ADDIS ABABA UNIVERSITY

COLLEGE OF NATURAL AND COMPUTATIONAL SCIENCES

SCHOOL OF INFORMATION SCIENCE

DEVELOPING AND VALIDATING PRE-IMPLEMENTATION READINESS MEASURE FOR ENTERPRISE RESOURCE PLANNING (ERP) SYSTEMS

By

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Declaration

This thesis has not previously been accepted for any degree and is not being concurrently submitted in candidature for any degree in any university.

I declare that this thesis entitled "***Developing and Validating Pre-implementation Readiness Measure for Enterprise Resource Planning (ERP) Systems***" is a result of my own investigation, except where otherwise stated. I have undertaken the study independently with the guidance and support of my research advisor. Other sources are acknowledged by citations giving explicit references. A list of references is appended.

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This thesis has been submitted for examination with my approval as a university advisor.

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Dedication

Dedicated to my beloved family especially my Mom, my husband and my lovely daughter Yoki. Thank you for your power, encouragement and support in finalizing this thesis.

Acknowledgments

First and for most I would like to express my deepest thanks to my almighty God and his mother Santa Mariam, who gave me the power, strength, and knowledge to bring this thesis to completion and made me who I am today.

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Abstract

Prior researches attempted to develop Enterprise Resource Planning (ERP) pre-implementation readiness models and frameworks but developing a measurement model for same was not well addressed. This study is aimed at developing and validating an ERP pre-implementation readiness measurement tool for ERP systems for application in different sectors. The research question addressed in this study is:"What pre-implementation readiness measurement tool could be develop for ERP system implemtation?" The study has proposed a research model based on prior researchers.Then, survey was conducted using a self-administered questionnaire. Out of 120 questionnaires that have been distributed to employees, 103 valid questionnaires were collected and used for data analysis. The proposed model was tested using a partial least square with the help of the SmartPLS 2.0 software. The proposed model explained 91.6% of the variance in the ERP pre-implementation readiness. The empirical evidence of the study indicated that IT strategy & planning, top management commitment, planning, technology application management, service management, individual commitment, and individual capability were found as major influencing factors of ERP pre-implementation readiness measurement tool whereas IT resource management, process & structure, ERP system integration capability, partnership commitment, partnership capacity, ERP vendor support, software consistency with rules, having the right expectation from the software and ERP system upgradeability were found to have insignificant in determining ERP pre-implementation readiness. The study proposed measurement tool to measure the ERP pre-implementation readiness for different companies. Evaluating ERP pre-implementation readiness in the early stage is essential to decrease the failure of ERP initiatives and to know the gap of a company before launching an ERP project. This research has contributed to theory by proposing a measurement tool for ERP pre-implementation readiness. Practitioners can also use the proposed measurement tool as a quality criteria in the course of ERP implementation initiatives.

***Keywords**: ERP pre-implementation, ERP pre-implementation Readiness, ERP implementation Success*

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List of Acronyms

AVE	Average Variance Extracted
BPR	Business Process Re-engineering
CRM	Customer Relation Management
EEU	Ethiopian Electric Utility
EFQM	European Foundation for Quality Management
ERP	Enterprise Resource Planning
ES	Enterprise System
FCM-FAHP	Fuzzy Cognitive Maps and the Fuzzy Analytical Hierarchy Process
ICT	Information and Communication Technology
ISSPEAS	Integrated Standard Software Packages, and Enterprise Application Systems
IT	Information Technology
ITIL	Information Technology Infrastructure Library
ITSP	Information Technology Strategic Plan
KSF	Key Success Factors
PLS	Partial Least Square
SCM	Supply Chain Management
SEM	Structural Equation Model

CHAPTER ONE

INTRODUCTION

1.1 Background

In today's competitive business environment, the use of Information Technology (IT) has become pervasive in every facet of organizations' endeavors. IT contributes to the business success allowing information to move faster, increasing the pace at which individuals and organizations can respond to events. Getting the right information to the right person can make a huge difference in terms of a company's bottom line. IT has brought the best products to enrich various aspects of modern life; no organization can be effective without the adoption of the latest available technology. An Enterprise Resource Planning (ERP) system is one of the technologies used by organizations to attain effectiveness and efficiency (McNurlin, 2014).

When companies have efficient business processes, they can be more competitive in the marketplace. As an IT application, the ERP system is considered as one of the most important IT applications because it enables organizations to connect and interact with their administrative units to manage data and organize internal procedures. ERP system is one of the most widely accepted choices to help companies to integrate their operations by serving as a company-wide computing environment that includes a shared database delivering consistent data across all business functions in real-time (Ellen and Bret, 2013).

ERP is a packaged application software technology that combines the technologies, people, data, and business processes for fostering the use of IT to improve organizational performance. The term ERP is used for any software system designed to support and automate the business processes of medium and large businesses by one database. The well-known ERP systems are SAP R/3, Oracle Applications, PeopleSoft, and Baan. It is a software system designed to help the business process and to work effectively in the business of the organization. ERP is used to track companies' finances, human resources, and logistics. Upcoming market-driven requirements

focus on outside connectivity and up-to-date information supply, including business-to-business support, e-commerce, and virtual enterprises (Chand et al, 2005).

Several organizations try to implement integrated softwares such as ERP to improve their business performance and to increase competition. This means the integrated software provides immense benefits to the organization in both financial such as reduction of computer operating costs, reduction of business operating and administrative expenses and reduced inventory costs and stock-outs and non-financial measures such as reducing data errors, improve the efficiency of business process and improved decision support (Chand et al, 2005).

ERP implementation may provide high benefits for successful companies or it can be disastrous for an organization that is not successful to manage the implementation process. According to Kalbasi (2007), a comparison of successful ERP implementation with an unsuccessful implementation shown nine critical success factors and three important but not critical factors. The critical success factors are worded with functionality, maintained scope, project team management support, consultants, internal readiness, training planning and adequate testing in the other hand the important factors are deal with the organization, diversity and development, and budgeting **(**Kalbasi, 2007).

ERP system implementation projects are very complicated, costly, and have a high failure risk (Ahmadi, 2015). So, organizations are advised to perform readiness-relevant activities to ensure the successful implementation of an enterprise resource planning system. An ERP project comprises three phases: pre-implementation, implementation, and post-implementation. In the pre-implementation stage, organizations prepare themselves by performing activities, planning the project, and selecting the ERP system to implement. The readiness of an organization for accepting an ERP system is an important issue in the pre-implementation phase. Readiness is the extent to which an organization assesses that the project ran smoothly and problem-free when it looks backward at the end of the project. In practical terms before the project starts, the overall readiness is also a measure of the extent to which the organization has put in place the employees' skills, resources, and other factors required for the project to run smoothly and without problems. An inadequate pre-implementation project plan to guide management efforts for achieving sufficient readiness for implementing an ERP system may result in problems later and cause the project to fail (Ahmadi, 2015).

1.2 Motivation

The significance of ERP lies in its many benefits to improve the business process and achieve business goals. Integrated information systems can lead to more efficient business processes that cost less than those in unintegrated systems. ERP integrates people and data while eliminating the need to update and repair many separate computer systems. An ERP system can dramatically reduce costs, allows easier global integration, and improves operational efficiency (Ellen et al., 2013).

An ERP project comprises three phases; pre-implementation, implementation, and post-implementation phases. In the pre-implementation stage, organizations prepare themselves by performing activities, planning the project, and selecting the ERP system to implement. An organization requires performing readiness-relevant activities to ensure the successful implementation of an enterprise resource planning (ERP) system. Successful implementation of an ERP system depends largely on how an organization manages readiness-relevant activities to achieve a proper level of readiness for ERP implementation and is associated with organization readiness, social readiness, and technical readiness (Ahmadi, 2015).

Zewdu (2016) and Rahel (2018) have developed ERP frameworks in Ethiopian cases. However, in their study, they have recommended future studies to improve a framework and develop a measurement for each of the CSF indicators to increase usability and validate for any organization that wants to see if they're ready for ERP implementation. Moreover, the role of critical success factors on the successful implementation and ERP failure factors are widely researched and analyzed in different industries by different authors though validation for ERP measure tools has not addressed by them(Hidayanto et al, 2013, Harun. A & Mansor.Z, 2019, Mdima.et al, 2017).

However, the ERP Pre-implementation readiness measurement tool is less studied in Ethiopian cases. Moreover, target organization of this study especially Habesha Cement S.C has tried to implement an ERP system though it is not as successful as expected. Recently, the management has decided to adopt and implement a new ERP. So, checking pre-implementation readiness before starting ERP implementation in Habesha Cement S.Co can help a lot to prevent potential

failure as it happened previously. Hence, this study is motivated by the need to have a tool to evaluate the readiness of organizations for ERP implementation.

1.3 Statement of the Problem

ERP is a strategic initiative that has an impact on every aspect of the company. As a result, organizations must be prepared before beginning a big project. Despite the benefits of a successful ERP system deployment, there is evidence of a significant failure rate in ERP implementation projects (Ahmadi et al, 2015). Thus, companies should have a strategic plan to implement this software.

There exist some research on ERP pre-implementation readiness and has conceptualized it in different ways. By identifying three strategic aspects and developing a Strategic Framework for achieving ERP readiness in organizations, Ahmadi et al. (2015) established a strategic framework for achieving ERP readiness in organizations. The author has identified three strategic issues and ten critical factors under the issues which are: organizational readiness (strategic readiness, structural readiness, and organizational readiness for doing required planning) are crucial factors under the issues. Attaining the right user intention for interacting with the ERP system and achieving social readiness (organizational cultural readiness, Achieving the right user intention for interacting with the ERP system, and Achieving the right user intention for interacting with the ERP system. Organizations must focus on all of these factors simultaneously. In other words, each of these ten areas is a factor in achieving readiness and none of them will be sufficient separately. All of these factors have interrelations among each other.

Zewdu (2016), has tried to investigate ERP pre-implementation readiness using technical, organizational, and cultural parameters to view and develop a framework for evaluation of ERP pre-implementation readiness on Dashen Bank S.C. The author has tried to design a solution framework to address pre-implementation readiness issues. To assess organizational setup, the researcher has used the critical success factors framework that has been adopted by Somers and Nelson (2014) and incorporated it into eleven pillars. These pillars were classified under an organization such as IT strategy and planning, IT governance, Risk Management, Capacity, and Capability, and for technologies such, as Application Management, Service Management and IT

resource management and the relation to culture are Organization, Communication, Commitment and Change culture are selected to evaluate the readiness of ERP-implementation on Dashen Bank. The study also proposed a framework for evaluation of ERP Pre-implementation and recommended organizations to use the proposed pre-implementation framework to addresses all aspects of an organization to attain implementation success.

Rahel (2018), on her part, has examined ERP pre-implementation preparation in the sense of Ethiopian Electric Utility (EEU) Company from multi-stakeholder perspectives such as operational, technological, customer, consultant, and vendors with the intention of promoting a system for evaluating ERP Pre-implementation readiness and designing a solution framework to resolve such issues. The author has proposed to use to evaluate the readiness of assessment, the result of the case company has a limitation on the number of dimensions and proposed areas the company must pay attention to fill the gap.

According to different studies, ERP implementation can be affected by lack of appropriate training for all system users, lack of appropriate customization process, lack of formal communication with end-users, problems of quality training facility and coordination, poor conceptual technological infrastructure, lack of user involvement, and addressing addictive training and problem in user adaptability & physical equipment. Besides, the independent factors of business process re-engineering communication, top management support, team competency, and project management were found to have a positive & significant correlation with the dependent variable which is ERP implementation. (Engidayehu, 2014; Elias, 2019, Tsedale, 2018).

The studies conducted previously by different scholars have focused on the challenges of ERP implementation; the development of a pre-implementation assessment framework and it is noted that there is a gap in developing the measurement of pre-implementation tools to ensure and validate ERP pre-implementation readiness. This study, therefore, aims at developing and validating a measurement tool to be used to evaluate the readiness of ERP pre-implementation in organizations.

1.4 Research Question

Based on the research gap presented in section 1.3 above, the following research question is formulated:

- What pre-implementation readiness measurement tool could be developed for ERP system implementation?

1.5 Objective of the study

1.5.1 General objective

The general objective of this study is to develop and validate a tool to measure and evaluate the readiness of ERP pre-implementation.

1.5.2 Specific objectives

- ✓ Develop ERP pre-implementation framework based on previously conducted studies.
- ✓ Analyzing and preparing measurement tools for validation.
- ✓ Develop, test, and validate a measurement tool for ERP pre-implementation readiness.

1.6 Significance of the study

The findings of this study provide significance to different stakeholders as it aims to develop a measurement tool to evaluate the pre-implementation readiness of ERP. The findings mainly benefit companies, Company managers, shareholders, and scholars.

- ➢ The findings of this study benefit companies to measure and evaluate pre-implementation readiness and assist them to prepare for the implementation of ERP before the commencement of the project.
- ➢ The findings of this study provide insights for managers to efficiently manage the adoption of the ERP system across the organization.
- ➢ The study assists other shareholders by increasing their knowledge by providing helpful information on deciding the adaptation of the project or focus to boost their overall wealth.

- The study also adds know-how to the existing body of knowledge in relation to measuring and evaluating the readiness of ERP pre-implementation in organizations.

1.7 Scope of the study

This study examines the pre-implementation readiness of ERP in the organization to reduce the failure of the system during the implementation. Besides, the study is limited to selected companies to validate the pre-implementation readiness due to time and financial limitations. Besides, the study has been delimited to those organizations tried to implement ERP system and those companies making their Head Quarters in Addis Ababa, Ethiopia.

1.8 Organization of the Study

The study is organized into five chapters. Chapter one introduces the study background, giving an overview idea of ERP implementation, significance, scope, and limitation of the study, and the method of research employed. Chapter two reviews the literature on both theoretical and empirical studies on ERP implementation success and failure factors. It contains an assessment of related researches. The methodology employed is presented in chapter three. Chapter four presents the results of the analysis done and discusses the findings made. Chapter five, finally, concludes findings and suggests recommendations for policy consideration.

CHAPTER TWO

LITERATURE REVIEW

2. Introduction

The literature review chapter provides a sense about the research, understanding of the topic, and synthesizes what scholars researched on the topic. Accordingly, it discusses related theoretical and empirical literature on ERP pre-implementation readiness and uses that extant literature as a spring-board to develop a measurement of pre-implementation readiness of ERP systems. The main topics that are discussed in this chapter include the meaning of ERP, ERP implementation, ERP implementation phases, ERP implementation models, ERP pre-implementation readiness, models developed to evaluate pre-implementation readiness, ERP pre-implementation critical success factors, and development of a measurement tool for pre-implementation readiness of ERP based on extant literature.

2.1 Overview of Enterprise Resource Planning (ERP)

2.1.1 Meaning of ERP

Enterprise systems (ES) (synonymous with Enterprise-wide Systems, Enterprise Resource Planning (ERP), Integrated Vendor Solutions: Integrated Standard Software Packages, and Enterprise Application Systems) are complex standard software solutions that automate and integrate the core processes of a business. They integrate data and other processes with core processes in an enterprise (Singh, 2006).

Enterprise applications are cross-functional systems that concentrate on implementing business operations around the organization which include all levels of management. Enterprise applications: enterprise systems, supply chain management systems, customer relationship management systems, and knowledge management system are the four main enterprise applications. ERP systems, integrate business processes in manufacturing and production, finance and accounting, sales and marketing, and human resources into a single software system (Laudon & Laudon, 2012).

Companies are investing heavily in implementing ERP packages with an aggregate view and automate business processes to gain efficiency and better financial control. The major applications of an ERP system include business and strategic planning, resource planning, executive decision support, sales, and operations planning, forecasting, customer relationship management, order entry, quoting and product configuration, master production schedule (Chand et al. 2005; Singh, 2006).

Enterprise resource planning is a packaged application software technology that combines the technologies, people, data, and business processes for fostering the use of IT to improve organizational performance. The term ERP is used for any software system designed to support and automate the business processes of medium and large businesses by one database. The well-known ERP systems are SAP R/3, Oracle Applications, PeopleSoft, and Baan. It is a software system designed to help the business process and to work effectively in the business of the organization. Enterprise Resource Planning Systems (ERP) is used to track companies' finance, human resource, and logistics. Upcoming market-driven requirements focus on outside connectivity and up-to-date information supply, including business-to-business support, e-commerce, and virtual enterprises (Chand et al., 2005).

2.1.2 Evolution of ERP

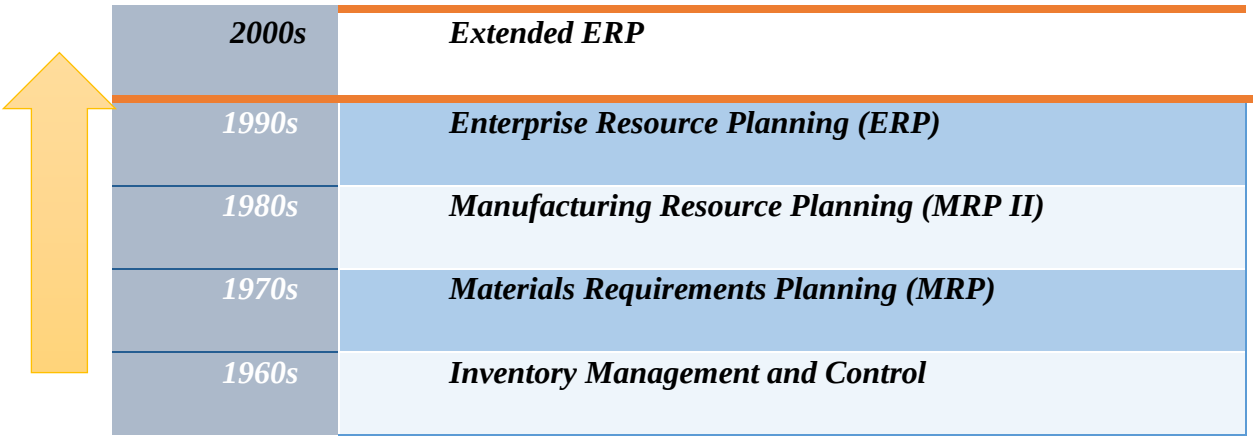
Since its introduction a couple of decades ago, ERP systems have experienced different changes in functionality, complexity, architecture, and other key features. The evolution of ERP software was mainly aimed at addressing market demands such as aggressive cost management, cost analysis, flexibility, and rapid market changes. With many hurdles, computer engineers and system designers have worked hard to introduce different enterprise resource management systems into the organizational management processes. ERP systems and strategic management processes can lead to a competitive advantage focusing on the process of building competitive advantage from the output of the system (Mugahed, 2018)

Until recently, most companies had unintegrated information systems that supported only the activities of individual business functional areas. Thus, a company would have a marketing information system, a production information system, and so on each with its hardware, software, and methods of processing data and information. Such unintegrated systems might

work well within each functional area, but to be competitive, a company must share data among all the functional areas. When a company's information systems are not integrated, costly inefficiencies can result. Historically, legacy information systems have been functionally based and not integrated across multiple locations or functional areas. The same information was captured multiple times, in multiple places, and was not available in real-time. It seems obvious today that a business should have integrated software to manage all functional areas. An integrated ERP system, however, is an incredibly complex hardware and software system that was not feasible until the 1990s. Current ERP systems evolved as a result of three things: (1) the advancement of the hardware and software technology (computing power, memory, and communications) needed to support the system, (2) the development of a vision of integrated information systems, and (3) the reengineering of companies to shift from a functional focus to a business-process focus (Ellen et al., 2013).

Enterprise Resource Planning systems (ERP) have emerged in the late 1980s and the beginning of the 1990s as solutions-oriented to manage the organization´s resources in an integrated way. They allowed the automation of department's activities, making information available to users at the right time, at the right place, and at the right person to supporting more accurately, effectively, and efficiently on their decision-making (Azevedo et al., 2012).

Table 2. 1 Evolution of ERP



2.1.3 The Significance and Benefits of ERP Systems

Organizations aim to use information as a means of maximizing productivity gains, which tends to choose the problems of integration of information. Because isolated tools in their most varied environment lead to the duplication of information in the organization and get different results. The main problems of fragmentation of information are the difficulty of obtaining consolidated information and the inconsistency of redundant data stored on more than one system. ERP system solves these problems by aggregating, in one integrated system, the various process and support of the organization. ERP systems are created as management systems that allow the administration of an organization's resources in an integrated manner by automating the functions to make the information available in real-time (Azevedo et al., 2012).

The significance of ERP lies in its many benefits. An integrated information system can lead to more efficient business processes that cost less than those in unintegrated systems. Moreover, Ellen et al. (2013) have outlined the following benefits of the ERP system:

- ERP allows for easier global integration. Barriers of currency exchange rates, language, and culture can be bridged automatically, so data can be integrated across international borders.
- ERP integrates people and data while eliminating the need to update and repair many separate computer systems. For example, at one point, Boeing had 450 data systems that fed data into its production process; the company now has a single system for recording production data.
- ERP allows management to actually manage operations, not just monitor them. For example, without ERP, getting an answer to "How are we doing?" requires getting data from each business unit and then analyzing that data for a comprehensive, integrated picture. The ERP system already has all the data, allowing the manager to focus on improving processes. This focus enhances the management of the company as a whole and makes the organization more adaptable when change is required.

Enterprise resource planning systems provide firms with transaction processing models that are integrated with other activities of the firm, such as production planning and human resources. By implementing standard enterprise processes and a single database that spans the range of

enterprise activities and locations, ERP systems provide integration across multiple locations and functional areas. As a result, ERP systems have led to improved decision-making capabilities that manifest themselves in a wide range of metrics, such as decreased inventory (raw materials, in-process and finished goods), personnel reductions, speeding up the financial close process, and others. Thus, ERP can be used to help firms create value. In particular, ERP facilitates value creation by changing the basic nature of organizations in several different ways (Daniel, 2000).

