act, that they will be free to act without limitation. This combination of TAM and TPB was tested by Kwahk and Lee (200) while investigating the role of readiness for change in ERP implementation. Their study showed that the role of readiness had an indirect influence on behavioural intention to use an ERP system through PEOU and PU. Nevertheless, limitations such as required skills, time, organizational culture, socio-technical limits, unconscious habits and change management factors may limit the freedom to act. TAM alone used as an IS success measure can be misleading. This is because the TAM alone cannot completely explain the reasons for the failure or success of an Information System

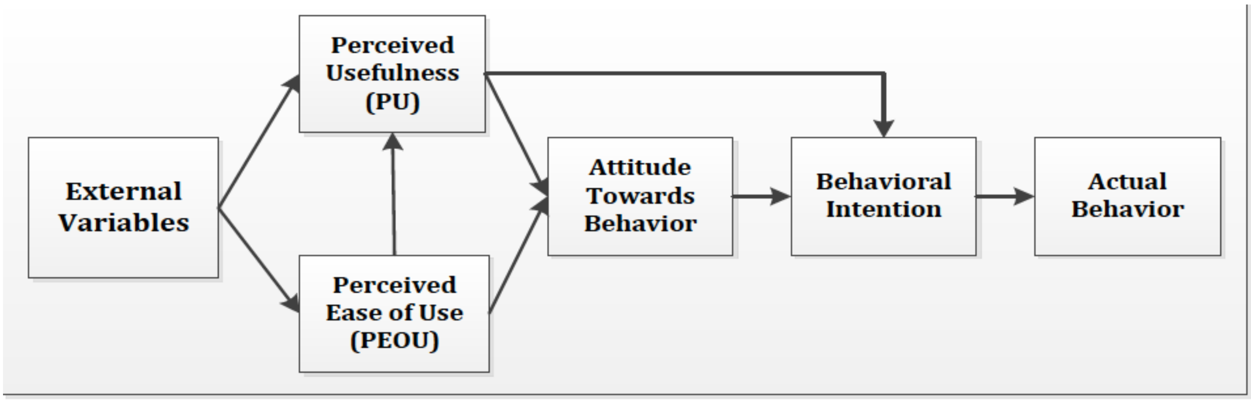

Figure 2.3: Technology Acceptance Model (Source: Davis, 1989)

While there is a large body of empirical studies that have used the TAM to explain the adoption of ERP systems, there are a smaller number of published papers that have applied the TAM to ERP systems. These papers, based on the constructs of TAM, attempt to uncover external factors that could influence the intention to use ERP systems during their different lifecycle stages (Amoako-Gyampah and Salam, 2004; Sternad and Bobek, 2013). Some of these external factors identified include Computer anxiety and computer self–efficacy, top management (Somers and Nelson, 2001), user training (Somers and nelson, 2003), Project management (Umble *et al.,*2003), ERP software or vendor selection (Somers and Nelson, 2003), Cultural difference (Welti, 1999), communication, user involvement and acceptance (Amoako-Gyampah, 1999), systems integration and customization (Al-Mashari et al.,2003). For this study, the Operational factors that will be measured from this theory are Perceived ease of use, perceived usefulness and social influences

2.3.4 The Delone and McLean IS success model (D&M model)

The first multidimensional Delone and McLean (D&M) IS model was developed in 1992 based on the existing technology adoption, communication, and information "influence" theories (Davis 1989; Ajzen, 1980; Shannon and Weaver,1949). Delone and Mclean developed their framework for measurement and evaluation of IS Success factors, with IS being the dependent variable. The D&M theory posits that the success of an information system can be measured or evaluated in terms of its system quality and information quality, and that these attributes influence the use and user satisfaction of the system, which when achieved, has individual and organizational impacts (See figure 2.4)

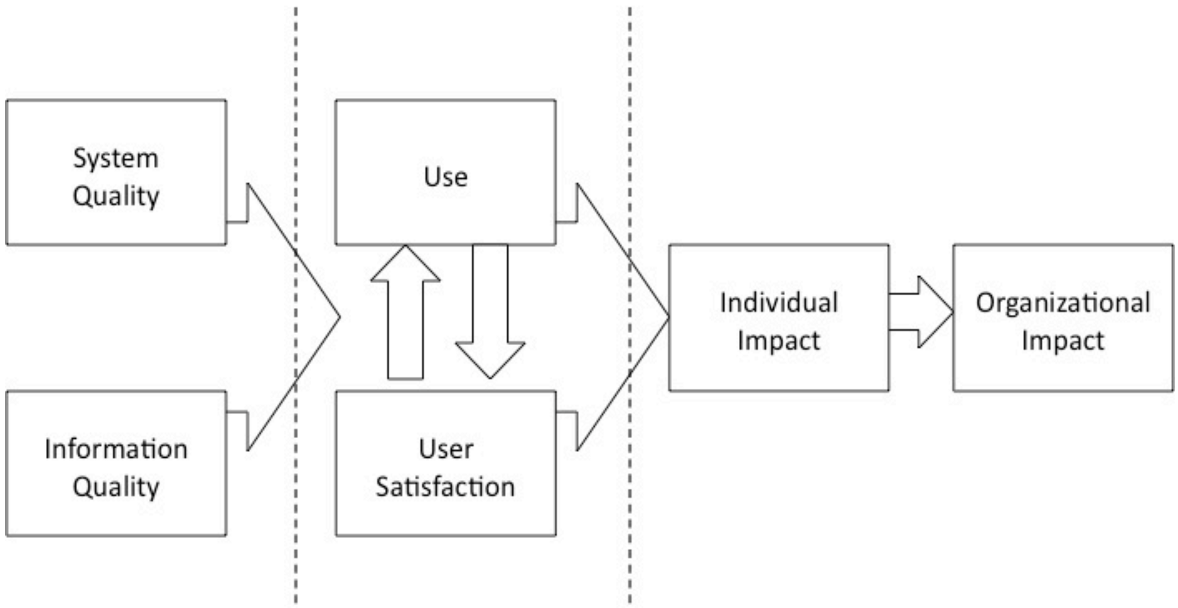

Figure 2.4: D&M Information Systems Success Model (Source: Delone and Mclean 1992)

Taking process and casual relations into consideration, the six dimensions were suggested to be interdependent and not independent. The process model as described by Delone and Mclean comprised of three elements: introduction of the IS, the *use* of the system and the effects of the system use. With the *process* model, *use* must precede *user satisfaction,* but a positive experience of *use* leads to better *user satisfaction* in the causal model. The Six categories of Delone and McLean's IS Success proposes that *Information Quality*, *System Quality, Intention to Use, User Satisfaction, and Net Benefits* all contribute significantly to IS Success. However, a process model alone cannot be used to measure the success of the IS, because even though there is an extensive use of the system, the benefits might never be realised. The variance model was thus introduced. The variance model measured the causal relationship between the dependent variables. Delone and McLean then updated the original model in 2003 to include service quality, and net benefits. The new model combined both the process and variance model as shown in figure 2.5.

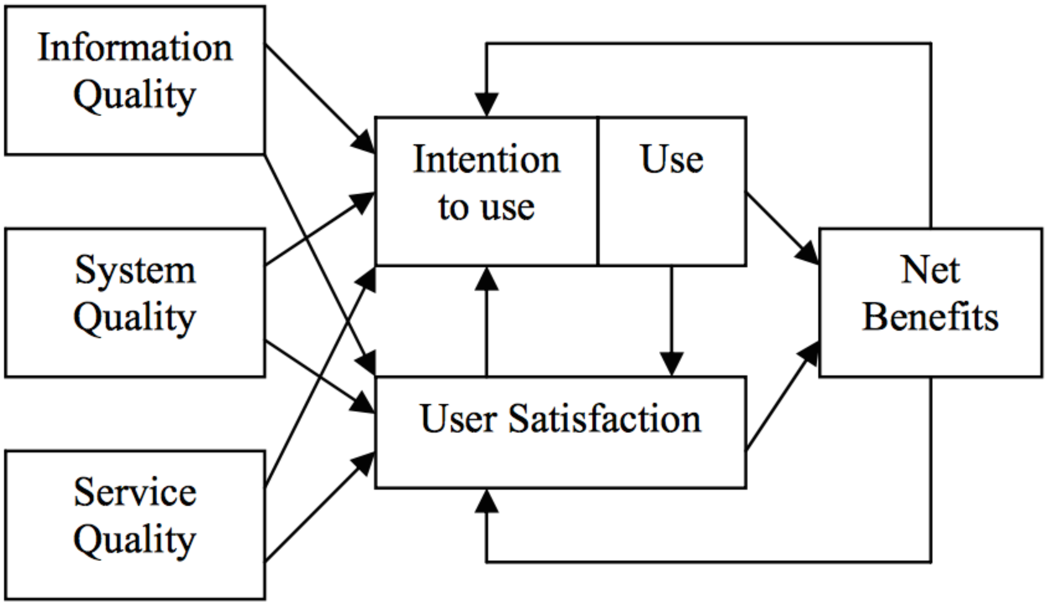

Figure 2.5: Extended D&M Model (Source: Delone and Mclean 1992)

Literature does not explicitly address the Intention to use completely because intention is not only about usefulness and benefits. Intention to use a new system based on Delone and McLean's six dimensions of IS success alone does not, in most cases guarantee use. Their updated model also included Net Benefits which was defined as "the effect an IS has on an individual, group, organization, industry or society. This is often measured in terms of organizational performance, perceived usefulness, and effect on work practices" (Petter and McLean, 2007). However, the model does not investigate Net Benefits in its totality as it does not take into consideration what factors could lead to negative or positive Net Benefits for organizations. This point is supported by Delone and McLean (2003), where they suggested that "more field-study research should investigate and incorporate "Net Benefits" measures." Finally, none of these researchers studied the key aspect of change management as an IS success measure. For this study, the Operational constructs that will be measured from this theory are presented in the table 2.2.

Table 2.2 D&M Operational constructs

Operational Constructs	Associated variables
Information Quality	Importance, relevance, usefulness, timeliness, readability, content
System Quality	Ease of learning, ease of use. Convenience, realization of user requirement, usefulness of features and system
Service Quality	data and system accuracy
Individual impact	Learning, productivity, performance
Organizational impact	Overall productivity gains

2.3.5 The Unified Theory of Acceptance and Use of Technology (UTAUT)

The Unified Theory of Acceptance and Use of Technology (UTAUT) is an integration of eight dominant technology adoption theories. With the aim of deriving some core constructs from these models, Venkatesh *et al.* (2003) mapped and combined the Theory of Reasoned Action (TRA), Technology Acceptance Model (TAM), Motivational Model (MM), Theory of Planned Behaviour (TPB), a combined Theory of Planned Behaviour/Technology Acceptance Model (C-TPB-TAM), Model of PC Utilization (MPCU), Innovation Diffusion Theory (IDT), and Social Cognitive Theory (SCT). By unifying these theories, Venkatesh *et al.* (2003) hoped to provide a comprehensive model that explains IS adoption. The constructs which were derived from the unified model are social expectancy, performance expectancy, social influence and facilitating conditions.

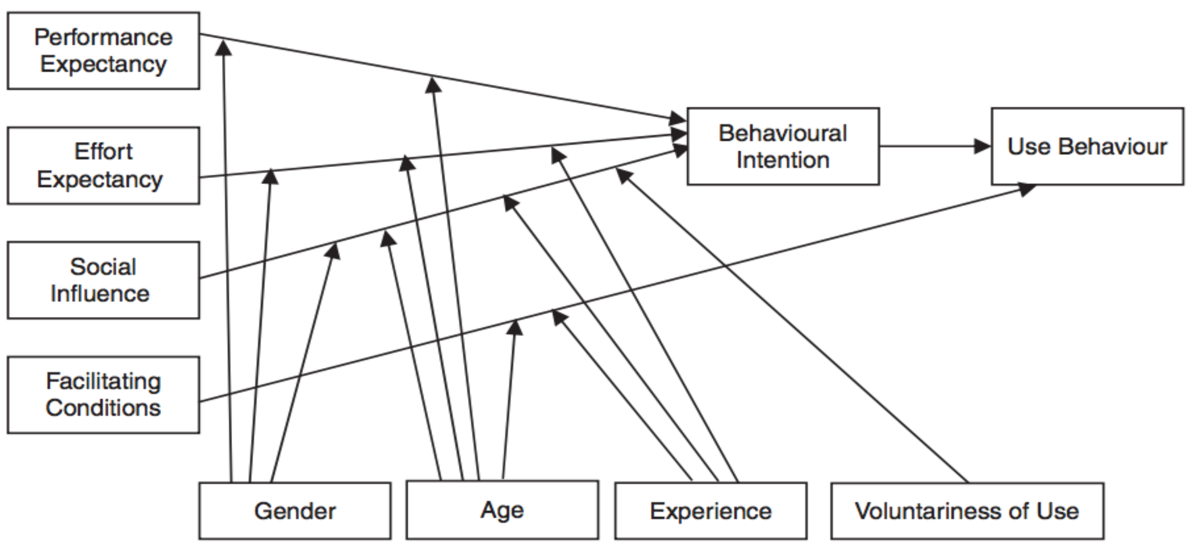

Figure 2.6: UTAUT Model (Source: Venkatesh et al, 2003)

Based on the UTAUT theory, the operational constructs are defined as Effort Expectancy – "the degree of ease of use associated with using a system"; Performance Expectancy – "the degree to which using a system provides benefits to users on performing functions"; Social Influence – "the extent to which users perceive others believe they should use system"; Facilitating conditions – Users' perception of resources and support" (Venkatesh, 2003). The theory suggests that when mediated by age, gender, experience and voluntariness, the four constructs influence behavioural intention to use a system. The findings from the model showed performance expectancy as the strongest predictor of intention to use a system. The model also suggests that age and gender moderate the results with caution taken in the generalisation of the model.

However, resistance to change, which is a key detractor of adoption is not addressed in this unified model. One of the key points made by Venkatesh *et al*. (2003) is the ability of their model to increase its explanatory power significantly. Questions have been raised about the parsimony and explanatory power of the model based on this point made (Williams, 2011). Further, their underlying concept for user acceptance models suggest that an individual's reactions to using an information technology, their intentions to use the IT both lead to the actual usage of the IT. This concept can be misleading because constructs such as those derived from the DOI model, or the TPB can influence this intention. The UTAUT does not explain the degree to which these constructs influence the intention to use, or adoption. This study assumes that systems perceived to be successful from an IT adoption perspective will be adopted. For this study, the Operational factors that will be measured from this theory are presented in the table 2.3

Table 2.3 UTAUT Operational Constructs

Operational Constructs	
Effort Expectancy	Ease of learning, Ease of use, skilful, understand system
performance expectancy	productivity, useful, benefits, accomplish
social influence	people influence
Anxiety	apprehanesion, hesitation, intimidation, scared
self efficacy	complete task using system
facilitating conditions	resources, support
Attitude	attitutde towards using the system

2.3.6 ERP and Change Management

Change management is often viewed as a separate set of activities that takes place during a project within an organization. To fully integrate these activities into an implementation plan, a more systemic view of change management can be adopted which involves drawing from both inside and outside the organization (Stapleton and Razek, 2004).

Like the challenges faced with ERP implementations, change management also highlights the complex nature of change implementations and often records high failures" (Lines *et al.*, 2015). This is logical, seeing that reports of failed ERP implementations usually accompany a change process. Further to the factors measured by technology adoption theories, change management factors also play a vital role in user adoption of ERP systems. One of the major reasons for ERP system change failure is user resistance.

Resistance to change is defined as "any dissenting action that slow, oppose, or obstruct a change management effort" (Lines *et al.,* 2015). Unique issues of change management are particularly important for multinational organizations where their parent sites are geographically separate. This complexity involves several dimensions including business strategy, software configuration, technical platform, and management execution. Of these four, management execution contributes toward ERP implementation success to the greatest degree (Nah *et al*., 2001). Different managerial reporting lines, languages, and national cultures also make managing a multi-site ERP implementation project challenging (Markus *et al.,* 2000). Local management must therefore be prepared to deal with the issues of enterprise-wide implementation on a site level. Companies in developing countries such as Nigeria confront issues substantially different from those faced by companies in the developed world due to the differences in sophistication of IT maturity and infrastructure (Tarafdar and Gordon, 2007).

The implementation of an ERP software package can help integration of departments and functions to achieve a true process focus. It has the potential to integrate databases, data flows and systems even across different companies, and to streamline operations and reporting. However, implementation of ERP is a big commitment for any company (Huq *et al.,* 2006). The process of implementing ERP begins with planning. Parr and Shanks (2000) suggest that after planning is completed, a project team should embark on a few discrete phases. After the system is up and running, there may be a post-implementation review leading to a stabilization phase. Whilst these different phases are crucial to a successful implementation, it does not guarantee a successful adoption of the system. The change management phase must begin the discrete phases mentioned above, and continue throughout the change process. A few prescriptions on how to manage these change processes exists, but the careful communication for the need for change as well as involving key stakeholders such as employees in the decision-making and implementation is crucial (Meyer and Stensaker, 2006). Also, user involvement and training are the top factors users consider important to the success of ERP systems (Amoako-Gyampah, 2005).

Top management is therefore a primary change agent responsible for identifying factors in the organization's environment and culture (Martin and Huq, 2007). Unfortunately, insufficient top management actions have also been cited as significant obstacles in the implementation failure of ERP systems (McAlary, 1999; Kumar and Hillegersberg, 2000) as well as employees' understanding and the use of ERP systems (Martin and Huq, 2007).

2.3.7 Resistance to change

Definition of Resistance – "Resistance is defined as a phenomenon which can deter the overall change process, either by delaying or slowing down its beginning, obstructing or hindering its implementation, and increase its costs" (Ahmed *et al.*, 2006)

User resistance is an important issue in ERP implementations and has been attributed as the root cause of many enterprise software project failures (Hill, 2003). For example, Klaus and Blanton (2010) found a significant amount of user resistance even after nine months of ERP integration testing, partly due to the many interfaces with existing systems. Maurer (2002) finds that the reason for low ERP system return on investments is user resistance. Furthermore, a report on 186 companies that implemented the commercial package, SAP Enterprise System found that resistance is the second most important contributor to time and budget overruns and is the fourth most important barrier to SAP implementation (Cooke and Peterson, 1998). Additional studies also reveal how users' resistance causes technology implementation failures (Umble and Umble 2002; Barker and Frolick, 2003).

To implement an ERP system, the goal of managers is to achieve the desired level of use of the system. Organizations are recognizing that user satisfaction with information systems is one of the most important determinants of the success of those systems. Thus, theories and practitioners have continuously explored the user acceptance of information system by developing many models and theories. Kazmi (2008) found that the role of strategic IT planning, executive and managerial commitment, IT skills, business process skills, ERP training and learning are very important in successful ERP systems implementation. The gap between ERP systems users experience and skills needs to be bridged by conducting successful training for employees. Organizational performance depends on individuals' task completion. With the rapid growth in use of computing in organizations, practitioners are constrained to investigate the impact of information technology acceptance on individuals' performance (Nah, *et al.,*2005;). In a negatively scaled study, Oreg (2006) found that trust and information provided about the change had the most significant effects on resistance to change, yet this point has not been incorporated in any adoption models.

There various reasons why resistance will surface during a change process. According to Ahmed *et al.* (2006), six fundamental reasons for user resistance to change are described as:

1. the nature of the change is not clearly communicated to the users
2. The change or quantifiable objectives are not properly articulated
3. The potential users feel strong forces dissuading them from changing
4. The users are mandated to undergo the change without an input to the nature or direction of change
5. The change appears to be subjective i.e. made on personal grounds
6. The change is drastic and ignores current institutions in the organization

Other causes of resistance from literature include denial, user myopia i.e. the user not understanding the vision of the change or long term benefit (Barr *et al.,* 1992), subjective norms (Venkatesh *et al.,* 2003), lack of necessary capabilities, reactive mindset resignation, deep rooted values and emotional loyalty (Kruger, 1996).

Overall, the sources of user resistance can be examined in three broad areas. The resistance can either be system oriented, people oriented or interaction oriented (Ali *et al.,* 2015). When these sources of user resistance are not addressed during an ERP implementation, resistance could manifest in the form of sabotage or under-utilization of the system, which works against the reasons for implementing the ERP system (see section 2.1.2) in the first instance.

2.3.8 Summary

This study focuses on the users of the ERP systems and how these users are key to organizations achieving their intended goals for investing heavily in ERP Systems. Based on the systematic review of the foundational technology adoption theories in literature, many IS Success measures have been extensively measured over time, and all possess key contributions to the concept of technology adoption. Nevertheless, none have explicitly measured change management factors which is a key aspect. Also, none of the models has shown the degree to which the measured constructs impact adoption. If intended users perceived threat, they will not readily accept change, and even if they were forced to use the new system being introduced, the extent to which they will use it effectively and efficiently will have a negative benefit for the organization. Despite the gaps and limitations, the reviewed technology adoption theories provide a platform to build an integrated model that incorporates change management factors and their impact on adoption. The section also reviews resistance to change, sources of resistance and its manifestations. This establishes the importance user resistance in the implementation of ERP systems.

2.4 Section Three: Conceptual framework

The preceding sections have provided a review of the most commonly cited foundational technology and change management theories. Based on the review, operational constructs have been identified in literature to form the basis of the conceptual framework. Two categories of variables will be tested. The first category is the independent variables or the predictors - Trust (T), System Qualities (SQ), Training (TR), Commitment and Trust (CT), Communication (C), Organizational Benefits (OB) and Resistance to change (R). The second category to be measured is the dependent variable – Adoption. It is premature to specify the structure of the model at this stage because of the complex nature of the relationships. The Structural equation model will specify these relationships and their dependencies. Nevertheless, the constructs and their associated variables have been summarised in table 2.4 below. These variables have been determined as the key factors from the reviewed technology adoption theories and change management literature. This forms the basis for the structural equation model which will be addressed in chapter 5.

Table 2.4: Conceptual framework showing the Operational Constructs and their associated variables

Constructs	Variables	Source
System Quality	Ease of use	Delone & McLean Model (1992, 2003), Apriori Model (Sedera & Gable, 2004) , TAM (Davis et al. 1989); Dezdar & Sulaiman (2009); Ram et al.; (2013), Venkatesh et al. (2003), Laumer et al.(2016)
	System meets requirement	
	Relevant information	
	Timely feedback	
	Information intergrity	
	Information accuracy	
Organisational Benefit	Improved Overall productivity	Delone & McLean (2003), Ajzen(1980, 1991), Venkatesh et al. (2003)
	Increased capacity	
	Reduced Costs	
	Improved outputs	
Training	Involvement in design/implementation	Ram et al. (2013), Tharenou et al. (2007), Amoako-Gyampha & sala (2004); Venkatesh et al. (2003); Oreg (2006)
	Pre-implementation training	
	Implmentation training	
	Post implementation training	
	Useful Technical support	
Communication	Need for change	Rogers (1995;2003), Sagie and Koslowsky (2000)Dezdar and Sulaiman (2009); Finney and Corbett (2007)
	User buy - in	
	User involvement	
	open and honest communication	
	team work	
Perfromance & Productivity	New skills to complete task effectively	Venkatesh et al. (2003), Laumer et al.(20
	System impacts daily work	
	system is useful in perfoming tasks	
	equips user to accomplish work and increase productivity	
	increased quality of work	
	increased effectiveness	
Motivation (Enhancers)	personal gains and rewards	Bingi et al. (1999); Dezdar and Sulaiman (2009); Finney and Corbett (2007); Plant and Willcocks (2007); Snider et al. (2009); Somers and Nelson (2004); Lines et al, 2015; Vineburgh (2015), Oreg (2006), Venkatesh et al. (2003), Bhattacherjee & Hikmet (2007)
	further career opportunities	
	use of system is enjoyable	
	user satisfaction	
Motivation (Detractors)	Fear of job loss, redundancy,making mistakes	
	habit	
	Difficulty in adjusting	
Trust and Commitment	Trusted information	
	job security	
	rewards	

2.5 Chapter Summary

From the review of the literature, key factors have been identified and have formed the conceptual model. Using the SEM technique, the multiple relationship between these factors and how they influence resistance to change, and ultimately adoption, will be tested. As an example, some studies already picked up the issues of communication and insufficient top management actions as contributors to resistance long before the UTAUT model was developed (Kumar and Hillegersberg, 2000). However, Venkatesh *et al.* (2003) in unifying the dominant technology adoption models neglected these constructs.