Shang and Seddon (2000) also classify ERP benefits into five groups as follows:

- Operational - relating to cost reduction, cycle time reduction, productivity improvement, quality improvement, and customer services improvement.
- Managerial - relating to better resource management, improved decision making and planning, and performance improvement.
- Strategic - concerning supporting business growth, supporting business alliance, building business innovations, building cost leadership, generating product differentiation, and building external linkages.
- IT infrastructure - helping to build business flexibility, IT cost reduction, and increased IT infrastructure capability.
- Organizational - relating to support organizational changes, facilitating business learning, empowering, and building common visions.

Thus, ERP systems can help organizations to manage their key resources, to mention some money, staff, products, customers, and suppliers, more effectively. Therefore, it can be concluded that the effectiveness of ERP systems in enterprises cannot be ignored. The recent rapidly growing implementation of this system in various enterprises supports such a claim.

2.1.4 ERP Pre-implementation Critical Success Factors

Several research attempts have been carried out to find factors that have significant impacts on the successful implementation of an ERP project. These factors are called ERP Critical Success Factors (CSFs).

Critical success factors refer to the limited number of areas that will ensure successful competitive performance for the individual, department, and organization. Critical success factors are elements that are vital for a strategy to be successful (Raravi et al., 2013).

The key success factors (KSFs) or CSFs constitute a vital part of ERP implementation. The KSFs are found in each stage of the ERP implementation life cycle. Several factors impact an ERP implementation success both technical and non-technical (Zainal and Gede, 2012).

This study has employed a detailed and focused literature review to understand more about Enterprise Resource Planning concepts and ERP pre-implementation framework to get CSFs. An ERP pre-implementation critical success factors framework for this study is adopted from previously conducted related local studies by Zewdu A. 2016 and Rahel T. 2018 which are mentioned hereunder.

1. Top management support and commitment
2. Adequate ERP system selection
3. Minimal customization of packages
4. Data and information quality
5. Formalized project plan /schedule
6. A formalized project approach and methodology
7. Project management
8. Careful change management
9. The use of ERP implementation
10. consultant Management of expectation
11. Empowered decision-makers
12. Teamwork
13. Interdepartmental cooperation
14. Organizational fit for ERP
15. Integration of business planning with ERP planning
16. Good project scope management
17. Experienced project manager leadership
18. Business process re-engineering
19. Dedicated resource

20. IT department capability
21. Training for different user group
22. Communication among the implementation team members
23. Project team competency
24. Project team composition/team skill
25. Reducing trouble shooting-project risk
26. Implementation strategy
27. Vendor/customer partnership
28. Business plan and long-term vision
29. Managing consultants
30. Clear vision, goal. And objectives of the ERP system
31. Focus on user requirement
32. Steering committee
33. Organizational culture /cultural change /political issues
34. Use of vendor development tools
35. Motivational factors to implement an ERP system
36. IT Resource Management
37. Service Management
38. IT Governance
39. Risk Management
40. Applications Management
41. IT Strategy and Planning
42. Capacity
43. Commitment
44. Capability
45. Change culture
46. Communication

2.2 Implementation of ERP Systems

The implementation of ERP projects is a large-scale project that cannot be separated from complexity and uncertainty. ERP implementation project is considered as a huge project

requiring a significant level of resources, commitment, and changes throughout the organization. As a result, the problems concerning the implementation process have become one of the industry's major concerns. And it gets worse as a result of numerous failed cases, including a few fatal disasters that lead to the demise of some businesses (Moon, 2007).

Implementing a large ERP system necessitates not only a significant amount of time and effort but also a wide range of expertise and knowledge of functional aspects; system configuration and system integration; technical knowledge of related hardware and software; project management and change management; knowledge transfer and user training. ERP-adopting organizations typically lack this expertise and outsource these activities to ERP vendors, hardware vendors, and consulting firms (Simon, 1997; Holland, 1998; Sumner, 2000).

2.2.1 Phases of ERP implementation

After the framework has been developed, the implementation (project) phase of the ERP system lifecycle starts and the implementation partner has been selected, as well, and ends after the system "go-live" (Lech, 2013). It is an on-going process as new features, modules, enhancements, and corrections are required in accordance with changes in business processes, this is the procedure to use. The implementation of ERP systems causes remarkable change to the existing work processes, hence the need for managing change for project success. The success of the project is concerned with the degree of mutual fit between the ERP system and business processes (Zewdu, 2016; Mdima et.al, 2017).

Ehie & Madsen (2005) divided ERP implementation phases into five major phases. These phases are preceded by a critical look at a company's strategic enterprise architecture and surrounded by change management and business development components. The strategic enterprise architecture analyzes the driving motive for implementing an ERP system while change management and business development seek to integrate the human resource dimension and coordinate daily operations with the new business process design, respectively. In phase one, project preparation, a comprehensive planning process involving people handling leadership roles, establishing budget targets, and determining the project plan to be followed. In the second phase, the business blueprint, the analysis of the existing business process provides the background for system selection before extensive education and training on functionality and configuration gives the

project team the needed insight to map the new process design. A sound project management framework acts as a significant condition for achieving overall success with an ERP system. The third phase, realization, focuses on developing the technical foundation while testing each process design on a conference room pilot. In the fourth phase, final preparation, the entire process design integration is tested under full data load and extreme situations. Simultaneously, the people who intended to use the system and those influenced by it will go through the education and training needed to understand how data flow through the system and how the system is operated at each point in the supply chain. Finally, the go-live and support phase emphasizes process flow optimization and continuous expansion of the system to enjoy a new competitive advantage. Knowledge gained from the development of these phases served as the groundwork for the design of the study. The items in the questionnaire ranged from the driving motives of the implementation to the enforcement of change management and business process development in the organization (Ehie & Madsen, 2005).

ERP implementation cycle is composed of the pre-implementation, implementation, and post-implementation phases (Mdima et al., 2017).

2.2.1.1 Pre-implementation Phase

The ERP project's pre-implementation phase encompasses more than just set up and aims to integrate all relevant activities in a structured manner. Its sub-phases involve readiness assessment, requirement identification, and solution selection. According to the studies, an appropriate readiness evaluation process is a required condition for achieving success towards the utilization of the opportunities provided by the ICT. An extensive preparation before the implementation of the ERP system enhances the possibilities of achieving project success. The preparedness for the implementation of an ERP system incorporates business maturity in a broad range of organizational capabilities and structures (Mdima, Mutagahywa, Mohamed, & Mahabi, 2017). In the context of this study, the preparedness of an organization refers to the organizational readiness to change before the implementation of the ERP system.

2.2.1.2 Implementation Phase

Implementation of an ERP system is generally a large and complex project with an extensive, lengthy, and costly process covering all organizational levels, business processes, and activities. Also, the implementation of an ERP system is unique in terms of nature, scale, scope, complexity,

organizational changes, project costs and need for business processes re-engineering. During this phase, an ERP system is installed, configured, standardized, and customized under the client-server architecture environment and a single centralized database across an organization. Since the ERP systems are designed to support a diverse variety of enterprises through their pre-defined standard business processes, it must be configured so that at least meets the requirements of an enterprise. Studies suggest that organizations must invest in ERP projects and enterprise architecture initiatives as a package to ensure the business-IT alignment as they supplement each other. This implies that to ensure successful implementation, there are critical issues that must be carefully considered before, during, and after implementation of the ERP project (Baraka et.al, 2017).

2.2.1.3 Post Implementation Phase

Once an ERP system is introduced, the effectiveness and successful utilization of the system becomes a crucial concern of an organization. Enhancing employees' knowledge, skills, and learning roles in usage are equally important post-implementation issues. Even if usage is mandatory, effective utilization leads to improved efficiency, productivity, and competitiveness. Training is provided before implementation, and lack of continuous IT learning will cause a gap between how IT is used and the realization of its full potential (Baraka et.al, 2017).

2.2.2 ERP Implementation Approaches

ERP implementation approaches are typically and most commonly classified based on two factors: scope and function. Davenport (2000) proposes, based on these factors, a matrix of ERP implementation strategies with two extremes: incremental and big-bang approaches. The incremental process requires implementing the system and relevant business change in small pieces, whereas the big-bang approach involves implementing everything all at once. According to Parr and Shanks (2000), the concept of ERP implementation is not generic. As a result, they created a taxonomy of ERP implementation approaches. They classified ERP implementations into three categories: comprehensive, middle-of-the-road, and vanilla.

- **Comprehensive (All-inclusive or Wide-Ranging)**

  Apart from the physical scope of the project, there is the implementation of the ERP's complete functionality, which could include the setting up of industry-specific modules

on occasion. An ERP, such as SAP R/3, is made up of 12 main modules, each with its own set of subsystems. Adopting the ERP's full functionality can entail running all or most of the 12 modules, as well as the execution of a module tailored to the industry Furthermore since there are several locations, each with its own set of business processes, the complexity and degree of BPR needed, are far higher. Another feature is the method for integrating the ERP module with legacy systems. This may be a'module-by-module' or an 'absolute ERP' approach (Parr et al., 2000; Aiman, 2015).

- **Middle-road**

  This category is, as the name suggests, a route or a mid-way in between This group is in the middle of the Complete and Vanilla implementations, as the name suggests. Typically, there are several sites (although there may only be one extensive site), and one of the main options is to execute only core ERP modules. For example, with the SAP R/3 method, financials, controlling, and asset management, as well as project management, can be determined. The level of BPR is important, but not as extensive as that required for complete execution (Parr et al., 2000; Aiman, 2015).

- **Vanilla**

  This is the most zealous and potentially dangerous execution/implementation strategy/methodology. To completely leverage the ERP's developed methodology, the decision was made to provide only core ERP features and to do minimal BPR. Rather than modifying the ERP to represent sole business processes, this decision was made to align company operations with the ERP. These systems are the simplest, and they can usually be completed in 6 to 12 months (Parr et al., 2000; Aiman, 2015).

ERP implementation approaches based on scope characteristics can be Physical scope, BPR scope, technical scope, module implementation strategy, and resource allocation are all important considerations. Each of these characteristics has a set of values that represent key decisions in the implementation process. Combinations of these features serve to classify an implementation. It is possible that more than one combination of characteristics will result in the same category (Parr and Shanks, 2000).

2.2.3 Challenges of ERP Implementation

According to Harrison et al., (2012), it is hypothesized that many of the factors affecting the successful adoption of new technologies like ERP are generic and that the successful adoption of internet technologies in part depends on how these are used in conjunction with the other technologies and management practices that form a technology cluster. However, the most critical challenges can be ascribed to the very limited information and communication infrastructure available in most developing countries. Reasons vary widely among sectors and countries and are most commonly related to lack of applicability to the business, preferences for established business models.

Common challenges include enabling factors (availability of ICT skills, qualified personnel, network infrastructure); cost factors (ICT equipment and networks, software and re-organization); security and trust factors (security and reliability of e-commerce systems, the uncertainty of payment methods, legal frameworks and intellectual property right); and challenges in areas of management skills, technological capability, productivity, and competitiveness (Harrison, 2012). Japhet and Usman (2010) identified the following specific challenges hindering the adoption of ERP in developing countries.

- Lack of a convenient distribution system, the imperfect legal system, and lack of large-scale telecommunication transmission capability (broadband), Internet security are problems faced by these countries.
- Other most pressing limitations are access to technology (computers, connectivity, and gateway to Internet), limited bandwidth, which reduces the capacity to handle audio and graphic data; poor telecommunications infrastructures, and unreliable electricity supply.
- The cost of Internet access makes it inaccessible to most users in developing countries. The cost of accessing the infrastructures also influences the growth of ERP. The priority for most developing countries is to put in place the necessary infrastructure and a competitive environment and regulatory framework that support affordable Internet access. The monthly connection cost of the Internet far exceeds the monthly income of a significant portion of the population.

2.3 ERP Pre-implementation Readiness Assessment: an Empirical Review

There are dramatic changes in the business environment due to increased customer demands and supply market competition. These changes have enforced the companies to minimize total costs, maximize return on investment, shorten lead times, and improve efficiency. In recent years, ERP systems have been employed by many companies to achieve these business objectives though it can be disastrous for an organization that is not successfully managed the implementation process (Razmi and Sadegh, 2008).

ERP system implementation projects are very complicated, costly, and have a high failure risk. Thus, to be successful, companies should evaluate their readiness for ERP implementation before launching the system (Ahmadi, 2015).

Different scholars have developed various ERP models and frameworks in this regard. Accordingly, some of the models and frameworks are discussed hereinafter.

2.3.1 An EFQM based model to assess an Enterprise Readiness

Shafaei and Dabiri, 2008 have developed an ERP model based on the EFQM excellence model. EFQM (European Foundation for Quality Management) based model is a model used to assess the readiness of an enterprise for effective and successful ERP implementation. Besides, the EFQM is a self-assessment framework for measuring the strengths and areas for improvement of an organization across all of its activities. The model by the author is applied to assess the readiness of a company intending to implement an ERP system. This model has employed six basic criteria such as leadership, policy and strategy, people, partnership and resource, processes, and ERP-specific criteria. Under each criterion, EFQM based model uses different elements and guidelines to develop a conceptual model of ERP Pre-implementation readiness. The elements are strategy and goals, management, structure, process, and behavior of people. Moreover, the model uses nine guidance points with different critical factors for the first five criteria. The ERP model developed by Shafaei and Dabiri, 2008 has introduced ERP-specific criteria besides mentioned criteria under the EFQM model. The newly introduced ERP-specific criteria are important criteria having their elements and guidance points which are summarized in the table hereunder.

Table 2. 2 ERP specific criteria with elements and guidance points by Shafaei and Dabiri, 2008

Criteria	Element	Guidance Points
ERP-Specific	System integration Capability	• Vendor experiences and credibility • Consultant knowledge and experiences • Is a system for integrated documentation of processes • Being communication infrastructure
	Software consistency with community rules	• Benchmarking from countries with similar rules • implemented package in internal companies • support of internal consultants
	System upgradeability	• ERP system selection • Benchmarking from best practices • Implementing the service-oriented architecture
	Vendor support	• Vendor experiences and credibility • Strong negotiation to contract • Making wide communication
	Having the right expectations from software	• Consultant credibility and reputation • Personnel knowledge and experiences • Review the implementation process by management • The great internal implementation team

2.3.2 An FCM–FAHP approach for managing readiness-relevant activities

The other approach to validating ERP pre-implementation readiness is FCM-FAHP based approach developed by Ahmadi, Yeh, Papageorgiou, & Martin in 2015. FCM-FAHP approach

means Fuzzy Cognitive Maps and Fuzzy Analytical Hierarchy Process. This approach enables the organization to identify the readiness-relevant activities, determine how these activities influence each other, assess how these activities will contribute to the overall readiness, and prioritize these activities according to their causal interrelationships to allocate management effort for the overall readiness improvement. According to this approach, any organization that plans to introduce a new ERP system will carry out a range of activities to evaluate its readiness for ERP implementation. It has identified nine functional areas and activities that may assist in managing the ERP readiness of a given entity that as described in the following table.

Table 2. 3 ERP readiness functional areas and associated activities developed by Ahmad et al, in (2015) based on FCM–FAHP approach

Functional area	Activity	Activity description
F1: Planning	A1	Identifying required changes in the company
	A2	Conducting an ERP system implementation feasibility study for the company
	A3	Preparing a clear, stable, and well-defined project plan
	A4	Planning project risks
	A5	Well defined IT infrastructure plan
F2: Staff	A6	Effective inter-department communications
	A7	Staff awareness about the ERP system
	A8	Training staff about the ERP system
	A9	Perception of staff about the necessity of an ERP system implementation
	A10	Enthusiastic staff to cooperate with the ERP system implementation project

	A11	Existence of general IT knowledge in the company
	A12	Determining tangible and intangible improvements resulting from ERP implementation
F3: Technical requirements	A13	Providing required IT infrastructure in the company
	A14	Employing proper IT human resources in the company
	A15	Determining ERP specification
F4: Strategic alignment	A16	Aligning the ERP implementation goals and the company's goal
	A17	Stabilizing corporate objectives
F5: Top management support	A18	Getting top management support about the project
	A19	Selecting a well-qualified and knowledgeable project champion
	A20	Forming a powerful steering committee
	A21	Empowering the chief information officer (CIO) in the company
	A22	A regular mentioning of an ERP system by top management and other authorized staff
F6: Processes and structure	A23	Business process, documentation, improvement, and integration
	A24	Aligning the company's structure with ERP requirements
	A25	Defining and documenting business needs and functional requirements

F7: Data management	A26	Preparing data to migrate to an ERP system
	A27	Documenting data flow in the company
	A28	Integrating information between different departments
F8: Consultant	A29	Using an ERP consultant before deciding on an ERP system

ERP readiness management developed by authors based on FCM–FAHP approach is used to analyze the activities and found that the four activities; getting top management support, using an ERP consultant, conducting the feasibility study, empowering the CIO, and aligning the ERP implementation goals and the company's goal has high influence dispatching degree and a high interaction level with the other activities. These four activities are also located in a zone with high contribution weights and influence on the other activities. Thus, these four activities can be considered as a group with the highest priority for management effort allocation. Another two activities, one regarding the business process documentation, improvement, and integration and the other regarding the documentation of business needs and functional requirements are located in the zone which has a low contribution to the overall readiness and a high influence on the other activities. Moreover, these two activities are high influence dispatcher activities and have high interactions with the other activities. The direct contribution of these activities to the overall readiness is low but they have a high positive influence on the other activities and therefore should receive special management attention. The four zones can be used to prioritize these activities. These activities are: forming a powerful steering committee, training staff about the ERP system, selecting a well-qualified project champion, determining tangible and intangible improvements resulting from the ERP implementation, employing proper IT human resources, and stabilizing the corporate objective, all have a higher influence dispatching degree than the mean. Thus all these activities have a higher priority for improvement than other activities in the regular attendance zone.

2.3.3 Additional ERP System Models developed by different Authors

have developed an ERP system model that mainly focuses on the usage of ERP and its impact on end-user. The study was conducted targeting end-users of ERP systems in selected Indian organizations and it was carried out in organizations that had implemented ERP systems within a time frame of fewer than five years. This model shows how companies can adopt ERP and how they can be prepared or get ready for ERP implementation. The implementation of ERP is a difficult process as it involves different types of end-users. The model tries to show the effect of some of the individual, organizational, and technological factors on the usage of ERP and its impact on the end-user. More importantly, the model suggests that computer self-efficacy, organizational support, training, and compatibility have a positive influence on ERP usage which in turn has a significant influence on panoptic empowerment and individual performance.

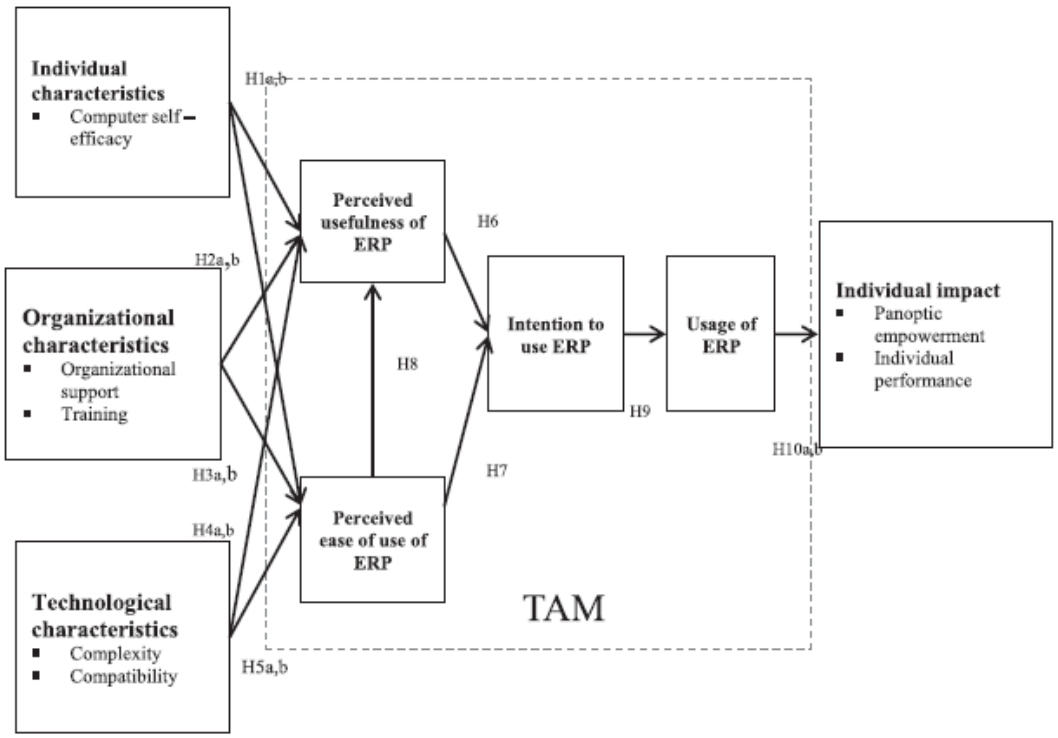


Figure 2.1 Adoption of ERP system model (Rajan and Baral, 2015)

This model provides insights for managers to efficiently manage the adoption of the ERP system across the organization. Organizations should understand and identify factors in terms of individual, organizational, and technological characteristics when a complex information system

such as ERP is implemented in the organization. Technology acceptance models have been criticized for considering usage as an end in itself. The model tries to identify the impact of usage on the individual's panoptic empowerment and individual performance. Managers should have the goal of not just making use of the system but to make employees satisfied with using the system, to improve their performance, and also to empower them to make decisions.

Zewdu (2016) developed a model to investigate ERP Pre-implementation readiness using parameters (constructs) such as technical, organizational, and cultural in the context of Dashen Bank Share Company with the view of the framework for evaluation of ERP pre-implementation readiness and design a solution framework to address those issues. In constructing the model, the author has adopted critical success factors from Somers and Nelson's conceptual framework.