This thesis has incorporated relevant constructs from both sides of the divide – change management and technology adoption as a basis for theoretical model. The following chapter reviews the methodology considered for data collection and analysis.

Chapter 3: Methodological review

3.1 Introduction

One of the most important expectations for organizations that make costly ERP investments is maximizing the return on investment of the project. However, as highlighted in chapter 1 of this study, between 55% - 75% of these ERP projects fail. The preceding chapters, which focus on the research question, have evaluated ERP systems, reviewed existing literature and developed a conceptual framework with hypotheses to be tested. A critical review of the literature has shown that despite the different models and theories posited, ERP implementations still fail.

This chapter will review the different research approaches considered and justify the methodology adopted in pursuing the overall aim and objectives of the study. The following sections will discuss the research design, study's viewpoint, what research approach will be taken, data collection methods, sample framing, the pilot study and the relevant data analysis techniques that justify the use of the chosen methods.

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3.2 Review of methodology

In achieving the outlined aims and objectives of this study, it is helpful to be knowledgeable about the various methodologies to determine the appropriate approach for this study. To rationalise the chosen methodology for this study, fundamental philosophical concepts and relevant methodologies will be reviewed in the following sections.

3.2.1 Strategies of inquiry: Quantitative, Qualitative or Mixed?

Deciding what research methodology to adopt requires a review of the overall research design which must "reflect the assumptions of the selected research paradigm" (Collis and Hussey, 2009). Three main traditional research strategies in academic research are quantitative, qualitative and mixed research, all of which have great significance when used appropriately.

Quantitative research, usually associated with a positivist stance, deductive (or top-down) approach, survey strategy, and correlational studies, uses methods with pre-determined, observable and highly structured data collection techniques to test hypothetical generalizations (Hoepfl, 1997). Unlike other methods, quantitative research seeks to deduce causal relationships, predict, and generalise the findings on different environments (internal and external). This kind of research requires data collection from a large random sample size, is objective, and explanatory (Saunders *et al.,* 2007; Cohen *et al.,* 2007).

The purpose of this study is to investigate the change management influences on user adoption of ERP systems. To be able to test the hypotheses posited, and generalize the findings of this study, the fundamental characteristics discussed above make the quantitative method an integral part of the research methodology. Key advantages of using this method are that the results from quantitative research can be generalized, measured and used to develop statistically robust and significant theories.

Qualitative research is exploratory in nature and seeks to understand phenomena in context-specific settings to study their inter-relationships (Hoepfl, 1997). This kind of research does not use statistical techniques and is used when not much is known about research topic. Qualitative research attempts to investigate more than one perspective to view the research problem comprehensively. This method also involves face-to-face interviews and observations of behaviour. It is usually employed during inductive approach which tends to develop and explore relationship during an investigation (Hammond and Wellington, 2013). While qualitative research is beneficial in developing a rigorous consistency between theoretical and philosophical assumptions, seeking for knowledge of reality, examining in-depth complexities and processes in a less acknowledged phenomenon, and can provide credible and influential evidence, it has its limitations. Results from qualitative research cannot be generalized or measured, remain largely subjective and is subject to researcher bias (Sekaran, 2006).

To develop a statistically robust and significant causal model, a qualitative approach is not primarily suitable for this study. However, this study will employ the use of qualitative face to face interviews to confirm the practicality of the causal model developed from the quantitative data analysed from the decision makers'/ managers' perspective.

Mixed method research involves using both quantitative and qualitative research analysis and procedures in a single research design. It combines the methodological paradigm and the method of both quantitative and qualitative researches to better answer the research questions. As a rationale, mixed method researches are used to offset the limitations and advantages of quantitative and qualitative methods in an attempt answer or validate a research question. The mixed method research is based on the pragmatic paradigm. "With Pragmatism, a research design should be planned and conducted based on what will best help answer the research questions" (Hoepfl, 1997). This kind of research is beneficial because it leverages on the complementary strengths of both quantitative and qualitative research and non-overlapping weaknesses. The mixed method research is both confirmatory and exploratory, connects theory and practice, and enables triangulation to take place.

However, because this study is primarily quantitative and only uses some element of the qualitative method to confirm the causal model for practicality, a mixed method approach will be employed.

3.2.2 Types of Research Approaches – Deductive vs Inductive

The two most commonly cited and utilized research approaches in adoption studies are deductive and inductive. They are both associated with different epistemological stances – positivism or interpretivism, and both employ either a quantitative or a qualitative method of inquiry.

A Deductive approach, is the "logical process of deriving a conclusion from a known premise or something known to be true" (Zikmund and D'Amico, 2000). It is also described by Lee and Lings (2008) as an approach that begins with a theory and ends with drawing a conclusion to support or revise the existing theory. It follows a top-down approach and has the following features as highlighted in the works of Hussey (1997) and Saunders *et al.* (2007) below:

1. It entails a highly structured and logical process of hypotheses testing using statistical techniques
2. It employs a quantitative data collection method, usually from a large sample size using surveys, to draw conclusions
3. It requires controllability to ensure data validity
4. Deductive studies take an epistemological stance of a positivist which use scientific methods and present numeric data. They seek to draw inferences from the collection of generalizable data (Creswell, 2008).

A conceptual framework has been developed for this study and will be tested to better understand the reasons for ERP implementation failures due to resistance to change. Based on the characteristics of the deductive approach outlined above, this stance will be employed for this study.

On the other hand, an *Inductive approach* is the opposite. The researcher collects data and then develops a theory based on the findings. It takes a bottom-up approach and has the following features:

1. It begins with data collection and ends with developing a theory
2. It employs a qualitative data collection method, usually from a small sample size using observational methods, to build a theory that cannot be generalised.
3. Inductive studies are interpretivist in nature and seek to explore a new phenomenon rather than test an existing one

Since this study has been established as a quantitative one, the inductive approach is not suitable and will not be adopted.

To determine what approach to take, the nature of the research topic and objectives of the study need to be considered. Hence, having developed an implicit conceptual framework, this study logically moves in a deductive manner (theory, hypotheses, hypothesised model, data collection, data analysis, findings and conclusion), hence, the rationale for choosing a hypothetical deductive approach.

3.2.3 Philosophical consideration: Positivism vs Interpretivism

There are different epistemological stances that can be adopted by a researcher. The most cited methodologies are the Positivism and Interpretivism viewpoints.

3.2.3.1 Interpretivism

This is an anti-positivist school of thought that usually implies adopting an empathetic philosophical stance, thus seeking to understand the world of the research subjects from their own view point. An interpretive researcher sees the world as a social construction that will demonstrate large variance depending largely on the observer and the interpreter of the phenomenon (Saunders *et al*., 2007; Avison and Pries-Heje, 2005). This anti-positivist position is one that cannot accept the clear distinction between black and white (facts) like the positivist, but believes that there are shades of grey (values) in between, and rather sees them interwoven. It is one which assumes that "access to reality (given or socially constructed) is only through social constructions such as language, consciousness, shared meanings, and instruments" (Myers, 2008). This approach uses a qualitative method of data collection and analysis, and is based on two beliefs (Dudovsky, 2015):

1. A perception that a reality exists between conscious minds which are based on meanings and understandings on social and experiential levels

2. That people cannot be separated from their knowledge, therefore there is a clear link between the researcher and research subject

Due to the nature of qualitative methods (discussed further in following sections), which can only be applied on small sample sizes, is time consuming and not void of the researcher's feelings, the Interpretivism stance is not suitable for the research. Apart from the fact that this approach does not allow for theory testing, findings from the study cannot be generalized, thus cannot achieve the objectives of this study.

3.2.3.2 Positivism

A positivist takes the stance of a natural scientist, and seeks the causes or evidences of occurrences, with little regard to the subjective state of the individual implies a Positivist stance (Hussey and Hussey, 1997). A positivist research is deductive in nature and includes surveys and fact finding questions of different kinds in which the researcher has control over the subjects or variables in question with closed questions. However, to obtain further details and opinions from the respondents, open ended questions are usually included.

This approach is usually done through quantitative research, hence the pseudo name, Quantitative Positivist Research (QPR), which is void of the researcher's feelings. QPR has been defined as "a set of methods and techniques that allow IS researchers to answer scholarly and pragmatic questions about the interaction of humans and artefacts such as computers, systems, and applications" (Avison and Pries-Heje, 2005). It is a statistically dependent, scientific method for interpreting reality.

The positivist approach was chosen for this study with careful consideration of the characteristics of the other different paradigms, the objectives, and type of study being reviewed. Investigations carried out on empirical data should typically be conducted in an observable environment with limited consideration to the subjective belief of the researcher, resulting in collecting factual data to support the hypothesis. Some other considerations made in deciding to adopt a Positivist stance for this study are highlighted below:

- Positivism takes a scientist view that knowledge comes from human experience, has an ontological perspective of the world as involving discrete, observable elements and events that interact in an observable, determined manner (Collins, 2010). Since this study is focused on investigating the influences of change management on user adoption of ERP systems, and tests the experiences of the users involved in a technology change process, adopting a positivist approach is justifiable.

- This study is in accordance with the deterministic, empirical, mechanistic and methodological aspects of science, which are underlying grounds for adopting positivism (Crowther and Lancaster 2008). The study aims to determine causal relationships between change management factors that lead to the resistance and potential sabotage of the new ERP systems. Hypotheses, which will be accepted or rejected through the application of appropriate research methods (discussed in the following sections), have also been developed. Therefore, a positivist approach is justified.

- Positivism uses deduction, which starts with a theory and ends with drawing an inference to support or revise the hypothesised model (Al-Jalahma, 2012). This is one of the objectives of this study. Also, since deduction has been established as an approach to be used by this study, positivist stance is justified.

- Due to the behaviour being investigated, a large sample size is required to ensure a representative sample size of the population for both internal and external validity. Structural Equation modelling technique which is suitable to analyse large data sets will be used to test the hypotheses and develop a causal model (this will be reviewed in the following sections). Referencing Straub *et al.* (2005), this kind of statistical measurements are characteristic of a positivist approach.

Despite being adopted as a dominant philosophical approach in information systems research by Orlikowski and Baroudi (1991), the positivist paradigm has some recorded shortcomings. One important shortcoming to note is that depending on the sample size, the data analysis will require the use of a sophisticated and highly analytical techniques which can show the causal relationship between the variables but will require a practicality test.

3.2.4 Types of Research Strategies

3.2.4.1 Surveys

Surveys are a methodical means of data collection from a sample size or population. These are usually used in quantitative studies which require data to be collected from large sample sizes. They are usually conducted through different methods such as interviews, questionnaires or published statistics, then analysed using statistical techniques (Gable, 1994). The point of using surveys is to determine "quantity" with regards to a behaviour efficiently, and quickly. To rationalize the use of survey for data collection, certain characteristics of the survey approach were considered.

The dominance of survey approach use cited in premier IS journals (MIS Quarterly, IS Research, Management Science, Journal of MIS), the popularity of surveys in technology adoption studies, and research where large data samples are required are considered. This is especially true for studies using Structural Equation Modelling for analysis (Hair *et al.*, 2010), which is used in this study and will be discussed in the followings sections. This study aims to determine what influences resistance as a behaviour among organizations that have implemented ERP systems. This will also involve data collection from a large sample size. Surveys are also commonly used when empirically testing hypothesis, the extent of the researchers is minimal, and the assumptions of the study are based on positivist, mainly quantitative methodologies (Creswell, 2008). The need to test several hypotheses within the model, and the generalisations of the findings justifies the use of a survey approach as opposed to case studies.

While surveys are strong on providing logical measures of reliability and validity, they fail to address possible bias in the selection of the respondents, and the responses of the participant based on their state of mind at that instance. This may lead to the researcher making naïve assumptions about the accuracy of the responses. It is difficult for the researcher to measure some variables that might be of interest due to the controlled nature of surveys (Gable, 1994; Hammond and Wellington, 2012). To mitigate this, open ended questions are included in questionnaires to determine the underlying meaning of the data.

Within a survey approach, data can be collected through different methods – interviews, face to face, mail or self-administered questionnaires. For this study, self-administered questionnaires are used for some of the following reasons:

- Self-administered questionnaires can measure numerous variables that are too cumbersome for other methods like interviews or mail, and are therefore more suitable for probability sampling. This study will be testing 45 variables as identified in the literature review, hence self-administered questionnaires will be the quickest method of survey.

- Considering the sample size and type of investigation, self-administered questionnaires were the most suitable method. This is because they allow many respondents (over 100) to be used, can be administered to all intended respondents simultaneously and cost effective (Ritchie and Guilder, 1994).

- When collecting sensitive information, it is important to assure the respondents' anonymity to ensure honest feedback. This justifies the use of self-administered questionnaires.

- Self-administered questionnaires reduce the researchers influence on the outcome of the research, which increases reliability, standardisation and uniformity of questions

- Data collection depends on the data analysis technique to be employed. In this study, the Structural Equation Modelling (SEM) will be considered (section 3.2.4.4). There is therefore a strong justification for the survey method. In the following sections, the data analysis techniques will be discussed.

3.2.4.2 Case Studies

Yin (1984) describes a case study as a group of methods that are usually associated with qualitative studies. Data collected from case study research are typically from a small number of organizations through in-depth interviews, observational and longitudinal studies. These kinds of studies seek to "go-deep" in understanding a phenomenon and make new discoveries. In contrast to quantitative research which uses the survey approach, the case study approach deals with a small sample size and the findings are not generalizable, replicable or controlled.

This is because this type of research deals with feelings and the researcher is part of the research subject. For these reasons, this approach will not be used for this study.

3.2.4.3 Action Research

Action research, developed by Collier (1945), refers to a specific way of understanding and managing the relationship between theory and practice. This approach requires the involvement of the researcher in the social system being studied, and is used by qualitative studies. It involves the researcher studying a small sample of organizations, using in-depth interviews and participant observation to collect data. In this kind of approach, the researcher is expected to use the findings to improve the organization participating in the research (Kock, 2004). This method does not test theories or variables to generalise findings. It is usually time consuming and expensive and even though it is aimed at integrating theory and practice, this study will not be employing this approach.

3.2.4.4 Data Analysis Techniques

Apart from the aims and objectives of the study, other intricacies need to be considered when analysing large data sets. There are many multivariate techniques that can be used to explore or confirm relationships among variables, or to compare groups. Some of these techniques include Factor Analysis, Multiple Regression, Multiple Correlation, Multiple Discriminant Analysis, Logistic Regression, Canonical Correlation, Multivariate Analysis of Variance and Covariance, Conjoint Analysis, Cluster Analysis and Structural Equation Modelling (SEM) (Pallant, 2013; Hair *et al.,* 2009).

Factor Analysis, uses a deduction technique in which the defined variables from the hypothesised model are reduced into a smaller set of factors. This is an independent technique in which there is no dependent variable and looks for the underlying structure of the data matrix with an aim to group together statements that are closely related into factor. In other words, carrying out a factor analysis “helps to reduce a vast number of variables to a meaningful, interpretable, and manageable set of factors” (Sekaran, 2003). This technique does not test hypotheses, or determine whether a data group significantly differs from the other (Pallant, 2013). It will not be used for this study, which aims to determine causal relationships between the variables. Even though there are two types of factor analysis – exploratory and confirmatory, these types are used within more complex techniques like the structural equation modelling that will be discussed in the following section

Multiple Linear Regression (MRL) assumes two variables, a dependent variable (adoption) and an independent set of variables (the factors generated from the factor analysis) that are cross tabulated with the aim of establishing key drivers. In other words, "multiple regression analysis is carried out to examine the simultaneous effects or associations of several independent variables on a dependent variable that is interval scaled" (Sekaran, 2003). It is suitable to use a MRL technique only when a single metric dependent variable is presumed to have relationships with two or more metric independent variables (Hair *et al.,* 2009). The main assumptions for MRL as described by (Anuar *et al.*, 2012) are as follows:

1. Proper specification of the model
2. The variables must have linear relationships
3. The data must be interval or near interval scaled, with limited range
4. Maintains the same relationship throughout the range of independent variables

However, meeting the strict assumptions of MRL is usually not practical. Because model construct relationships cannot be evaluated simultaneously, the evaluation must be performed sequentially. This means that MRL does not allow multiple interaction between multiple variables. The equation for MRL is shown below, where Y is the dependent variable, Beta are the parameter estimates, x is the independent variable

$$Y_i = \beta_0 + \beta_1 X_i + \varepsilon_i$$

This study requires a more statistical technique that will show the causal relationships and allow multiple paths between independent variables and the dependent variable. For this reason, Multiple Linear Regression will not be used for this study.

Structural Equation Modelling (SEM), like regression analysis, is a more advanced multivariate technique used to simultaneously predict multiple relationships of dependent and independent variables within a proposed hypothesised model. This means that it allows separate interactions for each of a set of dependent variables (Hair *et al.,* 2009), and makes it an extension of the linear models earlier discussed. SEMs are useful for constructing and testing models (usually causal models) and are characterised by two components;

1. Structural model or the path analysis that relates the dependent and independent variables pre-defined by the researcher.

2. Measurement model which enables the researcher to use several indicators for a single dependent or independent variable.

This research adopts the use of SEM for the following reasons:

1. SEM is suitable for theory testing, rather than theory building because it supports confirmatory rather than exploratory modelling. It usually begins with the proposed hypotheses, represents it as a model, operationalises the constructs of interest with a measurement model and then tests the model (Ratner, 2015). The use of SEM fir this study is justified because this is a deductive, positivist study with a large set of variables to be tested.
2. Embedded in SEM are some applications - Confirmatory Factor Analysis (CFA), Causal modelling or path analysis, second order factor analysis, covariance structure models, and correlation structure models (Anuar *et al.,* 2012). This makes the SEM a robust and technique suitable for this study.
3. Compared to MRL and FA which are simplistic, linear and do not show causal relationships, SEMs are complex, and has the capacity to estimate and test the relationships between Factors (Constructs). This better models the reality of the theory for practice. SEM also permits the use of multiple methods to represent constructs, thus addressing the problem caused by measure-specific errors because the researcher can establish the construct validity of the factors (Weston and Gore, 2006).

SEM experts agree on the six steps required for model testing. These steps are data collection, model specification, identification, estimation, evaluation and modification (Hoyle, 1995; Kaplan, 2000; Schumacker and Lomax, 2004; Hair et al, 2014). These steps will be discussed in more detail in the following chapter.

3.2.4.5 Summary

Having reviewed different methodologies considered for this study – quantitative vs qualitative or mixed methods, deductive vs inductive, positivist vs interpretivist, surveys vs case study or action research, and data analysis techniques, the methodology shown below has been established for this study. This chosen methodology and research methods will be discussed in detail in the next chapter.

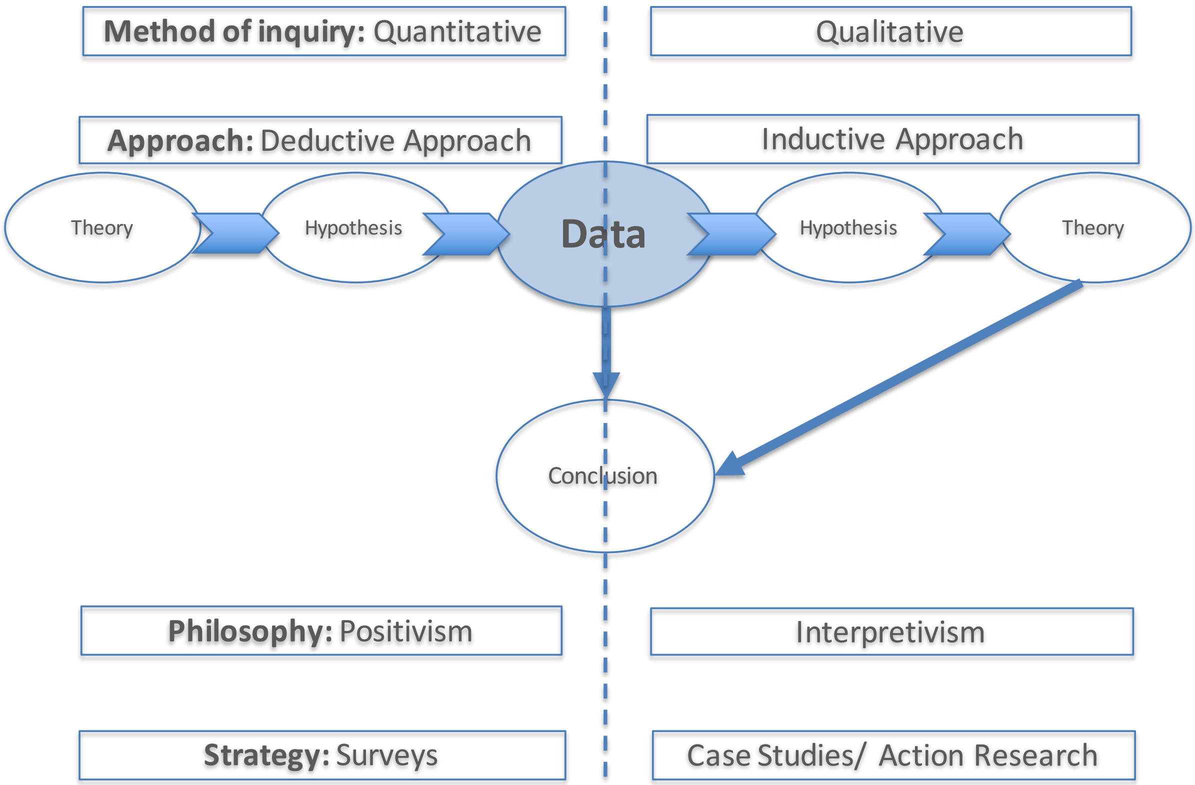


Figure 3.1: Summary of methodological approach

Chapter 4: Research Methodology and Design

4.1 Introduction

The choice of an appropriate research design has an important influence on the selection of the type of data collection method and sampling techniques for this study (Hair *et al.,* 2010). Specifying the overall guidance and framework of the way the data will be collected, analysed and interpreted, in such a manner that the researcher can draw inferences, is what forms the basis of a research design (Bryman and Bell, 2011). Because it is important to link the hypotheses/theory with the empirical data to make deductions, the research design should be a logical sequence of the decisions throughout the process of the research.

The preceding chapters have produced the variables and conceptual framework to be tested, reviewed the different methodologies and justified the use of the adopted methodology. This is still an incomplete framework for the research design as the data collection instruments, methods, sampling techniques and how the data will be analysed has not been discussed.

This chapter will focus on discussing the data collection methods, time, sampling, and data analysis used for this study.

4.2 Research Methods

4.2.1 Multi- method research

Quantitative methods are generally positivist, deductive and explanatory in nature, with emphasis on statistics to test a hypothesis or theory, and then determine a generalizable outcome. They are usually cross-sectional studies, which are carried out at a specific point in time. On the other hand, qualitative methods are usually interpretivist, inductive and exploratory in nature, seeking to understand a phenomenon in a longitudinal time frame. These are two distinct approaches used for different kinds of studies. However, to obtain a robust, integrated model that will be useful or practical, data was collected using a multi-method research approach. This method of data collection has been reported by Creswell (2003) to improve the efficiency, reliability and validity of the conceptual framework because it leverages on the complementary strengths of both quantitative and qualitative research. It is also useful in connecting theory and practice by using the quantitative methods to efficiently gather large data sets that can be analysed using the structural equation modelling, and then using qualitative interviews to confirm the practicality of the developed model using a subset from the same sample frame (David *et al*., 2015). Certain factors must be considered when planning for a mixed method research. There are four factors identified by Creswell (2009) and Morse (1991) as being critical to planning for this combination research – Weighting, Timing, Mixing and Theorizing. Table 4.1 below presents an outline of these factors and how they will be applied in this study.

Table 4.1: Mixed Method Research (Source: Adapted from Morse (1991); Althonayan (2013))

Weighting (Priority)	Timing (Approach)	Mixing (Integration)	Transforming (Theoretical perspective)
Equal	Simultaneous: QUAL + quan; OR QUAN + qual	At Data collection	Explicit
		At Data Analysis	
Qualitative	Sequential: QUAL quan	At Data Interpretation	
Quantitative	Sequential : QUAN qual	With some combination	Implicit

Weighting - The weighting is determined by the objectives of the study and what the researcher seeks to emphasize. This drives the decision on how much priority is given to each research method, and what it will be used for (either explanatory or confirmatory). The weightings between the two methods can either be equal, or skewed towards quantitative or qualitative. Taking the aim, objectives and methodological review into consideration, it has been established that this study will adopt a quantitative, deductive, positivist approach. Based on this, priority will be given to the quantitative method as the predominant method of inquiry. The weighting will therefore be skewed towards quantitative method.

Timing – When using a multi- method approach, it is important to consider in which phase to use a quantitative or qualitative research for data collection, i.e. if the data from both methods will be collected at the same time (concurrently) or in phases (sequentially), and which should come first. Data collection for this study will be sequential and carried out in phases.

In the first phase, the required data for testing the hypothesised framework will be collected using quantitative data collection methods (self-administered questionnaires). The data will be analysed and a causal model developed using Structural Equation Modelling. This completes the explanatory phase.

In the second phase, a qualitative data collection instrument (interviews) is conducted on a sample size from the same sample frame to test the developed model for effectiveness and practicality with the managers of the organizations from which the data was collected. This completes the confirmatory phase.

Mixing – This involves the "when" and "how" the methods will be mixed. The mixing of the methods can either be *connected* - where both data sets are kept separate but connected, or *integrated* – where both data sets are merged, or embedded. Seeing that the qualitative research instrument will only be used at the end of the study to confirm the developed model being proposed, the data sets will be kept separate but connected.

Transforming – This is necessary to define the researcher's theories, frameworks and "hunches" explicitly, implicitly, or not mention them at all. When adopting a mixed research, theories are usually found at the beginning to determine what kinds of questions to ask respondents, define who participates, data collection method and the implications of the findings. As this is a predominantly quantitative, deductive, positivist study, whose finding will be generalised, the framework of the study will be explicitly defined after the confirmatory phase.

4.3 Data collection methods

Having defined the research methods that will be used, the following sections will detail the data collection methods as outlined below.

4.3.1 Sampling techniques

The population, which is the universe of units (people) from which the sample that will be under investigation is selected, is from Nigerian organizations that have in the past 3 years invested an ERP system. These organizations were chosen because they are the market leaders in their various sectors and fore runners in contributing to the GDP of the Nigeria economy. This is where the sample will be selected.

4.3.2 Unit of Analysis

Sekaran (2003) noted that there are five different units of analysis that can be chosen from during a study. They can be individuals, dyads, groups, organizations, or culture. Since this study is focused on the end users, the unit of analysis is the user of the ERP system, which means each respondent's response is treated as an individual data source (Sekaran, 2003).

4.3.3 Sample Frame

Based on the research questions and objectives, the *adoption* of the newly introduced ERP system within an organization has been established as the dependent variable. The target population of this research are employees from three of the top contributing industries to the Nigerian economy. These industries – Oil and Gas, Telecommunications and Banking, also have the highest number of ERP users, hence an obvious choice for the sample frame. The organizations that agreed to participate in the research all had ERP systems that had been implemented in the last three years with failed adoption at different stages. The respondents were selected based on relevance to the nature of the research i.e. they were users of the ERP system, and the number of years spent at the organization i.e. they were part of the change process. To simplify the stratification of the respondents, all employees had an equal chance to fill the questionnaires, however, not all employees were users of the ERP system. To address this, the questionnaire was designed in such a way that it eliminates employees that were not part of the ERP change process, or are not current ERP users. In addition, the organizations and participants must have given prior consent to participate in the survey, with an option to discontinue at their discretion. A total of six organizations were selected. For confidentiality, these organizations will be referred to as Company A, Company B, Company C, Company D, Company E and Company F.

4.3.3.1 Business Case for ERP Implementation

The surveyed organizations all had legacy systems and applications ranging from SAGE, DacEasy, ACCPAC, to PEERS for Payroll. The decision to make these investments were based on the need for integrating important parts of the business such as product planning, advanced procurement (purchasing of office supplies, assets, products constituents and additives), interacting with suppliers, providing customer service, tracking orders and staff productivity, CRM, project, order management, HRM, understanding sales patterns, managing supply chain activities, recruitment and managing financial metrics. Some of the documented benefits that were expected include:

- Improved efficiency and flexibility
- Facilitating growth strategies
- Reducing costs due to inefficiencies
- Improving customer service
- Improved data availability
- Higher levels of transparency in business and financial operations
- More informed management decisions
- Potential reduction in operational and staff costs

In selecting the ERP system, some main cost elements that were considered included Hardware and connectivity, Software license and updates, and Implementation and Training. Forecasting an average timeline of 18 months for the implementation, some key risk areas that were assessed include:

- High staff turnover
- High levels of customisation and the selection of the implementation team
- No proven execution methodology / framework to follow
- Finding qualified consultants
- Finding replacement for consultants where they fail to live up to expectations

In terms of the allocations for the main cost elements, Company A allotted only 5% of the total budget to change management, compared to the recommended 15% (Jacoby, 2015).

4.3.4 Sample Size

This study follows the most common approaches adopted in determining the statistical power of relationships between the measured variables (Hair *et al.,* 2014). In calculating an appropriate sample size, the type of data analysis technique was taken into consideration. For the SEM technique to be used for this study, Tabachnick and Fidell (2007) suggest that the number of independent variables being measured should determine the sample size, using the formula:

"$N > 50 + 8m$: where N= Sample Size, m = number of independent variables"

From the conceptual framework developed in chapter 3, 45 variables will be tested. Computing the sample size based on the formula above, N > 50 + 8(45) implies that N > 410. This means that the sample size for this study must be at least 410. However, William (2010) and Hair *et al.* (2009) recommend that for a SEM study, the sample size should be greater than or equal to 500. For this reason, the number of respondents for this study is targeted at over 500.

4.3.5 Type of sampling

Collecting data from the total population in a survey method is sometimes impractical, hence a sample, which is the subset or a fraction of the total population that is under investigation, is selected. The concept of sampling is intrinsic to survey research, as this is where the planning of the fieldwork begins. Due to the large amount of data associated with survey research, it is economical to select a sample of the total population being studied. The technique used to select a sample is also critical not only to the internal, but also the external validity of the survey (Bryman, 2010). The sample selected must be representative of the larger population to determine generalization.

Sampling methods can either be probability or representative sampling, and non-probability or convenience sampling (Bryman, 2010). Probability sampling involves a random selection of samples so that each unit within the population has a chance of being selected. This study employed a non-probability, with the aim of keeping sampling errors to a minimum. Non-probability on the other hand, does not allow the selection of samples and suggests that some units within the population are more likely to be selected than others. The central characteristics of a sample can be established based on different criteria such as the research approach, data analysis technique, population clusters, data availability or restriction and probability.

The sample frame used are the employees of organizations that have undergone an ERP change process in the last three years. The employees being surveyed must have been part of the change process. To achieve this, the questionnaire must be designed in such a way that it eliminates employees that were not part of the ERP change process. In addition, the organizations and participants must have given prior consent to participate in the survey, with an option to discontinue at their discretion. Based on the explanation above, the use of a non-probability or convenience sampling method is justified. The investigation of this study is carried out in a natural working environment with minimal interference from the researcher (Sekaran, 2003). The questionnaires were handed out to the employees of the organization ensuring that the researcher only clarified questions at the users' request. The questionnaires were distributed to all employees of the organizations who were identified by their management as users of the ERP system. The only excluded employees were the CEOs and the IT managers who championed the change. This was as a request from the management of the organizations as they considered this exercise a scorecard for their performance.

4.3.6 Questionnaire Design

Given that the use of SEM has been established, designing a questionnaire must be done using the Likert scale. The survey approach using self-administered questionnaires was justified in the methodological review chapter. This section explains the questionnaire design, measurement scale used, pre-testing the questionnaire and piloting.

In designing an effective questionnaire, what is being measured (research objective), the type of measurement scale and generation of items need to be taken into consideration (Rattray and Jones, 2007). Using the 45 independent variables, information about the importance of these factors compared to how they were addressed by the organization will be gathered from the respondents' point of view. To ensure best practice in designing the questionnaire, it was ensured that:

- The questionnaire began with objectives of the research
- Related questions were grouped together and were without bias
- The questions were specific and did not include any shorthand or jargon
- Questions were not worded in a negative way
- There were no hypothetical questions

The questionnaire contained a cover page and a brief explanation of the objectives of the study, and the definition of an ERP system. It also indicated what ERP system was used in the organization to avoid any confusion. The questionnaire was segmented into two parts – screener questions and main questions.

Part 1 - Screener Questions: Demographics, Eligibility questions

Screener questions are necessary to determine whether respondents have the required characteristics to make them eligible for the study. The screener questions also gather information about the demographics of the respondents that may be required during analysis.

For this study, information was required only from respondents that were part of the change process and are current users of the ERP system. To achieve this, the questionnaire was designed in such a way that it eliminated employees that were not part of the ERP change process. The screener questions particularly asked questions about how long the respondents have worked in the organization, if the respondents were part of the change process, and if they are current users of the ERP system. At this stage, a respondent who is not eligible is instructed to discontinue filling the questionnaire. The screener questions outline is presented below:

Section A: Questions 1-5: Demographics, Questions 7-9: Eligibility questions

At this stage, a respondent who currently uses the ERP system and was part of the change process continues to fill the questionnaires, while those who answered No terminate. Incomplete??

Part 2 – Main Questions: User Perceptions on variables

The second section of the questionnaire was designed to measure the perception of the users. These sections each consisting of sets of variables to measure the user's perception of the system quality, information quality, individual impact, organizational impacts, and change management influences including communication, motivation, commitment, trust, support. This section contains closed and open ended questions.

It was also used for generating mean scores that would be used for the gap analysis between perception and reality. The questionnaire therefore measured the users' expectations (Importance) and how these factors were addressed by their organizations (Extent Addressed). As a guide, the Importance rating Likert scale rated each attribute between 1 and 5, where 1 was Very Unimportant and 5 was Very Important. Likewise, the performance rating was based on a similar 5-point scale, with 1 being Very Poorly Addressed and 5 being Addressed Exceptionally well for all the attributes. Although closed questions were considered the best suitable, an open-ended question was added at the end of the questionnaire to give the respondents an opportunity and freedom to write what they felt was important to them.

The main questions outline is presented below:

Section B: Instructions to fill section

Question S1- S6: Measures the importance of the variables associated with the System Quality construct compared to how these variables were addressed by the organization during the implementation of the ERP change process.

Questions C1 – C9: Measures the importance of the variables associated with the Communication construct compared to how these variables were addressed by the organization before, during and post implementation of the ERP change process.

Questions P1- P6: Measures the importance and the extent addressed of the variables that impact the productivity and performance of the users.

Questions O1-O4: Measures the organizational impact of the associated variables.

Questions T1 – T9: Measures training and education

Questions M1 – M12: Measures motivational factors that lead to resistance

Questions CT1 – CT3: Measures commitment and Trust

Section C: Questions 11 - 14 Contains one open-ended question and 3 closed questions measuring how motivated the users are in using the adoption of the ERP system.

4.4 Pilot Testing and Validity

The goal of pre-testing or piloting a questionnaire is to ensure that the questions are worded correctly, follow a logical flow, are understood by the respondents, the instructions are clear and adequate. It also ensures that any additional questions are included or unnecessary ones deleted (Sudman and Bradburn, 1973; Saunders *et al.*, 2007).

In this research, a pilot test was conducted to identify and correct any mistakes and omissions. For this pilot test, a total of 30 people was selected across the sample frame. The 30 ERP users from the population were chosen randomly. Being multinationals, the nationality of the respondents were a mix of Nigerians and non-Nigerians. Upon analysis, it was noticed that only 3 out of the respondents agreed to fill in their job titles in the questionnaire because they felt the question might give their anonymity away. Also, some of the questions were considered ambiguous and required further clarification. There were questions considered not relevant which increased the length and time to fill in the questionnaires. To address these issues, some questions were deleted and others worded differently. Once amended, the questionnaires went through a second pilot. Overall, the pilot test showed an estimate of how long it would take respondents to complete each questionnaire and helped check whether all the instructions and questions were concise and clear. In addition, the variables were reduced from 49 to 45 based on the feedback. This provided face validity.

4.5 Reliability

Reliability refers "to the consistency of a measuring instrument" (Heyes *et al.,* 1986). The result from the pilot study should not only be able to test the validity of the questionnaire but also the reliability (Pallant, 2001). The scale of alpha should ideally be above 0.7 (Ghauri and Gronhaug, 2002). In this study, using all 45 variables, the Cronbach's Alpha Coefficient was 0.970, which indicates that the measuring instrument (questionnaire) has a good internal consistency that makes it reliable.

Table 4.2: Cronbach's Alpha Reliability Test

Cronbach's Alpha	No of Items
.952	45

4.6 Data Analysis

For quantitative studies with large datasets aimed at measuring causal relationships amongst variables, adopting a Structural Equation Model (SEM) technique for data analysis was justified in the methodological review chapter. To develop a SEM that will explain the cause and effect of the multiple relationships, a theoretical measurement model is to be developed using a Confirmatory Factor Analysis (CFA). As a pre-requisite for a CFA, several steps need to be checked to ensure the suitability of the dataset. The process begins with checking for missing data, outliers, a normal distribution, the skewness, kurtosis, and finally the degree of multicollinearity present between the variables. Once these steps have been established, the researcher must then decide what factor reduction technique to adopt.

4.7 Data Analysis Technique - Structural Equation Modelling (SEM)

There are various data analysis techniques such as the Factor Analysis, Multiple Regression, Multiple Correlation, Multiple Discriminant Analysis, Logistic Regression, Canonical Correlation, Multivariate Analysis of Variance and Covariance, Conjoint Analysis, Cluster Analysis and Structural Equation Modelling (SEM) (see section 3.2.4.4). Based on comparisons with these other techniques, SEM has been selected as the data analysis technique for this study. SEM is employed to establish multiple non-linear relationships amongst the latent variables from the measurement model, and defining the explanatory power of their cause and effects on the dependent variable (Su and Yang, 2010). There have been calls to apply caution when inferring causality from structural models; however, Pearl (2009) explains causality using the statement "*Y is a cause of Z if we can change Z by manipulating Y*". This statement highlights the illustrative power of SEMs and encapsulates the aim of this study. SEM is a robust technique whose applications includes path analysis or causal modelling, Confirmatory Factor Analysis (CFA), Regression models, correlation and covariance structure models as special cases which will be useful in performing the technique. The SEM technique as an approach, tests the relationships and multiple pathways amongst all latent constructs specified in the hypothesised framework. It establishes the cause and effect of each construct, thereby suitable for theory testing and confirmation (Tabachnick and Fidell, 2000).

SEM based studies provide flexibility to perform: "(i)model relationships among multiple predictor and criterion variables, (ii) construct unobservable latent variables, (iii) model errors in measurements for observed variables and (d) statistically test a priori substantive / theoretical and measurement assumptions against empirical data (i.e. confirmatory analysis)" (Chin, 1998). One other feature that makes SEM a more comprehensive technique for this study is its ability to analyse all paths simultaneously, testing all observed and latent variables. This ability to analyse constructs simultaneously is what differentiates SEM from older regression models like ANOVA, MANOVA, and linear regression. These first-generation regression models are only capable of analysing one set of independent and dependent variables at a time (Gefen *et al*., 2000).

In performing the SEM technique, three main steps are required (i) Exploratory Factor Analysis (EFA) (ii) assessing the measurement model, and (iii) specifying the structural model (path analysis) (Nunkoo *et al.,* 2013). The combined analysis of the two steps in (ii) and (iii) allows the hypothesis testing of the factor analysis and the measurement errors of the observed variables in one single operation, while the measurement model defines the latent variables (or constructs) as loaded by the researcher, and assigns observable variables to each. The three steps necessary for the SEM technique are described below:

(i) Exploratory Factor Analysis (EFA) – To identify the variables associated with each of the defined constructs, an EFA is conducted. Preliminary data preparation is mandatory process to ensure data suitability. This involves (i) data screening, (ii) testing the dataset for normal distribution, (iii) measuring the degree of multicollinearity of the dataset, (iv) testing for the consistency of the data using Cronbach's Alpha Coefficient, (v) comparing the validity and fit of the responses collected using the Bartlett's Test of Sphericity, and (vi) factor extraction. The EFA is conducted using the SPSS statistical package.

(ii) Assessing measurement model – Based on the constructs derived from the EFA, the hypothesized measurement model is assessed using a Confirmatory Factor Analysis (CFA). This determines the extent to which the derived constructs are correlated (Brown, 2006). To achieve this, a construct validity, which measures the degree to which the variables represent the same theoretical concept that are meant to measure, is conducted (Hair *et al.,* 2014). Also, a Goodness-of-Fit (GoF) indices to evaluate the overall fit of the measurement model is conducted. The CFA is conducted using the statistical AMOS to develop the measurement model.

(iii) Specifying the structural model – Towards building the theory, the structural relationships between constructs in the hypothesised model need to be defined using a path analysis. While CFA tests the correlations amongst constructs, the structural model tests the degree of the relationships amongst the constructs. Based on the type of relationships between the constructs, the CFA model is transformed to produce a structural model specification used to test the hypothesized model. This will further explain the degree to which a construct affects another construct in the adoption of an ERP system. It also highlights the gap between the factors the users consider as important for an ERP to be adopted and how these factors were addressed by their organizations.

Chapter 5 – Findings, Analysis and Discussion

5.1 Introduction

This chapter presents the results from the quantitative and qualitative data analysis. It implements the use of SEM justified in the methodology chapter, to formulate the theoretical basis for this study. The data technique applications and findings from the SEM analysis of the hypothesized model proposed in the literature review are presented as follows:

In the first section, pre-requisite tests for an EFA are conducted. These preliminary tests use descriptive statistics to screen for missing data and outliers, testing for skewness, kurtosis, normality, degree of multicollinearity and reliability. Once the data suitability is validated, the EFA is conducted and the measurement model developed.

In the second section, the proposed Measurement Model validation is conducted using a Confirmatory Factor Analysis (CFA).

In the third section, SEM Analysis (Path Analysis) is conducted. This confirms the structural and causal relationships between the derived Factors. The Measurement Model, CFA and SEM use the Analysis of Moment Structure (AMOS).

In the last section, the statistical structural model is validated by conducting qualitative interviews within a subset of the sample frame to confirm its practicality. The chapter ends with a summary

5.2 Section One: Exploratory Factor Analysis (EFA)

The following section presents the steps carried out in ensuring the data is suitable for EFA. To validate the suitability or adequacy of the dataset for EFA, and to confirm a patterned relationship amongst the variables, the following preliminary tests were conducted as suggested by Tabachnick and Fidell (2007), and Hair *et al.,* (2014)

5.2.1 Data Screening - Sample Size, Missing Data and Outliers

5.2.1.1 Sample Size

Based on the aims and objectives of this study, a quantitative approach was adopted. A non-probability non-convenience sampling technique was used to collect data from the sample frame as discussed in the methodology chapter. The sample for the study were users of organizations who had undergone an ERP change in the last 3 years. The users had to be part of the change process and current users of the ERP systems. With no financial rewards or incentives, respondent participation in the survey was voluntary. Also, the sample size was calculated to be 410 which was exceeded, N=690, this being necessary to develop a good theoretical model.

Due to its ability to represent a large population, low cost and convenient data gathering, an electronic survey was initially utilised for data collection. However, because most of the respondents were professionals with busy schedules, the response rate was low within the specified time frame and most of the questionnaires came back incomplete. To improve the rate of timely responses, the researcher made the decision to administer the rest of the questionnaires manually. This greatly improved the response rate and the number of completed responses. To allow for unreturned and uncompleted questionnaires, a total of 764 questionnaires were administered, with 690 returned.

5.2.1.2 Subject to Item Ratio

There are varying postulations as to the number of cases required per variable denoted as N: p, where N is the Sample Size and p is the number of variables (Hogarty *et al.,* 2006). To consider factors as stable, Yong and Pearce (2013) suggest that a subject to item ratio should be at least 10:1, while Hair *et al*. (2014) recommend as high as 20:1. However, depending on the factor loading of the variables (a measure of how much a variable contributes to the factor), a relatively smaller sample size can be used. This study had N=690 indicating ~15:1 subject to item ratio.

5.2.1.3 Missing Data

Screening the data collected identified some missing data in the returned questionnaires. Out of the 690 returned questionnaires, a total of 72 cases were found with missing data. An assessment of the missing data showed that the questionnaires were not completed because the users were not core users of the ERP system, were not part of the change process, or were unavailable to complete some questions.

The missing data represents 10.4% of data item. Due to the small number, the missing data was not repaired. Instead, the Exclude Cases Listwise option was adopted, where the respondents with missing data were deleted (Pallant, 2010). A total of 618 questionnaires were usable after data cleaning.

5.2.1.4 Outliers

Hair *et al.* (2014) describe outliers as "observations with a unique combination of characteristics identifiable as distinctly different from the other observations". They can have a marked effect of any type empirical analysis that deviate the statistics and have an impact on Structural Equation Model (Tabachnick and Fidell, 2007).

Two outliers were discovered as the values were extreme compared to the rest of the data (s2, and T10). Before deciding on the treatment of these outliers, the data was checked to ensure that they were not due to data entry mistakes. Since there were only two observed cases which had a standard deviation close to zero, they were removed from the data set and were not used in further analysis. After data screening, 616 cases were used for further analysis (N=616).

5.2.2 Test for Normality

A fundamental requirement of SEM is that the data collected adheres to normal distribution, hence it is necessary to conduct a test for normality. In general, the effects of non-normality on Maximum likelihood based results depend on its extent; the greater the non-normality, the greater the impact on reliability and validity of the results. Therefore, the distribution of the observed variables should be assessed prior to analysis to make an informed decision concerning the estimation method.

Two common indices of normality are typically used to evaluate the distribution as suggested by Pallant (2010). The Skewness value indicates the balance or equilibrium of the distribution, providing information on whether a distribution is more skewed to one side than the other. For instance, should the distribution be positively skewed, then a positive relationship can be inferred. The other indices are the Kurtosis, which indicates how peaked or flat the distribution is. To calculate the statistic value (z) for skewness and kurtosis, the following formulae were used:

$$z_{\text{skewness}} = \frac{\text{skewness}}{\sqrt{\frac{6}{N}}} \qquad z_{\text{kurtosis}} = \frac{\text{kurtosis}}{\sqrt{\frac{24}{N}}}$$

To assume a multivariate normality, the critical value for z, which is equivalent to Skewness and Kurtosis values divided by their standard error, should fall within the recommended critical value of >+2.58, with significance level = 0.1 (Tabachnick and Fidell, 2007; Hair *et al.,* 2014). All the tested variables in the data set had a critical value C.R.>+2.58, hence the data is normally distributed (See Appendix C1).

5.2.3 Test for Multivariate Collinearity (Multicollinearity)

Multicollinearity exists when two or more predictor or independent variables are highly correlated (>0.9), leading to potential issues with the model estimates, unreliable statistical inference, significance levels, confidence intervals, standard errors and incorrect t-tests of the parameters being measured. However, some degree of multicollinearity always exists in most datasets. What is important is not entirely the absence or presence of multicollinearity, but the degree of the multicollinearity in a sample i.e. we do not "test for multicollinearity" but can measure its degree in any sample (Yu *et al.,* 2015).

In detecting the presence and measuring the degree of multicollinearity in a dataset, three methods were used based on the number of regressors i.e. to reduce the possibility of one variable being a surrogate to another (Yu *et al.,* 2015).

1. Multicollinearity can be detected by examining the bivariate relationship that exists between the predictors using the pairwise Pearson Correlations, where r>0.90 indicates a high degree of multicollinearity. However, because this approach does not consider the underlying multivariate relationships of the data, it cannot sufficiently diagnose the presence of multicollinearity when there are more than two regressors in large data sets. It causes redundant information that can be eliminated using a further technique.
2. Tolerance: this is the direct inverse of multicollinearity and is measured by calculating the R^2 value for each independent variable explained by other independent variables in the regression model. Next step is calculating the tolerance as $1-R^2$. For an acceptable degree of multicollinearity, the value of tolerance should be > 0.
3. The degree of multicollinearity can also be measured using the VIF (Variance inflation Factor) of a predictor (Bollen, 1989). The VIF is calculated as the inverse of tolerance with a suggested cut-off value of 10 (Hair *et al.,* 2014).

Given that one test is not sufficient to measure the degree of multicollinearity, all three techniques were used. In this study the value of R^2 for each variable is <0.90 (average of r~0.6), highlighting a patterned relationship among the variables with no high correlations. Tolerance values were greater than 0.1 and VIF values were less than 3.0. This indicates no significant level of multicollinearity. The table 5.1 shows the results from a regression method used in determining multicollinearity between the variables (S1 – C4) in the dataset. The variables (data types) from the data set is interval, hence the regression method used in determining the degree of multicollinearity.