Table 2. 4 ERP readiness model proposed by Zewedu A, 2016

Readiness Aspect	Measuring dimension	CSFs
Technological Readiness	Application management	❖ Vendor support ❖ Minimal Customization ❖ Vendor Partnership ❖ Vendor tools
	Service Management	❖ Management of expectations ❖ Data analysis and conversion
	IT Resource Management	❖ Project management ❖ Dedicated resources
Organizational Readiness	IT Strategy and Planning	❖ Clear goals and objectives ❖ Education on new business processes
	IT Governance	❖ Steering committee ❖ Business Process Reengineering

		❖ Architecture Choices
	Risk management	❖ Careful package selection ❖ User of consultants
	Capacity	❖ Dedicated resources ❖ User training
	Capability	❖ Project Team Competence ❖ Project management
Culture Readiness	Communication	❖ Interdepartmental Co-operation ❖ Inter-departmental Communication
	Change culture	❖ Business Process Reengineering ❖ Architecture Choices
	Commitment	❖ Top management support ❖ Business Process Reengineering ❖ Dedicated resources

Rahel T. (2018) on her part developed an ERP Pre-implementation readiness framework to look at ERP deployment readiness before it goes live from multi-stakeholders perspectives such as organizational, technical, user, consultant, and vendors perspective in the context of Ethiopian Electric Utility (EEU) Company with the aim of creating an assessment process for ERP pre-implementation readiness and design a solution framework to address those issues.

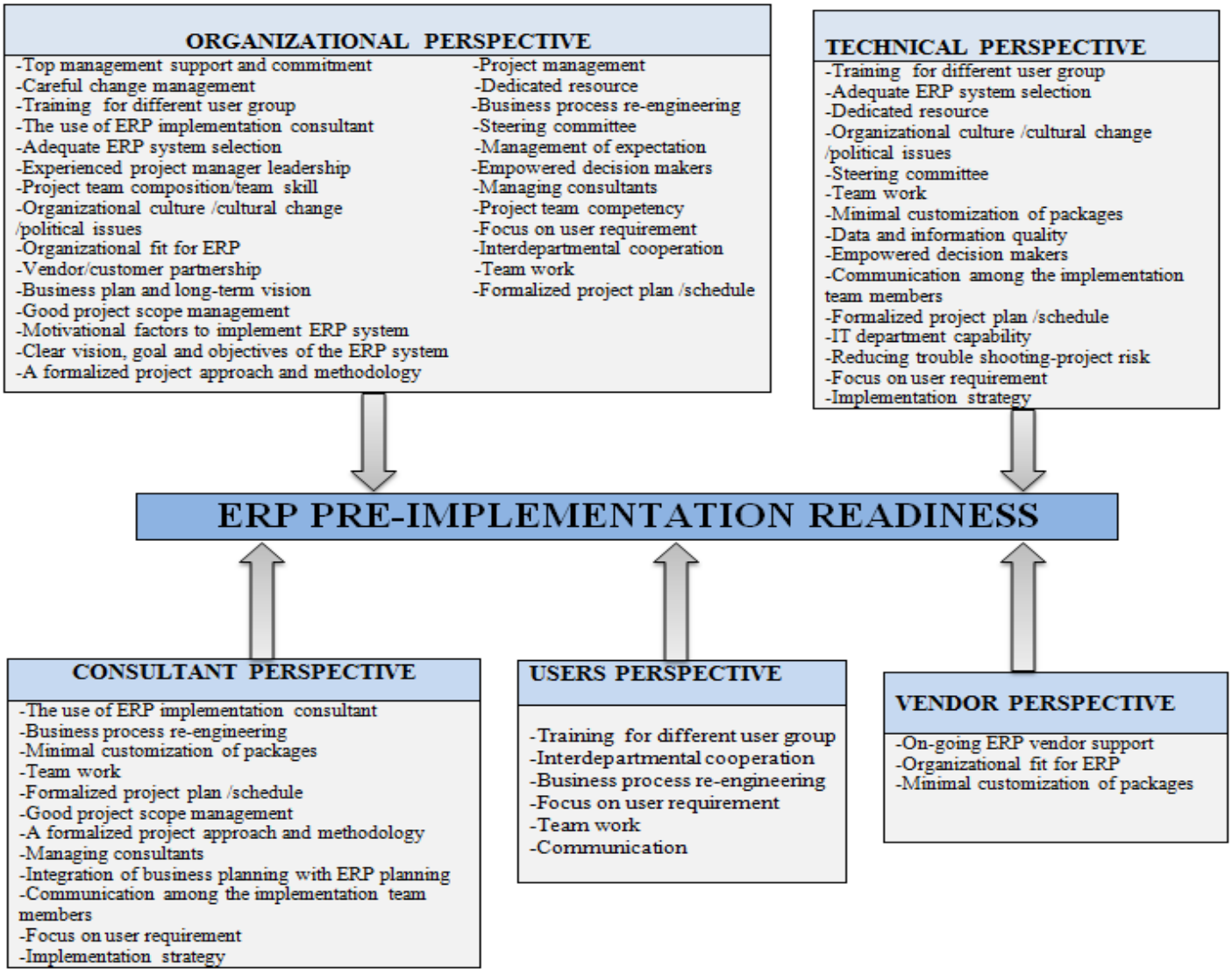


Figure 2. 2 ERP readiness conceptual framework proposed by Rahel T. 2018

Previously conducted related empirical studies by different authors dealing with ERP readiness assessment are summarized hereunder in the following table.

Table 2. 5 Related empirical literature reviewed dealing with a readiness assessment

S. No	Title	Authors	The objective of the study and its finding	Methodology
1.	An EFQM Based Model to Assess an Enterprise readiness for ERP implementation. 2008	Rasoul Shafaei, Nooraddin Dabiri (2008)	In this paper, a model based on EFQM with a focus on ERP CSFs factors was developed. The suggested model has been used to measure a company's readiness for the successful implementation of an ERP system.	The ERP Critical Success Factors have been established, as well as the relationship between them. It has identified relations between ERP, CSFs, and EFQM criteria. It investigated the ERP CSFs relevant to EFQM criteria and a cross-index table has derived then the validity of the relations obtained in the cross-index table. Questionnaires and interviews responded by the experts in the field of ERP and EFQM were used to assess the situation. Finally based on the result proposed model

				was introduced.
2.	Framework for measuring ERP application readiness in Small and Medium Enterprise(SME): A Case Study in Software Developer Company (2013)	Achmad Nizar Hidayanto, Muhammad Azani Hasibuan, Putu Wuri Handayani and Yudho Giri Sucahyo (2013)	The research was conducted to formulate the framework of self-assessment of open source ERP implementation readiness which concentrated on ERP pre-implementation issues The proposed ERP implementation readiness assessment framework was created using the Fuzzybased ANP (Fuzzy ANP), and the examined readiness factors are divided into three categories: project management readiness, organizational readiness, and change management readiness. The framework of Ramzi's Fuzzy ANP is used in their study.	The study adopts the framework of Ramzi's Fuzzy ANP and the framework defines the ERP implementation preparation in three categories, namely: ✓ Project management readiness ✓ Organizational readiness ✓ Change management readiness
3.	An assessment of readiness factors for implementing ERP based on agility (Extension of Mckinsey 7S Model 2014)	Soheila Shiri, Alireza Anvari, Hassan Soltani (2014)	The main goal of the study was to determine and assess organizational readiness factors for implementing ERP based on organizational agility. This study, along with the extension of the McKinsey 7S model that was developed by McKinsey & Company. (strategy, structure, systems,	Agility criteria were weighted and rated using group AHP with the fuzzy logic approach; so that accountability, speed, and flexibility have obtained the maximum score.

			skills, style, staff, and shared values) to 9S (7S+ self-evaluation and supportive factors).	
4.	Strategic Framework for achieving readiness in organizations to implement an ERP System (2014)	Sadra Ahmadi, Chung-Hsing Yeh, and Rodeny Martin (2014)	The research was conducted to investigate the best strategies for achieving organizational readiness to implement an ERP system. They developed a strategic framework for achieving the ability to implement an ERP System by identifying three strategic issues and critical factors within the issues, which are organizational readiness, social readiness, and technical readiness.	This study employs content analysis methodology to evaluate previously scientific literature in order to identify the best strategies for achieving the organizational capacity to implement an ERP system, and finally, three major preparation categories were identified: organizational readiness, social readiness, and technical readiness.
5.	Adoption of ERP system: An empirical study of factors influencing the usage of ERP and its impact on end-user	Christy Angeline Rajan and Rupashree Baral (2015)	The study was proposed a conceptual framework and examined it to find the effect on individual, organizations, and technological factors on the usage of ERP and its impact on the end-user.	This research was adopted a survey questionary to test the proposed model and hypothesis. Besides, the data was collected through purposive sampling.

6.	Developing a framework for Evaluation of ERP Pre-implementation readiness: The Case of Dashen Bank Share Company.	Zewdu Ayenew (2016)	The primary goal of the study is to investigate the level of te chnical, organizational, and cu ltural readiness in an attempt t o implement ERP in the conte xt of Dashen Bank Share Com pany and it has designed a framework to address those issues. In this study, CSFs from Somers and Nelson were chosen for study 21, then categorized into eleven pillars, and finally, a framework was created based on an organization's organizational, technological, and cultural aspects.	This study employs the variance research approach, with the author employing Nelson and Somers' 22 CSFs that are believed to affect the ERP project.
7.	Developing ERP Pre-implementation readiness assessment framework for Ethiopian Context: A Multi Stakeholders' Perspective	Rahel Tekleselasie (2018)	The study has developed a comprehensive ERP pre-implementation framework based on a multi-stakeholder perspective that will be useful for businesses in measuring their readiness level and identifying their weaknesses in implementing an ERP system.	This study used a group of critical success factors derived from peer-reviewed literature. In addition, data was gathered through interviews and survey questionnaires. CSFs were discovered through a literature review.

Even though there are various studies conducted on the area of ERP, relatively most of them are focused on investigating critical success factors for the implementation of ERP. Thus, as a result of the outlined empirical works, it is clear that there is a gap in developing measurement tools or

instruments that aid to evaluate research models for ERP pre-implementation readiness and validation of designed tools. This study, therefore, aims at developing a measurement tool to be used to evaluate the readiness of ERP pre-implementation in organizations.

2.4 Conceptual Framework

Theoretical and conceptual frameworks are used to guide the paths of research and offer the foundation for establishing its credibility of the research. The conceptual framework refers to the relationship between the main concepts of a study. The benefit of conceptual research assists the researcher in identifying and constructing a worldview on the phenomenon to be investigated (Dickson et al. 2018).

Various researchers have developed an ERP pre-implementation readiness conceptual framework based on various factors. (Shafaei & Dabiri, 2008) proposed an ERP implementation readiness assessment framework based on the EFQM approach, in which they examined readiness factors classified into six criteria, namely leadership, strategy and policy, people, partnership & resources, process, and ERP-specific.

(Ahmadi et al., 2015) developed a new approach for determining the ERP readiness in the organization by considering fuzzy cognitive maps (FCMs) and the fuzzy analytical hierarchy process (FAHP) including different activities. (Rajan and Baral, 2015) presents a strategic framework for achieving preparation in institutions to implement an ERP system that was produced by selecting three strategic concerns and critical factors under the issues of organizational readiness, individual readiness, and technical readiness. Similarly, (Zewdu, 2016) investigated ERP Pre-implementation readiness using parameters in Ethiopia (constructs) such as technical, organizational, and cultural issues in the context of Dashen Bank Share Company in order to develop a framework for evaluating ERP Pre-implementation readiness and designing a solution framework to address those issues. Last but not least, (Rahel, 2018) studied in Ethiopia to develop a conceptual model of ERP pre-implementation readiness using different perspectives like organization, technical, user, consultants, and vendor in the case of multi-stakeholders in specific of EEU.

As clearly mentioned, previously conducted studies mainly focus on developing a conceptual framework that will use for ERP pre-implementation. Similarly, there are studies conducted in

Ethiopia on developing conceptual framework though, they haven't addressed measurement tools for ERP pre-implementation. Thus, it's clear that there is a gap in developing measurement tools for ERP pre-implementation readiness especially in Ethiopia. Therefore, the newly proposed conceptual framework in this study is believed to fill the gap identified variously. First, it is done in the context of developing countries in Ethiopia, and companies in this country are increasingly implementing ERP systems, so they can benefit from this framework as a starting point for measurement tools for their readiness for implementing the system. Secondly, it contains six main factors that make it different and more focused on measurement tools of ERP pre-implementation readiness. It is also different from previously conducted local studies such as studies made by Zewdu A.2016 and Rahel T.2018 as it includes different factors and validations that haven't been addressed by studies conducted so far.

According to empirical evidence discussed, ERP pre-implementation readiness is affected by different factors. This study has used six main factors which include; technical & technology, partnership (consultant & vendor), individual readiness, strategy & policy alignment, top management, and ERP-specific factors. These factors will help companies to measure their readiness in multiple ways and lead to the successful implementation of an ERP system. The final distinguishing feature of this conceptual framework is that it conducts validation in the case companies. This implies that any business regardless of size and sector can use the framework as the base of measurement tools to their context and measure its readiness level before the implementation of the ERP system.

The variables and measurement tools are selected based on previous relevant related studies and considering the Ethiopian context. In this model, there are six factors and 16 critical success factors mainly adopted from works of local studies by Zewdu A. (2016) and Rahel T. (2018). Besides, other models by different foreign authors are also considered to some extent. The similarity of concepts, the researcher's decision, and analyzing what is done by whom in the case company are all factors to consider in the grouping of variables. This model holds the dependent variable (ERP Pre-implementation readiness) in the circle and independent variables such as technical and technological requirements, partnership, individual readiness, strategy and policy alignment, top management, and ERP-specific with its CSFs in a rectangle box. The arrow shows the effect of the variables on the pre-implementation readiness of an ERP.

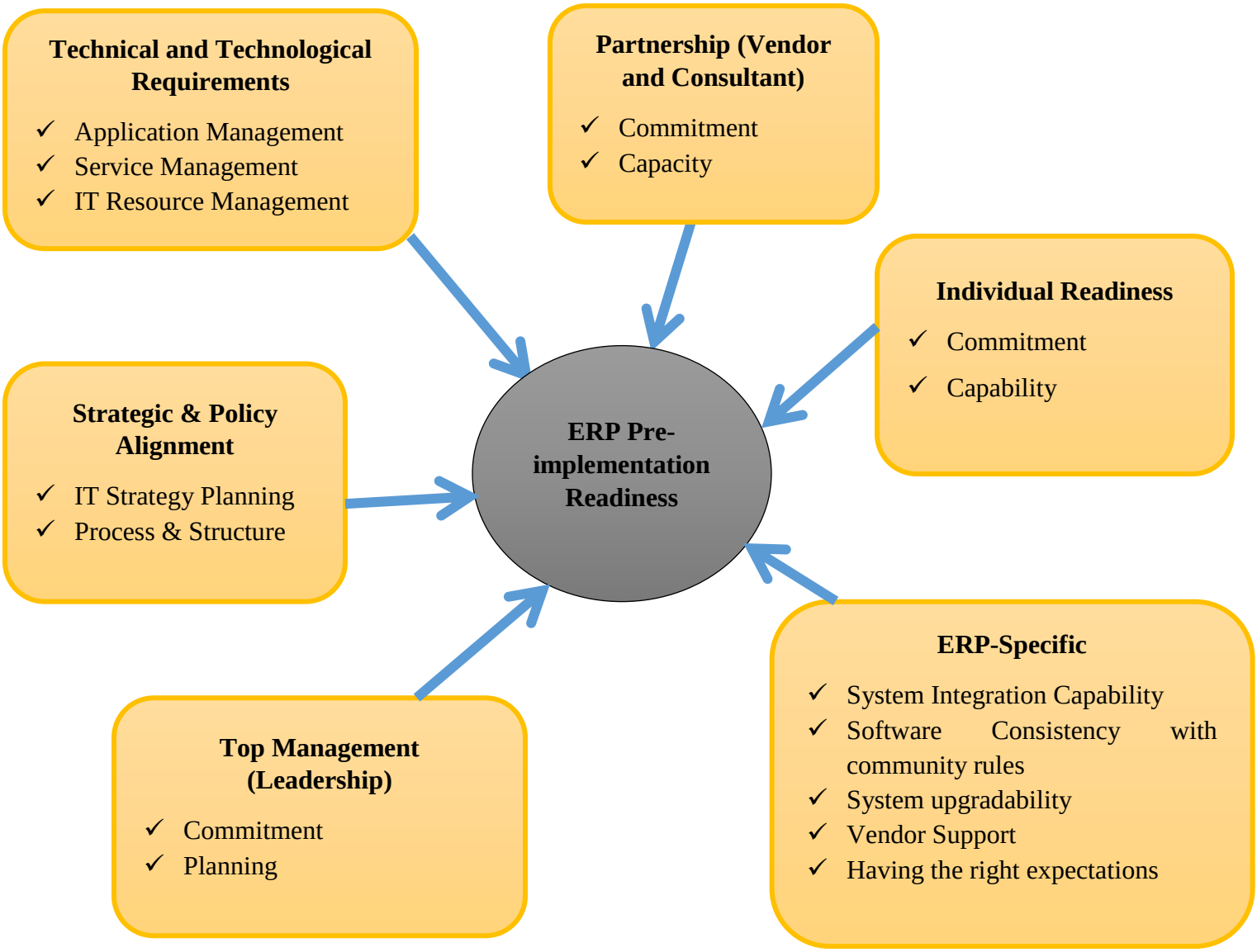


Figure 2. 3 Schematic Conceptual Framework

2.5 Research Model and Hypotheses of the Study

2.5.1 Research Model

ERP pre-implementation readiness assessment framework has been created by various researchers based on various factors. The above conceptual model under figure 2.3 summarizes the main focus and scope of this study in terms of variables included. A model is proposed based on the most frequently used constructs affecting ERP Pre-implementation readiness. The research model of this study is shown in the following figure.

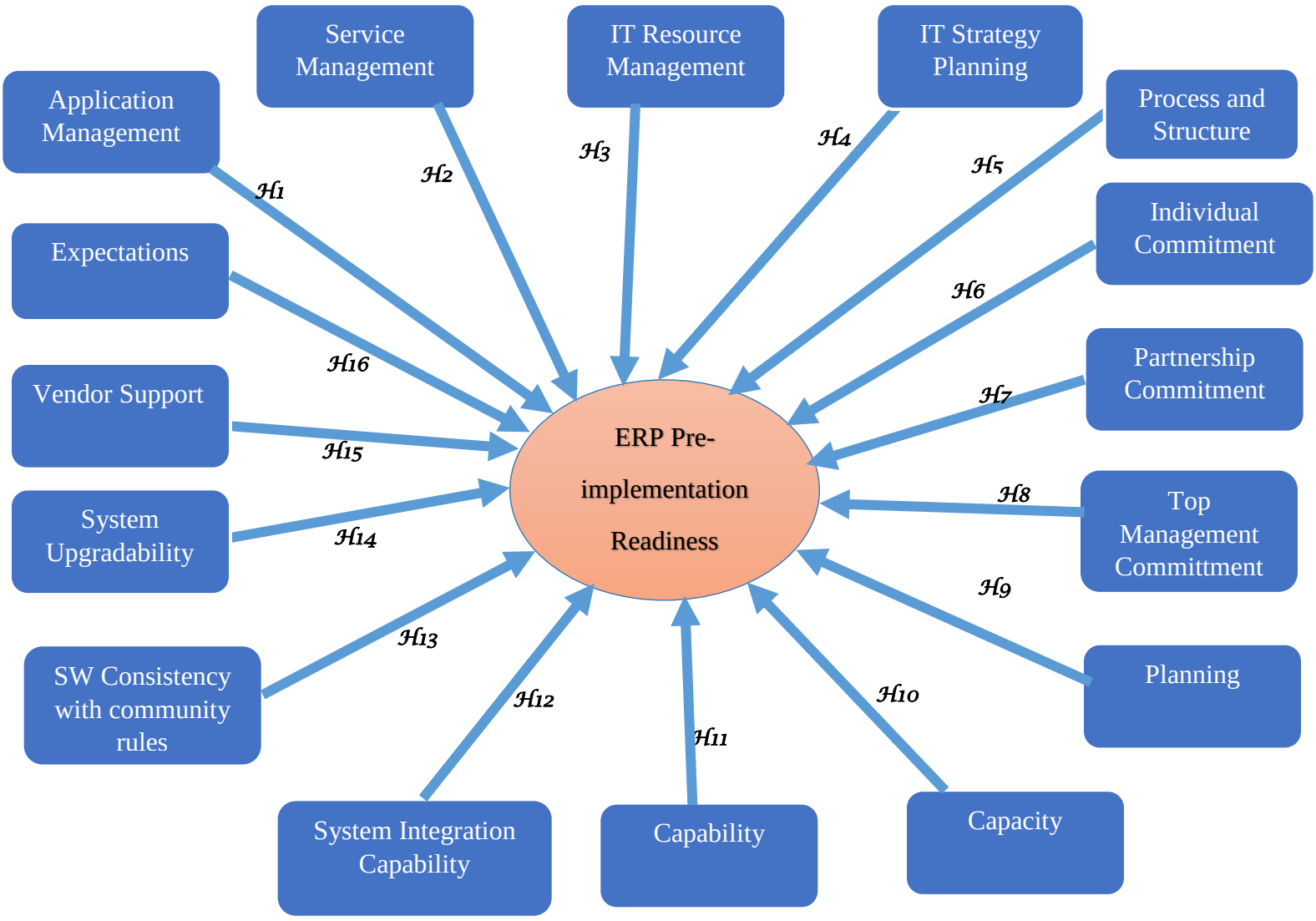


Figure 2. 4 Research Model of this study

2.5.2 Hypotheses of the Study

The research model of this study is developed based on reviews of results and analysis made by different authors through literature review. Based on the developed model, this study has defined the following hypotheses that are expressed in an alternative form to be statistically tested in the next chapters.