Table 5.1: Test for degree of Multicollinearity

Statistic	S1	S2	S3	S4	S5	S6	C1	C2	C3	C4
R^2	0.657	0.662	0.661	0.625	0.644	0.678	0.558	0.627	0.537	0.565
Tolerance	0.343	0.338	0.339	0.375	0.356	0.322	0.442	0.373	0.463	0.435
VIF	2.913	2.96	2.95	2.664	2.812	3.101	2.264	2.678	2.159	2.297
Statistic	C5	C6	C7	C8	C9	P1	P2	P3	P4	P5
R^2	0.655	0.627	0.668	0.657	0.587	0.518	0.509	0.591	0.545	0.572
Tolerance	0.345	0.373	0.332	0.343	0.413	0.482	0.491	0.409	0.455	0.428
VIF	2.897	2.684	3.009	2.911	2.42	2.076	2.039	2.442	2.199	2.339
Statistic	P6	O1	O2	O3	O4	T1	T2	T3	T4	T9
R^2	0.59	0.523	0.537	0.529	0.489	0.462	0.619	0.682	0.66	0.667
Tolerance	0.41	0.477	0.463	0.471	0.511	0.538	0.381	0.318	0.34	0.333
VIF	2.439	2.097	2.159	2.124	1.955	1.859	2.626	3.141	2.945	3
Statistic	T10	M2	M3	M4	M5	M6	M7	M8	M9	M10
R^2	0.561	0.366	0.526	0.536	0.442	0.312	0.5	0.509	0.598	0.656
Tolerance	0.439	0.634	0.474	0.464	0.558	0.688	0.5	0.491	0.402	0.344
VIF	2.277	1.577	2.11	2.156	1.792	1.452	1.999	2.037	2.49	2.907
Statistic	M11	M12	CT1	CT2	CT3					
R^2	0.711	0.674	0.626	0.618	0.476					
Tolerance	0.289	0.326	0.374	0.382	0.524					
VIF	3.461	3.067	2.674	2.617	1.909					

5.2.4 Reliability – Cronbach's Alpha

To test the consistency of the data, the Cronbach's Alpha coefficient (α) method was applied. Internal consistency should be determined before a test can be employed for research or examination purposes to ensure validity (Moshen and Reg, 2011). The scale of Alpha should ideally be above 0.7 (Ghauri and Gronhaug, 2002).

In this study, testing all 45 variables, the Cronbach's Alpha Coefficient was 0.952, indicating that the measuring instrument has good internal consistency, and therefore, is reliable.

Table 5.2: Reliability statistics – Cronbach's Alpha Coefficient

Cronbach's Alpha	No of Items
.952	45

5.2.5 Bartlett's Test of Sphericity (BTS) / Kaiser-Meyer-Olkin(KMO) measure of Sampling Adequacy

BTS checks the case to variable ratio. This test also compares the validity and fit of the responses collected to the research problem. The Bartlett's Test of Sphericity significance must be less than 0.05 ($p<0.05$) for EFA to be used. The KMO index which ranges from 0 to 1, is recommended to be at least 0.5 to be considered suitable for EFA to be performed on the data (Hair *et al.,* 2014). Based on this, the values for Bartlett's test is 0.000, with KMO of 0.950, satisfying the conditions presented to validate the suitability of the dataset

Table 5.3: KMO/Bartlett's test

Kaiser-Meyer-Olkin Measure of Sampling Adequacy		.950
Bartlett's Test of Sphericity	Approx. Chi-Square	12316.224
	df	455
	Sig.	0.000

5.2.6 Factor Extraction Method

Unweighted Least Squares, Generalised Least squares, Principal components, maximum likelihood, principal axis factoring, image factoring and alpha factoring are the various extraction methods available when performing an EFA. For this study, the two commonly used methods in EFA based on different assumptions which yields different estimates were considered. Per (Winter and Dodou, 2011), *Principal Axis Factoring (PAF)* - estimates factor loadings using a least-squares estimation of the common factor model. This method extracts factors from the original correlation matrix whose correlation coefficients are then iterated to estimate new communalities until the changes made satisfy the convergence criteria for extraction. It is about the error type and reduces Ordinary Least Squares of the residual matrix.

Maximum Likelihood Factor Analysis (MLFA) – based on the assumption that the sample being used is from a normally distributed multivariate dataset, this method of extraction produces estimates of parameters that have the highest likelihood to have produced the observed correlation matrix. These correlations are then weighted by the inverse of the exclusivity of the variables, using an iterative algorithm.

In comparing their properties, the MLFA extraction method was adopted for this study for the following reasons:

- Even though the PAF performs better at recovering weak factors (i.e. factors with weak loadings), the MLFA is more asymptotically efficient (Winter and Dodou, 2011).
- In addition, the MLFA uses a multivariate normally distributed sample, and takes special account of the common variance (Hair *et al.,* 2006)
- ML is more useful for confirmatory factor analysis and structural equation modelling.

5.2.7 Factor Extraction Criteria

In determining Factor Extraction, the Kaisers rule (where eigenvalue>1)/ total variance and the scree plot test were applied to check the number of significant factors. This satisfies the suggestions made to use multiple criteria for data extraction (Costello and Osborne, 2005). The Kaiser's criterion is reliable when:

1. there are less than 30 variables with the average extracted communalities at least more than 0.70, or
2. the sample size is greater than 250 with the averaged extracted communalities equal or greater than 0.60 (Field, 2009),

For this study, there were 5 variables with the average extracted communalities more than 0.70. Also, the averaged extracted communalities were greater that 0.60, indicating that the Kaiser's criterion is reliable.

Scree plot – shows the plot of Eigen values against the components. The point of inflection/ elbow point of a scree test indicates the total number of factors with the actual loadings for the data. The point of inflection for this study is at 6, indicating that the data has 6 factors.

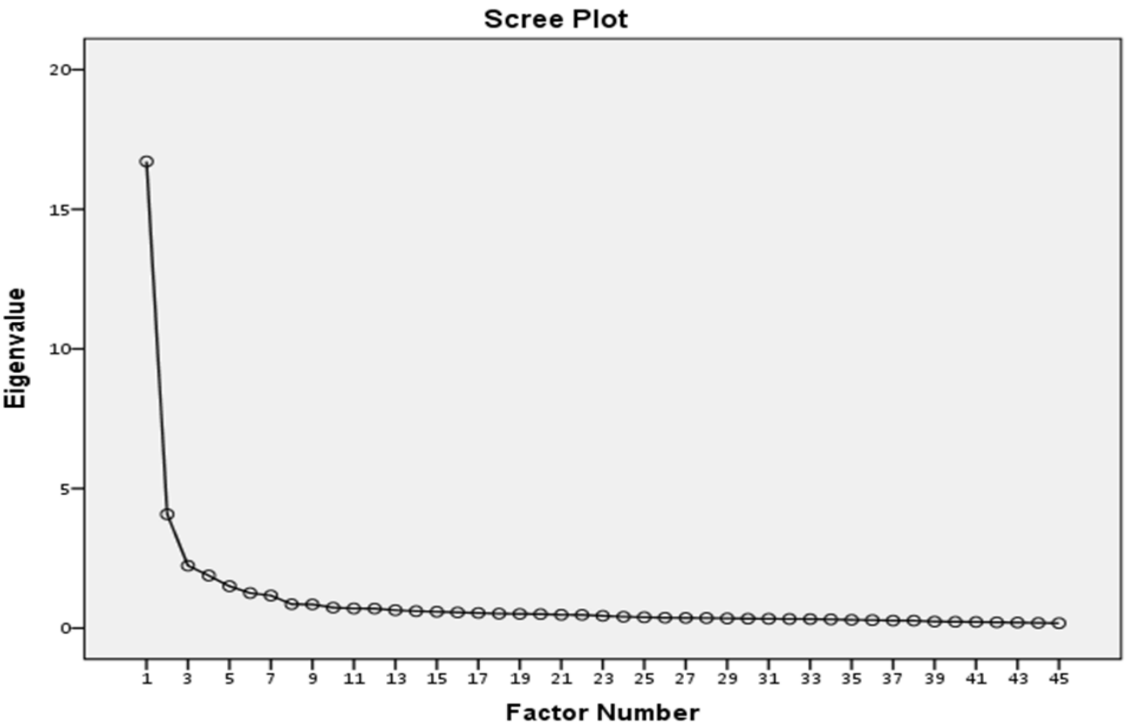


Figure 5.1: SPSS Output for Scree Plot

5.2.8 Results from Exploratory Factor Analysis (EFA)

The data has been established as suitable for an EFA. Using an extraction method of Maximum Likelihood, a Varimax orthogonal rotational method and a factor loading cut-from 0.6 (Hair et al, 2014), the factor analysis was run. A total of six Factors were produced as follows: Trust (T), Resistance (R), Communication and Engagement (CE), Organizational Benefits (OB), System Qualities (SQ) and Training (TR).

Table 5.4: Total Variance Explained

Total Variance Explained									
	Initial Eigenvalues			Extraction Sums of Squared			Rotation Sums of Squared Loading		
Factor	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
Trust	12.414	40.044	40.044	4.328	13.960	13.960	5.347	17.249	17.249
Resistance	3.381	10.905	50.949	8.874	28.625	42.585	3.773	12.171	29.420
Organisational benefits	1.884	6.076	57.026	2.959	9.546	52.131	3.264	10.528	39.949
Communication & Engagement	1.386	4.470	61.496	1.490	4.805	56.936	2.571	8.292	48.241
System Qualities	1.257	4.056	65.552	1.012	3.265	60.202	2.475	7.983	56.225
Training	1.015	3.275	68.827	.655	2.112	62.314	1.673	5.397	61.622

Table 5.5: EFA Rotated Component Matrix

Variables		Trust (T)	Resistance (R)	Organisational Benefits (OB)	Communication & Engagement (CE)	System Qualities (SQ)	Training (TR)
Trust communication content	CT1	.943					
Trust communication process	CT2	.657					
Fear of not being able to change	M11		.872				
Mistakes with consequence	M12		.840				
Not adjusting to new system	M10		.807				
Habit	M9		.756				
Job loss	M8		.628				
Increased capacity	O2			.782			
Reduced Cost	O3			.729			
Increased productivity	O1			.697			
Feedback and engagement	C5				.754		
Open and honest communication	C6				.664		
user involvement	C4				.597		
Meets user requirements	S3					.748	
Data Reporting by system	S2					.744	
Ease of Use	S1					.734	
Data accuracy	S6					.731	
Timely reporting	S5					.705	
Ease of learning	S4					.677	
Training after implementation	T4						.669
Training before implementation	T2						.656
Training during implementation	T3						.653
Adequate support from ERP trainers	T9						.584

5.2.9 Summary of EFA Results

In this section, the dataset was checked for suitability and an exploratory factor analysis (EFA) was conducted to identify the variables/attributes associated with each of these constructs. The initial 45 variables produced six constructs. These constructs account for 61.49% of the covariance among the variables, and measure Training (TR), System Quality (SQ), Communication and Engagement (CE), Resistance (R), Organizational Benefits (OB) and Trust (T) respectively. The 6-factor solution satisfy the measures of goodness of fit criteria: (1) KMO value of 0.958 (2) Percentage of total variance accounted for 61.49% for the rotated solution (3) Factor Pattern is clear for all 6 factors.

At this stage of the SEM process, a hypothesised measurement model needs to be developed to determine if these constructs have a direct/indirect impact on the factor structures. This will be detailed in the following section

5.3 Section Two: Confirmatory Factor Analysis (CFA)

Data analysis of the hypothesised model using Structural Equation Modelling (SEM). In this section of the SEM analysis process, two steps were followed: the first step is developing and validating a Measurement Model of sets of constructs (latent variables) using CFA (Confirmatory Factor Analysis). The second step evaluates structural model and tests hypothesized relationships between sets of constructs using SEM (Structured Equation Modelling).

5.3.1 Validating the Measurement Model using CFA

Based on the factors (constructs) obtained from the EFA, a further multivariable analysis test to confirm the efficacy of these factors to the factorial structure for each of the latent variables is conducted (Schumacker and Lomax, 2004). CFA is used to test the extent to which a researcher's hypothesised measurement model represents the actual data. CFA also describes the pattern of the observed variables and the unobserved variables in the hypothesised model (Schreiber *et al.,* 2006). In a sense, this technique permits a researcher to either "confirm" or "reject" a pre-conceived theory (Hair *et al.,* 2014). To assess the efficiency of the hypothesized model, the Goodness-of-Fit indices and the Construct Validity are measured. The results from these tests are presented below.

5.3.1.1 Construct Validity

This this involves measuring the relationships between the observed and the Latent variables. It measures the degree to which the variables represent the same theoretical concept they are meant to measure (Hair *et al.,* 2014). There are various ways the construct validity of a study can be measured. For this study, *construct reliability*, *convergent* and *divergent* (discriminant) validity were measured. A dataset has convergent validity if the variables of a construct share a high amount of variance i.e. an agreement between estimates of the same Factor evaluated using different techniques. Discriminant validity refers to the distinctiveness of different constructs i.e. the factors are uncorrelated and should be loaded on only one latent construct (Campbell and Fisk, 1959; Hair *et al.,* 2014). The construct reliability is measured using the Cronbach's Alpha coefficient, and should be greater than 0.7 for all constructs.

For a construct to be considered valid on a data set, Hair *et al. (*2014) recommend that the following assumptions should be met:

Convergent Validity;

1. Construct reliability should be greater than 0.7 i.e. CR > 0.7 (Cronbach's alpha of coefficients)

2. Construct reliability should be greater than the Average Variance Estimate i.e. CR>AVE
3. Average Variance Estimates should be greater than 0.5 i.e. AVE>0.5

Discriminant (Divergent) Validity;

1. The Mean Shared Variance should be less than the Average Variance Estimate i.e. MSV<AVE

Also, the Average Variance Estimate should be less than the Average Shared variance i.e. ASV<AVE

The following tables outline the results from the measurement based on the recommended construct validity measures

Table 5.6: Construct Validity

	CR	AVE	MSV	ASV	CE	TR	SQ	R	OB	T
CE	0.841	0.639	0.523	0.271	0.800					
TRust	0.893	0.676	0.596	0.337	0.723	0.822				
SQ	0.921	0.661	0.596	0.297	0.642	0.772	0.813			
R	0.883	0.604	0.068	0.036	-0.107	-0.261	-0.187	0.777		
OB	0.818	0.600	0.231	0.154	0.415	0.481	0.449	-0.246	0.775	
T	0.851	0.741	0.267	0.172	0.487	0.517	0.491	-0.084	0.324	0.861

The results from the construct validity Table 5.6 indicates that the standardised factor loading estimates ranged between 0.775 and 0.823 (which should ideally be >0.7) for all constructs. Secondly, the Average Variance Extracted (AVE) for the measured constructs were greater than 0.5. Thirdly, the construct reliability, checked by measuring the Cronbach's Alpha Coefficient for each construct was greater than the 0.7 threshold (Sekaran, 2003). Hence, there was convergent validity of the constructs. In contrast, the constructs also indicate divergent validity because the AVE estimates measured factors for any given two factors are greater than square of the correlation between the two factors indicating their uniqueness.

5.3.1.2 Goodness-of-Fit (GOF)Indices

This assesses the overall fit of a measurement model i.e. how well the model matches the observed data (Albright, 2008). Even though the CFA output produces several fit indices, not all are significant in the assessment of the model fit. Four key GOF indices, per Hair *et al.* (2014) are significant. To check that the estimated covariance matrix and observed covariance matrix match, the Chi-Square (X^2) is measured (null hypothesis). Not rejecting the null hypothesis indicates a good model fit. Other fit indices that are considered key are the Absolute Fit Measures, Incremental and Parsimony Fit Indices.

This study is investigating the change management influences on user adoption of ERP systems. To achieve this, the respondents were asked to measure the importance of the variables to them, and the extent to which those tested variables were addressed by their organizations. For the measurement model, the Importance and the Extent addressed attributes were measured separately with the aim of identifying the gaps in user expectation and implementation. The figure 5.2 and table 5.7 below present the results from the measurement models and the GOF indices compared to the acceptable threshold of the measurement framework (where results from the importance and extent addressed where measured). The recommended GOF values by Hair *et al.* (2006) show that the constructs obtained from the EFA are a good fit for the measurement model.

5.3.2 Summary of CFA Results

In assessing the overall fit of the CFA model, some key metrics were measured to determine if their values indicate a good fit for the model. The findings from the model are discussed.

Table 5.7: Goodness of Fit Indices

Fit Indices	Recommended Value (Hair et al, 2006)	Actual Value
$\chi 2$ /df	<5 preferable <3	1.678
Significant p-value	< 0.05	***
Goodness-of-fit index (GFI)	>0.90	0.952
Adjusted Goodness-of-fit index (AGFI)	>0.80	0.936
Comparative fit index (CFI)	> 0.90	0.984
Root mean square residuals (RMSR)	< 0.08	0.033
Root mean square error of approximation (RMSEA)	<0.08	0.037
Normed fit index (NFI)	> 0.90	0.961
Parsimony normed fit index (PNFI)	> 0.60	0.794

5.3.2.1 Measurement Model – Importance

Firstly, all the loading estimates are significant with values greater than 0.7. The construct reliabilities for all 5 constructs exceed the recommended threshold of 0.7 (CE=0.8, OB=0.8, R=0.9, SQ=0.9, TR=0.9). These suggest convergent validity. To determine discriminant validity, the "AVEs for all constructs were compared with the square of the estimated correlations between the constructs" (Hair *et al.,* 2014). The AVEs for all constructs are greater than the recommended threshold of 0.5, and greater than their squared correlations. In terms of the fit indices, the overall model χ 2 is 516.804 with a degree of freedom of 269. Given the large sample size (N=616), the χ 2 is significant, however, the normed χ 2 falls within recommended range with a value of 1.678 (<5 preferably<3). Using a type I error rate of 0.05, the p-value was 0.000. The χ 2 GoF statistic therefore indicates that the observed covariance matrix and the estimated covariance matrix within the variance sampled match. In addition, this study also relied on multiple indices for assessment (at least one incremental absolute the model fit as highlighted by the CFI (0.98) and RSMEA (0.03) are considered adequate. This model which represents the users' expectations before and ERP implementation shows a good model fit.

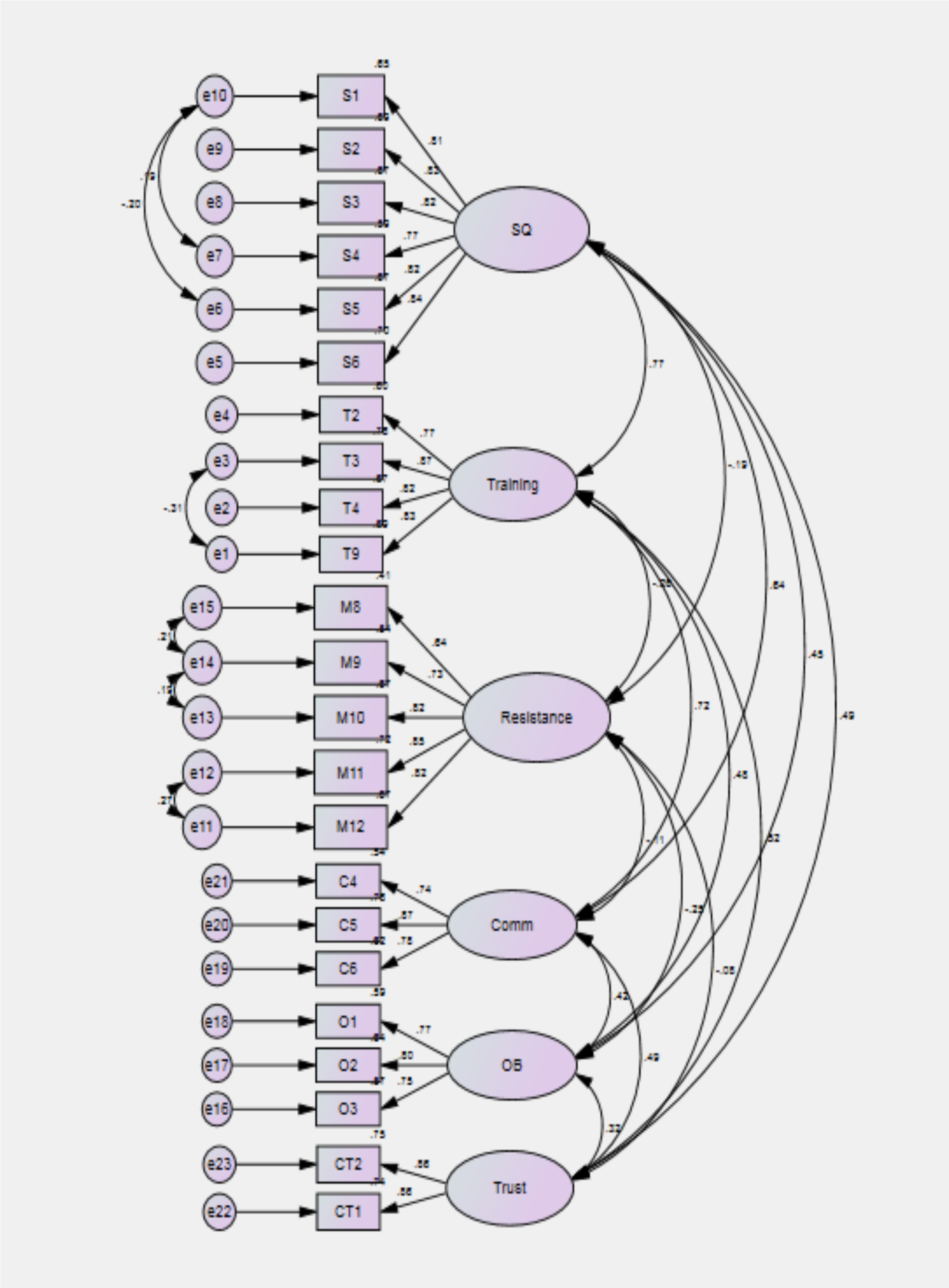


Figure 5.2: Measurement Model

5.4 Section Three: Structural Model Evaluation and Hypotheses testing

Based on the measurement model developed and assessed in the preceding section, a theoretical model was produced using the hypotheses below:

5.4.1 Model Hypotheses:

Hypothesis 1: Effect of Communication and Engagement

H1a: Communication and Engagement (CE) significantly impacts Training (TR)

H1b: Communication and Engagement (CE) significantly impacts System Quality (SQ)

H1c: Communication and Engagement (CE) significantly impacts Organizational Benefits (OB)

H1d: Communication and Engagement (CE) significantly impacts Trust (T)

H1e: Communication and Engagement (CE) significantly impacts Resistance (R)

H1f: Communication and Engagement (CE) significantly impacts Adoption

Hypothesis 2: Effect of Trust

H2a: Trust (T) significantly impacts System Quality (SQ)

H2b: Trust (T) significantly impacts Training (TR)

H2c: Trust (T) significantly impacts Resistance (R)

H2d: Trust (T) significantly impacts on Adoption

Hypothesis 3: Effect of System Qualities

H3a: System Quality (SQ) significantly impacts Organizational Benefits (OB)

H3b: System Quality (SQ) significantly impacts Resistance (R)

H3c: System Quality (SQ) significantly impacts Adoption

Hypothesis 4: Effect of Training

H4a: Training (TR) significantly impacts System Quality (SQ)

H4b: Training (TR) significantly impacts Organizational Benefits (OB)

H4c: Training (TR) significantly impacts Resistance (R)

H4d: Training (TR) significantly impacts Adoption

Hypothesis 5: Effect of Organizational Benefits

H5a: Organizational Benefits (OB) significantly impacts Resistance (R)

H5b: Organizational Benefits (OB) significantly impacts Adoption

Hypothesis 6: Effect of Resistance

H6: Resistance (R) significantly impacts Adoption

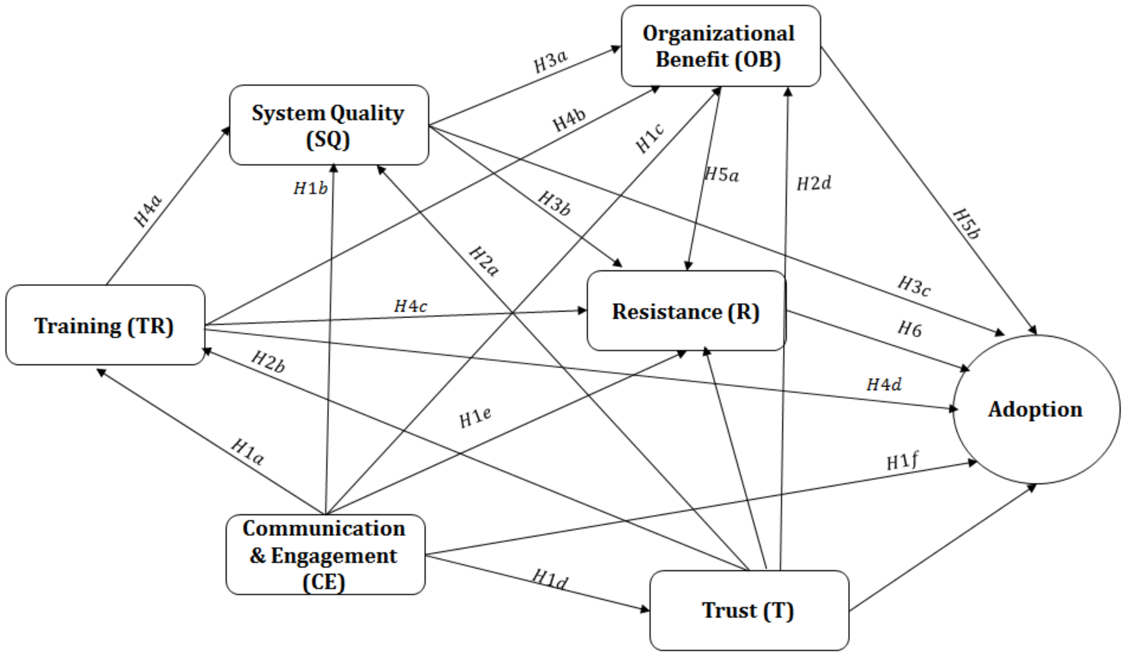


Figure 5.3: Model Hypotheses

During the SEM analysis, all probable paths were tested in AMOS and the results presented. To further measure the strength of the relationship between the constructs and how much of the variance in the dependent variables is explained by the independent variable, the coefficient of determination (R^2) was calculated. R^2 can only be measured when a construct acts as an endogenous variable for its associated exogenous construct. The results from the path analysis highlights the interrelationships amongst the constructs and the degree to which one construct impacted another.