- **Application Management**

Application Management Services (AMS) aim to maintain many IT applications including ERP systems to support the business in high levels of service quality and availability by restoring normal application service operations and minimizing negative business impact. Besides, ERP systems have become a common feature of life in organizations should support by the Application of Management during ERP implementation (Ying li et al., 2017 & Robert, 2011). Therefore, Application management is one of the critical factors for ERP pre-implementation Readiness.

- H1: Application management has a positive and significant impact on ERP pre-implementation readiness

- **Service Management**

The ITIL(Information Technology Infrastructure Library) skills base has produced good management practices for IT departments that have contributed to improving the services provided by the computing entities to their clients (Himi, Bahsani, and Semma,2011). IT service management is often related to the ITIL framework, which is a set of descriptive guidance documents produced by a UK government agency in the 1980s. Service Management provides a framework to structure IT-related activities and the interactions of IT technical personnel with customers and clients. Besides, ERP Service Management is a general set of IT processes and tools to effectively support a large-scale ERP software solution (Zewdu, 2016). Therefore, Service management is one of the critical factors for ERP implementation Readiness.

- H2: Service management has a positive and significant impact on ERP pre-implementation readiness.

- **IT Resource Management**

Resource management is the process of pre-planning, scheduling, and allocating the resources to use to maximize efficiency. IT needs resources such as tools, infrastructures, and processes that give a clear, complete, and accurate view of the management (Zewdu, 2016). That means, it is critical to check the IT resource for ERP pre-implementation readiness.

- H3: IT resource management has a positive and significant impact on ERP pre-implementation readiness.

- **IT Strategy & Planning**

Strategic planning is analysis and synthesis in planned settings to help leaders and managers successfully to address the major challenges that their organizations face (Bryson, 2004). An Information Technology Strategic Plan (ITSP) refers to discovering the resources and IT in an organization, to direct the technological and information architecture to its strategic objectives (Wagner S, Jano M and Marco V, 2018). IT strategic plan focuses on using IT to optimize customer loyalty, the company's mission, business processes, and to maximize customer satisfaction, and IT strategy and planning is one critical success factor (pillar) for ERP Pre-implementation (Zewdu,2016).

- H4: IT strategy & planning has a positive and significant impact on ERP pre-implementation readiness.

- **Process and Structure**

One of the reasons for the failure is that implementing an enterprise system in a company is a complex process. To ensure the success of an ERP implementation, the changes caused by the ERP system have to be linked with the company’s long-time strategic goals. These are more of results of appropriate business processes and organizational structure. The ERP system should support this strategy, or even be one of the important factors for the strategy´s success. The implementation project as part of the enterprise-wide strategy (e.g., the implementation as a method of strategic goal achievement) is mandatory (Soja, 2007).

- H5: Process and Structure have a positive and significant impact on ERP Pre-implementation readiness.

- **Commitment**

Commitment is the leaning to remaining a member of the organization in the case of the perceived costs of doing (Randall, N.D.). According to Rahel T (2018), implementing an ERP system is a major project requiring a significant level of resources, commitment, and changes throughout the organization. The commitment of partnership, individual, and top management is variant as their responsibilities during the implementation of ERP.

- H6: Individual commitment has a positive and significant impact on ERP pre-implementation.
- H7: Partnership commitment has a positive and significant impact on ERP pre-implementation.
- H8: Top management commitment has a positive and significant impact on ERP pre-implementation Readiness.

- **Planning**

ERP initiates from project preparation, comprehensive planning process that involving people handling leadership roles, establishing budget targets, and then determining the project plan. In the process, Companies should consider the integration of internal functions with planning and execution activities, understanding the basic project management fundamentals of both end-users and vendors to minimize or prevent the failure risk in implementing an ERP system or any other system. Moreover, top management must ensure the plans are communicated and understood by the entire company members (Ike C. and Mogens M, 2005 and Shahin D. and Sulaiman A., 2011).

- H9: Planning has a positive and significant impact on ERP pre-implementation Readiness.

- **Capacity**

Cultural and organizational constraints in transferring technology in the wide training and absorptive capacity have crucial effects on the success of IT projects (Maria J., 2009). The undertaking of integrating two or more applications for any vendors is not easy. Therefore, ERP vendors are currently searching for ways to make integration a much easier process for the ERP

Software (Sia T., N.D). Therefore, vendor capacity should be considered on ERP pre-implementation system.

- H10: Capacity has a positive and significant impact on ERP pre-implementation readiness.

- **Capability**

ERP system is viewed as a process of knowledge transfer of best practices from one company to others. However, the individual capability for adapting ERP systems has an impact on ERP usage at its implementation. That means people who had a greater ability to know new knowledge and synthesize it with prior knowledge on tasks would achieve better performance on the implementation of ERP (Jong-Hun, Hyun-Ju, and Hee-Dong, 2007).

- H11: Capability has a positive and significant impact on ERP pre-implementation Readiness.

- **System integration Capability**

Integration refers to various dimensions and meanings in the domain of information systems. ERP system is one of information system and its need to be integrated not only with the other business information systems inside the organization but also with the systems of business partners. ERP system vendors contribute to ERP system integration in many other ERP development network partners. (Tommi k., Kari S., and Andrey Maglyas., 2015).

- H12: System integration capability has a positive and significant impact on ERP pre-implementation readiness.

- **Software consistency with community rules**

Consistency with community rules for ERP has important to the successful implementation of projects. That means an ERP system has to check with benchmarking from countries with similar rules, internal companies that are implemented package and support of internal consultants (Shafaei & Dabiri, 2008).

- H13: Software consistency with community rules has a positive and significant impact on ERP pre-implementation readiness.

- **System Upgradeability**

The most important factors of selection and estimation of ERP system are applicability, integration, adaptability, and upgradeability as the main criteria to choose an ERP system. For stakeholders or users, satisfaction was perceived as compromised by at least one of the criteria, such as time, budget, upgradeability, and benefit has a high impact on the project was considered successful (Marcus et.al., 2009 and Manouchehr et.al., 2012). That means system upgradeability should be checked before ERP pre-implementation.

- H14: System upgradeability has a positive and significant impact on ERP Pre-implementation.

- **Vendor Support**

ERP system will always be a new module and version to be installed and better fits to the organization to achieve alignment between business and system. Besides, vendor support represents an important factor with any packaged software including extended technical assistance, emergency maintenance, updates, and special user training. Accordingly, vendor support is vitally important to successful ERP projects to enhancing an organization's competitiveness and efficiency (Somers & Nelson 2001).

- H15: Vendor support has a positive and significant impact on ERP Pre-implementation.

- **Having the right expectations from the software.**

For effective software developments, there is a need to seriously consider various aspects of software quality to measure and achieve in pursuit of business objectives (Liza, 2014). A common risk on software projects such as ERP systems is managing user expectations. Software project managers should balance the needs and requirements of the users with the time and budget allocated to the project (Stacie, 2008). Therefore, having the right expectation from users from the software is related to the success of ERP pre-implementation.

- H16: Having the right expectations from the software has a positive and significant impact on ERP pre-implementation Readiness.

2.6 The measurement tool of Pre-implementation readiness of ERP

Reliability and validity are the two most important and fundamental features in the evaluation of any measurement instrument or tool for good research (Haradhan, 2017). Most locally conducted previous studies by different authors have focused on identifying critical success factors and developing models for ERP pre-implementation and many of them have ignored the designing of measurement tools. This study aims to fill this gap by developing measurement tools employing related models and CSF's already developed by different authors thereby measuring the reliability and validity of the factors described hereunder.

➢ Technical & Technology

According to Ahmadi et al.,2015 & Mohamed Y.2015, technical requirements related to the required IT infrastructure to implement the ERP system and the existence of adequate resources IT infrastructure have a positive effect during ERP implementation success. In addition, the previous literature discussed technical requirements area contracts with the required IT infrastructure to implement the ERP system. These factors are related to providing the required IT infrastructure in the company, employing proper IT human resources in the company, and determining ERP specifications.

Technical and Technology readiness is measured using different CSFs to see the relation between them. Also, the business value is enhanced through the alignment of complementary factors occurring along with dimensions of the technology. The technical and technology factor comprises application management, service management and IT resource management as determining variables (Zewdu A. 2016 & Rahel T.2018).

Table 2. 6 Measurement tool for technical and technological factors

ID	Measurement	Reference
Application Management		
TAM 1	The company shall maintain minimal customization of packages before implementing an ERP system.	Zewdu, 2016
TAM 2	The company shall accept the application to manage technology complexity & compatibility before implementing an ERP system.	Rajan & Baral, 2015

TAM 3	The company shall determine ERP specifications in technical and technological before implementing an ERP system.	Ahmadi et al., 2015
TAM 4	The company should have an adequate ERP system selection technically and technologically before implementing an ERP system.	Rahel, 2018
Service Management		
TSM 1	The company should ensure organization culture/cultural change/government issues before ERP system implementation.	Rahel, 2018
TSM 2	The company should ensure service management of data analysis & conversion before implementing an ERP system.	Zewdu, 2016
TSM 3	The company ensures management expectations technically and technology after ERP system implementation.	
IT Resource Management		
TRM 1	The company should have a dedicated resource technically and technology before implementing an ERP system.	Zewdu A., 2016, Rahel T., 2018
TRM 2	The company must hire proper IT human resources before implementing an ERP system.	Ahmadi et al., 2015
TRM 3	The company should provide the necessary IT infrastructure before implementing an ERP system.	
TRM 4	The company should establish a steering committee for ERP system implementation before launching the system.	Rahel,2018
TRM 5	The company shall be ready to implement an ERP system in team works.	
TRM 6	The company is ready to make an empowered	

	decision that makes successful ERP system implementation.	
TRM 7	The company is ready to give training for different user groups before ERP system implementation.	

- **Strategic & Policy alignment**

This area deals with the requirement of the organization to align its strategy with the ERP implementation goals. It deals with the required changes to the organizational structure or business structure and key business processes before implementing the ERP system (Ahamdi et al., 2015).

Shafaei & Dabiri, 2008 recommended that the strategy and policy of the company's strategic roadmap be revised and subsequent organizational changes are made before the implementation of the ERP system and also the results obtained for policy and strategy support such argument.

Table 2. 7 Measurement tools designed for strategic and policy alignment

ID	Measurement	Reference
IT strategy & planning		
SPIT 1	The organization should have clear goals & objectives for ERP system implementation.	Rahel, 2018
SPIT 2	The culture of the organization is ready to educate on the new business process for ERP system implementation.	Zewdu, 2016
SPIT 3	The culture of the organization is ready to align the ERP system implementation goals & the company's goal.	Ahmadi et al.,2015
SPIT 4	The organization should have to stabilize corporate objectives for ERP system implementation.	
Process and structure		
SPPS 1	The organization is ready to align the company's structure with ERP requirements	Ahmadi et al.,2015

SPPS 2	The organization should adopt a ready business process, documentation, improvement, and integration for ERP system implementation.	
SPPS 3	The organization has to define and document business needs and functional requirements for ERP system implementation.	

➢ Top Management (Leadership)

Top management support deals with the decisions which are made at the top level of the organization and will generate support within the senior management group. Top management gives support for project managers to understand and achieve the project's objectives, which are specified by the client and/or top management. Top management support is critical even if there are appropriate business plans and vision, re-engineering business processes, effective project management, user involvement, and education and training, organizations can not embrace the full benefits of such a complex system and the risk of failure might be at a high level (Khaled et al., 2008, Cao H., & Fredric W., 2010 & Ahmadi et al, 2015). Managers should have the goal of not just making use of the system but to make employees satisfied with using the system, to improve their performance, and also to empower them to make decisions. (Rajan & Baral, 2015). In ERP deployment, repositioning the organization and reforming business operations must be approved by top management, and top management commitment is required to support the implementation process. The implementation plan must also be disseminated from top to bottom to demonstrate top management's attentiveness (Daniel G., 2018,). Therefore, top management or leadership is one of the critical factors for ERP pre-implementation Readiness.

Table 2. 8 Measurement tools designed for top management

ID	Measurement	Reference
Commitment		
TMC 1	Top management shall commit themselves to re-engineer the business process before implementing an ERP system.	Zewdu,2016 & Rahel, 2018
TMC 2	Top management shall commit themselves to dedicate resource support before implementing an ERP system.	

TMC 3	Top management shall commit themselves to select a well-qualified & knowledgeable project champion before implementing an ERP system.	Ahmadi et al.,2015
TMC 4	The top management shall commit themselves to form a powerful steering committee before implementing an ERP system.	
TMC 5	Top management shall commit to empowering the Chief information officer (CIO) in the company before implementing an ERP system.	
TMC 6	The top management shall commit to the regular mentioning of an ERP system before implementing an ERP system.	
Planning		
TMP 1	Top management shall commit to identifying required changes in the company before implementing an ERP system.	Ahmadi et al.,2015
TMP 2	Top management shall commit to conducting an ERP system implementation feasibility study for the company before implementing an ERP system.	
TMP 3	Top management shall commit to preparing a clear, stable, and well-defined project plan for ERP system implementation before launching the system.	
TMP 4	Top management shall commit to identify and plan project risks before implementing an ERP system.	
TMP 5	Top management shall commit to planning a well-defined IT infrastructure before implementing an ERP system.	

- **Partnership (Vendor and Consultants)**

ERP systems (as well as consultants) may be a long-term commitment for many businesses. Partnership deals with external ERP consultants and vendors. A consultant and vendor with broad industry experience can assist in many activities in the ERP implementation project

(Ahamdi, et al, 2015). There have always been new modules and versions to configure, bug fixes to apply, and changes to make to improve the fit among business and system. Consultants are frequently involved in all phases of the execution, performing requirement specifications, recommending appropriate solutions, and managing the execution. As a result, the number of consultants, how and when to use them, and their roles in the implementation must all be determined (Rahel T, 2018).

Consultants and Vendors should have in-depth knowledge of software, should be involved in different stages of implementation, should have multiple skills, and covering functional, technical, and interpersonal areas. The company should be able to manage well these consultants. Therefore, consultants & vendors are critical factors for ERP implementation (Swaminathan, 2011).

Table 2. 9 Measurement tools designed for Partnership

ID	Measurement	Reference
Commitment		
PCO 1	Partnerships shall be committed for ongoing ERP vendor support for ERP system implementation.	Rahel T, 2018
PCO 2	Partnerships shall committed for business process re-engineering during ERP system implementation.	
PCO 3	Partnerships shall committed for teamwork during ERP system implementation.	
PCO 4	Partnerships shall to be commit implementation Strategy for ERP system implementation	
Capacity		
PCA 1	A partnership should fits with the organization for ERP system implementation.	Rahel, 2018
PCA 2	The partnership has the capacity for minimal customization of packages during ERP system implementation.	

PCA 3	A partnership can integrate business planning with ERP planning during ERP system implementation.	
PCA 4	The partnership has the capacity to formalized project plans/Schedules before and during ERP system implementation.	

- **Individual Readiness**

Individual readiness refers to user involvement of the psychological state of the individual and is defined as the importance and personal relevance of a system to a user. It is also defined as the user's participation in the implementation process. There are two areas for user involvement when the company decides to implement an ERP system: (1) user involvement in the stage of definition of the company's ERP system needs, and (2) user participation in the implementation of ERP systems (Bhatti, N.D).

According to Shafaei and Dabiri, 2008 and Rahel, 2018, people or users have the highest numbers of related CSFs with the highest rate of accepted factors. The functions of the ERP system depend on the user to use the system after going live, but the user is also a significant factor in the implementation.

Table 2. 10 Measurement tools developed for individual readiness

ID	Measurement	Reference
Commitment		
IRC 1	Individual commitment is essential to inter-departmental cooperation during ERP system implementation.	Rahel, 2018
IRC 2	Individual commitment is relevant in creating good communication skills during ERP system implementation.	
IRC 3	Individual commitment is relevant in creating awareness about the ERP system	Ahmadi et al, 2015
IRC 4	Individual commitment to know the existence of general IT knowledge in the company	

Capability		
IRCA 1	Individually capable to project team competence during ERP implementation.	Zewdu, 2016
IRCA 2	Individually capable of managing the project during ERP system implementation.	
IRCA 3	Individually can have effective inter-department communications during ERP system implementation.	Rahel,2018, Ahmadi et al.2015
IRCA 4	Individual capable of teamwork during ERP system implementation	Rahel,2018

- **ERP-Specific**

Shafaei & Dabiri, 2008 have introduced and included ERP-specific variables as an extension to the EFQM model to get a good model for ERP pre-implementation readiness. ERP- specific with the following factors have the highest weight and considered as one of the critical factors for ERP pre-implementation readiness according to them.

Table 2. 11 Measurements tools designed for ERP-specific variables

ID	Measurement	Reference
System integration Capability		
ERPSI 1	The vendor has experience and credibility in system integration during ERP system implementation.	Shafaei & Dabiri, 2008
ERPSI 2	Consultants have knowledge and experience in system integration during ERP system implementation.	
ERPSI 3	The organization has integrated documentation of processes for ERP system implementation.	
ERPSI 4	The organization should have a communication infrastructure for ERP system implementation.	
Software consistency with community rules		
ERPSC 1	The system is benchmarking from countries with similar	Shafaei &

	rules	Dabiri, 2008
ERPSC 2	The system should implemented package in internal companies	
ERPSC 3	The system should support internal consultants.	
System Upgradeability		
ERPSU 1	ERP system selected because of easy to upgrade.	Shafaei & Dabiri, 2008
ERPSU 2	The system can benchmark from best practices.	
ERPSU 3	The system can implement the service-oriented architecture	
Vendor support		
ERPSV 1	The vendor has experience and credibility for support users during ERP system implementation.	Shafaei & Dabiri, 2008
ERPSV 2	The vendor is capable of strong negotiation to contract.	
ERPSV 3	The vendor can make wide communication before, during, and after ERP system implementation.	
Having the right expectations from the software		
ERPSH 1	Consultant credibility and reputation should do the right expectations from the software	Shafaei & Dabiri, 2008
ERPSH 2	Personnel knowledge and experiences should to know what the system will do at the end of the implementation.	
ERPSH 3	The organization has a great internal implementation team during ERP implementation.	
ERPSH 4	Should review the implementation process by management	

2.7 Summary

In today's competitive market, Enterprise Resource Planning (ERP) system is widely being used by industries. However, the results of the research efforts carried out in this field reveal that the rate of successful implementations for ERP projects is low and in most cases, the planned goals are not achieved. This is because; most companies overlook conducting a comprehensive study before implementing such technology to assess for pre-required necessary infrastructure and capabilities. Thus, to be successful, companies should evaluate their readiness for ERP implementation before launching the system.

The Pre-implementation aspect is a critical step in the implementation process. Considering this, various researchers have created an ERP pre-implementation readiness assessment framework based on various factors. Many of these farmworkers or studies are conducted in developed countries based on their situation. Based on previously conducted relevant related studies, this study has identified six factors such as technical & technology, partnership consultant & vendor, individual readiness, strategy & policy alignment, top management, and ERP-specific factors. Based on identified factors, the study has developed numerous measurement tools under each factor for further validation of tools to be addressed in the next chapters.

CHAPTER THREE
RESEARCH DESIGN AND METHODOLOGY

3.1 Introduction

The research methodology is the collection of procedures, methods, instruments, and techniques used to perform research and achieve the study's final output of the study. It is an important part of research as it helps researchers to decide how to achieve the specified objective, what data to collect, and how to collect and analyze the data to solve the target problems. Therefore, it needs much consideration in selecting acceptable procedures capable of producing the required results.

This study attempts to develop and validate pre-implementation readiness measures for ERP. Thus, the chapter presents the research design and methodology that is applied for the study specifically, on the research design, sampling design, source of data, data collection methods, method of data analysis, and at the end chapter summary has been explained.

3.2 Research Design

The research design is the blueprint for the collection, measurement, and analysis of the data and also indicates how the research outcome at the end will be obtained in line with meeting the objective of the study (Kassu, 2019, Akhtar, 2016). The choice of appropriate research design helps the researcher to answer the research questions and to satisfy the research objectives. Therefore, it is paramount to properly define and evaluate the research design before conducting the research.

3.2.1 Research Approach

The research approach is a plan and the procedure for research that encompass the steps from broad assumptions to detailed methods of data collection, analysis, and interpretation (Vijay, 2015). There are three main research approaches: quantitative, qualitative, and mixed approachs.

Quantitative research establishes statistically significant conclusions about a population by studying a representative sample of the population whereas qualitative research describes an event in its natural setting and it is a subjective way to look at life as it is lived and an attempt to

explain the studied behavior (Lowhorn, 2007). For this study, quantitative research approach was adopted in which quantitative analysis is employed to develop and validate measurement tool for ERP pre-implementation readiness by collecting data from end-users which involves survey in which data is gathered from pre-defined group of respondents to gain information and insights into topic of interest.

Quantitative research is an approach for testing objective theories by examining the relationship among variables. These variables, in turn, can be measured, typically on instruments, so that numbered data can be analyzed using statistical procedures. Quantitative research tests or verifies theories or explanations; ientifies variables to study; relates variables in questions or hypotheses; uses standards of validity and reliability; observes and measures information numerically and employs statistical procedures (Creswell, 2009).

3.2.2 Research Strategy

A research strategy introduces the main components of a research project that refers to how the researcher proposes to answer the research questions set and how to implement the methodology. Quantitative research approach includes various strategies and designs such as surveys and experiments (Creswell, 2009).

- **Survey research** provides a quantitative or numeric description of trends, attitudes, or opinions of a population by studying a sample of that population. It includes cross-sectional and longitudinal studies using questionnaires or structured interviews for data collection-with the intent of generalizing from a sample to a population (Creswell, 2009).
- **Experimental research** seeks to determine if a specific treatment influences an outcome. The researcher assesses this by providing a specific treatment to one group and withholding it from another and then determining how both groups scored on an outcome. Experiments include true experiments, with the random assignment of subjects to treatment conditions, and quasi-experiments that use non-randomized assignments. Included within quasi-experiments are single-subject designs (Creswell, 2009).