Out of the 21 hypotheses from the hypothesised model, *H2c, H2d, H3b, H3c* and *H4d* were not supported i.e. $p>0.05$, and were deleted from the model. 16 hypotheses were supported ($p<0.05$), with all constructs showing R^2 values which might infer causality i.e. a direct effect, and the extent to which one factor is addressed has a direct significant impact on the performance of another construct.

To determine the constructs that uniquely contributed to the variance of the dependent variable, the six derived factors were regressed on Adoption and Resistance to change.

Table 5.8a: Prediction on Adoption

Factor	Direct Effect	Indirect Effect	Total Effect
CE**	0.16	-0.13	0.31
T**	-0.16	-0.73	-0.23
OB***	-0.19	0.43	-0.15
R***	-0.3	-	-0.3

** p<.01, ***p<.001

Table 5.8b: Prediction on Resistance

Factor	Direct Effect	Indirect Effect	Total Effect
CE*	-0.14	-0.18	-0.11
TR***	-0.39	-0.07	-0.6
OB**	-0.14	-	-0.17

** p<.01, ***p<.001

Table 5.8a shows the direct, indirect and total effects of the constructs. These findings show that Communication and Engagement (CE), Organizational Benefits (OB), Trust (T) and Resistance (R) have direct effects on Adoption, accounting for 15% of the variance. While CE, T and OB all have direct positive effects on Adoption, Resistance has an inverse effect. This means that the higher the degree of resistance present during a system change process, the lower the level of Adoption. Also, table 5.8b shows the negative (or inverse) direct effect of CE (β =-.137), TR (β =-.274) and OB (β = -.127) on Resistance, accounting for 11% and thereby supporting H4b, H3c and H5. This indicates that a one-unit increase in any of the constructs means a decrease by the Beta values of the constructs.

Figure 5.4 shows the relationships and multiple paths between CE, TR, T, OB, SQ and R. All paths shown on the structural models are significant ($p<0.05$). The findings obtained from the SEM analysis indicate that Communication and Engagement (β =.32) has a significant and direct effect on the Trust and accounts for 10% (R^2 =0.10), thus supporting H1d. Also, Communication and Engagement (β = .47) and T (β = .37) had direct paths to Training (R^2 =0.47), indicating that CE and T are responsible for 47% of Training thereby validating the paths (H1a, H2b). Training (β = .40), Communication and Engagement (β = .16) and Trust (β = .20) constructs in turn explain 63% of the variance of System Quality (R^2= 0.63), supporting H4, H1b and H2a. For Organizational Benefits, System Qualities (β =.25), Communication and Engagement (β =.22) and Training (β =.40) explain 28% of the variance of the construct (R^2= 0.28) validating the H3a, H1c and H4b paths.

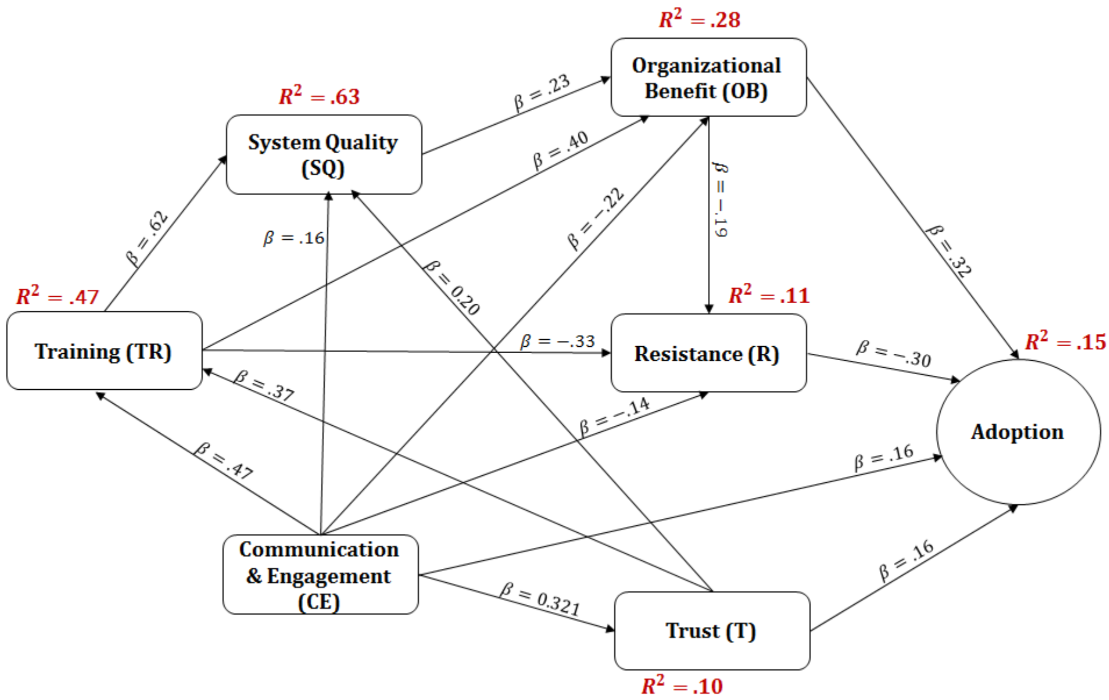


Figure 5.4: Structural Model (where CMIN/DF (χ 2 /df) =1.866; P***; GFI = .945; AGFI = .928; CFI = .977; RMSR = 0.054; RMSEA = .039; NFI = .951; PNFI = .779, R^2 = coefficient of determination)

Figure 5.4 shows the relationships and multiple paths between CE, TR, T, OB, SQ and R. All paths shown on the structural models are significant (p<0.05). The findings obtained from the SEM analysis indicate that Communication and Engagement (β =.32) has a significant and direct effect on the Trust and accounts for 10% (R^2 =0.10), thus supporting H1d. Also, Communication and Engagement (β = .47) and T (β = .37) had direct paths to Training (R^2 =0.47), indicating that CE and T are responsible for 47% of Training thereby validating the paths (H1a, H2b). Training (β = .40), Communication and Engagement (β = .16) and Trust (β = .20) constructs in turn explain 63% of the variance of System Quality (R^2= 0.63), supporting H4, H1b and H2a. For Organizational Benefits, System Qualities (β =.25), Communication and Engagement (β =.22) and Training (β =.40) explain 28% of the variance of the construct (R^2= 0.28) validating the H3a, H1c and H4b paths.

Table 5.9: Hypotheses Testing Model

Hypotheses	Regression Paths	Standardized Regression Weights (β)	Estimate	S.E.	C.R.	P	Hypothesis
H1a	TR <--- CE	0.471	0.736	0.078	9.443	***	Supported
H1b	SQ <--- CE	0.157	0.265	0.075	3.552	***	Supported
H1c	OB<--- CE	-0.22	-0.422	0.121	-3.488	***	Supported
Hd	T<--- CE	0.321	0.714	0.115	6.191	***	Supported
H1e	R<--- CE	0.136	0.325	0.159	2.041	0.041	Supported
H1f	Adoption <--- CE	0.163	0.404	0.153	2.647	0.008	Supported
H2a	SQ<--- T	0.118	0.089	0.029	3.09	0.002	Supported
H2b	TR<--- T	0.367	0.257	0.03	8.57	***	Supported
H2e	Adoption <--- T	-0.161	-0.18	0.057	-3.158	0.002	Supported
H3a	OB<--- SQ	0.231	0.263	0.086	3.039	0.002	Supported
H4a	SQ<--- TR	0.62	0.67	0.057	11.837	***	Supported
H4b	OB<--- TR	0.389	0.477	0.102	4.678	***	Supported
H4c	R<--- TR	-0.328	-0.5	0.137	-3.662	***	Supported
H5a	R<--- OB	-0.14	-0.174	0.071	-2.446	0.014	Supported
H5b	Adoption <--- OB	-0.188	-0.243	0.068	-3.567	***	Supported
H6	Adoption<--- R	-0.304	-0.317	0.047	-6.772	***	Supported
H2c	OB <--- T	0.081	0.07	0.046	1.527	0.127	Not Supported
H2d	R<--- T	0.079	0.085	0.06	1.42	0.156	Not Supported
H3b	R<--- SQ	0.013	0.018	0.113	0.163	0.871	Not Supported
H3c	Adoption <--- SQ	-0.028	-0.041	0.107	-0.387	0.699	Not Supported
H4d	Adoption <--- TR	-0.082	-0.13	0.131	-0.997	0.319	Not Supported

Table 5.9 shows a summary of the path relationships with their Beta values. The Path analysis model has shown the interrelationships between the tested constructs and the effects of each one on resistance. This is from the end user's perspective based on the Importance dataset.

5.4.2 SEM Discussion – Evidence of contribution

This section highlights the key role of Trust, Communication and Engagement (CE), Training (TR) and Organizational benefits (OB), their interactions and their causalities within the model, which will help managers make informed decisions during change implementation plans. From the SEM analysis, the Communication and Engagement (CE) construct had a significant direct effect on all other constructs and the dependent variable, indicating that CE is important to the users throughout the system change process.

The first engagement with the decision makers is the through CE. This is the main factor that determines trust in the sequence of activities that lead to adoption or influence. Trust directly or indirectly impacts on resistance through the pathways T-→SQ-→OB-→R, T-→TR-→OB and T-→SQ-→OB-→R. If managers understand these pathways, they can put a good implementation plan together to facilitate these factors which impact the adoption of ERPs.

Also, Communication and Engagement, and Trust have the most influence on Resistance, and are the key determinants as evident by the multiple paths. Where there is mistrust in these paths, the Resistance factor starts building up.

The CE factor must be considered as a potential source from where resistance begins. This is demonstrated by the pathways in the model which all originate from CE. If this cardinal factor of change is not properly designed and implemented, and the users don't believe the communication, then trust is destroyed. Amoako-Gyampah (2005) extended TAM based study examines perceived usefulness, perceived ease of use, intrinsic involvement of users and an argument for change. His results suggest that of the four constructs examined, perceived usefulness was the most important predictor of behavioural intention. However, the results from this study shows that the direct or indirect effects Trust, Training, System qualities, Organizational Benefits or resistance have on adoption appear to come from the effect of Communication and engagement on these constructs. The users can start to resist an intended ERP system change from this stage of the process. If the argument for change, intrinsic or situational involvement and benefits are not effectively communicated, then there is a higher risk that the variables associated with resistance are evoked. CE is thus shown to have a ripple effect i.e. a direct or indirect influence on all examined constructs.

The structural model (figure 5.4) shows a direct positive relationship between Communication and Engagement (β =.32) and Trust, with the Communication construct accounting for 10% (R^2 =0.10). This signifies that communication is a predictor for organizational trust which has a direct effect on Adoption (β =.32). An effective communicative process creates an open channel to accept and address formal knowledge, ensuring that the users prior knowledge, habits, and experiences are included (Innes 1998; Oreg, 2003). These findings indicate that for the users of an intended change to trust the change process, they must trust the communication content and process. However, these views are only a partial perspective to adoption.

CE and T also account for 47% of the TR construct. A technological change usually involves a business process re-engineering that requires training. Failing to communicate to all users about an intended change, being dishonest about the change processes and implications, not clearly expressing the change vision/ rationale or goals and not giving employees a voice in the change process can lead to distrust of the change process by the users. An organizational environment with high level of perceived distrust usually evoke feelings of threat, stress, divisiveness and unproductiveness (Dong, 2001; Hurley, 2006). However, if the users perceive that CE has been properly addressed, then they Trust the system change process. This in turn will lead to reception of the proposed training and reduce the barriers to learning. The ripple effect of positive effective communication, trust and training directly impact the SQ and therefore its associated variables. These constructs account for 63% of the way users perceive the ease of use and perceived usefulness of the ERP system. Once there is a breakdown in communication which may lead to outright distrust, the users might already have an intention not to use the system and may not be receptive to the trainings and knowledge transfers.

These findings close the gap in the reviewed technology adoption theories which do not show relationships or their causalities. TAM based change management strategies can cost a lot of time and money if a comprehensive approach to change is not adopted.

The ERP users from this study also consider training before, during and post implementation necessary for the effective adoption of a new system. This increases the interaction with the system and reduces the effect on resistance on the premise of effective communication. User involvement, user buy-in, argument for change, perceived usefulness, perceived ease of use, perceived increase in productivity, knowledge transfer and user training are some of the variables associated with Communication and Engagement, System Qualities and Training. These constructs have a direct effect on the perceived benefits by the users, accounting for 28%. During a change process, the users are concerned with how the new system will increase their productivity, and what the perceived benefits are. This relationship implies that perceived personal and organizational must be aligned. After all, if the organization is profitable from the use of the system, the users also gain personal benefits (bonuses or incentives).

Lastly, the structural model supports that effective communication and engagement (CE), has a direct relationship to all other constructs and the dependent Variable, Adoption. In addition, trust, training and organizational benefits are also direct predictors of adoption. Amoako-Gyampah (2005) tested 571 users' perception of usefulness, ease of use, level of intrinsic involvement and suggested that these factors all directly affect the users' intention to use the technology. However, the intention to use a system is rarely solely about perceived usefulness, intrinsic involvement and ease of use of use. Change management factors that may lead to resistance to change need to be addressed and mitigated, which is the missing link in Amoako-Gyampah's framework. Even though these TAM based core constructs are variables associated with constructs that are supported in this study, other factors discovered from this study evoke an intention not to use the system (resistance) as we have seen in the SEM in figure 5.4 which has a direct impact on adoption. What this research has found is that neglecting the sources and causes of resistance to change is detrimental to the organizations.

Further, Communication and Engagement, Training and Organizational Benefits all have direct paths to Resistance. This emphasises that open, honest and consistent communication and user participation through each phase of any change management is considered important by the users, and not addressing this can lead to an intention not to use the system (resistance), thereby not adopting the change. Resistance, either active or passive does lead to an inefficient use of the system, meaning that the system will not be used optimally, processes are disrupted and productivity reduces, which defeats the purpose of such huge investments

In summary, from the users' perspective, all six factors in the model discussed have a significant effect on resistance to change directly or indirectly as witnessed by the paths in the model, which have an influence on adoption.

In the next section, we consider what extent these factors in the model were addressed by the surveyed organizations to identify the gaps and recommend where the change intervention strategies could be improved. A gap analysis using the Paired sample t-test was conducted applied on the dataset to achieve this.

5.4.3 Analysing Importance and Extent Addressed Data using Paired t-Test Statistics

The previous section has developed a structural model showing the separate relationships and strengths between sets of latent variables. This represents what factors 616 users consider as important to the adoption of an ERP system and how these factors should be ranked in terms of importance. In the questionnaire, the users were also asked to rank the extent these factors were addressed by their organizations. To highlight where the gaps were in the failed adoption of the ERP systems, the mean of the weighted factor scores was derived, and then measured against the results from the Paired t-Test Analysis. To derive the weighted mean factor scores for each construct (F), the formula below was computed using the Importance and Extent addressed responses

$$F = \frac{\sum_{i=1}^{n} f_i * \overline{x_i}}{\sum_{i=1}^{n} f_i}$$

where F is weighted mean score for each construct/Factor, f_i is the loading on the construct/factor, $\overline{x_i}$ is the weight mean responses.

The graphs below compare the Importance for the total dataset with the results of the Extent Addressed Dataset of the: (a) total dataset, (b) dataset from Company A (low resistance) and (c) dataset from Company B (high resistance). These illustrations show the gap between the company that addressed these factors closest to the users' expectations and the company that deviated significantly from these expectations. From the results of the t-test, all measured variables showed a significant difference (Gap) between the extent they were addressed and the users' expectations, indicating that these variables were not properly addressed. The most significant gaps were attributed to Communication and Engagement, (CE) Training (TR) and Resistance to change (R). This also reflects the direct effect of communication as established in the structural model. To further drill down to the variables associated with these factors, an independent sample t-test was conducted. At a 5% level of significance, the paired t-test was applied on the responses from the variables associated with the Factors in the Importance Data, and the corresponding data from the Extent addressed data. This also illustrates the power of the model to pinpoint failure points during a change management process.

Figure 5.6 below shows the behaviour of the respondents from Company A, which recorded a lower degree of resistance. From the t-test, the extent to which the variables associated with the constructs were addressed trended slightly below the users' expectations. Important to note is the impact this had on the variables associated with resistance. However, Figure 5.7 presents a different outcome. Based on the same constructs and their associated variables, the extent these variables were addressed by Company B trended significantly below the users' expectations. This illustrates the influence the Communication, Trust, Organizational Benefit, and Training have on Resistance. By not considering all factors, the managers cause friction in the logistics and the distribution and service of the organizations.

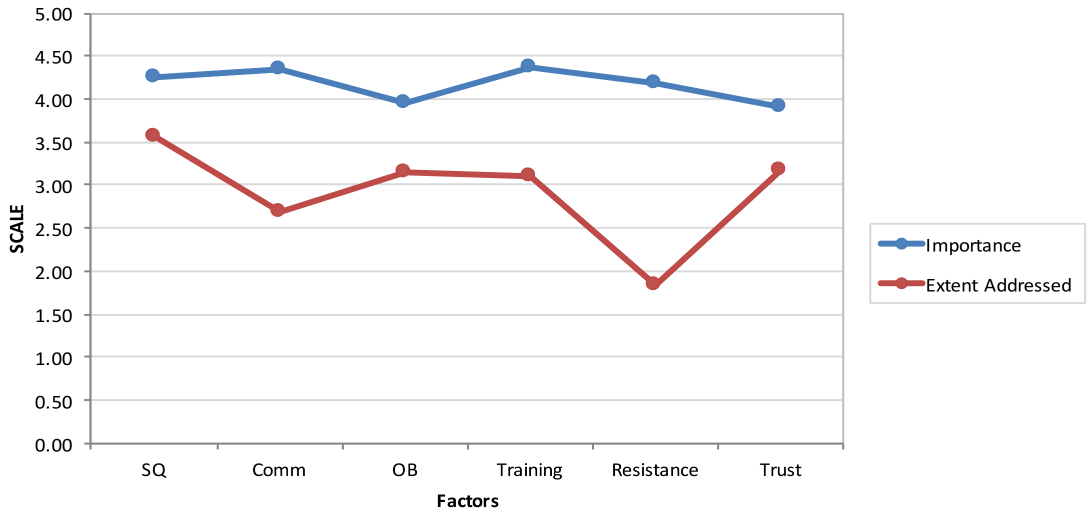


Figure 5.5: Adoption Index (a) – Total Dataset (Aggregated performance)

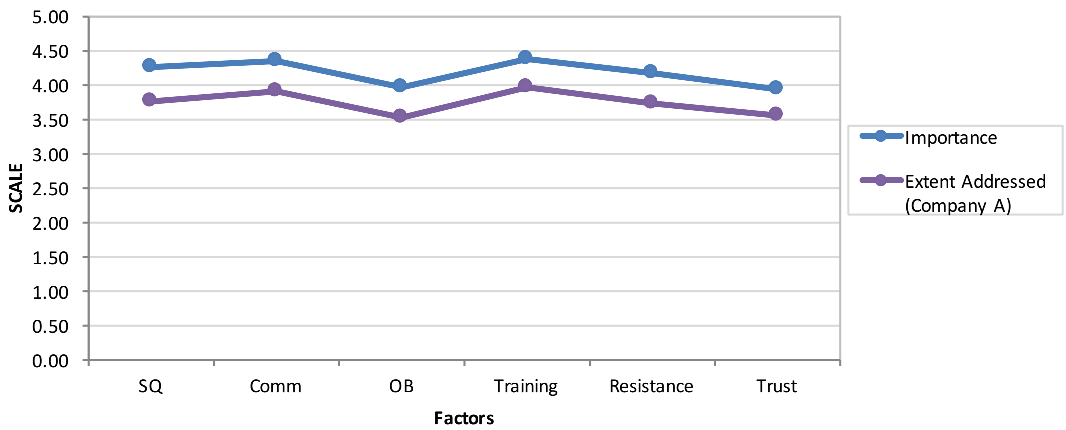


Figure 5.6: Adoption Index (b) – Low degree of resistance to change (Company A)

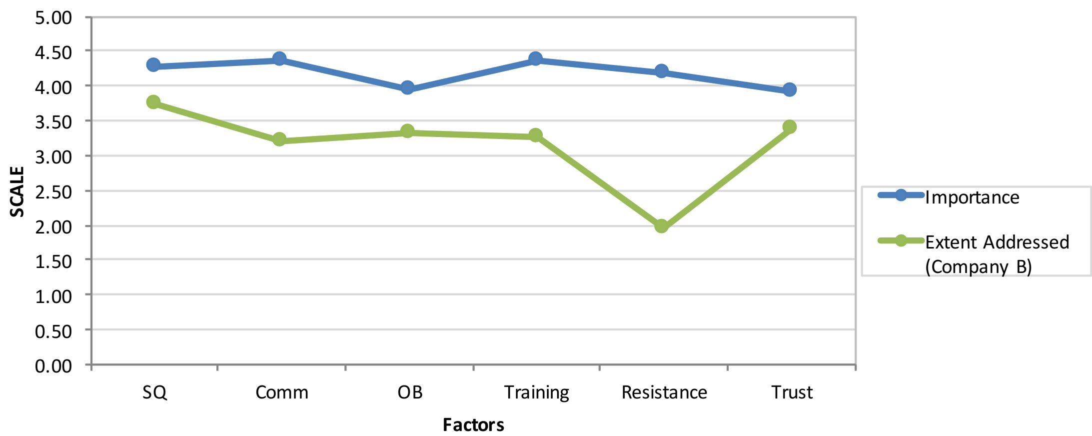


Figure 5.7: Adoption Index (c) – High degree of resistance to change (Company B)

5.5 Section 4 - Model Confirmation using Qualitative interviews

Referencing the research methodology (section xxx), the approach taken was to confirm the theory using a SEM from a positivist perspective, and then to use qualitative interviews to confirm the model. This weighted mixed method approach ensures the statistical model developed is verified and validated. Thus, qualitative interviews were used to confirm the statistical SEM findings.

To confirm the validity and practicality of the developed structural model, the findings from the research, were discussed with the managers during the model review. The interview results are classified based on the different constructs.

During the interviews, some new themes emerged and were included by the interviewees (the project managers) based on their experience. These are discussed in the following sections.