This study initially used a structured interview with experts(end-users) to check the validation of ERP pre-implementation readiness measurement tools then followed by closed-ended questions to validate ERP pre-implementation tools. Thus, this study used quantitative survey

research to get answers to the research questions and to validate ERP measurement tools based on study model.

3.2.3 Research Process Map

The research process map in Figure 3.1 illustrates the steps that the study follows throughout the research phase to assess the case corporation's preparation for ERP system implementation and to validate the framework by measuring the readiness of the company. As can be seen in the following figure it begins with the recognition of the issue and progresses to the company's implementation decision.

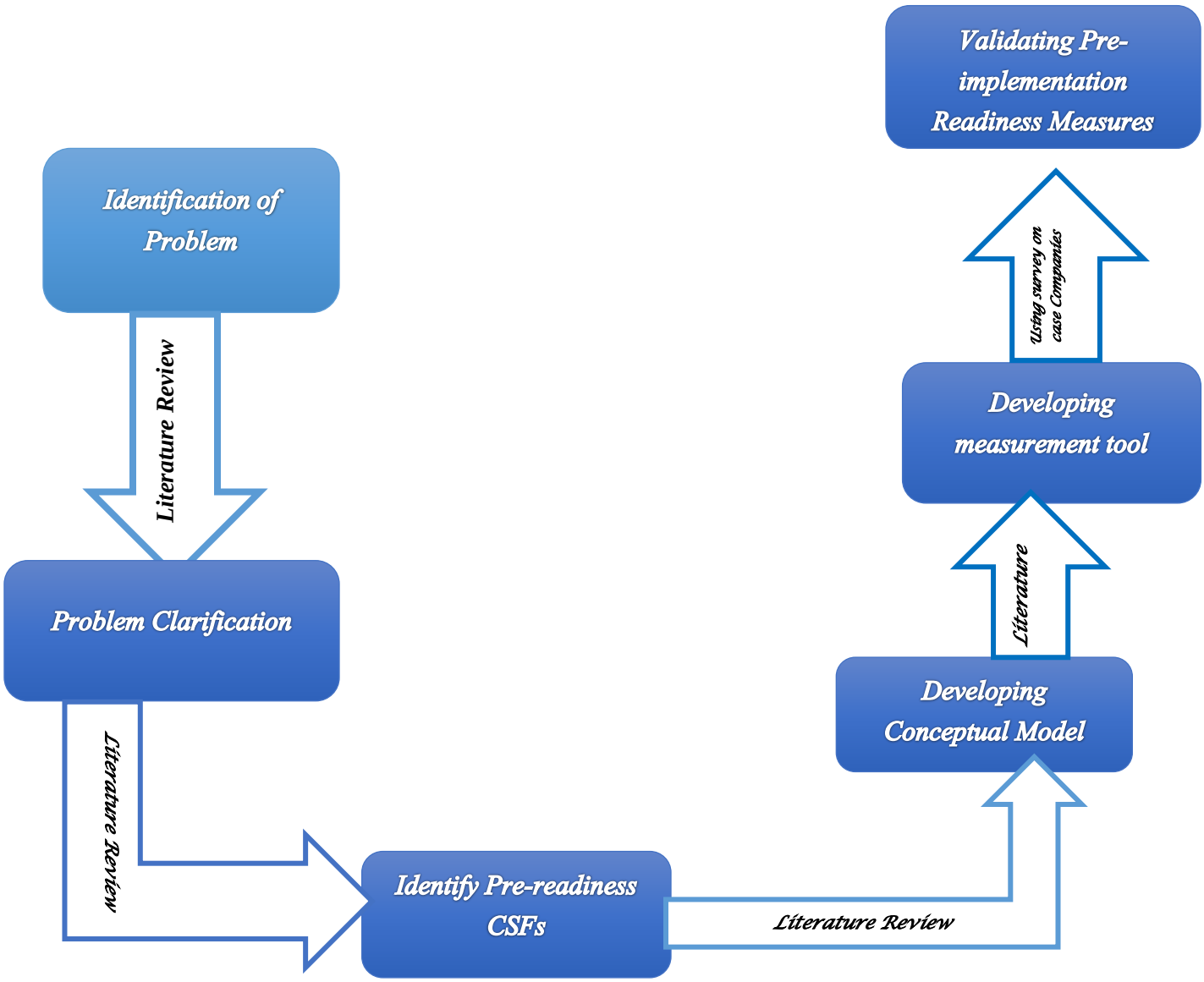


Figure 3. 1: Research Process Map

3.2.4 Target Population and Sampling Design

Target Population

The target population of this study includes all companies that are tried to implement an ERP; companies that are in the progress of implementation and those companies that are successfully implemented an ERP system in Addis Ababa. As the target of this study is to validate pre-implementation readiness measures for ERP, the study doesn't include those firms that are not planned or attempted to implement an ERP system in their organizations.

Sampling Design

This study attempts to develop an ERP readiness measurement tool focusing on selected companies in Ethiopia. The selected companies have either implemented an ERP system in their organization or made some effort to implement an ERP system but not yet finalized the implementation.

Due to the various constraints such as time, finance, and willingness of the target companies; taking a representative sample is essential in conducting studies. In this study, considering the availability of information; six companies that are operating in Addis Ababa, Ethiopia in different sectors are selected purposefully. The selected companies are organizations operating in different industries that are implemented an ERP, on the progress of implementation and implemented ERP in their organization. The companies are: Addis Ababa University, Ethiopian Shipping and Logistics, Moha Soft Drinks Industry S.C, Lion International Bank S.C, Ethiopian Electric Utility, and Habesha Cement S.C. It is assumed that taking companies from the different sectors may better help in validating pre-implementation readiness measures for an ERP system. To get valuable information, twenty questionnaires are distributed for each of the selected companies. The selected companies are briefly described below.

- Addis Ababa University (AAU), which was established in 1950 as the University College of Addis Ababa (UCAA), is the oldest and the largest higher learning and research institution in Ethiopia. Since its inception, the University has been the leading center in teaching-learning, research, and community services. Beginning with an enrollment capacity of 33 students in 1950, AAU now has 47,610 students (29,872 undergraduate, 15,398 Master's and 2,340 Ph.D. students) and 8,709 staff (3,110

academics, 4,346 admin support staff, and 1253 health Professionals). In its 14 campuses, the University runs 70 undergraduate and 293 graduate programs (72 Ph.D. and 221 Masters), and various specializations in Health Sciences[1].

- MOHA soft drinks Industry S.C was acquired from the Ethiopian Privatization Agency and established on May 15, 1996, with the mission of becoming the best beverage industry in the country. The company operates with the vision of making Pepsi products to be a drink of the first choice among consumers and obtainable throughout the Ethiopian market. To do this, the company has opened factories and many outlets throughout the country emphasizing innovation and technological improvement to keep always ahead of the competition. To meet its objectives, the company has implemented an ERP system that better helps it in managing production levels and inventories throughout a network of branches with the help of technolog[2].

- Lion International Bank S.C (LIB) has been established in October 2006 by Proclamation No፡ 84/94 and the Commercial Code of Ethiopia. The company based its roots on a larger number of shareholders than any other Bank has had during the time and has become a pioneer for the Banks that came later. LIB is a fully-fledged bank providing all banking services to the public with the help of technology and operating with large geographical coverage in the country. The bank has adopted an ERP technology system that assists it to run banking services efficiently through a network of branches and various organizational units[3] (Anon n.d.).

- Habesha Cement S.C. is part of the cement and concrete product manufacturing industry. In order to facilitate is production and inventory management, the newly established cement company has tried to implement an ERP system though not as successful as expected. Now, the management has decided to adopt and implement the new ERP system[4].

[1] http://www.aau.edu.et/
[2] https://mohasoftdrinksindustry.com/
[3] https://anbesabank.com/
[4] https://www.habeshacement.com/

- The Ethiopian Shipping and Logistics Service Enterprise is the result of the merger of four businesses that were previously operating separately in the sea transport market. Ethiopian Shipping Lines Share Business, Ethiopian Maritime and Transit Service Enterprise, Dry Port Enterprise, and the former Comet Transport Share Company were merged into the new company in August 2016. It is charged with the enormous responsibility of providing more effective and reliable sea transport and logistics services to the country's importers, exporters, and investors by reducing transit time, expense, and handoffs[5].

- Ethiopian Electric Utility has played an important role in delivering affordable, dependable, and equal electric power. Ethiopia's government has launched a rural electrification program to link rural towns, districts, and villages to ensure service accessibility and coverage across the region. This program promotes rapid socioeconomic growth, the emergence of small businesses, the reduction of job pressure on women, and has many positive spillover effects in other areas[6].

In general, the stages of the company's implement ERP are different based on the companies. AAU has partially adopted an ERP system to facilitate its educational and community service among and between various operational units and campuses. Ethiopian Shipping and Logistics, Moha Soft Drinks Industry S.Co, and Ethiopian Electric utility are implemented ERP successfully. Habesha Cement S.Co and Lion International Bank S.co are trying to implement an ERP system in their companies. Taking this different sector as prominent to better helps the researcher to get essential information that assists in validating ERP measurement tools and drawing conclusions.

3.2.5 The Study Variables

This study has identified seventeen variables that affect ERP pre-implementation readiness that is grouped under six categories as listed below. Based on the developed model, the study has defined the following hypotheses that are expressed in an alternative form to be statistically tested.

[5] https://www.eslse.et/
[6] http://www.eeu.gov.et/

Table 3. 1 Variable that affect ERP pre-implementation readiness and their expected effects on the dependent variable

S. No	Factors	Variables	Predicted sign and impact on ERP
1	Technical and Technology	Application Management	Positive and Significant
		Service Management	Positive and Significant
		IT Resource Management	Positive and Significant
2	Strategy & Policy Alignment	IT Strategy & Panning	Positive and Significant
		Process and Structure	Positive and Significant
3	Top Management (Leadership)	Top Management Commitment	Positive and Significant
		Planning	Positive and Significant
4	Partnership-Vendor & Consultants	Commitment	Positive and Significant
		Capacity	Positive and Significant
5	Individual Readiness	Individual Commitment	Positive and Significant
		Individual Capability	Positive and Significant
6	ERP specific factors	System integration Capability	Positive and Significant
		Software consistency with rules	Positive and Significant
		System Upgradeability	Positive and Significant
		Vendor support	Positive and Significant
		Having the right expectations from the software	Positive and Significant

3.2.6 Study Participants

The participants of this study consist of end-users of the system in organizations. End-users are those individuals who are using the ERP systems and some of them have even participated during the implementation of the system. The end-user selected census that have given higher validity data based on the job performance and training performance criteria found from HR.

3.2.7 Data Collection Instrument

This study uses quantitative approach in the collection of data. The quantitative method is the collection of numerical data that can be transformed into statistics are taken into consideration. In quantitative data, collections are done through online or paper surveys, mobile, face-to-face interviews, online pools, and telephone interviews (Sharma, 2018).

The validity of measurement tools developed by this study are checked and addressed through an interview and questionnaires are distributed to various end-users. Besides, data is also obtained through the literature review from peer-reviewed sources from both local and foreign studies as ERP is a new phenomenon for our country Thus, to achieve its objective this study uses document review, questionnaires, and interviews as the data collection techniques.

- **Questionnaire:** This study also uses a questionnaire to explore relevant information from target respondents regarding measurement tools for ERP pre-implementation readiness of the target organizations. survey questionnaire is prepared and distributed to ERP end-users to validate the measurement tools on the case companies.
- **Interview:** The validity of measurement tools developed by this study will be checked and addressed by an interview with purposefully selected experts(end-users) in the case companies to identify the relevance of ERP measurement tools.

3.2.8 Data Analysis

Data analysis is the process in which the researcher uses tools to sort and reduce data for interpretation to make sense. It provides senses for the data collected and enables them to report results and make interpretations. The collected data should be well organized and analyzed to test the proposed hypothesis using statistical techniques. These techniques should be carefully selected based on the type of data collected and carried out in the context of measures derived from a theory (Lowery & Gaskin, 2014).

Data analysis in research relates to the type of research strategy chosen for the procedures. A quantitative strategy is best suited for the studies that have a large focus on numbers and the use of hypothesis and statistical tools to analyze them (Creswell, 2009). Thus, due to quantitative

nature of data, this study has used quantitative research analysis to examine the relationships between dependent variable and independent variables.

Accordingly, as a strategy, this study conducts detailed and focused literature reviews to develop measurement tools for ERP pre-implementation readiness. The critical success factors are selected depending on previously conducted local studies and considering the ERP implementation status of the case companies. Then data is collected with the collecting instruments that are mentioned above. Then the gathered data has been analyzed, and finally, the comprehensive ERP pre-implementation readiness measurement tools are determined and those tools are validated through the study. The detailed findings of the study are presented in chapter four.

In this study, SmartPLS software is employed to analyze and interpret the collected data. PLS software is becoming a choice of various disciplines that may include management of information systems, e-business, organizational, and consumer behaviors. According to Venkatesh et al. (2003), PLS software is applied to examine the reliability and validity measures along with other construct measures. Hypothesis testing using PLS involves considering the likelihood of type I and type II errors, which relate to whether the data supports accepting or rejecting the hypothesis. Moreover, its capability of handling formative indicators, independence of data normalization, and fitting for sample size are the qualities of PLS to be preferred in testing complex multivariate causal relationships.

The process of data analysis in this study is started by coding the raw data into a computer by converting it from manually filled questionnaire papers. For this purpose, one of Microsoft (MS) Office products' MS Excel is selected to convert the data. MS Excel 2016 is used to correct data types, naming rules, and representation values to make the record fit for additional analysis. The next step of the data is to save in comma-delimited (CSV) file format as it is suitable for SmartPLS software and in Excel (.xlsx) file format and SPSS (Statistical Package for Social Sciences) software.

3.2.9 Validity and Reliability

Validity and reliability are the two most important factors to consider when evaluating a measurement instrument in conducting studies. Validity is the precision in which the findings

accurately reflect and it indicates how well an instrument measures what it is supposed to measure. The term "reliability" refers to the quality of being able to rely on and the consistency of the analytical procedures, including accounting for personal and research method biases that may have influenced the findings. It is the manner in which we rely on the research or the process output of the research result (Noble and Smith, 2015). Roberta & Alison, 2015 have outlined validity and reliability as two important measures of quality in a quantitative study and they have defined validity as the extent to which a concept is accurately measured in a quantitative study, whereas reliability or accuracy of an instrument shows the extent to which a research instrument consistently has the same results if it is used in the same situation on repeated occasions.

Accordingly, there are different types of validity such as content validity that is the extent to which a research instrument accurately measures all aspects of a construct; construct validity which is the extent to which a research instrument (or tool) measures the intended construct and criterion validity that is the extent to which a research instrument is related to other instruments that measure the same variables. Although it is not possible to give an exact calculation of reliability, an estimate of reliability can be achieved through different measures. The three attributes of reliability are homogeneity, stability, and equivalence. Homogeneity or internal consistency shows the extent to which all the items on a scale measure one construct; stability on the other hand shows consistency of results using an instrument with repeated testing and equivalence expresses consistency among responses of multiple users of an instrument, or among alternate forms of an instrument. This study employs criterion validity that is measured by convergent and divergent validity. The measurement helps in showing whether the variables are highly or poorly correlated with instruments in similar and different variables. Cronbach's α test is also employed to determine homogeneity or internal consistency of results.

Generally, the comprehensive ERP pre-implementation readiness measurement tool developed by this study is validated and the reliability of the study is ensured by measuring the readiness of the case companies and uses multiple sources of evidence at the time of data collection through the help of mentioned test instruments.

3.3 Chapter Summary

This chapter has outlined the study's key objectives as well as the research design that was used to achieve those objectives. The chapter has also described the proposed process model, hypotheses of the study, and methodologies to collect and analyze data from target respondents to validate measurement tools for ERP pre-implementation readiness. Moreover, it has addressed analysis tools, strategies, and techniques to interpret the collected data. The next chapter presents the result of the analysis in detail.

CHAPTER FOUR

RESULTS AND DISCUSSION

4.1 Introduction

This study aims to develop and validate pre-implementation readiness measures for ERP. The first objective which was developing an ERP readiness measurement tool has been achieved through an in-depth review of the literature. The second objective of the study is validating measurement tools of an ERP that are identified and developed through a review of the literature. This validation initially is undertaken by selected individual experts(end-users) working on case companies. The respondent's data has been analyzed according to the objectives of the research which was developing and validating pre-implementation readiness measures for ERP.

4.2 Respondents Demographic Characteristics

In total, 120 questionnaires (20 questionaries' to each case organizations) were distributed to various respondents working in the ERP area within the organizations in Addis Ababa. Among the total questionnaires, 103 questions were responded and they are valid for analysis. All the collected questionnaires were used to conduct data analysis, resulting in a response rate of 85.8%. In this study, a Partial Least Square (PLS) analysis is used to test the proposed research model and hypotheses, and SPSS descriptive analysis is used to analyze the demographic and strata variables.

The demographic variables used in this study are departments of respondents, their role in the company, their educational level, and their work experience in ERP (See Table 4.2).

Majority of respondents constituting 38.8% of total participants were individuals working in the IT department, and 30.1% respondents are IT, professionals. Based on the educational qualification level of respondents, the majority of respondents constituting 70.9% of total participants were individuals who have Bachelor's degree qualifications. Moreover, the majority

of respondents constituting 48.5% of total participants were individuals who have 3-6 years of work experience.

Table 4. 1 Demographic characteristics of respondents

Variables	Classification of Variables	Frequency	Percent
Working Department of respondents	ICT	40	38.8
	Finance	33	32.0
	Sales & Marketing	12	11.7
	Procurement	10	9.7
	Human Resource	5	4.9
	Other	3	2.9
	Total	103	100.0
The job role of respondents	Manager	19	18.4
	IT professional	31	30.1
	Accountant	29	28.2
	Sales	9	8.7
	Other	15	14.6
	Total	103	100.0
Educational Level of respondents	Diploma	4	3.9
	Bachelor Degree	73	70.9
	Masters	26	25.2
	Total	103	100.0
Working Experience of respondents in ERP	2 years or less	15	14.6
	3-6 Years	50	48.5
	7-15 years	33	32.0
	More than 15 Years	5	4.9
	Total	**103**	**100.0**

4.3 Analysis on the Structural Equation Model (SEM)

Partial least square (PLS) is a method for constructing predictive models when the factors are numerous and highly collinear (Wong, 2013). PLS is commonly used in different sciences and information systems research to assess the quantitative quality and standard of results. Along with its ability to model latent constructs under non-normality and small to medium sample sizes, the PLS procedure, as one of the SEM techniques, has attracted significance and use by many researchers in recent years. It enables researchers to specify the relationship between conceptual factors of interest as well as the measures underlying each construct (Dinkesa, 2017). Thus, the proposed research model and hypotheses are tested using partial least squares (PLS) analysis. SEM (structural equation modeling) is a powerful multivariate technique that is increasingly being used in scientific research to test and evaluate multivariate causal relationships. SEM differs from other modeling approaches in that they examine both direct and indirect effects on presumptively causal relationships (Yi Fan et al., 2016). Researchers can use SEM to visually explore the relationships that exist between variables of interest to prioritize resources to better serve their customers. SEM is ideal for tackling business research problems because it can use unobservable, difficult-to-measure latent variables (Wong, 2013).

Initially, the survey data were manually entered into SPSS to get suitable data for SMART PLS and saved as CSV. To ensure SMART PLS can import the Excel data properly, the names of those indicators (TAM 1, TAM 2, TAM 3, TAM 4…) are placed in the first row of a .csv file of Excel spreadsheet. In this study, the model is created in Smart PLS version 2 to show SEM and to show test the measurement model results and the structural model results and to identify the qualified indicators for ERP pre-implementation readiness measure tool (See the figure below).

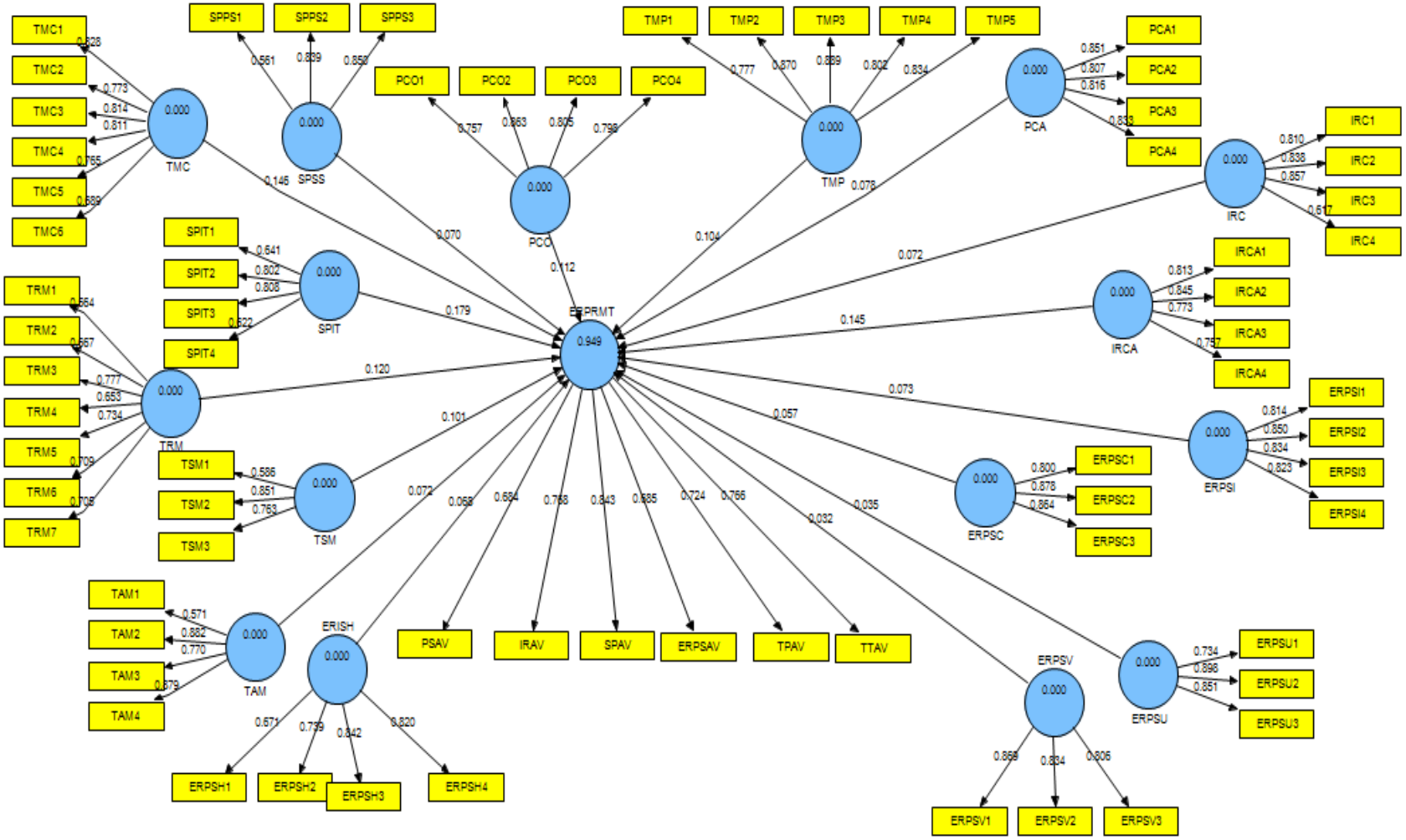


Figure 4. 1 The measurement model created through SMART PLS

4.4 Reliability and Validity Measurement Results

4.4.1 Reliability Test

The consistency of a measure is referred to as its reliability. A respondent completing a motivational instrument should have roughly the same responses each time the test is completed. Reliability can be assessed in terms of composite reliability or Cronbach's Alpha, which measures the degree to which items are free from random error and therefore yield consistent results (Heale & Twycross, 2015).