5.5.1 Data Collection Method

5.5.1.1 Sample size

From the sample frame, 11 employees participated in the interviews. These were the project managers, who are also ERP users and were part of the entire change process, and the users. The researcher decided to interview these managers because they could objectively study the structural model, identify the gaps and discuss their experiences based on these gaps. They managers were also able to confirm if the model's practicality in their decision-making process during a future change process. To compare the responses from the project managers, the users were also interviewed. This created anecdotal evidence to confirm the statistical evidence.

5.5.1.2 Design and Administration

A discussion guide was developed prior to the interviews based on the initial questionnaires and the developed model. The questions were structured as open ended questions and lasted an average of 45 minutes per interview. Of the 11 interviews conducted, 6 were face to face, while 5 were conducted over the phone. The interviews were transcribed by the researcher for further analysis. The table below shows the profile of the respondents, and the resultant constructs from the developed structural mode (figure 5.4). This model was presented to the interviewees for their feedback on the developed model's practicability, validation and any emerging variables for future research.

Table 5.10: Qualitative interviews - Instrument summary

Organization	Respondents	ERP system	Interview time	Tested constructs
Company A	Managers	Oracle	Average 45 minutes	- Communication & Engagement - Training - System Qualities - Organizational Benefits - Resistance
Company B	Managers, Employees	Oracle		
Company C	Managers, Employees	SAP		
Company F	Managers, Employees	SAP		

5.5.1.3 Communication and Engagement (CE)

From the SEM analysis, CE is a key factor to consider when planning an ERP change. Managers D and E indicated that most of their communication happened after the change process had started and users had started resisting. Managers B and C stated that their top management did not see the need in the communication plan and assumed the users would have no choice but to adopt the system. Below are some excerpts from their interviews:

"At the time, we thought we had a good change management plan. But in hindsight, we did not effectively communicate the need for the change to the users. They felt they were performing their jobs optimally with the legacy systems and were resistant to the idea of changing systems" – Manager, Company C

"*In every change process, there are the internal and the external users. We did not have a robust communication plan. While we thought we had communicated the change to the internal users, we omitted the external users. This had serious repercussions. They simply did not use the system. We could not pay them manually any longer, and they stopped distribution of products. This cost us."* – Manager, Company B

"We ran an internal poll to understand the perception of legacy system by the users. This helped us understand the sentiments and predict behavioural patterns… After the initial communication, we had a roadshow with the management to all branches to gain their trust and let them know it was only going to be successful through teamwork. It was not going to be

easy, but we were honest about the anticipated teething issues at the beginning of the implementation. Users always want to know the truth" – Manager, Company A

One common feedback from all the managers interviewed was the lack of a communication plan pre-implementation, during and post implementation. The users were not fully engaged and were mostly not part of the decision process. Communication was done in silos and not throughout the change process.

Similarly, the users of the ERP system felt that the management were dishonest about the change management process and the implications on their job functions.

"I did not clearly understand the change objectives or the rationale behind the change. Decisions are made without any sort of input from the employees or how it will affect us. After all said and done, it is we, the employees that use the system, not really the top management. They should at least get our input" – Employee, Company F

"*We have a think Tank portal where innovation is shared, and new ideas are developed. But when it came to such a big decision that will impact most employees, we were not given a voice. In my opinion, the management failed to communicate the change properly to the employees. Most of the information I got were rumours…. Of course, the change process became tedious and difficult and I was reluctant to use the system optimally* – Employee, Company F

"It would have been nice to know specific details about the change process. For example, when will it happen? How will it happen? How will it impact my job? What are the potential benefits? Will there be data loss during the change that will affect our vendors and customers? Instead, we were told that trainers will be coming in during the week and we should co-operate. I was upset" – Employee, Company F

Effective communication can reduce confusion and employee resistance to a planned system change. It was clear from the interviews that communication and engagement plays a big role in the resistance or adoption of a new ERP system.

5.5.1.4 Training

From the interviews, Managers A-F suggested that they felt the users got adequate training pre- and during implementation. However, for the model developed, training was not properly addressed as far as the users were concerned.

"*Training was one of the aspects I think we handled well. We trained the trainers and the change champions and the super users. Even though we were not able to train all the user directly, there was a lot of hand holding to reduce frustrations after the system change*" – Manager, Company B

"*We developed to-do guides for the users and ensured that dedicated local helpdesk remained for support 2 months after the change process…Some of the users were not taking the trainings seriously because the felt it would not have a big impact on the way they perform their daily tasks"* – Manager, Company A

"We trained the users before the system change, but we did not complete the user acceptance trainings phase because we were behind schedule. The company has subsidiaries who were ready for the rollout so we had to speed things up" – Manager, B

Whilst the system managers believed the training was adequately addressed, the users felt otherwise

"Without training, expecting a successful change process is a waste of everyone's time. We were trained before the system was implemented, but after the rollover, I realised there some things we were trained on. This impacted on my ability to attend to customers. It affected my productivity because I started spending up to 10 minutes on a call instead of 4 minutes. My average calls per day moved from 100 calls to about 75. How do I get a bonus if I don't meet my target? I felt I was being set up to fail – Employee, Company B

Measuring the models, I and II i.e. importance and extent addressed, there was a gap between the perception of importance amongst the two.

5.5.1.5 System Qualities

This construct consists of variables that measure the perceived ease of use, ease of learning, perceived usefulness and system features and how they impact the adoption of ERP systems. Even though the managers and the employees felt that the system qualities were important to its adoption, the users did not think it had a significant impact on the adoption of the new system.

"The SAP software is not the easiest of applications to use. The users found it difficult to carry out their daily tasks and required a lot of support from the trainers and change champions" – Manager F

"*Oracle is an interesting software that is easy to learn and makes working a bit more seamless. But this was not my initial experience. You must be trained properly on a system to be able to identify the qualities of the system. If they employed a different set of trainers, they might have been able to communicate more effectively"* – Employee, Company G

Employee K believed that the challenge with the ERP system was not the system qualities as the system produced the required reports which were accurate, relevant and refined some of their cumbersome and bureaucratic processes. A given example was with the HR module. With the Legacy systems, the employees were required to fill out books manually to apply for Leave or travel. This process was subject to delays, cumbersome and impacted productivity. Employee G also stated due to the nature of his role, they needed a system that was flexible to enable them carry out their daily tasks and improve their performance and productivity.

5.5.1.6 Organizational Benefits

Without addressing the factors users consider as important to the adoption of new ERP systems, the users cannot perceive the organizational benefits that will be derived from using the system. Variables associated with organizational benefits occur because of adoption of the ERP system. These perceived benefits, from the SEM analysis, are a result of the direct effect of Communication, training and system qualities.

"The benefits of the new system were communicated early in the change process. The users understood that if they used the system effectively, it would improve both personal and overall company productivity. If the company is profitable as a result, they get their incentives and rewards. It's a cycle we communicated early to the users" – Manager, Company A

This statement supports the results from the t-test in figure 5.6 which showed that Company A had a lower degree of resistance compared to Company B.

5.5.1.7 Resistance

"When you deal with resistance by selling the positive aspects of the change and by attacking the resistance when it surfaces, you are not getting rid of the resistance, you are driving it underground" (Karp, 1995). Resistance to change is the direct inverse of adoption. It must be noted that it is not the absence of resistance that is being measured, but the degree to which resistance begins have a direct impact on adoption. i.e. the higher the degree of resistance to change, the lower the expected adoption. The rationale of the study stems from the high rate of ERP implementation failures despite successful technical integrations. This was evident in the qualitative responses.

According to Managers A to D, the resistance had started happening from the beginning of the project but it was masked with passive behaviour by the users.

"*We should have taken the user acceptance trainings and change management more seriously. We only realised internal users, and all of the external users were resisting when it was too late. This is our second attempt at trying this implementation, and still we did not get it right*" – Manager, Company F

"*In my opinion, we focused on the technical integration and neglected the actual users of the system. The change process was dead on arrival"* – Manager, Company C

"*I think we did pretty well with the adoption. The users had few complaints and there was adequate support. Did we do everything right? No. There are some factors we did not consider that became a problem…. considering gender balance when selecting change champions is one to look out for. 10 out of the 13 change champions were female and believe it or not, 8 of them had maternity leaves that coincided. We selected more females because they were the influencers and were empathetic. It took us almost 6 months to recover from this*" – Manager A

Manager E indicated that the communication and training processes were the reasons why he thinks the users resisted the new System

Without prompt, all the users mentioned resistance to change while responding to other questions. The users indicated that resistance was imminent due to change management approach. Some reasons for resistance mentioned include Loss of control, more work, Unintended consequences, Loss of competence, Loss of identity, and the element of surprise as they were unaware a technology change decision was being taken.

"*Despite the impact this technology change would have, the management did not address us formally about it. The first time I heard about the new system change was through rumours that the company was automating the processes because they wanted to downsize*"- Employee, Company C

"I lost trust in the company a few years ago because communication from management is not honest. I felt there was a hidden agenda we weren't being told upfront… I liaise with the vendors so I felt the if the process was automated I will be made redundant and lose my job…so I didn't even want to try to learn to use the system… I was not alone in this decision" – Employee, Company B

The structural model was shown to the managers for review and feedback. All managers indicated that resistance to change was a key component to be addressed and that communication and engagement were the first critical steps to adoption of a new system. They also indicated that to earn the trust of the users, the management and the project managers needed to be open, honest empathetic while communicating the change. The "positives" (manager C) of the new system should be highlighted. When asked to mention the areas where they faced the most challenges during the change management process, communication, participation of users, training, trust, technical integration, gender consideration, internal and external users were the most mentioned. When probed, Manager, Company A indicated that communicating the need for the change, the benefits, reassuring the users of job security and encouraging a feedback process were some of the factors that reduced the degree of resistance.

5.6 Summary

This chapter has presented the results from the qualitative interviews conducted to confirm the structural model developed in chapter 5. After transcribing, the statements were categorised under the appropriate constructs based on the factors that were mentioned. Some other factors also emerged from the interviews – gender balance, categorising users into external and internal users which helped in budgeting correctly for system change. However, the type of commercial ERP package was not mentioned as a system quality or ease of training concern, neither was it discussed as a barrier to adoption. After reviewing the model and discussing their ERP implementation experiences, the interviewed managers confirmed the practicality of the model and signified interest in further details, and a customised report to use as a guide for future change process to ensure adoption.

Chapter 6: Conclusion

6.1 Introduction

One area of study that has been widely discussed in IS literature is the issue of costly ERP systems investments and their high failure rates. However, even though many technology adoption theories and change management models have been developed, up to 75% of ERP system investments still fail (Chapter 1). A systematic review of the literature has shown that despite the attention given to a user's behavioural intention on adoption, influences of change management have never been incorporated with technology adoption models from a comprehensive approach. One of the main contributions of this research is a novel approach to ERP adoption where for the first time, technology adoption and change management constructs are integrated and assessed in a comprehensive manner. Another key contribution is the development of a tested, validated and practical model which emphasises the importance of resistance to change as a significant predictor of adoption. Therefore, the novelty of this research is a common-sense perspective of the realities of user resistance which

i. provides a new approach by bringing together new technology adoption and change management constructs
ii. explains the complex relationships between these factors that need to be addressed
iii. provides a tool for deploying this model
iv. applies this model to the case study organizations

Lastly, employing robust statistical techniques (SEM) with a practical model confirmation, the findings from this research explicitly show that failure to comprehend key change factors will lead to resistance which can be costly. The following sections discuss the findings and contributions in detail.

6.2 Linking Research objectives and outcomes

The aim of this research is to review the degree of influence of change management factors and resistance to change on the adoption of newly implemented ERP systems from an end users' perspective, taking Nigeria as a focus.

The objectives of this research are to:

1. Identify the change management factors that influence ERP systems adoption

2. Develop and validate a conceptual framework which reflects and relates these factors
3. Evaluate the application of the model to the case study organizations
4. Identify the implications for decision makers in organizations and government in change policy decisions concerned with ERP systems

6.2.1 Objective 1: Identify the change management factors that impact ERP systems adoption

To identify the factors that lead to user adoption of ERP systems, a systematic literature review was conducted. This was contextualised using position papers and focusing on the key areas of user acceptance in literature. There is a vast repository of studies on user acceptance which has been the subject of in-depth discourse within Management Information systems (MIS) academia. These studies have produced numerous theoretical models used to classify and analyse the explanatory power of users' cognitive attributes in relation with the adoption of new technologies. A review of literature shows three main perspectives of these studies classified under process, technology and people. There is a consensus by reviewed studies that users are the most important stakeholders during an ERP change, which has led to the extensive studies in this area. The literature review on ERP implementations, user acceptance, change management, resistance to change and technology adoption theories, fall under the umbrella of the people perspective. Even though these theories are foundationally valid, constructs from change management and technology adoption theories have been measured in silos without comprehensively addressing the underlying factors and their complex relations that lead to user resistance, and the significance of their influence on adoption.

One of the outcomes from this study identifies the key constructs that cause these complexities and their resultant effects on resistance to change and adoption.

From this integrated approach, 45 variables were identified through the scrutiny of technology adoption and change management models. These variables were used to develop a general conceptual framework and hypotheses for the study, from which the measurement and structural equation models were produced. These variables such as ease of use, fear of not being able to change, user involvement, habit, job loss and redundancy amongst others, were determined in chapter 5. The resultant factors identified as impacting adoption are – Communication, Commitment and Trust, System Qualities, Training, Organizational Impacts, Individual Impacts, Motivational Factors (directly related to Resistance), Performance and productivity and Resistance. Identifying these factors were essential to the development of the theoretical model which helps us understand their relationships and effect on adoption.

6.2.2 Objective 2: Develop and validate a conceptual framework which reflects and relates these factors

To provide a context and rationale for developing hypotheses and systematically detect distinct causal relationships between the identified latent variables, a theoretical framework was developed. This framework provides a justification for the explanatory power (63%) of our model based on the latent variables, their multiple relationships and the underlying structure of their complexities.

In developing the theoretical model, an Exploratory Factor Analysis (EFA) was applied to the variables contained in the conceptual model. The purpose of the EFA is to reduce the variables and group them into factors. But more importantly, the EFA was used to understand the underlying structure of each construct in relation to the variables associated with it. These constructs were then used to build the theoretical or measurement model to be analysed using a Confirmatory Factor Analysis technique. The measurement model was evaluated and established to have construct validity and have a good model fit based on the goodness of fit indices, thus statistically validating the model. To determine the relationships and the cause and effects between the constructs, a path analysis was conducted measuring all the feasible paths between the constructs as shown in the Structural model below (figure 6.1).

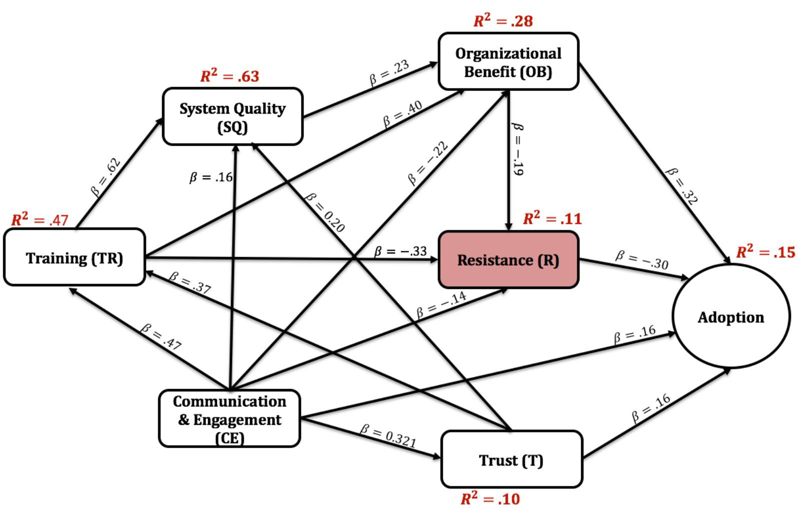
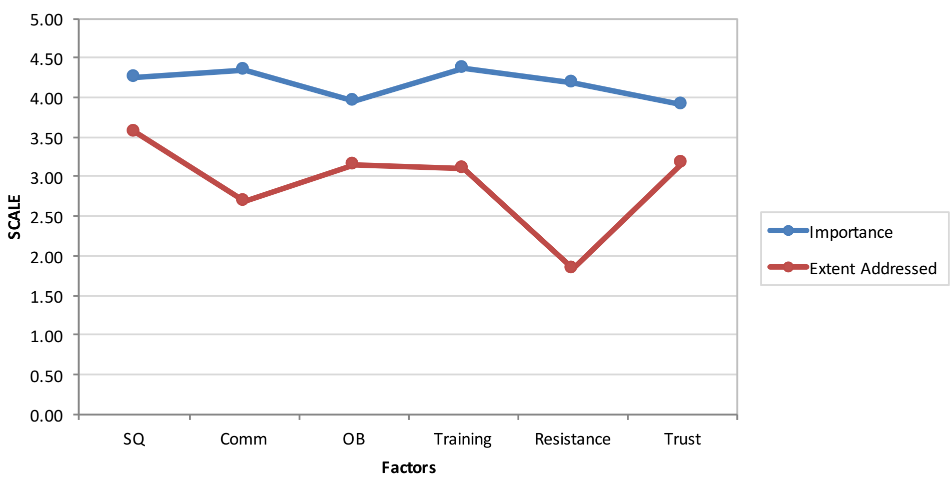


Figure 6.1: Structural Model

The complex and multiple relationships amongst the constructs emphasise the point that relying on any of these constructs in isolation without an integrated approach as developed in this research can lead to resistance of the new system, which defeats the purpose of the ERP investment. As shown, even though Communication and Engagement (CE), Trust (T), Resistance (R) and Organizational Benefits (OB) have direct paths to Adoption, all paths directly or indirectly lead to resistance. Therefore, the effect of not addressing the preceding constructs (other paths) in the value chain is Resistance. At this point the paths can either stop (if factors are not properly addressed and resistance is high), or continue to adoption (if factors are properly addressed and resistance is low). This developed theory has shown that the UTAUT (Venkatesh, 2003) is deficient in its accommodation of universal factors i.e. ignoring the change management influences identified in earlier chapters. This theory addresses these.

6.2.3 Objective 3: Evaluate the application of the model to the case study organizations

In objective 2, SEM is statistically validated as the consequence of the process applied. Nevertheless, a further evaluation of the model from a practical perspective by its application in the case study organizations is conducted. Using the data collected from the sample frame which measures the users' expectations (Importance dataset) and the extent to which the variables being measured were addressed (Extent Addressed dataset), the weighted mean factor scores and a Paired Sample t-test (gap analysis) were conducted to produce an Adoption Index tool. This serves as a yardstick for comparing the effectiveness of the adoption strategies implemented by the case study organizations. Figure 6.2 re-iterates the Adoption Index discussed in chapter 5.



F

Figure 6.2: Adoption Index Tool

From the gap analysis, the focal points of failure are confirmed as Communication and Engagement (CE), Training (TR) and Resistance (R). However, the multiple influence pathway depicted in the Structural model (figure 6.2) shows the indirect influences that must be considered simultaneously. This analysis further strengthens the model analysis by pinpointing the degree to which these constructs influence resistance. By providing a predictive measure to adoption, the comprehensiveness of this model addresses the gaps in the reviewed models in literature.

6.2.4 Objective 4: Identify the implications for decision makers in organizations and government in change policy decisions concerned with ERP systems

The findings from this research provides a clear view of the influences of change management on user adoption of ERP systems. The outcomes offer insight into key points of failure during an ERP implementation.

First, a causal model explaining the multiple influence of the relationships between the factors and Adoption is developed. This model shows the inter-connectedness of all the factors, and confirms Resistance as an effect of not addressing the variables associated with the Factors.

Secondly, an Adoption index tool is developed as a yardstick to benchmark the effectiveness of an implementation strategy. This tool also allows managers or policy makers understand, measure and mitigate the factors that evoke resistance to change.

Ultimately, the goal of investing in an ERP system by any organization or government is to increase its revenue generation. Therefore, identifying and mitigating the factors that evoke resistance will help managers avoid the pitfalls of ERP myopia associated with these ERP investments.

6.3 Research Contributions

This Ph.D. provides three contributions presented in the following sections

6.3.1 Theoretical Contribution

This research provides a new way of approaching ERP user adoption by integrating technology adoption and change management factors to identify key points of failure that lead to resistance, which are not clearly articulated in literature.

The foundational theories reviewed in chapter 2 (TAM, TRA, TPB, DOI, D&M and UTAUT) and extensions of these theories show that factors that affect technology adoption have been tested and treated in silos. In the TAM (Davis, 1989), the strongest predictors for the intention to use a system are identified as perceived ease of use and perceived usefulness. The UTAUT (Venkatesh *et al.*, 2003) which is an integration of key technology adoption theories, suggests that performance expectancy is the strongest predictor of intention to use a system. The DOI theory (Rogers, 1995) put forward communication as the strongest adoption predictor, while TPB (Ajzen, 1991) pinpointed Behavioural intention and control as the predictors to adoption. None of these theories tests the interactions between their derived factors and resistance to change, which is a critical component of change management. However, from the theory developed in this thesis, the interactions between the technology adoption factors and change management factors are tested and measured. For instance, the resistance construct (β=-33) has an almost equal influence on adoption as organizational benefits (β=28). This indicates neglecting the variables that lead to resistance to change can totally negate any expected organizational benefits, which none of the established prominent theories discussed have identified or considered.

6.3.2 Practical Contribution

The model developed in this research is grounded in reality by managers from the sample frame. After reviewing the model, the managers acknowledged they could precisely identify the failure points that led to resistance during their ERP implementations. Even though the concept of technology adoption and change management are not new, the integration of both to produce a practical model explaining the cause and effects of the factors that influence adoption is novel. The model and adoption index tool developed in this research should be used to assess failed implementations and during new implementation plans for effectiveness. This will save organizations from the cost associated with failed ERP implementations.

In addition to identifying the points of failure, the tool developed from this research will help managers further drill down to the variables associated with constructs to inform better decision making. As an example, the performance of the communication and engagement factor can be assessed and identified problems amended before proceeding to the next phase. This will assist in addressing any resistance from the first phase of the implementation.

6.3.3 Economic Contribution

Medium to Large Enterprises in the top contributing sectors have a key role to play in the development of the GDP of the Nigerian economy, and want to remain competitive and profitable. Therefore, ERP systems are perceived to be a cornerstone with its associated benefits of yielding a good Return on Investment (ROI), thereby justifying these organizations investing heavily in ERP implementations. However, as discussed in the motivation for this study (Chapter 1), the ERP market is plagued with high failure rates. The impact of these failure rates can have a negative ripple effect on the economy if these organizations do not realise the benefits associated with ERP implementations for their business strategies and ROI. Drawing on the practical implications discussed above, this research contributes significantly by providing managers of these organizations with a novel framework to utilise during their implementation strategies. As there are organizations who have had failed ERP implementations, this research can be used as an index to measure failure points by using the model developed to understand and address the key focal points.

Also, despite the progressive move and thinking towards a streamlined Information and Communication Technology (ICT) enabled economy by the Ministry of Information arm of the Nigerian government, the current ICT strategy document does not consider the role of change management from this researcher’s approach. Even though this study was conducted in the context of ERP systems adoption, the underlying structure of the theory is applicable to technology change implementations in general. The national Strategy need also to address change management influences on implementation of strategy and policy development where ICTs are concerned. This research therefore has economic implications and provides an initial guide to ICT policy and strategy development.

6.4 Limitations of Study

As with any research, there were limitations in this study that future research can address.

First, the explanatory power of this model is only 63%. Further investigations are required to improve the model. Because of the cultural dimensions and nuances unique to Nigeria, the generalisation of this research to countries other than Nigeria should considered with caution.

Secondly, this research focuses on Enterprise Resource Planning (ERP) systems. Further investigations should be carried out to generalise to other areas and countries.

Thirdly, this research did not consider the demographics (age, gender, education), or the nationality of the respondents or the national culture of the surveyed country - Nigeria. It only considered the users' years of experience at the organization as a screener to the main questions.

6.5 Recommendations for future research

As this is an original study integrating change management and technology adoption, there are areas out of the scope of this current study that will increase the explanatory power of the developed framework.

One of the emerging factors from the qualitative interviews was the gender effect on the change process. This study did not take the age, gender or educational qualification into account. These mediating factors should be measured to determine if they have an influence on adoption using the developed model. In addition, bearing in mind the cultural, belief, social and economic nuances, this model should be tested in other countries to expand its generalisation and improve its robustness using Hofstede's cultural dimensions theory. As this study was based on individualism among respondents (Nigerians and Non-Nigerians) and not collectivism, the Hofstede's cultural dimensions theory was not taken into consideration.