Composite reliability of Cronbach's Alpha, which measures the degree to which items are free of random error and thus produce internal consistent results, can be used to assess reliability. Cronbach's Alpha coefficient with a cutoff value of 0.6 and composite reliability with a cutoff value of 0.7 was used as internal consistency measures in this study, as recommended (Garson, 2013). Composite reliability results in our measurement model ranged from 0.781 to 0.920 and Cronbach's Alpha in the measurement model interval from 0.5925 up to 0.8914 (See Table 4.3). As a result, all reflective latent variables have shown good internal consistency and reliability. Outer loadings for indicators of reflective variables demonstrate the dependability of each indicator. The reflective variables are greater than the minimum acceptable value of 0.7. The table shows composite reliability was larger than 0.7 but Cronbach's α values were less than and greater than 0.7.

Table 4. 2 The measurement result of the study

Construct	Composite Reliability	Cronbach's Alpha	AVE
TSM	0.7818	0.5925	0.5498
SPSS	0.801	0.6223	0.5807
SPIT	0.8124	0.6897	0.5236
ERPSU	0.8688	0.7725	0.6897
TAM	0.8628	0.782	0.6174
ERISH	0.8532	0.783	0.5943
ERPSV	0.8749	0.7862	0.7
IRC	0.8646	0.788	0.6183
ERPSC	0.8848	0.8078	0.7194
IRCA	0.8747	0.809	0.6361
TRM	0.863	0.8148	0.4758
PCO	0.8813	0.8199	0.6503
ERPRMT	0.8828	0.8398	0.558
PCA	0.8961	0.8458	0.6834
ERPSI	0.8987	0.8502	0.6893
(TMC	0.9036	0.872	0.6106
TMP	0.9202	0.8914	0.698

4.4.2 Validity Test

The validity of the findings is concerned with whether they are truly about what they appear to be about. Convergent and discriminant validity are two components of a larger scientific measurement concept known as construct validity (Straub et al., 2004).

- Convergent validity is demonstrated when each measurement item has a strong correlation with the theoretical constructs assumed. Convergent validity necessitates a factor loading of at least 0.70 and an AVE of at least 0.50 (Fornell and Larcker, 1981). For all the constructs with multiple reflective measures, most of the constructors have high loadings, whereas thirteen constructors are not facilitating conditions constructors whose outer loading value was less than 0.7. So these constructors are removed from the

model of ERP pre-implementation readiness measurement. Thereafter, the Smart PLS is executed and the generated results were summarized by distinguishing qualified indicators from non-qualified constructs. Accordingly, Smart PLS results for qualified indicators are shown in the following table and the results for non-qualified and qualified indicators are presented on annex one (1) and annex two(2) of appendix with all values above the threshold demonstrating convergent validity.

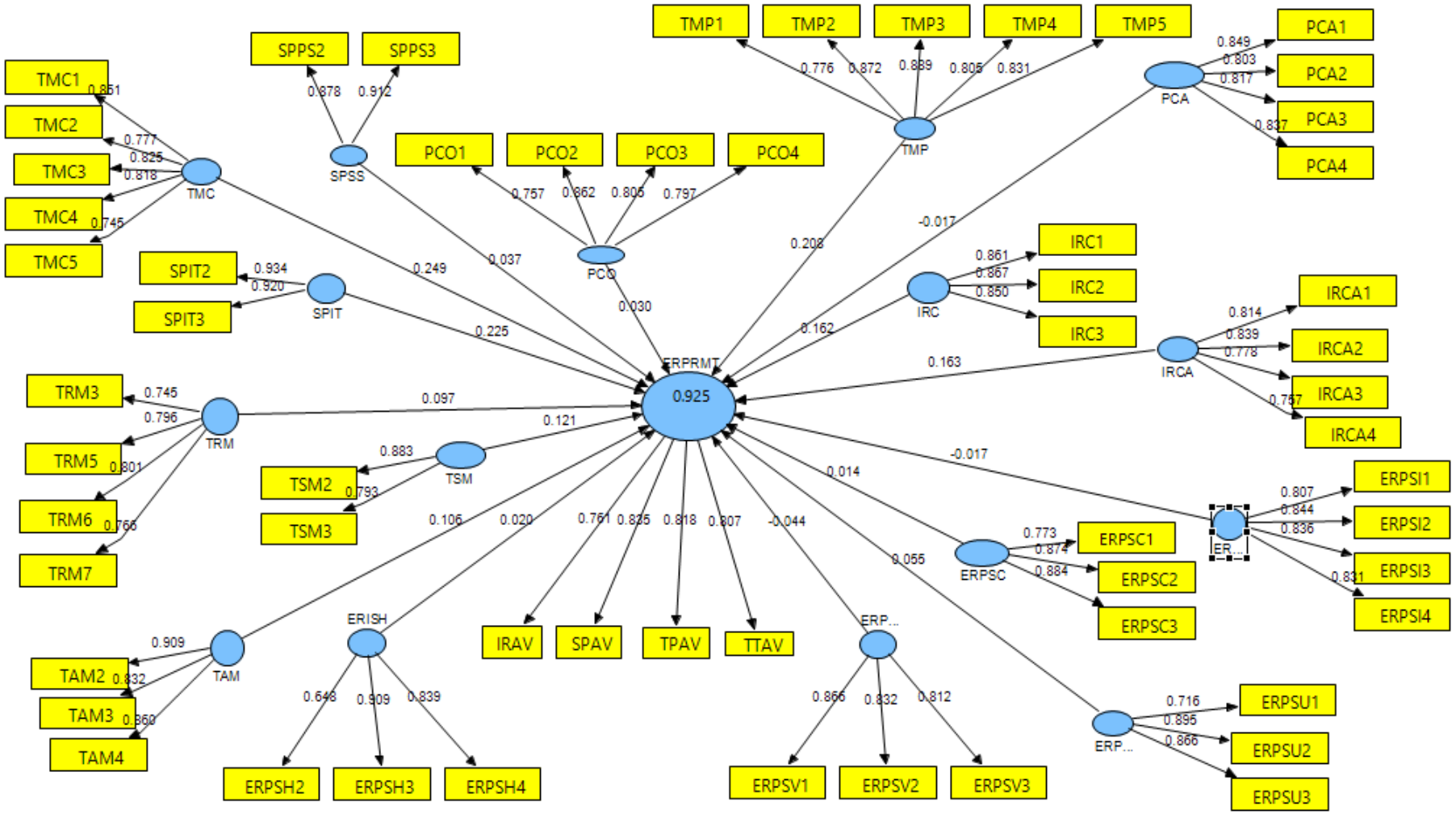
- Discriminant Validity testing can be done using the average variance extracted (AVE) analysis. AVE analysis test means each latent construct is much larger than any other correlation among any pair of latent constructs. AVE analysis compares the square root of every AVE and correlated with their pair of latent constructs. Discriminant validity is shown when each measurement item correlates weakly with all other constructs except for the one to which it is theoretically associated. In general, discriminant validity is shown when two things happen:
  - ✓ The correlation of the latent variables scores with measurement item needs to show an appropriate pattern of loading, one in which the measurement item load highly on their theoretically assigned factor and not high on other factors.
  - ✓ Establishing discriminant validity requires an appropriate Average Variance Extracted (AVE) analysis, the square root of each construct's AVE (diagonal values in bold) is much larger than any correlation among any pair of latent constructs. As a rule of thumb, the square root of each constructs' AVE should be much larger than the correlation of the specific construct with any of the other constructs in the model and should be at least 0.5 (Zait, 2011). This study fills the criterion, as can be seen from Table 4.4.

Table 4. 3 AVEs, Square rooted AVEs, and Correlation of latent variables

	AVE	ERISH	ERPRMT	ERPSC	ERPSI	ERPSU	ERPSV	IRC	IRCA	PCA	PCO	SPIT	SPSS	TAM	TMC	TMP	TRM	TSM
ERISH	0.594	**0.771**																
ERPRMT	0.558	0.409	**0.747**															
ERPSC	0.719	0.366	0.2554	**0.848**														
ERPSI	0.689	0.456	0.5663	0.519	**0.83**													
ERPSU	0.69	0.421	0.3936	0.463	0.598	**0.83**												
ERPSV	0.7	0.507	0.471	0.313	0.578	0.489	**0.837**											
IRC	0.618	0.262	0.6622	0.051	0.3	0.155	0.302	**0.786**										
IRCA	0.636	0.379	0.5998	0.324	0.525	0.415	0.519	0.326	**0.798**									
PCA	0.683	0.329	0.4705	0.375	0.508	0.362	0.377	0.207	0.359	**0.827**								
PCO	0.65	0.215	0.5747	0.127	0.244	0.245	0.41	0.503	0.319	0.528	**0.806**							
SPIT	0.524	0.427	0.5746	0.38	0.709	0.508	0.472	0.189	0.477	0.558	0.286	**0.724**						
SPSS	0.581	0.151	0.5466	0.176	0.326	0.133	0.188	0.258	0.407	0.328	0.377	0.302	**0.762**					
TAM	0.617	0.234	0.626	0.047	0.282	0.124	0.221	0.556	0.264	0.302	0.53	0.225	0.405	**0.786**				
TMC	0.611	0.216	0.7921	0.144	0.36	0.149	0.296	0.537	0.384	0.287	0.423	0.281	0.565	0.522	**0.781**			
TMP	0.698	0.162	0.7141	-0.02	0.248	0.105	0.277	0.482	0.299	0.222	0.394	0.199	0.364	0.464	0.685	**0.835**		
TRM	0.476	0.401	0.7038	0.239	0.493	0.463	0.373	0.444	0.429	0.5	0.417	0.514	0.319	0.34	0.474	0.462	**0.771**	
TSM	0.55	0.272	0.6441	0.165	0.294	0.204	0.329	0.423	0.227	0.306	0.5	0.303	0.32	0.442	0.515	0.463	0.588	**0.741**

Another method of testing the discriminate Validity of AVE is cross-loading. AVE had better be greater than 0.50 as well as better than the cross-loadings, which means factors have to clarify at the smallest half the variance of their own indicators. AVE below 0.50 indicates that an error variance goes beyond clarified variance (Garson, 216). As it can be shown in the annex three, factor structure matrix of loadings and cross-loadings all highlighted cells are those on the diagonal that indicates the loading of each indicator was higher for its designated variable than or any of the other variables and each of the variables loaded highest with its own items which confirm discriminant validity as well achieved. Moreover, the model shown below is constructed after removing the non-qualifying indicators of the constructs.

Figure 4. 2 The measurement model after removing non-qualified constructs



4.5 Structural Model and Hypothesis Test

The model depicted on figure 4.2 indicates the relationships between the study variables as per the relationships presented in the proposed research model. The applicability of the structural model is estimated for each path coefficient presented in the model.

To determine statistical significance of the path coefficients, a complete bootstrapping was carried out in Smart PLS. The bootstrap had a sample size of 4,999 cases and 300 iterations of re-sampling as recommend by Jörg (2015). Nine proposed measurement items were excluded from the model due to the insignificance of path coefficients and lower t-statistics value (Table 4.5).

Table 4. 4 The structural model results

	PLS Path coefficient	Sample Mean	Standard Deviation	Standard Error	T Statistics	Level of Significance
ERISH -> ERPRMT	0.0225	0.0166	0.0386	0.0386	0.5829	Not Significant
ERPSC -> ERPRMT	0.0142	0.0153	0.0345	0.0345	0.411	Not Significant
ERPSI -> ERPRMT	-0.0174	-0.0176	0.0553	0.0553	0.3153	Not Significant
ERPSU -> ERPRMT	0.0555	0.0595	0.0476	0.0476	1.1665	Not Significant
ERPSV -> ERPRMT	-0.0442	-0.048	0.0508	0.0508	0.8708	Not Significant
IRC -> ERPRMT	0.1626	0.1607	0.0509	0.0509	3.1952	Significant
IRCA -> ERPRMT	0.1632	0.166	0.0434	0.0434	3.7597	Significant
PCA -> ERPRMT	-0.0163	-0.0129	0.0463	0.0463	0.3515	Not Significant
PCO -> ERPRMT	0.0302	0.0311	0.062	0.062	0.4872	Not Significant
SPIT -> ERPRMT	0.2241	0.2241	0.0496	0.0496	4.5133	Significant
SPSS -> ERPRMT	0.0367	0.0337	0.0374	0.0374	0.9817	Not Significant
TAM -> ERPRMT	0.105	0.1038	0.0454	0.0454	2.312	Significant
TMC -> ERPRMT	0.2492	0.2438	0.0589	0.0589	4.2339	Significant
TMP -> ERPRMT	0.2076	0.2119	0.0572	0.0572	3.6281	Significant
TRM -> ERPRMT	0.0962	0.0953	0.064	0.064	1.5042	Not Significant
TSM -> ERPRMT	0.1208	0.119	0.0464	0.0464	2.601	Significant

The values for the estimated path coefficients of variables, item loadings of each measurement item, and the coefficient of determination (R^2) of the dependent variable are illustrated in the following figure (4.3).

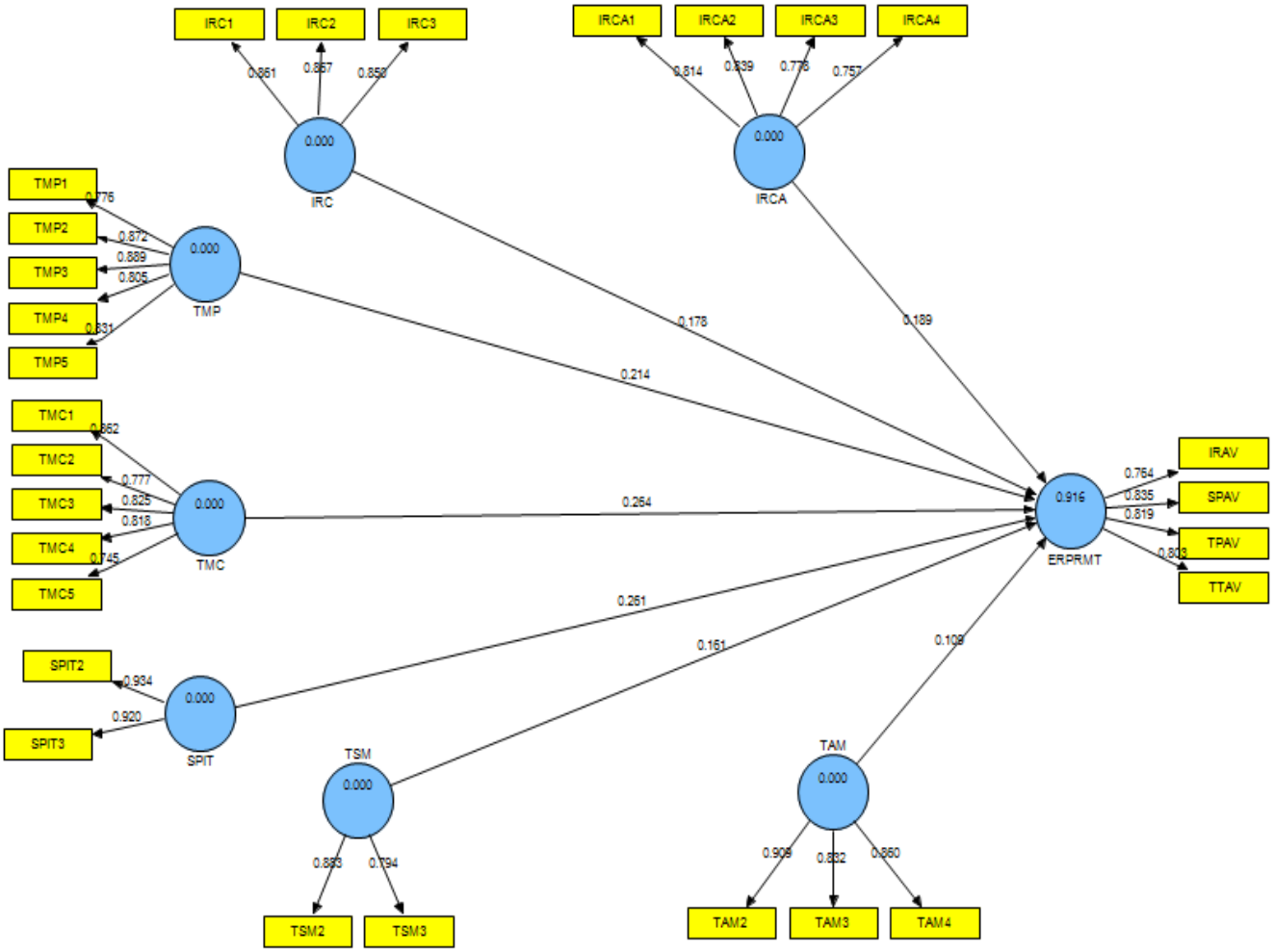


Figure 4. 3 The structural model

Path coefficients show the strength of the relationship between the factors. The scale is between -1 and 1: negative values indicate negative correlation while above zero signals positive correlation. T-values again justify the significance of relations: only relations possessing significant correlation should be taken into account (Hair et al., 2014). This study sets a limit to significance at 5%, thus, only relations exceeding 1.96 in t-values are considered significant.

R-square is used to measure how close the relationship among indigenous variables. The value of R-square closed to 1 indicating a better model in fitting the data. The R^2 of this study is 91.6% showing that the independent variables explained 91.6 percent of the variance in ERP pre-implementation readiness. This implies that 8.4 percent of the variance in ERP pre-implementation readiness is explained by other factors that are not included in the model. The R^2 of this study seems high because explanatory independent variables are taken from previously conducted studies.

4.6 Discussion

The main aim of this study is developing and validating an ERP pre-implementation readiness measurement tool for ERP systems in different companies. To achieve its objective, the study has formulated the research question as: "What pre-implementation readiness measurement tool could be developed for ERP system implementation?" To address the research question appropriately, data has been collected and the following discussions are presented in line with the objective of the study.

The structural model (Figure 4.3) presents how much of the variance in ERP pre-implementation readiness is explained by the underlying factors. The model variables have accounted for (R^2 value, coefficient of determination of 91.6%) of the variability. This means 91.6% of variations in ERP pre-implementation readiness, were explained by independent variables included in the model. However, the remaining 8.6% changes in ERP Pre-implementation readiness are caused by other factors that are not included in the model.

- ***The relationship between TAM and ERPRMT to Measure ERP pre-implementation Readiness***

Application Management was hypothesized to have a positive and significant relationship with ERP pre-implementation Readiness (H1). The empirical evidence of the study indicates that Application Management is the most powerful factor to measure ERP pre-implementation readiness as per the expectation (β=0.105, T <1.96).

- ☞ Therefore, H1 is accepted as the corresponding path coefficient is significant.

- ***The relationship between TSM and ERPRMT to Measure ERP pre-implementation Readiness***

In this study, Service Management refers to the extent IT processes and tools to effectively support a large-scale ERP software solution. Service Management was hypothesized to have a significant positive effect on ERP pre-implementation Readiness (H2). The empirical evidence of the study indicates that the technology service management factor positively influences ERP pre-implementation to measure ERP pre-implementation Readiness (β=0.1208, T >1.96).

- ☞ Thus, H2 is accepted as the corresponding path coefficient is significant.

- ***The relationship between TRM and ERPRMT to Measure ERP pre-implementation Readiness***

IT resource management was hypothesized to have a positive and significant relationship with ERP pre-implementation Readiness (H3). However, IT resource management is an insignificant variable in determining an ERP pre-implementation Readiness (β=0.0962, T <1.96).

- ☞ Therefore, H3 is rejected as the corresponding path coefficient is not significant.

- ***The relationship between SPIT and ERPRMT to Measure ERP pre-implementation Readiness***

IT Strategy & Planning was hypothesized to have a positive and significant relationship with ERP pre-implementation Readiness (H4). The empirical evidence of the study indicates that IT Strategy & Planning is the most powerful factor to measure ERP pre-implementation readiness as per the expectation (β=0.2241, T >1.96).

- ☞ Therefore, H4 is accepted as the corresponding path coefficient is significant.