Also, the research was conducted in an organizational setting in the context of ERP systems implementation. However, because user resistance is applicable to other areas outside of IS, this framework can still be extended and modified to the context of the change within an organizational setting as other change projects might yield a varied result.

Further, the framework could be tested in non-organizational settings like in the development of national policies and strategies, or in consumer settings where adoption is not mandatory.

Another factor that emerged during the qualitative interviews was the inclusion of external users i.e. suppliers, who also play vital roles in the supply chain management and resistance from them could also impact business operations. Future studies should consider including the external users of the change process.

6.6 Summary

The results from this thesis has pinpointed cogent reasons which lead to resistance of ERP systems implementations. These reasons have been established as factors which are mostly associated with the end users and not necessarily the technical integration of the ERP system. They have been identified as Communication and Engagement, Trust, System qualities, Training, perceived organizational benefits, and variables associated with resistance such as fear of not being able to change or fear of making mistakes. This kind of integration of technology adoption and change management factors were addressed in the UTAUT model by Venkatesh et al (2003)

This thesis aimed to improve ERP systems implementation from both the theoretical and practical viewpoints. In achieving this, some valuable contributions have been made to (i) user adoption studies in the form of a new approach and theory which provides new insights and understanding to adoption where ERP systems are concerned (ii) ERP systems implementation strategy the adoption of ERP systems. Further, a model to show the interdependence of these constructs, along with an adoption tool index to explicitly identify key focus areas in mitigating resistance, is a very important contribution to organizations.

In conclusion, applying these contributions by organizations who intend to make ERP investments will enhance their change management implementation strategies to avoid the pitfalls and costs associated with failed ERP projects.

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Appendix A

Cover Letter

Brunel University West London
Department of Information System and Computing

Dear Participant,

I am a PhD research student at Brunel University West London, under the supervision of Professor Panos Louvieris, at the School (Research) for department of Information System, Computing and Mathematics. The research title is: "**Investigation into the change management influences on user adoption of ERP systems".**

Enterprise Resource Planning systems, commonly referred to as ERP systems, have been defined as systems which "collects, records, integrates, manages and delivers data and information across all functional units of the enterprise" (Ali et al, 2017). Examples of ERP systems are SAP, Oracle, Microsoft, Peoplesoft, amongst others. The aim of this research is to review the degree of influence of change management factors and resistance to change on the adoption of newly implemented ERP systems from an end users' perspective, taking Nigeria as a focus. The resulting theory developed indicates the multiple influence relationships between these constructs as determinants of Adoption of ERP systems. In addition, the developed theory assists in the pinpointing of failure points that need to be addressed by Enterprise Resource Planning (ERP) project managers.

The questionnaire consists of consists of two main parts – The screener questions which consists of demographic and eligibility questions. Screener questions are necessary to determine eligibility. The second part consists of the main questions which will measure the perception of users of the ERP systems. The questionnaire will take approximately 12 minutes to complete. Your participation is voluntary, and should you wish not to participate, please discard the questionnaire at any time. All personal information will be kept completely anonymous and will only be used for this PHD research, and destroyed after two years.

If you have any questions or concerns, please contact me Olubusola.Tejumola@brunel.ac.uk or my supervisor Panos.Louvieris@brunel.ac.uk. Should you have any concerns or complaints regarding the ethical elements of this project please contact siscm.srec@brunel.ac.uk or Professor Zidong Wang, Tel. No. 0044 (1) 895 266021.

APPENDIX B

Appendix B1: Questionnaire

SECTION A: DEMOGRAPHICS

1. Gender
   - o Male
   - o Female
2. Please indicate your age group below
   - o 24 years and Below
   - o 25 – 34 years
   - o 35 – 44 years
   - o 45 – 55 years
   - o Above 55 year
3. How long have you worked with your organization?
   - o Less than 1 year
   - o 1-2 years
   - o 2-5 years
   - o 6-10 years
   - o Over 10 years
4. Please indicate the department you work in
   - o Administration
   - o Sales and marketing
   - o IT
   - o Customer care/technical support
   - o Finance
   - o Human Resource
   - o Other (please specify): ____________________
5. What is your current job status?
   - o Full time staff
   - o Temporary staff
6. What is your highest educational qualification?
   - o PhD
   - o Masters
   - o B.Sc.
   - o Diploma
   - o Other (Please specify):____________________

The next questions are about the Enterprise Resource Planning (ERP) system being used in your company.

7. Do you use the ERP solution?
   - o Yes
   - o No
8. How long have you been using this ERP solution?
   - o Less than a year
   - o 1 – 2 years
   - o 3 – 5 years
   - o 6 – 10 years
   - o 10 years and above
9. Did you experience the change/switch from your old solution / software to this new ERP solution?
   - o Yes PLEASE CONTINUE
   - o No TERMINATE

The following section aims to measure expectations and satisfaction of certain attributes that affect the actual usage of the ERP system (Oracle). There are no wrong or right answers; it is your honest opinion that is needed.

SECTION B: ERP Attributes

For EACH ATTRIBUTE, you are required to provide an answer for both levels.

Please specify the IMPORTANCE of each of the following attributes to your job using this guide: 1=Very Unimportant, 2=Unimportant, 3=Neutral, 4=Important, 5=Very Important.

Please specify the EXTENT ADDRESSED for the same attributes by either your organization or the ERP system using the following guide: 1=Very Poorly Addressed, 2= Poorly Addressed, 3=Neutral, 4=Addressed Well, 5=Addressed Exceptionally Well.

SYSTEM QUALITY

S1. Ease of Use of the ERP system

Importance 1 [ ] 2 [ ] 3[ ] 4 [ ] 5[ ] *Extent Addressed* 1 [ ] 2 [ ] 3[ ] 4 [ ] 5[ ]

S2. Information displayed in a simple and readable format

Importance 1 [ ] 2 [ ] 3[ ] 4 [ ] 5[ ] *Extent Addressed* 1 [ ] 2 [ ] 3[ ] 4 [ ] 5[ ]

S3. The ERP system meets user requirements

Importance 1 [ ] 2 [ ] 3[ ] 4 [ ] 5[ ] *Extent Addressed* 1 [ ] 2 [ ] 3[ ] 4 [ ] 5[ ]

S4. Ease of Learning

Importance *Extent Addressed*

1 [ ] 2 [ ] 3[ ] 4 [ ] 5[ ] 1 [ ] 2 [ ] 3[ ] 4 [ ] 5[ ]

S5. The ERP system provides timely feedback

Importance *Extent Addressed*

1 [ ] 2 [ ] 3[ ] 4 [ ] 5[ ] 1 [ ] 2 [ ] 3[ ] 4 [ ] 5[ ]

S6. The ERP system provides accurate and simple reports

Importance *Extent Addressed*

1 [ ] 2 [ ] 3[ ] 4 [ ] 5[ ] 1 [ ] 2 [ ] 3[ ] 4 [ ] 5[ ]

COMMUNICATION

C1. Information and awareness regarding the change should be communicated effectively and frequently before Implementation

Importance *Extent Addressed*

1 [ ] 2 [ ] 3[ ] 4 [ ] 5[ ] 1 [ ] 2 [ ] 3[ ] 4 [ ] 5[ ]

C2. It was ensured that the need for change was understood before implementation

Importance *Extent Addressed*

1 [ ] 2 [ ] 3[ ] 4 [ ] 5[ ] 1 [ ] 2 [ ] 3[ ] 4 [ ] 5[ ]

C3. Employee buy-in for change is required before implementation

Importance *Extent Addressed*

1 [ ] 2 [ ] 3[ ] 4 [ ] 5[ ] 1 [ ] 2 [ ] 3[ ] 4 [ ] 5[ ]

C4. User Involvement was encouraged before implementation

Importance *Extent Addressed*

1 [ ] 2 [ ] 3[ ] 4 [ ] 5[ ] 1 [ ] 2 [ ] 3[ ] 4 [ ] 5[ ]

C5. Management paid attention to suggestions made during the change process

Importance *Extent Addressed*

1 [ ] 2 [ ] 3[ ] 4 [ ] 5[ ] 1 [ ] 2 [ ] 3[ ] 4 [ ] 5[ ]

C6. There was open and honest communication during the deployment of the ERP system

Importance *Extent Addressed*

1 [ ] 2 [ ] 3[ ] 4 [ ] 5[ ] 1 [ ] 2 [ ] 3[ ] 4 [ ] 5[ ]

C7. Team work is encouraged

Importance *Extent Addressed*

1 [ ] 2 [ ] 3[ ] 4 [ ] 5[ ] 1 [ ] 2 [ ] 3[ ] 4 [ ] 5[ ]

C8. Team work is recognized and rewarded

Importance *Extent Addressed*

1 [ ] 2 [ ] 3[ ] 4 [ ] 5[ ] 1 [ ] 2 [ ] 3[ ] 4 [ ] 5[ ]

C9. Team members were encouraged to participate in the decision-making process of the ERP system

Importance *Extent Addressed*

1 [ ] 2 [ ] 3[ ] 4 [ ] 5[ ] 1 [ ] 2 [ ] 3[ ] 4 [ ] 5[ ]

PERFORMANCE AND PRODUCTIVITY

P1. The change over to the ERP system requires new skills and knowledge to effectively complete job tasks

Importance *Extent Addressed*

1 [ ] 2 [ ] 3[ ] 4 [ ] 5[ ] 1 [ ] 2 [ ] 3[ ] 4 [ ] 5[ ]

P2. It is clear how the new ERP system will impact work daily

Importance *Extent Addressed*

1 [ ] 2 [ ] 3[ ] 4 [ ] 5[ ] 1 [ ] 2 [ ] 3[ ] 4 [ ] 5[ ]

P3. The ERP system is useful in executing daily tasks

Importance *Extent Addressed*

1 [ ] 2 [ ] 3[ ] 4 [ ] 5[ ] 1 [ ] 2 [ ] 3[ ] 4 [ ] 5[ ]

P4. The ERP system equips me to accomplish more work which increases overall productivity

Importance *Extent Addressed*

1 [ ] 2 [ ] 3[ ] 4 [ ] 5[ ] 1 [ ] 2 [ ] 3[ ] 4 [ ] 5[ ]

P5. The ERP system has increased the quality of work

Importance *Extent Addressed*

1 [ ] 2 [ ] 3[ ] 4 [ ] 5[ ] 1 [ ] 2 [ ] 3[ ] 4 [ ] 5[ ]

P6. The ERP system has increased effectiveness in performing job

Importance *Extent Addressed*

1 [ ] 2 [ ] 3[ ] 4 [ ] 5[ ] 1 [ ] 2 [ ] 3[ ] 4 [ ] 5[ ]

ORGANIZATIONAL IMPACT

O1. The ERP system has increased the overall productivity of the organization

Importance *Extent Addressed*

1 [ ] 2 [ ] 3[ ] 4 [ ] 5[ ] 1 [ ] 2 [ ] 3[ ] 4 [ ] 5[ ]

O2. The ERP system has increased the capacity of the organization

Importance *Extent Addressed*

1 [ ] 2 [ ] 3[ ] 4 [ ] 5[ ] 1 [ ] 2 [ ] 3[ ] 4 [ ] 5[ ]

O3. The implementation of the new ERP system has reduced costs in the organization

Importance *Extent Addressed*

1 [ ] 2 [ ] 3[ ] 4 [ ] 5[ ] 1 [ ] 2 [ ] 3[ ] 4 [ ] 5[ ]

O4. The ERP system has led to improved outputs/outcomes

Importance *Extent Addressed*

1 [ ] 2 [ ] 3[ ] 4 [ ] 5[ ] 1 [ ] 2 [ ] 3[ ] 4 [ ] 5[ ]

TRAINING

T1. User involvement was encouraged in the design and implementation of the ERP system

Importance *Extent Addressed*

1 [ ] 2 [ ] 3[ ] 4 [ ] 5[ ] 1 [ ] 2 [ ] 3[ ] 4 [ ] 5[ ]

T2. Adequate training was provided before the implementation process

Importance *Extent Addressed*

1 [ ] 2 [ ] 3[ ] 4 [ ] 5[ ] 1 [ ] 2 [ ] 3[ ] 4 [ ] 5[ ]

T3. Adequate training was provided during the implementation process

Importance *Extent Addressed*

1 [ ] 2 [ ] 3[ ] 4 [ ] 5[ ] 1 [ ] 2 [ ] 3[ ] 4 [ ] 5[ ]

T4. Adequate training was provided after the implementation process

Importance *Extent Addressed*

1 [ ] 2 [ ] 3[ ] 4 [ ] 5[ ] 1 [ ] 2 [ ] 3[ ] 4 [ ] 5[ ]

T5. The support staff on the ERP system is helpful and professional

Importance *Extent Addressed*

1 [ ] 2 [ ] 3[ ] 4 [ ] 5[ ] 1 [ ] 2 [ ] 3[ ] 4 [ ] 5[ ]

T6. Remedial training was provided long after the implementation of the ERP system

Importance *Extent Addressed*

1[ ] 2 [ ] 3[ ] 4 [ ] 5[ ] 1 [ ] 2 [ ] 3[ ] 4 [ ] 5[ ]

MOTIVATION

This section is aimed at measuring the users' perception of personal gains, enjoyment, satisfaction, rewards, money, career, fear of change, promotions, recognition, communication, user engagement.

There is motivation to use the ERP system because:

M1. Using it productively will translate into personal financial gains and rewards

Importance *Extent Addressed*

1 [ ] 2 [ ] 3[ ] 4 [ ] 5[ ] 1 [ ] 2 [ ] 3[ ] 4 [ ] 5[ ]

M2. It will create further career opportunities

Importance *Extent Addressed*

1 [ ] 2 [ ] 3[ ] 4 [ ] 5[ ] 1 [ ] 2 [ ] 3[ ] 4 [ ] 5[ ]

M3. Using it is enjoyable even though it is mandatory

Importance *Extent Addressed*

1 [ ] 2 [ ] 3[ ] 4 [ ] 5[ ] 1 [ ] 2 [ ] 3[ ] 4 [ ] 5[ ]

M4. It enhances job performance as satisfaction is derived from it

Importance *Extent Addressed*

1 [ ] 2 [ ] 3[ ] 4 [ ] 5[ ] 1 [ ] 2 [ ] 3[ ] 4 [ ] 5[ ]

M5. It will translate into more financial gains

Importance *Extent Addressed*

1 [ ] 2 [ ] 3[ ] 4 [ ] 5[ ] 1 [ ] 2 [ ] 3[ ] 4 [ ] 5[ ]

There is NO motivation to use the ERP system because:

M6. It will require new skills (that is not possessed now)

Importance *Extent Addressed*

1 [ ] 2 [ ] 3[ ] 4 [ ] 5[ ] 1 [ ] 2 [ ] 3[ ] 4 [ ] 5[ ]

M7. It may lead to job redundancy and job loss

Importance *Extent Addressed*

1 [ ] 2 [ ] 3[ ] 4 [ ] 5[ ] 1 [ ] 2 [ ] 3[ ] 4 [ ] 5[ ]

M8. It would be preferred that things remain the way they used to be

Importance *Extent Addressed*

1 [ ] 2 [ ] 3[ ] 4 [ ] 5[ ] 1 [ ] 2 [ ] 3[ ] 4 [ ] 5[ ]

M9. Adjusting to the new system might be difficult

Importance *Extent Addressed*

1 [ ] 2 [ ] 3[ ] 4 [ ] 5[ ] 1 [ ] 2 [ ] 3[ ] 4 [ ] 5[ ]

M10. Fear not being able to change

Importance *Extent Addressed*

1 [ ] 2 [ ] 3[ ] 4 [ ] 5[ ] 1 [ ] 2 [ ] 3[ ] 4 [ ] 5[ ]

M11. Fear of making mistakes which may have serious consequences

Importance *Extent Addressed*

1 [ ] 2 [ ] 3[ ] 4 [ ] 5[ ] 1 [ ] 2 [ ] 3[ ] 4 [ ] 5[ ]

COMMITMENT AND TRUST

CT1. Information provided by management can be trusted

Importance *Extent Addressed*

1 [ ] 2 [ ] 3[ ] 4 [ ] 5[ ] 1 [ ] 2 [ ] 3[ ] 4 [ ] 5[ ]

CT2. Management recognizes and rewards excellence

Importance *Extent Addressed*

1 [ ] 2 [ ] 3[ ] 4 [ ] 5[ ] 1 [ ] 2 [ ] 3[ ] 4 [ ] 5[ ]

CT3. Job Security is a major reason for continued commitment

Importance *Extent Addressed*

1 [ ] 2 [ ] 3[ ] 4 [ ] 5[ ] 1 [ ] 2 [ ] 3[ ] 4 [ ] 5[ ]

SECTION C

10. Please refer to the period <u>before the implementation</u> of the ERP system at your organization. In your opinion, what were the main issues that needed to be addressed then?

11. Overall, how satisfied are you with the way that the above-mentioned issues were dealt with by the implementation of the new ERP system at your organization.
    - Very Satisfied
    - Satisfied
    - Neutral
    - Dissatisfied
    - Very Dissatisfied

12. Compared to the processes before the implementation of the ERP system, how satisfied are you now with the current ERP system at your organization.
    - Very Satisfied
    - Satisfied
    - Neutral
    - Dissatisfied
    - Very Dissatisfied

13. Personally, how motivated are you with the voluntary continued usage of the current ERP system
    - Highly Motivated
    - Quite Motivated
    - Neutral
    - Not Motivated
    - Not Motivated at all

14. And how motivated would you say your team is in using the new ERP system
    - Highly Motivated
    - Somewhat Motivated
    - Neutral
    - Not Motivated
    - Not Motivated at all

Appendix C

Appendix C1: Descriptive analysis of constructs

Descriptive Statistics									
	Mean	Std. Error of Mean	Median	Mode	Std. Deviation	Skewness	Std. Error of Skewness	Kurtosis	Std. Error of Kurtosis
S1	4.231	0.04	5	5	0.99	-1.281	0.098	0.987	0.197
S2	4.291	0.036	5	5	0.892	-1.308	0.098	1.477	0.197
S3	4.222	0.037	4	5	0.918	-1.276	0.098	1.44	0.197
S4	4.242	0.037	4	5	0.911	-1.22	0.098	1.042	0.197
S5	4.253	0.036	4	5	0.891	-1.182	0.098	0.965	0.197
S6	4.338	0.035	5	5	0.872	-1.435	0.098	1.896	0.197
C1	4.282	0.035	4	5	0.869	-1.28	0.098	1.314	0.197
C2	4.242	0.036	4	5	0.899	-1.29	0.098	1.482	0.197
C3	4.206	0.037	4	5	0.92	-1.148	0.098	0.89	0.197
C4	4.151	0.04	4	5	0.995	-1.31	0.098	1.402	0.197
C5	4.093	0.042	4	5	1.031	-1.186	0.098	0.834	0.197
C6	4.117	0.04	4	5	0.996	-1.109	0.098	0.624	0.197
C7	3.984	0.043	4	4	1.068	-1.019	0.098	0.303	0.197
C8	3.916	0.044	4	4	1.086	-0.939	0.098	0.078	0.197
C9	3.989	0.044	4	5	1.08	-0.965	0.098	0.058	0.197
P1	4.195	0.039	4	5	0.96	-1.261	0.098	1.227	0.197
P2	4.263	0.033	4	5	0.81	-1.122	0.098	1.199	0.197
P3	4.3	0.033	4	5	0.824	-1.271	0.098	1.596	0.197
P4	4.153	0.034	4	4	0.832	-1.159	0.098	1.653	0.197
P5	4.295	0.033	4	5	0.823	-1.35	0.098	2.19	0.197
P6	4.261	0.034	4	5	0.843	-1.293	0.098	1.869	0.197
O1	4.026	0.046	4	5	1.13	-1.136	0.098	0.438	0.197
O2	3.909	0.043	4	4	1.077	-0.932	0.098	0.142	0.197
O3	3.942	0.044	4	5	1.098	-0.955	0.098	0.162	0.197
O4	4.18	0.039	4	5	0.97	-1.214	0.098	1.037	0.197
T1	4.247	0.041	5	5	1.013	-1.49	0.098	1.752	0.197
T2	4.356	0.034	5	5	0.849	-1.438	0.098	1.976	0.197
T3	4.385	0.034	5	5	0.848	-1.565	0.098	2.54	0.197
T4	4.381	0.035	5	5	0.859	-1.578	0.098	2.57	0.197
T9	4.339	0.033	5	5	0.821	-1.389	0.098	2.032	0.197
T10	4.136	0.036	4	4	0.899	-1.175	0.098	1.352	0.197
M2	3.925	0.043	4	4	1.079	-0.995	0.098	0.264	0.197
M3	4.068	0.04	4	5	1.005	-1.101	0.098	0.774	0.197
M4	4.063	0.037	4	4	0.916	-1.054	0.098	0.999	0.197
M5	3.443	0.054	4	4	1.339	-0.541	0.098	-0.902	0.197
M6	3.531	0.054	4	4	1.341	-0.558	0.098	-0.944	0.197
M7	3.817	0.047	4	5	1.169	-0.736	0.098	-0.519	0.197
M8	3.505	0.049	4	4	1.206	-0.397	0.098	-0.888	0.197
M9	3.554	0.053	4	5	1.318	-0.54	0.098	-0.912	0.197
M10	3.536	0.051	4	4	1.258	-0.44	0.098	-0.939	0.197
M11	3.364	0.053	4	4	1.317	-0.319	0.098	-1.092	0.197
M12	3.594	0.051	4	5	1.263	-0.471	0.098	-0.934	0.197
CT1	3.911	0.045	4	5	1.128	-0.943	0.098	0.029	0.197
CT2	3.924	0.046	4	4	1.134	-1.05	0.098	0.353	0.197
CT3	4.185	0.042	5	5	1.04	-1.299	0.098	1.047	0.197

Appendix C2: Univariate and Multivariate distributions

Variable/Univariate Normality	Skewness	C.R	Kurtosis	C.R
S1	-1.281	-13.009	.987	5.022
S2	-1.308	-13.284	1.477	7.515
S3	-1.276	-12.964	1.440	7.323
S4	-1.220	-12.395	1.042	5.303
S5	-1.182	-12.01	.965	4.91
S6	-1.435	-14.577	1.896	9.644
C1	-1.280	-13.006	1.314	6.686
C2	-1.290	-13.101	1.482	7.537
C3	-1.148	-11.662	.890	4.527
C4	-1.310	-13.301	1.402	7.129
C5	-1.186	-12.049	.834	4.242
C6	-1.109	-11.262	.624	3.177
C7	-1.019	-10.354	.303	1.541
C8	-0.939	-9.54	.078	0.396
C9	-0.965	-9.802	.058	0.292
P1	-1.261	-12.81	1.227	6.241
P2	-1.122	-11.399	1.199	6.099
P3	-1.271	-12.912	1.596	8.116
P4	-1.159	-11.771	1.653	8.41
P5	-1.350	-13.714	2.190	11.139
P6	-1.293	-13.132	1.869	9.507
O1	-1.136	-11.537	.438	2.229
O2	-0.932	-9.467	.142	0.722
O3	-0.955	-9.702	.162	0.824
O4	-1.214	-12.327	1.037	5.277
T1	-1.490	-15.132	1.752	8.911
T2	-1.438	-14.61	1.976	10.051
T3	-1.565	-15.893	2.540	12.92
T4	-1.578	-16.023	2.570	13.07
T9	-1.389	-14.112	2.032	10.336
T10	-1.175	-11.938	1.352	6.875
M2	-0.995	-10.108	.264	1.343
M3	-1.101	-11.186	.774	3.936
M4	-1.054	-10.704	.999	5.083
M5	-0.541	-5.497	-.902	-4.588
M6	-0.558	-5.663	-.944	-4.803
M7	-0.736	-7.478	-.519	-2.638
M8	-0.397	-4.03	-.888	-4.518
M9	-0.540	-5.483	-.912	-4.637
M10	-0.440	-4.468	-.939	-4.776
M11	-0.319	-3.244	-1.092	-5.556
M12	-0.471	-4.782	-.934	-4.751
CT1	-0.943	-9.579	.029	0.146

Appendix D

Appendix D 1 EFA & CFA

KMO and Bartlett's Test

Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		.950
Bartlett's Test of Sphericity	Approx. Chi-Square	12316.224
	df	465
	Sig.	0.000

Communalities[a]