- ***The relationship between SPPS and ERPRMT to Measure ERP pre-implementation Readiness***

Process and Structure were hypothesized to have a positive and significant relationship with ERP pre-implementation Readiness (H5). However, Process and Structure is an insignificant variable in determining an ERP pre-implementation Readiness (β=0.0367, T <1.96).

- ☞ Therefore, H5 is rejected as the corresponding path coefficient is not significant.

- ❖ ***The relationship between IRC and ERPRMT to Measure ERP pre-implementation Readiness***

Individual Readiness Commitment was hypothesized to have a positive and significant relationship with ERP pre-implementation Readiness (H6). The empirical evidence of the study indicates that Individual Readiness Commitment is the most powerful factor to measure ERP pre-implementation readiness as per the expectation (β=0.1626, T >1.96).

- ☞ Therefore, H6 is accepted as the corresponding path coefficient is significant.

- ❖ ***The relationship between PCO and ERPRMT to Measure ERP pre-implementation Readiness***

Partnership Commitment was hypothesized to have a positive and significant relationship with ERP pre-implementation Readiness (H7). However, Partnership Commitment is an insignificant variable in determining an ERP pre-implementation Readiness (β=0.0302, T <1.96).

- ☞ Therefore, H7 is rejected as the corresponding path coefficient is not significant.

- ❖ ***The relationship between TMC and ERPRMT to Measure ERP pre-implementation Readiness***

Top Management Commitment was hypothesized to have a positive and significant relationship with ERP pre-implementation Readiness (H8). The empirical evidence of the study indicates that Top Management Commitment is the most powerful factor to measure ERP pre-implementation readiness as per the expectation (β=0.2492, T >1.96).

- ☞ Therefore, H8 is accepted as the corresponding path coefficient is significant.

- ***The relationship between TMP and ERPRMT to Measure ERP pre-implementation Readiness***

Top Management Planning was hypothesized to have a positive and significant relationship with ERP pre-implementation Readiness (H9). The empirical evidence of the study indicates that Top Management Planning is the most powerful factor to measure ERP pre-implementation readiness as per the expectation (β=0.2076, T >1.96).

  - ☞ Therefore, H9 is accepted as the corresponding path coefficient is significant.

- ***The relationship between PCA and ERPRMT to Measure ERP pre-implementation Readiness***

Partnership Capacity was hypothesized to have a positive and significant relationship with ERP pre-implementation Readiness (H10). However, Partnership Capacity is an insignificant variable in determining an ERP pre-implementation Readiness (β=-0.0163, T <1.96).

  - ☞ Therefore, H10 is rejected as the corresponding path coefficient is not significant.

- ***The relationship between IRCA and ERPRMT to Measure ERP pre-implementation Readiness***

Individual Capability was hypothesized to have a positive and significant relationship with ERP pre-implementation Readiness (H11). The empirical evidence of the study indicates that Individual Capability is the most powerful factor to measure ERP pre-implementation readiness as per the expectation (β=0.1632, T >1.96).

  - ☞ Therefore, H11 is accepted as the corresponding path coefficient is significant.

- ***The relationship between ERPSI and ERPRMT to Measure ERP pre-implementation Readiness***

System Integration of ERP was hypothesized to have a positive and significant relationship with ERP pre-implementation Readiness (H12). However, System Integration of ERP is an insignificant variable in determining an ERP pre-implementation Readiness (β=-0.0174, T <1.96).

- ☞ Therefore, H12 is rejected as the corresponding path coefficient is not significant.

- ❖ ***The relationship between ERPSC and ERPRMT to Measure ERP pre-implementation Readiness***

Software consistency with community rules was hypothesized to have a positive and significant relationship with ERP pre-implementation Readiness (H13). However, System Integration of ERP is an insignificant variable in determining an ERP pre-implementation Readiness (β=0.0142, T <1.96).

- ☞ Therefore, H13 is rejected as the corresponding path coefficient is not significant.

- ❖ ***The relationship between ERPSU and ERPRMT to Measure ERP pre-implementation Readiness***

System upgradeability with community rules was hypothesized to have a positive and significant relationship with ERP pre-implementation Readiness (H14). However, System upgradeability is an insignificant variable in determining an ERP pre-implementation Readiness (β=0.0555, T <1.96).

- ☞ Therefore, H14 is rejected as the corresponding path coefficient is not significant.

- ❖ ***The relationship between ERPSV and ERPRMT to Measure ERP pre-implementation Readiness***

ERP Vendor Support with community rules was hypothesized to have a positive and significant relationship with ERP pre-implementation Readiness (H15). However, ERP Vendor Support is an insignificant variable in determining an ERP pre-implementation Readiness (β=-0.0442, T <1.96).

- ☞ Therefore, H15 is rejected as the corresponding path coefficient is not significant.

- ❖ ***The relationship between ERPSH and ERPRMT to Measure ERP pre-implementation Readiness***

Having the right expectations from the software were hypothesized to have a positive and significant relationship with ERP pre-implementation Readiness (H16). However, having the right expectations is an insignificant variable in determining an ERP pre-implementation Readiness (β=0.0225, T <1.96).

☞ Therefore, H16 is rejected as the corresponding path coefficient is not significant.

Generally, this chapter has discussed the results of the study regarding the determinants for ERP pre-implementation readiness of firms. Accordingly, seven explanatory variables are found to be significant as hypothesized. The variables of the measurement tool's predicted effect on ERP and the actual effect on ERP are shown in the following table (Table 4.6). Moreover, the final output of the measurement tool that is ready to measure ERP pre-implementation readiness is also shown in table 4.7. Thus, the results of the findings are summarized hereunder.

Table 4. 5 Summary of actual and expected signs of explanatory variables on the dependent variable

S. No	Factors	Explanatory Variables	The predicted sign & impact on ERP	The actual impact on ERP
1	Technical and Technology	Application Management	Positive and Significant	Positive & Significant
		Service Management	Positive and Significant	Positive & Significant
		IT Resource Management	Positive and Significant	Insignificant
2	Strategy & Policy Alignment	IT Strategy & Panning	Positive and Significant	Positive & Significant
		Process and Structure	Positive and Significant	Insignificant
3	Top Management (Leadership)	Management Commitment	Positive and Significant	Positive & Significant
		Planning	Positive and Significant	Positive & Significant
4	Partnership-Vendor & Consultants	Commitment	Positive and Significant	Insignificant
		Capacity	Positive and Significant	Insignificant
5	Individual Readiness	Individual Commitment	Positive and Significant	Positive & Significant
		Individual Capability	Positive and Significant	Positive & Significant
		System integration Capability	Positive and Significant	Insignificant

6	ERP specific factors	Software consistency with rules	Positive and Significant	Insignificant
		System Upgradeability	Positive and Significant	Insignificant
		Vendor support	Positive and Significant	Insignificant
		Having the right expectations from the software	Positive and Significant	Insignificant

Finally, only the following measurement tools are found to be significant variables in determining ERP pre-implementation readiness of firms.

Table 4. 6 The final output of the ERP pre-implementation readiness measurement tool

- **Top Management perspective**

ID	Measurement
Commitment	
TMC 1	Top management shall commit themselves to re-engineer the business process before implementing an ERP system.
TMC 2	Top management shall commit themselves to dedicate resource support before implementing an ERP system.
TMC 3	Top management shall commit themselves to select a well-qualified & knowledgeable project champion before implementing an ERP system.
TMC 4	The top management shall commit themselves to form a powerful steering committee before implementing an ERP system.
TMC 5	Top management shall commit to empowering the Chief information officer (CIO) in the company before implementing an ERP system.
Planning	
TMP 1	Top management shall commit to identifying required changes in the company before implementing an ERP system.
TMP 2	Top management shall commit to conducting an ERP system implementation feasibility study for the company before implementing an ERP system.

TMP 3	Top management shall commit to preparing a clear, stable, and well-defined project plan for ERP system implementation before launching the system.
TMP 4	Top management shall commit to identify and plan project risks before implementing an ERP system.
TMP 5	Top management shall commit to planning a well-defined IT infrastructure before implementing an ERP system.

- **Strategic and Policy Alignment perspective**

ID	Measurement
IT Strategy & Planning	
SPIT 2	The culture of the organization is ready to educate on the new business process for ERP system implementation.
SPIT 3	The culture of the organization is ready to align the ERP system implementation goals & the company's goal.

- **Individual Readiness**

ID	Measurement
Commitment	
IRC 1	Individual commitment is essential to inter-departmental cooperation during ERP system implementation.
IRC 2	Individual commitment is relevant in creating good communication skills during ERP system implementation.
IRC 3	Individual commitment is relevant in creating awareness about the ERP system
Capability	
IRCA 1	Individually capable to project team competence during ERP implementation.
IRCA 2	Individually capable of managing the project during ERP system implementation.
IRCA 3	Individually can have effective inter-department communications during ERP

	system implementation.
IRCA 4	Individual capable of teamwork during ERP system implementation

- **Technology and Technical perspective**

ID	Measurement
Service Management	
TSM 2	The company should ensure service management of data analysis & conversion before implementing an ERP system.
TSM 3	The company ensures management expectations technically and technology after ERP system implementation.
Application Management	
TAM 2	The company shall research the application of technology complexity and compatibility before purchasing an ERP System.
TAM 3	The company shall determine ERP specifications in technical and technological before implementing an ERP system.
TAM 4	The company should have an adequate ERP system selection technically and technologically before implementing an ERP system.

In addition, the following figure shows measurement tools that are found to be significant variables in determining ERP pre-implementation readiness of firms.

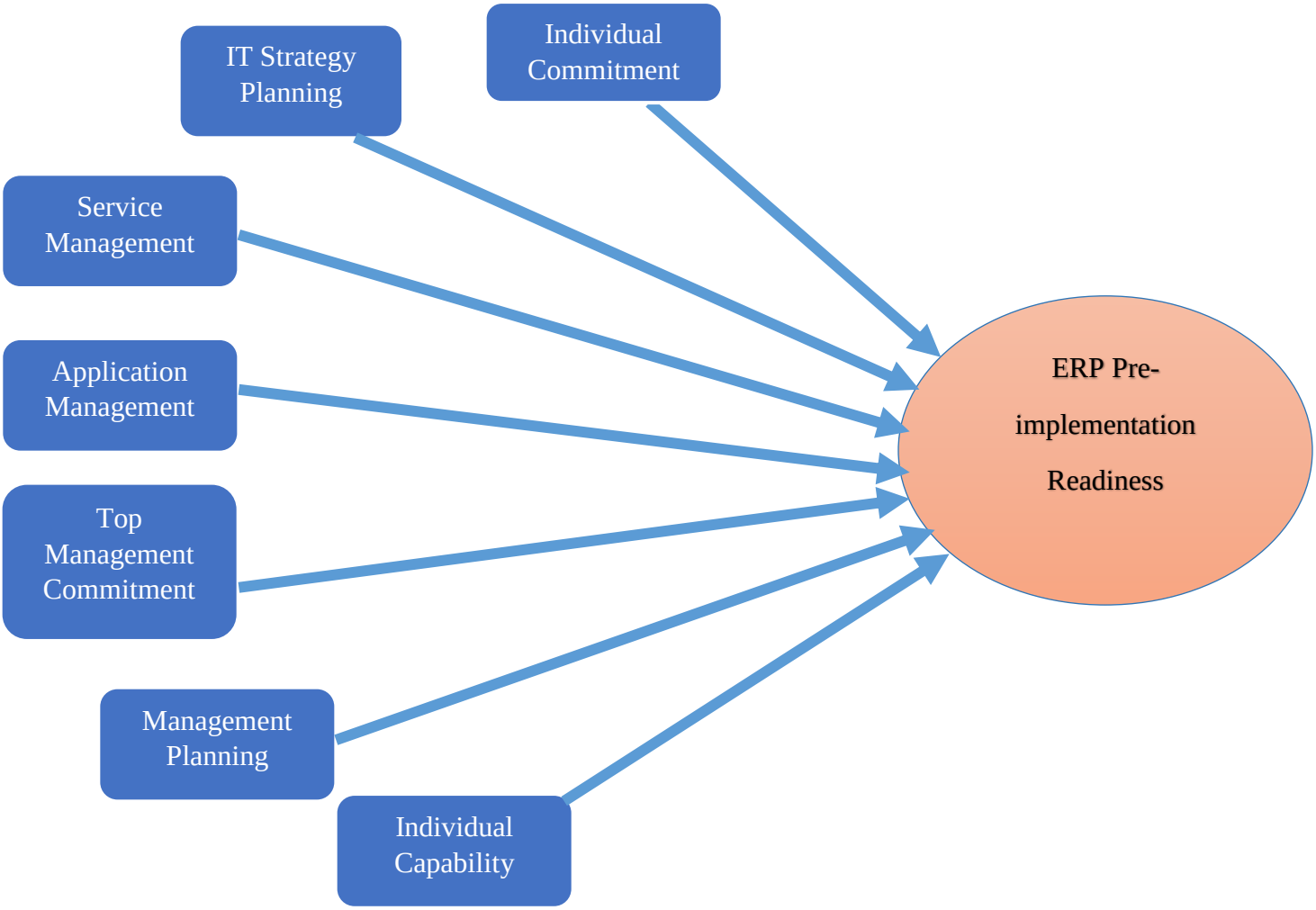


Figure 4. 4 Measurement tools that are found to be significant in determining ERP pre-implementation readiness

4.7 Chapter Summary

This chapter has discussed the results of the study regarding to the determinants of ERP pre-implementation readiness. Accordingly, seven explanatory variables such as top management commitment, management planning, individual capability, individual commitment, IT strategic planning, application management and service management are found to be significant in determining ERP pre-implementation readiness as hypothesized. The chapter has also described statistics of study participants and the respondent's data has been analyzed according to the objectives of the research. The tests for reliability and validity measurement results were also checked and presented. The next chapter presents the conclusions of the study and recommendations based on the study findings in detail.

CHAPTER FIVE

CONCLUSION AND RECOMMENDATION

5.1 Introduction

This chapter presents the conclusions drawn from the findings of the study, recommendations forwarded and future works suggested based on the discussion of results as per the conceptual research model designed to validate ERP pre-implementation readiness measurement tools.

5.2 Conclusion

This study was aimed to develop and validate pre-implementation readiness measures for ERP that assist companies in successful ERP implementation. To achieve its main goals an intensive literature review was done and conceptual research models and critical success factors were adopted from various studies conducted previously. To undertake validation of ERP measurement tools that are obtained through in-depth literature, questionnaires were distributed to end-users working on different companies that are operating in different sectors.

To validate ERP pre-implementation readiness measurement tools from different perspectives, this study has considered different sectors such as the manufacturing industry, utility service sector, beverage industry, transportation industry, financial service industry, and educational service sector. As the study aims to develop and validate a tool to measure and evaluate the readiness of ERP implementation; it seeks to address the following question: What pre-implementation readiness measurement tool could be developed for ERP system implementation?

The analysis was primarily focused on the impact of the following variables or constructs on ERP pre-implementation readiness to address the above research query: application management, service management, IT strategy & planning, process and structure, top management commitment, planning, commitment, capacity, individual commitment, individual

capability, system integration capability, software consistency with rules, system upgradeability, and vendor support.

The main indicators influencing ERP Pre-implementation readiness were identified in this study. Quantitative survey research was employed to validate ERP pre-implementation tools and a survey strategy is adopted to get answers to the research questions and to validate ERP measurement tools based on the study model. Accurate questionnaires of 103 out of 120 questionnaires were collected and used in this study. The proposed model of the study was validated using a partial least squares method with the assistance of SMART PLS software version 2.0 and SPSS.

The structural model shows how much of the variable is clarified by the underlying factors influencing ERP pre-implementation readiness. After an in-depth literature review and response from end-users, the study has identified ERP pre-implementation readiness indicators such as ERPST, TSM, SPSS, SPIT, ERPSU, TAM, ERPSH, ERPSV, IRC, ERPSC, IRCA, TRM, PCO, PCA, ERPSI, TMC, and TMP. Among the explanatory variables; top management commitment (TMC), management planning (TMC), individual capability (IRCA), individual commitment (IRC), IT strategic planning (SPIT), application management (TAM) and service management (TSM) are found to be significant indicators that influence ERP pre-implementation readiness positively. Moreover; TMP, TMC, and SPIT were found to be highly significant indicators of a measurement tool to ERP pre-implementation readiness.

This test shows that an ERP pre-implementation readiness is measured through different indicators and companies should take into account these variables to reap the benefits of adopting ERP and improve their business process. Understanding, the measurement tools are helpful to get the gap of the company, understand the output of the system, and can assist implementation to be done within the schedule. This also ensures that the cost of the implementation of ERP not far from budget and affordable. Therefore; it can be concluded that identifying measurement tools of ERP pre-implementation readiness before adopting an ERP will help to minimize the risk of ERP implementation.

On the other hand, TRM, SPSS, PCO, PCA, ERPSV, ERPSU, ERPSI, ERPSC, and ERPSH are found to be insignificant in affecting ERP pre-implementation readiness. This result shows that

to measure ERP pre-implementation readiness, the above indicators don't affect the adoption of ERP in the companies.

The R^2 of this study is 91.6% showing that the independent variables explained 91.6 percent of the variance in ERP pre-implementation readiness. This implies that 8.4 percent of the variance in ERP pre-implementation readiness is explained by other factors that are not included in the model. Overall, the result of this study is indeed helpful to the various companies operating in different sectors sector that have the interest to implement ERP and it will be used as the springboard for other researchers for future work on the area. The deficiency of time and cost to address all the economic sectors all over Ethiopia are some of the challenges and limitations of this study.

5.3 Implications of the Study

Technology is moving rapidly, so this study is as innovative of a long journey, not a conclusion. The following implications are recommended to the different sectors especially those working in Ethiopia related to the adoption of ERP implementation to help the implement with success in their companies.

5.3.1 Theoretical implication of the Research

This research employed and tested a research model, with which indicators are used to measure ERP pre-implementation readiness are analyzed. The study has addressed the question; how to develop and validate ERP pre-implementation readiness to measure the company's readiness in the early stage. This research has contributed to the existing theory by validiating existing frameworks and it has tried to consider existing gaps in the measurement of pre-implementation tools to ensure and validate ERP pre-implementation readiness specifically in Ethiopia. Therefore, it will be used to add on the area of measurement tool of ERP in early-stage as literature by exploring different indicators which can affect the pre-implementation of ERP and also help as the initiation for other researchers for the future work on the area.

5.3.2 Practical implication of the Research

The outcomes are useful to different sectors of Ethiopia that are interested to adopt ERP systems in their companies. This study will help them to understand and fill the gap of the companies at the early stage of implementing ERP. The results of this study may support decision-makers on which indicators should be influenced and to what extent when they implement an ERP system. The study made a significant contribution to the companies in understanding their status when making a decision to adopt ERP based on the data analysis made with the proposed research model before implementing it.

5.4 Recommendations

Based on the above findings of the study, the following recommendations are put for the companies that are interesting to implement ERP in their companies and to test the status of the companies before adopting ERP in their companies.

- Organizations are advised to pay high attention to management for successful implementation of an ERP system as the top management commitment and planning are found to be significant determinants of ERP readiness.

- There is a growing tendency for companies to adopt ERP to improve their business operations, though most organizations are still in the early stage of ERP implementation. However, there are no adequate measurement tools to assist organizations on how to be ERP-ready in case of Ethiopia. Therefore it is recommended that any organization interested in implementing ERP can use the proposed ERP pre-implementation readiness measurement tool to addresses all aspects of an organization to attain implementation success. This helps them to improve their business operations.

- Companies should invest a portion of their assets in staff developments and training to enhance their capability and reward and motivate them through financial & non-financial rewards to improve their commitments as individual readiness is found to be a significant determinant of ERP readiness.

- Finally, companies should identify ERP pre-implementation readiness variables that influence their implementation before adopting the system to minimize the cost and risk of implementation.

5.5 Suggestion for Future Research

This study was conducted to develop and validate pre-implementation readiness measures for the ERP system. As such, there are still room for further investigation of ERP system measurement tools from different perspectives. The following are areas that could be considered for future research:

- From the result obtained on the analysis of the structural model, the research model demonstrated an explanation power (coefficient of determination: R2 value of 91.6%). The unexplained 8.4% of the overall research model indicates that some important factors influencing pre-implementation readiness of ERP system may have been ignored in the study. Thus, searching for additional new variables may improve the accuracy of the findings in further studies.
- Furthermore, as the study had covered the limited number of sectors of the company from specified sectors, there is a need to extend the analysis by including newly emerging companies and addressing various economic sectors.
- Conducting validation statements by identifying and increasing more indicators that are not addressed through this study.

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APPENDICES

Appendix A: Questionnaire Survey: ERP pre-implementation measurement tool validation to be filled by users.

Session One: User Validation

Addis Ababa University
School of Graduate Studies College of Natural Science
Department of Information Science

Dear Sir or Madam:

In partial fulfillment of the requirements for the Degree of Master of Science in Information System, I am conducting the study on "Developing and Validating Pre-Implementation Readiness Measure for Enterprise Resource Planning (ERP) Systems" at Addis Ababa University. Accordingly, I have prepared the following ERP measurement tools to be used in any company. The main goal of this questionnaire is to get measurement tools used to validate the pre-implementation readiness of the company from the **Technology and Technical perspective, Strategic and Policy Alignment perspective, Top Management perspective, Partnership perspective, Individual Readiness, and ERP-Specific**. This study has confidence that it produces valuable results that can validate the pre-implementation readiness of ERP system by the development of measurement tools to prevent the failure of ERP.

Your honest, attention, and time to each answer to each question and statement are extremely important to the outcome of this study. The questionnaire will take about 30 minutes to complete, and the test findings will only be used for academic purposes. As a result, all responses will be kept strictly confidential and will not influence anyone in any way.

Your commitment is greatly respected and appreciated, and I would like to take this opportunity to express my gratitude in advance for your kind participation, frank, and timely answer to the questionnaire.

N.B:- Make sure the questionnaire paper contains 7 pages excluding the cover page.