	Initial	Extraction
S1	.648	.662
S2	.654	.693
S3	.644	.686
S4	.612	.614
S5	.635	.642
S6	.667	.693
C1	.549	.601
C2	.615	.657
C3	.525	.583
C4	.512	.544
C5	.631	.769
C6	.571	.631
P3	.544	.538
P4	.530	.514
P6	.547	.529
O1	.501	.576
O2	.523	.659
O3	.511	.603
O4	.452	.466
T2	.583	.621
T3	.672	.698
T4	.648	.688
T9	.654	.679
T10	.528	.534
M8	.443	.441
M9	.575	.583
M10	.635	.683
M11	.692	.770
M12	.662	.719
CT1	.607	.999
CT2	.595	.581

CFA Model Fit Summary

CMIN

Model	NPAR	CMIN	DF	P	CMIN/DF
Default model	67	350.639	209	.000	1.678
Saturated model	276	.000	0		
Independence model	23	8998.178	253	.000	35.566

RMR, GFI

Model	RMR	GFI	AGFI	PGFI
Default model	.039	.952	.936	.721
Saturated model	.000	1.000		
Independence model	.372	.238	.168	.218

Baseline Comparisons

Model	NFI Delta1	RFI rho1	IFI Delta2	TLI rho2	CFI
Default model	.961	.953	.984	.980	.984
Saturated model	1.000		1.000		1.000
Independence model	.000	.000	.000	.000	.000

Parsimony-Adjusted Measures

Model	PRATIO	PNFI	PCFI
Default model	.826	.794	.813
Saturated model	.000	.000	.000
Independence model	1.000	.000	.000

NCP

Model	NCP	LO 90	HI 90
Default model	141.639	93.930	197.235
Saturated model	.000	.000	.000
Independence model	8745.178	8438.500	9058.194

FMIN

Model	FMIN	F0	LO 90	HI 90
Default model	.570	.230	.153	.321
Saturated model	.000	.000	.000	.000

Model	FMIN	F0	LO 90	HI 90
Independence model	14.631	14.220	13.721	14.729

RMSEA

Model	RMSEA	LO 90	HI 90	PCLOSE
Default model	.033	.027	.039	1.000
Independence model	.237	.233	.241	.000

AIC

Model	AIC	BCC	BIC	CAIC
Default model	484.639	490.080	780.996	847.996
Saturated model	552.000	574.416	1772.816	2048.816
Independence model	9044.178	9046.046	9145.912	9168.912

ECVI

Model	ECVI	LO 90	HI 90	MECVI
Default model	.788	.710	.878	.797
Saturated model	.898	.898	.898	.934
Independence model	14.706	14.207	15.215	14.709

HOELTER

Model	HOELTER .05	HOELTER .01
Default model	428	456
Independence model	20	22

Appendix E

SEM Model Fit Summary

CMIN

Model	NPAR	CMIN	DF	P	CMIN/DF
Default model	68	483.105	232	.000	2.082
Saturated model	300	.000	0		
Independence model	24	8690.015	276	.000	31.486

RMR, GFI

Model	RMR	GFI	AGFI	PGFI
Default model	.053	.936	.918	.724
Saturated model	.000	1.000		
Independence model	.329	.264	.200	.243

Baseline Comparisons

Model	NFI Delta1	RFI rho1	IFI Delta2	TLI rho2	CFI
Default model	.944	.934	.970	.964	.970
Saturated model	1.000		1.000		1.000
Independence model	.000	.000	.000	.000	.000

Parsimony-Adjusted Measures

Model	PRATIO	PNFI	PCFI
Default model	.841	.794	.815
Saturated model	.000	.000	.000
Independence model	1.000	.000	.000

NCP

Model	NCP	LO 90	HI 90
Default model	251.105	191.917	318.054
Saturated model	.000	.000	.000
Independence model	8414.015	8112.975	8721.402

FMIN

Model	FMIN	F0	LO 90	HI 90
Default model	.786	.408	.312	.517
Saturated model	.000	.000	.000	.000
Independence model	14.130	13.681	13.192	14.181

RMSEA

Model	RMSEA	LO 90	HI 90	PCLOSE
Default model	.042	.037	.047	.995
Independence model	.223	.219	.227	.000

AIC

Model	AIC	BCC	BIC	CAIC
Default model	619.105	624.867	919.885	987.885
Saturated model	600.000	625.424	1926.974	2226.974
Independence model	8738.015	8740.049	8844.173	8868.173

ECVI

Model	ECVI	LO 90	HI 90	MECVI
Default model	1.007	.910	1.116	1.016
Saturated model	.976	.976	.976	1.017
Independence model	14.208	13.719	14.708	14.211

HOELTER

Model	HOELTER .05	HOELTER .01
Default model	342	363
Independence model	23	24

Regression Weights: (Group number 1 - Default model)

			Estimate	S.E.	C.R.	P	Label
Trust	<---	Comm	.721	.116	6.208	***	par_27
SQ	<---	Comm	.758	.084	9.031	***	par_24
SQ	<---	Trust	.262	.033	8.035	***	par_28
Training	<---	Comm	.331	.067	4.952	***	par_25
Training	<---	Trust	.118	.026	4.566	***	par_30
Training	<---	SQ	.530	.043	12.220	***	par_33
OB	<---	Comm	-.429	.121	-3.548	***	par_26
OB	<---	Trust	.069	.046	1.515	.130	par_29

			Estimate	S.E.	C.R.	P	Label
OB	<---	SQ	.266	.087	3.068	.002	par_32
OB	<---	Training	.479	.102	4.703	***	par_35
Resistance	<---	Trust	.090	.060	1.502	.133	par_31
Resistance	<---	SQ	.073	.110	.668	.504	par_34
Resistance	<---	Training	-.395	.126	-3.140	.002	par_36
Resistance	<---	OB	-.206	.069	-2.993	.003	par_37
T9	<---	Training	1.000				
T4	<---	Training	1.043	.046	22.627	***	par_1
T3	<---	Training	1.091	.049	22.470	***	par_2
T2	<---	Training	.974	.046	21.073	***	par_3
S6	<---	SQ	1.000				
S5	<---	SQ	.999	.041	24.258	***	par_4
S4	<---	SQ	.956	.043	22.002	***	par_5
S3	<---	SQ	1.031	.042	24.552	***	par_6
S2	<---	SQ	1.013	.040	25.007	***	par_7
S1	<---	SQ	1.100	.046	23.704	***	par_8
M12	<---	Resistance	1.000				
M11	<---	Resistance	1.080	.040	27.156	***	par_9
M10	<---	Resistance	1.006	.056	17.877	***	par_10
M9	<---	Resistance	.957	.060	15.990	***	par_11
M8	<---	Resistance	.754	.050	15.134	***	par_12
O3	<---	OB	1.000				
O2	<---	OB	1.036	.060	17.390	***	par_13
O1	<---	OB	1.044	.061	17.045	***	par_14
C6	<---	CE	1.000				
C5	<---	CE	1.240	.088	14.020	***	par_15
C4	<---	CE	1.055	.080	13.178	***	par_16
CT1	<---	Trust	1.000				
CT2	<---	Trust	1.016	.065	15.732	***	par_23
Adoptions	<---	Resistance	-.225	.045	-5.043	***	par_38

Standardized Regression Weights: (Group number 1 - Default model)

			Estimate
Trust	<---	CE	.321
SQ	<---	CE	.447
SQ	<---	Trust	.346
Training	<---	CE	.211
Training	<---	Trust	.168
Training	<---	SQ	.573
OB	<---	CE	-.222

			Estimate
OB	<---	Trust	.081
OB	<---	SQ	.233
OB	<---	Training	.389
Resistance	<---	Trust	.084
Resistance	<---	SQ	.052
Resistance	<---	Training	-.259
Resistance	<---	OB	-.167
T9	<---	Training	.822
T4	<---	Training	.820
T3	<---	Training	.868
T2	<---	Training	.775
S6	<---	SQ	.836
S5	<---	SQ	.817
S4	<---	SQ	.765
S3	<---	SQ	.819
S2	<---	SQ	.828
S1	<---	SQ	.810
M12	<---	Resistance	.815
M11	<---	Resistance	.844
M10	<---	Resistance	.823
M9	<---	Resistance	.747
M8	<---	Resistance	.644
O3	<---	OB	.757
O2	<---	OB	.799
O1	<---	OB	.768
C6	<---	CE	.643
C5	<---	CE	.817
C4	<---	CE	.684
CT1	<---	Trust	.856
CT2	<---	Trust	.865
Adoptions	<---	Resistance	-.217

Covariances: (Group number 1 - Default model)

			Estimate	S.E.	C.R.	P	Label
e14	<-->	e15	.156	.041	3.791	***	par_17
e13	<-->	e14	.103	.045	2.268	.023	par_18
e11	<-->	e12	.148	.051	2.892	.004	par_19
e7	<-->	e10	.066	.018	3.783	***	par_20
e6	<-->	e10	-.059	.014	-4.166	***	par_21
e1	<-->	e3	-.055	.012	-4.442	***	par_22

Correlations: (Group number 1 - Default model)

			Estimate
e14	<-->	e15	.193
e13	<-->	e14	.164
e11	<-->	e12	.287
e7	<-->	e10	.194
e6	<-->	e10	-.199
e1	<-->	e3	-.280

Variances: (Group number 1 - Default model)

	Estimate	S.E.	C.R.	P	Label
CE	.185	.023	7.967	***	par_39
e29	.835	.080	10.467	***	par_40
e25	.308	.027	11.292	***	par_41
e28	.158	.016	9.809	***	par_42
e26	.495	.052	9.501	***	par_43
e27	.963	.090	10.642	***	par_44
e1	.218	.018	12.370	***	par_45
e2	.241	.017	14.137	***	par_46
e3	.176	.016	10.795	***	par_47
e4	.288	.019	15.167	***	par_48
e5	.228	.016	14.437	***	par_49
e6	.263	.018	14.393	***	par_50
e7	.344	.022	15.340	***	par_51
e8	.278	.019	14.843	***	par_52
e9	.249	.017	14.631	***	par_53
e10	.338	.024	14.094	***	par_54
e11	.534	.057	9.428	***	par_55
e12	.497	.060	8.270	***	par_56
e13	.509	.053	9.691	***	par_57
e14	.767	.064	11.907	***	par_58
e15	.850	.055	15.431	***	par_59
e16	.515	.042	12.395	***	par_60
e17	.418	.039	10.728	***	par_61
e18	.524	.044	12.007	***	par_62
e19	.263	.018	14.313	***	par_63
e20	.142	.016	8.591	***	par_64
e21	.235	.017	13.418	***	par_65
e22	.338	.055	6.117	***	par_66
e23	.323	.057	5.713	***	par_67

	Estimate	S.E.	C.R.	P	Label
e24	1.091	.063	17.412	***	par_68

Squared Multiple Correlations: (Group number 1 - Default model)

	Estimate
Trust	.103
SQ	.420
Training	.653
OB	.282
Resistance	.090
Adoptions	.047
CT2	.748
CT1	.733
C4	.468
C5	.667
C6	.413
O1	.589
O2	.639
O3	.573
M8	.415
M9	.558
M10	.678
M11	.713
M12	.665
S1	.655
S2	.686
S3	.670
S4	.586
S5	.668
S6	.700
T2	.600
T3	.754
T4	.672
T9	.676

Matrices (Group number 1 - Default model)

Total Effects (Group number 1 - Default model)

	CE	Trust	SQ	Training	OB	Resistance
Trust	.721	.000	.000	.000	.000	.000

	CE	Trust	SQ	Training	OB	Resistance
SQ	.947	.262	.000	.000	.000	.000
Training	.917	.256	.530	.000	.000	.000
OB	.312	.262	.520	.479	.000	.000
Resistance	-.292	-.046	-.243	-.494	-.206	.000
Adoptions	.066	.010	.055	.111	.046	-.225
CT2	.732	1.016	.000	.000	.000	.000
CT1	.721	1.000	.000	.000	.000	.000
C4	1.055	.000	.000	.000	.000	.000
C5	1.240	.000	.000	.000	.000	.000
C6	1.000	.000	.000	.000	.000	.000
O1	.325	.273	.542	.500	1.044	.000
O2	.323	.271	.538	.496	1.036	.000
O3	.312	.262	.520	.479	1.000	.000
M8	-.220	-.035	-.183	-.372	-.156	.754
M9	-.280	-.044	-.232	-.472	-.197	.957
M10	-.294	-.047	-.244	-.496	-.208	1.006
M11	-.316	-.050	-.262	-.533	-.223	1.080
M12	-.292	-.046	-.243	-.494	-.206	1.000
S1	1.041	.288	1.100	.000	.000	.000
S2	.959	.265	1.013	.000	.000	.000
S3	.976	.270	1.031	.000	.000	.000
S4	.905	.250	.956	.000	.000	.000
S5	.945	.261	.999	.000	.000	.000
S6	.947	.262	1.000	.000	.000	.000
T2	.894	.250	.516	.974	.000	.000
T3	1.000	.280	.578	1.091	.000	.000
T4	.957	.267	.553	1.043	.000	.000
T9	.917	.256	.530	1.000	.000	.000

Standardized Total Effects (Group number 1 - Default model)

	CE	Trust	SQ	Training	OB	Resistance
Trust	.321	.000	.000	.000	.000	.000
SQ	.559	.346	.000	.000	.000	.000
Training	.585	.367	.573	.000	.000	.000
OB	.161	.304	.456	.389	.000	.000
Resistance	-.122	-.044	-.172	-.323	-.167	.000
Adoptions	.026	.009	.037	.070	.036	-.217
CT2	.278	.865	.000	.000	.000	.000
CT1	.275	.856	.000	.000	.000	.000
C4	.684	.000	.000	.000	.000	.000

	CE	Trust	SQ	Training	OB	Resistance
C5	.817	.000	.000	.000	.000	.000
C6	.643	.000	.000	.000	.000	.000
O1	.124	.233	.350	.298	.768	.000
O2	.129	.243	.365	.311	.799	.000
O3	.122	.230	.345	.294	.757	.000
M8	-.079	-.028	-.111	-.208	-.107	.644
M9	-.091	-.033	-.129	-.242	-.124	.747
M10	-.101	-.036	-.142	-.266	-.137	.823
M11	-.103	-.037	-.145	-.273	-.141	.844
M12	-.100	-.036	-.140	-.264	-.136	.815
S1	.452	.280	.810	.000	.000	.000
S2	.463	.287	.828	.000	.000	.000
S3	.457	.284	.819	.000	.000	.000
S4	.428	.265	.765	.000	.000	.000
S5	.457	.283	.817	.000	.000	.000
S6	.467	.290	.836	.000	.000	.000
T2	.453	.284	.444	.775	.000	.000
T3	.508	.319	.497	.868	.000	.000
T4	.480	.301	.470	.820	.000	.000
T9	.481	.302	.471	.822	.000	.000

Direct Effects (Group number 1 - Default model)

	CE	Trust	SQ	Training	OB	Resistance
Trust	.721	.000	.000	.000	.000	.000
SQ	.758	.262	.000	.000	.000	.000
Training	.331	.118	.530	.000	.000	.000
OB	-.429	.069	.266	.479	.000	.000
Resistance	.000	.090	.073	-.395	-.206	.000
Adoptions	.000	.000	.000	.000	.000	-.225
CT2	.000	1.016	.000	.000	.000	.000
CT1	.000	1.000	.000	.000	.000	.000
C4	1.055	.000	.000	.000	.000	.000
C5	1.240	.000	.000	.000	.000	.000
C6	1.000	.000	.000	.000	.000	.000
O1	.000	.000	.000	.000	1.044	.000
O2	.000	.000	.000	.000	1.036	.000
O3	.000	.000	.000	.000	1.000	.000
M8	.000	.000	.000	.000	.000	.754
M9	.000	.000	.000	.000	.000	.957
M10	.000	.000	.000	.000	.000	1.006

	CE	Trust	SQ	Training	OB	Resistance
M11	.000	.000	.000	.000	.000	1.080
M12	.000	.000	.000	.000	.000	1.000
S1	.000	.000	1.100	.000	.000	.000
S2	.000	.000	1.013	.000	.000	.000
S3	.000	.000	1.031	.000	.000	.000
S4	.000	.000	.956	.000	.000	.000
S5	.000	.000	.999	.000	.000	.000
S6	.000	.000	1.000	.000	.000	.000
T2	.000	.000	.000	.974	.000	.000
T3	.000	.000	.000	1.091	.000	.000
T4	.000	.000	.000	1.043	.000	.000
T9	.000	.000	.000	1.000	.000	.000

Standardized Direct Effects (Group number 1 - Default model)

	CE	Trust	SQ	Training	OB	Resistance
Trust	.321	.000	.000	.000	.000	.000
SQ	.447	.346	.000	.000	.000	.000
Training	.211	.168	.573	.000	.000	.000
OB	-.222	.081	.233	.389	.000	.000
Resistance	.000	.084	.052	-.259	-.167	.000
Adoptions	.000	.000	.000	.000	.000	-.217
CT2	.000	.865	.000	.000	.000	.000
CT1	.000	.856	.000	.000	.000	.000
C4	.684	.000	.000	.000	.000	.000
C5	.817	.000	.000	.000	.000	.000
C6	.643	.000	.000	.000	.000	.000
O1	.000	.000	.000	.000	.768	.000
O2	.000	.000	.000	.000	.799	.000
O3	.000	.000	.000	.000	.757	.000
M8	.000	.000	.000	.000	.000	.644
M9	.000	.000	.000	.000	.000	.747
M10	.000	.000	.000	.000	.000	.823
M11	.000	.000	.000	.000	.000	.844
M12	.000	.000	.000	.000	.000	.815
S1	.000	.000	.810	.000	.000	.000
S2	.000	.000	.828	.000	.000	.000
S3	.000	.000	.819	.000	.000	.000
S4	.000	.000	.765	.000	.000	.000
S5	.000	.000	.817	.000	.000	.000
S6	.000	.000	.836	.000	.000	.000

	CE	Trust	SQ	Training	OB	Resistance
T2	.000	.000	.000	.775	.000	.000
T3	.000	.000	.000	.868	.000	.000
T4	.000	.000	.000	.820	.000	.000
T9	.000	.000	.000	.822	.000	.000

Indirect Effects (Group number 1 - Default model)

	CE	Trust	SQ	Training	OB	Resistance
Trust	.000	.000	.000	.000	.000	.000
SQ	.189	.000	.000	.000	.000	.000
Training	.586	.139	.000	.000	.000	.000
OB	.741	.192	.254	.000	.000	.000
Resistance	-.292	-.136	-.316	-.099	.000	.000
Adoptions	.066	.010	.055	.111	.046	.000
CT2	.732	.000	.000	.000	.000	.000
CT1	.721	.000	.000	.000	.000	.000
C4	.000	.000	.000	.000	.000	.000
C5	.000	.000	.000	.000	.000	.000
C6	.000	.000	.000	.000	.000	.000
O1	.325	.273	.542	.500	.000	.000
O2	.323	.271	.538	.496	.000	.000
O3	.312	.262	.520	.479	.000	.000
M8	-.220	-.035	-.183	-.372	-.156	.000
M9	-.280	-.044	-.232	-.472	-.197	.000
M10	-.294	-.047	-.244	-.496	-.208	.000
M11	-.316	-.050	-.262	-.533	-.223	.000
M12	-.292	-.046	-.243	-.494	-.206	.000
S1	1.041	.288	.000	.000	.000	.000
S2	.959	.265	.000	.000	.000	.000
S3	.976	.270	.000	.000	.000	.000
S4	.905	.250	.000	.000	.000	.000
S5	.945	.261	.000	.000	.000	.000
S6	.947	.262	.000	.000	.000	.000
T2	.894	.250	.516	.000	.000	.000
T3	1.000	.280	.578	.000	.000	.000
T4	.957	.267	.553	.000	.000	.000
T9	.917	.256	.530	.000	.000	.000

Standardized Indirect Effects (Group number 1 - Default model)

	CE	Trust	SQ	Training	OB	Resistance
Trust	.000	.000	.000	.000	.000	.000
SQ	.111	.000	.000	.000	.000	.000
Training	.374	.198	.000	.000	.000	.000
OB	.384	.223	.223	.000	.000	.000
Resistance	-.122	-.128	-.224	-.065	.000	.000
Adoptions	.026	.009	.037	.070	.036	.000
CT2	.278	.000	.000	.000	.000	.000
CT1	.275	.000	.000	.000	.000	.000
C4	.000	.000	.000	.000	.000	.000
C5	.000	.000	.000	.000	.000	.000
C6	.000	.000	.000	.000	.000	.000
O1	.124	.233	.350	.298	.000	.000
O2	.129	.243	.365	.311	.000	.000
O3	.122	.230	.345	.294	.000	.000
M8	-.079	-.028	-.111	-.208	-.107	.000
M9	-.091	-.033	-.129	-.242	-.124	.000
M10	-.101	-.036	-.142	-.266	-.137	.000
M11	-.103	-.037	-.145	-.273	-.141	.000
M12	-.100	-.036	-.140	-.264	-.136	.000
S1	.452	.280	.000	.000	.000	.000
S2	.463	.287	.000	.000	.000	.000
S3	.457	.284	.000	.000	.000	.000
S4	.428	.265	.000	.000	.000	.000
S5	.457	.283	.000	.000	.000	.000
S6	.467	.290	.000	.000	.000	.000
T2	.453	.284	.444	.000	.000	.000
T3	.508	.319	.497	.000	.000	.000
T4	.480	.301	.470	.000	.000	.000
T9	.481	.302	.471	.000	.000	.000

Appendix G

Paired T- Test

Paired Samples Correlations

		N	Correlation	Sig.
Pair 1	S1	100	.168	.094
Pair 2	S2	100	.481	.000
Pair 3	S3	100	.361	.000
Pair 4	S4	100	.087	.391
Pair 5	S5	100	.411	.000
Pair 6	S6	100	.290	.003
Pair 7	C4	100	.355	.000
Pair 8	C5	100	.437	.000
Pair 9	C6	100	.212	.034
Pair 10	O1	100	.505	.000
Pair 11	O2	100	.548	.000
Pair 12	O3	100	.442	.000
Pair 13	T2	100	.141	.161
Pair 14	T3	100	.042	.676
Pair 15	T4	100	.184	.067
Pair 16	T9	100	.313	.002
Pair 17	M8	100	.562	.000
Pair 18	M9	100	.693	.000
Pair 19	M10	100	.556	.000
Pair 20	M11	100	.626	.000
Pair 21	M12	100	-.465	.000
Pair 22	CT1	100	.359	.000
Pair 23	CT2	100	.318	.001

Paired Samples Test

		Paired Differences					t	df	Sig. (2-tailed)
		Mean	Std. Deviation	Std. Error Mean	95% Confidence Interval of the Difference Lower	Upper			
Pair 1	S1	.630	1.022	.102	.427	.833	6.167	99	.00
Pair 2	S2	.580	.741	.074	.433	.727	7.827	99	.00
Pair 3	S3	.430	.879	.088	.256	.604	4.891	99	.00
Pair 4	S4	.740	1.186	.119	.505	.975	6.240	99	.00
Pair 5	S5	.370	.906	.091	.190	.550	4.083	99	.00
Pair 6	S6	.630	.849	.085	.462	.798	7.423	99	.00
Pair 7	C4	.390	.751	.075	.241	.539	5.195	99	.00
Pair 8	C5	.460	.744	.074	.312	.608	6.181	99	.00
Pair 9	C6	.470	.834	.083	.304	.636	5.633	99	.00
Pair 10	O1	.340	1.056	.106	.130	.550	3.219	99	.00
Pair 11	O2	.420	1.007	.101	.220	.620	4.171	99	.00
Pair 12	O3	.390	1.136	.114	.165	.615	3.433	99	.00
Pair 13	T2	.350	1.077	.108	.136	.564	3.251	99	.00
Pair 14	T3	.240	1.173	.117	.007	.473	2.046	99	.04
Pair 15	T4	.290	1.094	.109	.073	.507	2.650	99	.00
Pair 16	T9	.290	.844	.084	.122	.458	3.434	99	.00
Pair 17	M8	-.040	.828	.083	-.204	.124	-.483	99	.63
Pair 18	M9	.040	.695	.070	-.098	.178	.575	99	.56
Pair 19	M10	0.000	.791	.079	-.157	.157	0.000	99	1.00
Pair 20	M11	-.010	.759	.076	-.161	.141	-.132	99	.89
Pair 21	M12	1.760	1.232	.123	1.516	2.004	14.287	99	.00
Pair 22	CT1	.540	.989	.099	.344	.736	5.460	99	.00
Pair 23	CT2	.740	1.186	.119	.505	.975	6.240	99	.00