Thank you!!!

Eden T/haimnot
edentekla@gmail.com
+251920719696

- **Please enter your personal information.**

1. What is the name of your working department?

_____

2. What is your position or role in your company?

_____

3. What is your academic qualification?

   PHD

   Masters

   Bachelor Degree

   Diploma

   Other

4. How long have you been working experience in ERP?

   2 years or less

   3-6 years

   7-15 years

   More than 15 years

- **About measurement tool of ERP pre-implementation Readiness**

Questions below are given to get your opinions about measurements related to ERP pre-implementation readiness in your company.

Please rate each measurement as **Strongly Agree, Agree, Neutral, Disagree**, and **Strongly Disagree** on the question.

- *Please, put **"X"** sign in the box that you have selected.*

❖ **Technology and Technical perspective**

ID	*Measurement*	*Strongly Agree*	*Agree*	*Neutral*	*Disagree*	*Strongly Disagree*
Application Management						
TAM 1	The company shall maintain minimal customization of packages before implementing an ERP system.					
TAM 2	The company shall research the application of technology complexity and compatibility before purchasing an ERP System.					
TAM 3	The company shall determine ERP specifications in technical and technological before implementing an ERP system.					
TAM 4	The company should have an adequate ERP system selection technically and technologically before implementing an ERP system.					
Service Management						
TSM 1	The company should ensure organization culture/cultural change/ government issues before ERP system implementation.					
TSM 2	The company should ensure service management of data analysis & conversion before implementing an ERP system.					
TSM 3	The company ensures management					

	expectations technically and technology after ERP system implementation.					
IT Resource Management						
TRM 1	The company should have a dedicated resource technically and technology before implementing an ERP system.					
TRM 2	The company must hire proper IT human resources before implementing an ERP system.					
TRM 3	The company should provide the necessary IT infrastructure before implementing an ERP system.					
TRM 4	The company should establish a steering committee for ERP system implementation before launching the system.					
TRM 5	The company shall be ready to implement an ERP system in teamwork.					
TRM 6	The company is ready to make an empowered decision that makes successful ERP system implementation.					
TRM 7	The company is ready to give training for different user groups before ERP system implementation.					

- **Strategic and Policy Alignment perspective**

ID	*Measurement*	*Strongly Agree*	*Agree*	*Neutral*	*Disagree*	*Strongly Disagree*
IT Strategy & Planning						
SPIT 1	The organization should have clear goals & objectives for ERP system implementation.					
SPIT 2	The culture of the organization is ready to educate on the new business process for ERP system implementation.					
SPIT 3	The culture of the organization is ready to align the ERP system implementation goals & the company's goal.					
SPIT 4	The organization should have to stabilize corporate objectives for ERP system implementation.					
Process and Structure						
SPPS 1	The organization is ready to align the company's structure with ERP requirements					
SPPS 2	The organization should adopt a ready business process, documentation, improvement, and integration for ERP system implementation.			.		
SPPS 3	The organization has to define and document business needs and functional requirements for ERP system implementation.					

❖ **Top Management perspective**

ID	*Measurement*	*Strongly Agree*	*Agree*	*Neutral*	*Disagree*	*Strongly Disagree*
Commitment						
TMC 1	Top management shall commit themselves to re-engineer the business process before implementing an ERP system.					
TMC 2	Top management shall commit themselves to dedicate resource support before implementing an ERP system.					
TMC 3	Top management shall commit themselves to select a well-qualified & knowledgeable project champion before implementing an ERP system.					
TMC 4	The top management shall commit themselves to form a powerful steering committee before implementing an ERP system.					
TMC 5	Top management shall commit to empowering the Chief information officer (CIO) in the company before implementing an ERP system.					
TMC 6	The top management shall commit to the regular mentioning of an ERP system before implementing an ERP system.					
Planning						
TMP 1	Top management shall commit to identifying required changes in the					

	company before implementing an ERP system.					
TMP 2	Top management shall commit to conducting an ERP system implementation feasibility study for the company before implementing an ERP system.					
TMP 3	Top management shall commit to preparing a clear, stable, and well-defined project plan for ERP system implementation before launching the system.					
TMP 4	Top management shall commit to identify and plan project risks before implementing an ERP system.					
TMP 5	Top management shall commit to planning a well-defined IT infrastructure before implementing an ERP system.					

- **Partnership perspective**

ID	***Measurement***	***Strongly Agree***	***Agree***	***Neutral***	***Disagree***	***Strongly Disagree***
Commitment						
PCO 1	Partnerships shall be committed to ongoing ERP vendor support for ERP system implementation.					
PCO 2	Partnerships shall committed for business process re-engineering during					

	ERP system implementation.					
PCO 3	Partnerships shall committed for teamwork during ERP system implementation.					
PCO 4	Partnerships shall to be commit implementation Strategy for ERP system implementation					
Capacity						
PCA 1	A partnership should fits with the organization for ERP system implementation.					
PCA 2	The partnership has the capacity for minimal customization of packages during ERP system implementation.					
PCA 3	A partnership can integrate business planning with ERP planning during ERP system implementation.					
PCA 4	The partnership has the capacity to formalized project plans/Schedules before and during ERP system implementation.					

Individual Readiness

ID	*Measurement*	*Strongly Agree*	*Agree*	*Neutral*	*Disagree*	*Strongly Disagree*
Commitment						
IRC 1	Individual commitment is essential to inter-departmental cooperation during ERP system implementation.					
IRC 2	Individual commitment is relevant in creating good communication skills during ERP system implementation.					
IRC 3	Individual commitment is relevant in creating awareness about the ERP system					
IRC 4	Individual commitment to know the existence of general IT knowledge in the company					
Capability						
IRCA 1	Individually capable to project team competence during ERP implementation.					
IRCA 2	Individually capable of managing the project during ERP system implementation.					
IRCA 3	Individually can have effective inter-department communications during ERP system implementation.					
IRCA 4	Individual capable of teamwork during ERP system implementation					

❖ **ERP-Specific**

ID	*Measurement*	*Strongly Agree*	*Agree*	*Neutral*	*Disagree*	*Strongly Disagree*
System integration Capability						
ERPSI 1	The vendor has experience and credibility in system integration during ERP system implementation.					
ERPSI 2	Consultants have knowledge and experience in system integration during ERP system implementation.					
ERPSI 3	The organization has integrated documentation of processes for ERP system implementation.					
ERPSI 4	The organization should communication infrastructure for ERP system implementation.					
Software consistency with community rules						
ERPSC 1	The system is benchmarking from countries with similar rules					
ERPSC 2	The system should implement modules in internal companies					
ERPSC 3	The system should support internal consultants.					
System Upgradeability						
ERPSU 1	ERP system selected because of easy to upgrade.					
ERPSU 2	The system can benchmark from best practices.					

ERPSU 3	The system can implement the service-oriented architecture					
Vendor support						
ERPSV 1	The vendor has experience and credibility for support users during ERP system implementation.			.		
ERPSV 2	The vendor is capable of strong negotiation to contract.					
ERPSV 3	The vendor can make wide communication before, during, and after ERP system implementation.					
Having the right expectations from the software						
ERPSH 1	Consultant credibility and reputation should to do the right expectations from the software					
ERPSH 2	Personnel knowledge and experiences should to know what the system will do at the end of the implementation.					
ERPSH 3	The organization has a great internal implementation team during ERP implementation.					
ERPSH 4	Should review the implementation process by management					

Thank you again for your unreserved cooperation!!

Annex one (1): Qualified constructors

Construct	Indicators	Outer Loadings
ERP Software consistency with community rules	ERPSC1 <- ERPSC	0.8009
	ERPSC2 <- ERPSC	0.8787
	ERPSC3 <- ERPSC	0.8632
ERP Having the right expectations from the software	ERPSH2 <- ERPSH	0.7406
	ERPSH3 <- ERPSH	0.8405
	ERPSH4 <- ERPSH	0.8193
ERP System integration Capability	ERPSI1 <- ERPSI	0.8139
	ERPSI2 <- ERPSI	0.8502
	ERPSI3 <- ERPSI	0.8339
	ERPSI4 <- ERPSI	0.8227
ERP System Upgradeability	ERPSU1 <- ERPSU	0.735
	ERPSU2 <- ERPSU	0.8984
	ERPSU3 <- ERPSU	0.8497
ERP Vendor support	ERPSV1 <- ERPSV	0.869
	ERPSV2 <- ERPSV	0.8341
	ERPSV3 <- ERPSV	0.8055
Individual Commitment	IRC1 <- IRC	0.8091
	IRC2 <- IRC	0.8383
	IRC3 <- IRC	0.8567
Individual Capability	IRCA1 <- IRCA	0.8128
	IRCA2 <- IRCA	0.8448
	IRCA3 <- IRCA	0.7727
	IRCA4 <- IRCA	0.7568
Partnership Capacity	PCA1 <- PCA	0.851
	PCA2 <- PCA	0.8069
	PCA3 <- PCA	0.8154
	PCA4 <- PCA	0.8326

	PCO1 <- PCO	0.7568
	PCO2 <- PCO	0.8628
	PCO3 <- PCO	0.8052
Partnership Commitment	PCO4 <- PCO	0.7974
	SPIT2 <- SPIT	0.8036
IT strategy & planning	SPIT3 <- SPIT	0.8098
	SPPS2 <- SPPS	0.8385
Process and structure	SPPS3 <- SPPS	0.8496
	TAM2 <- TAM	0.8818
	TAM3 <- TAM	0.7689
Application Management	TAM4 <- TAM	0.8792
	TMC1 <- TMC	0.8279
	TMC2 <- TMC	0.7729
	TMC3 <- TMC	0.8141
	TMC4 <- TMC	0.8116
Top Management Commitment	TMC5 <- TMC	0.7644
	TMP1 <- TMP	0.777
	TMP2 <- TMP	0.8697
	TMP3 <- TMP	0.8894
	TMP4 <- TMP	0.8014
Top Management planning	TMP5 <- TMP	0.8346
	TRM3 <- TRM	0.7764
	TRM5 <- TRM	0.7343
	TRM6 <- TRM	0.7093
IT Resource Management	TRM7 <- TRM	0.7061
	TSM2 <- TSM	0.8499
Service Management	TSM3 <- TSM	0.7642
	TTAV <- ERPRMT	0.7633
ERP Readiness Management Tool	TPAV <- ERPRMT	0.7169

	SPAV <- ERPRMT	0.8413
	IRAV <- ERPRMT	0.7683

Annex Two (2):Non-Qualified constructors

Construct	Indicators	Outer Loadings
ERP having the right expectations from the software	ERPSH1 <- ERPSH	0.673
Individual Commitment	IRC4 <- IRC	0.618
IT strategy & planning	SPIT1 <- SPIT	0.6392
	SPIT4 <- SPIT	0.6202
Process and structure	SPPS1 <- SPPS	0.5629
Application Management	TAM1 <- TAM	0.5725
Top Management Commitment	TMC6 <- TMC	0.689
IT Resource Management	TRM1 <- TRM	0.5627
	TRM2 <- TRM	0.6663
	TRM4 <- TRM	0.6529
Service Management	TSM1 <- TSM	0.5856
ERP Readiness Management Tool	PSAV <- ERPRMT	0.6875
	ERPSAV <- ERPRMT	0.6929

Annex Three (3): Output of Cross Loading ERP pre-implementation Readiness Measurement tool

	ERISH	ERPRMT	ERPSC	ERPSI	ERPSU	ERPSV	IRC	IRCA	PCA	PCO	SPIT	SPSS	TAM	TMC	TMP	TRM	TSM
ERPSH3	**0.926**	0.44	0.345	0.514	0.405	0.384	0.257	0.386	0.311	0.199	0.494	0.208	0.255	0.217	0.164	0.448	0.266
ERPSH4	**0.834**	0.301	0.263	0.273	0.316	0.503	0.215	0.269	0.246	0.201	0.237	0.069	0.189	0.197	0.161	0.258	0.247
IRAV	0.375	**0.761**	0.328	0.524	0.395	0.475	0.659	0.772	0.37	0.452	0.44	0.341	0.45	0.488	0.443	0.43	0.373
SPAV	0.402	**0.835**	0.322	0.602	0.419	0.412	0.361	0.548	0.532	0.499	0.765	0.559	0.461	0.575	0.47	0.589	0.496
TPAV	0.236	**0.818**	0.076	0.349	0.157	0.27	0.512	0.298	0.277	0.398	0.309	0.498	0.507	0.862	0.856	0.483	0.482
TTAV	0.386	**0.807**	0.107	0.355	0.308	0.37	0.615	0.337	0.339	0.505	0.337	0.355	0.599	0.613	0.517	0.765	0.721
ERPSC1	0.289	0.132	**0.773**	0.403	0.235	0.329	0.014	0.201	0.339	0.065	0.301	0.092	-0.05	0.092	-0.11	0.16	0.086
ERPSC2	0.367	0.218	**0.874**	0.453	0.465	0.282	0.065	0.258	0.341	0.115	0.417	0.159	0.062	0.108	-0.07	0.228	0.087
ERPSC3	0.251	0.263	**0.884**	0.459	0.421	0.226	0.04	0.331	0.297	0.126	0.261	0.173	0.066	0.152	0.08	0.207	0.214
ERPSI1	0.395	0.442	0.394	**0.807**	0.377	0.538	0.222	0.477	0.469	0.261	0.547	0.296	0.212	0.356	0.219	0.311	0.185
ERPSI2	0.325	0.38	0.456	**0.844**	0.473	0.526	0.201	0.504	0.418	0.044	0.613	0.227	0.16	0.249	0.146	0.374	0.186
ERPSI3	0.498	0.499	0.422	**0.836**	0.544	0.447	0.31	0.445	0.424	0.21	0.603	0.224	0.283	0.241	0.185	0.413	0.211
ERPSI4	0.324	0.53	0.451	**0.831**	0.568	0.428	0.248	0.342	0.382	0.261	0.591	0.322	0.259	0.34	0.258	0.51	0.365
ERPSU1	0.431	0.253	0.384	0.371	**0.716**	0.394	0.024	0.342	0.273	0.228	0.308	0.066	0.013	0.089	0.05	0.324	0.263
ERPSU2	0.388	0.337	0.44	0.57	**0.895**	0.479	0.176	0.396	0.292	0.193	0.473	0.102	0.121	0.072	0.078	0.397	0.111
ERPSU3	0.255	0.374	0.343	0.527	**0.867**	0.357	0.16	0.307	0.332	0.199	0.461	0.151	0.151	0.196	0.123	0.422	0.162
ERPSV1	0.402	0.402	0.232	0.56	0.335	**0.867**	0.209	0.491	0.361	0.335	0.475	0.241	0.207	0.319	0.24	0.275	0.238
ERPSV2	0.361	0.418	0.345	0.453	0.502	**0.832**	0.368	0.411	0.29	0.432	0.359	0.097	0.169	0.22	0.241	0.346	0.288
ERPSV3	0.467	0.358	0.198	0.435	0.386	**0.812**	0.169	0.4	0.296	0.25	0.35	0.134	0.179	0.2	0.212	0.315	0.303
IRC1	0.207	0.6	-0.01	0.232	-0.01	0.202	**0.861**	0.233	0.184	0.412	0.174	0.232	0.564	0.498	0.476	0.374	0.411

IRC2	0.208	0.524	0.123	0.254	0.163	0.247	**0.867**	0.234	0.112	0.383	0.111	0.155	0.398	0.462	0.371	0.338	0.348
IRC3	0.28	0.579	0.026	0.289	0.251	0.331	**0.85**	0.37	0.231	0.499	0.197	0.273	0.46	0.422	0.389	0.428	0.328
IRCA1	0.408	0.48	0.371	0.477	0.314	0.449	0.232	**0.814**	0.317	0.202	0.417	0.273	0.184	0.306	0.248	0.39	0.174
IRCA2	0.289	0.527	0.239	0.518	0.423	0.49	0.296	**0.839**	0.351	0.32	0.47	0.523	0.293	0.376	0.226	0.356	0.168
IRCA3	0.359	0.453	0.185	0.302	0.303	0.394	0.183	**0.778**	0.17	0.204	0.27	0.226	0.207	0.283	0.276	0.305	0.186
IRCA4	0.157	0.448	0.236	0.359	0.271	0.313	0.327	**0.757**	0.295	0.285	0.349	0.248	0.148	0.251	0.204	0.314	0.203
PCA1	0.289	0.439	0.285	0.405	0.41	0.405	0.198	0.424	**0.85**	0.491	0.498	0.315	0.25	0.242	0.142	0.44	0.264
PCA2	0.22	0.36	0.32	0.412	0.29	0.236	0.182	0.331	**0.803**	0.376	0.372	0.25	0.184	0.22	0.148	0.402	0.158
PCA3	0.304	0.372	0.348	0.451	0.232	0.303	0.154	0.203	**0.817**	0.424	0.477	0.266	0.264	0.25	0.204	0.409	0.341
PCA4	0.242	0.377	0.295	0.417	0.246	0.286	0.146	0.209	**0.837**	0.444	0.491	0.248	0.301	0.238	0.246	0.401	0.247
PCO1	0.234	0.466	0.108	0.207	0.257	0.435	0.466	0.211	0.354	**0.757**	0.238	0.195	0.49	0.331	0.294	0.286	0.45
PCO2	0.068	0.457	0.117	0.192	0.259	0.313	0.417	0.242	0.389	**0.863**	0.221	0.271	0.416	0.293	0.295	0.302	0.412
PCO3	0.217	0.495	0.102	0.244	0.25	0.338	0.41	0.344	0.499	**0.805**	0.252	0.387	0.36	0.386	0.356	0.46	0.353
PCO4	0.202	0.429	0.08	0.135	0.004	0.226	0.322	0.22	0.457	**0.797**	0.207	0.362	0.447	0.349	0.322	0.284	0.4
SPIT2	0.38	0.557	0.35	0.67	0.429	0.418	0.177	0.431	0.594	0.265	**0.934**	0.305	0.256	0.294	0.183	0.448	0.28
SPIT3	0.437	0.506	0.354	0.644	0.517	0.46	0.174	0.454	0.433	0.265	**0.92**	0.253	0.157	0.225	0.187	0.508	0.282
SPPS2	0.116	0.45	0.115	0.268	0.084	0.148	0.182	0.348	0.33	0.33	0.264	**0.878**	0.339	0.525	0.293	0.26	0.265
SPPS3	0.185	0.524	0.194	0.312	0.151	0.185	0.274	0.379	0.263	0.345	0.277	**0.912**	0.384	0.49	0.354	0.309	0.305
TAM2	0.226	0.579	0.005	0.256	0.042	0.139	0.494	0.197	0.278	0.504	0.177	0.428	**0.909**	0.491	0.494	0.31	0.399
TAM3	0.166	0.54	0.017	0.189	0.077	0.198	0.45	0.276	0.262	0.404	0.26	0.298	**0.832**	0.427	0.333	0.259	0.404
TAM4	0.282	0.507	0.107	0.292	0.216	0.245	0.504	0.217	0.245	0.469	0.148	0.322	**0.86**	0.438	0.373	0.316	0.345
TMC1	0.163	0.706	0.097	0.308	0.068	0.237	0.493	0.362	0.258	0.366	0.296	0.545	0.395	**0.861**	0.58	0.416	0.406
TMC2	0.254	0.622	0.144	0.344	0.133	0.274	0.471	0.289	0.253	0.271	0.191	0.42	0.488	**0.777**	0.541	0.395	0.359
TMC3	0.126	0.656	0.1	0.334	0.162	0.244	0.464	0.275	0.206	0.339	0.242	0.512	0.46	**0.825**	0.545	0.416	0.489
TMC4	0.238	0.653	0.173	0.308	0.104	0.229	0.472	0.335	0.224	0.404	0.239	0.464	0.461	**0.818**	0.571	0.333	0.433

TMC5	0.173	0.544	0.062	0.137	0.145	0.208	0.234	0.281	0.217	0.321	0.149	0.309	0.291	**0.745**	0.527	0.35	0.388
TMP1	0.198	0.533	-0.01	0.211	0.178	0.279	0.284	0.184	0.196	0.267	0.172	0.276	0.34	0.549	**0.776**	0.409	0.27
TMP2	0.146	0.619	-0.05	0.165	0.091	0.224	0.314	0.221	0.186	0.304	0.234	0.286	0.317	0.567	**0.872**	0.412	0.41
TMP3	0.184	0.653	0.031	0.217	0.094	0.226	0.546	0.269	0.208	0.376	0.124	0.238	0.409	0.57	**0.889**	0.455	0.393
TMP4	0.03	0.51	-0.07	0.147	0.01	0.179	0.403	0.189	0.079	0.285	0.047	0.266	0.418	0.526	**0.805**	0.299	0.363
TMP5	0.19	0.648	0.028	0.286	0.068	0.248	0.447	0.362	0.24	0.396	0.237	0.445	0.454	0.645	**0.831**	0.346	0.48
TRM3	0.322	0.551	0.168	0.246	0.265	0.311	0.451	0.305	0.331	0.47	0.141	0.249	0.265	0.418	0.398	**0.745**	0.433
TRM5	0.256	0.551	0.061	0.356	0.245	0.27	0.395	0.244	0.369	0.289	0.307	0.384	0.377	0.474	0.439	**0.797**	0.572
TRM6	0.49	0.614	0.285	0.528	0.444	0.338	0.333	0.47	0.468	0.338	0.651	0.17	0.24	0.347	0.358	**0.801**	0.426
TRM7	0.186	0.45	0.225	0.389	0.505	0.223	0.173	0.292	0.378	0.172	0.491	0.189	0.16	0.21	0.217	**0.766**	0.391
TSM2	0.212	0.604	0.07	0.207	0.119	0.266	0.424	0.167	0.218	0.455	0.258	0.302	0.464	0.489	0.467	0.525	**0.883**
TSM3	0.289	0.466	0.229	0.301	0.241	0.292	0.269	0.225	0.311	0.379	0.253	0.228	0.255	0.363	0.292	0.458	**0.793**