ADDIS ABABA UNIVERSITY

COLLEGE OF NATURAL SCIENCES

SCHOOL OF INFORMATION SCIENCE

ERP Post-Implementation Management Framework: The case of Ethiopian Airlines

By

Elsa Taddele

June 2015

Addis Ababa, Ethiopia

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Name and signature of Members of the Examining Board

Name	Title	Signature	Date
_____	Chairperson	_____	_____
_____	Advisor	_____	_____
_____	Examiner	_____	_____
_____	Examiner	_____	_____

DEDICATION

This work is dedicated to my husband ***Dr. Begziabher Alebel*** *and our kids* ***Neamen***, ***Kidus*** *and* ***Bereket*** *who inspires me in every moment of my life!*

And above all, to the Almighty God!

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ABSTRACT

ERP system is being adopted by international organizations globally; in order to streamline business processes, manage and create seamless integration, and ensure real time information availability for decision making. ERP adoption is considered as one of the biggest and most complex projects a firm could manage even though these projects can vary in size, structure, and methodology. This is due to the extensive requirement of effort, time, resources, and organizational changes. As a result, ERP system implementation critical success factors (CSFs) and project management aspects have gotten much attention by both researchers and business practitioners. However, successful implementation of ERP is only a first step in the accomplishment towards achieving ERP success. Prior studies have revealed that organizations are not achieving the promised business values due to several post-implementation issues and underutilization of the system. This indicates, post-implementation is an essential phase of ERP life-cycle for the system success.

The purpose of this study is to investigate technical, organizational, and operational issues of ERP post-implementation success in the context of Ethiopian airlines and design a solution framework to address those issues. The general approach of this research was a case study in which a combination of quantitative and qualitative methods has been used to collect and analyze data. Based on extensive literature review, a research model was established which constitutes three main themes: technical, organizational and operational concerns that influence ERP post-implementation success. The survey questionnaire and interview outline contents were prepared based on the defined research model by partially adapting from existing literature and developing additional ones as required. The quantitative aspect of the study involved 124 end users from various departments of the organization with different job positions, roles, and work experience. In the qualitative study, direct interviews were used to collect data from 4 executive management members of the airline. Moreover, document analysis was used as a secondary source of data to gain more information and triangulate the findings.

The quantitative data were analyzed by employing appropriate techniques of descriptive and inferential statistics using SPSS software tool. The qualitative data were analyzed using the techniques of open codding. The result of the study indicated that organizational theme constructs were the most critical determinants of ERP post-implementation success; which make the highest

contribution (58.93%) of the total variance. Accordingly, continuous improvement (41.02%), user involvement (6.61%), training (4.94 %), absorptive capacity (3.23%) and top management championship (3.13%) are the major constructs of organizational theme. Technical theme has a significant contribution which explains 10.36% of the total variance of ERP post-implementation success. The technical theme constructs are ERP attribute, IT expertise and user support level quality, and external relationship management. Based on the research findings, a solution framework has been designed and presented in a two-dimensional matrix format. The first dimension of the matrix (vertical) represents the core issues/ activities to be executed and the second dimension (horizontal) represents the management, people, process, and technology perspectives of the proposed solutions with respect to the identified core issues/ activities.

The survey questionnaire and the interview outline contents were reviewed by IT professional and ERP experts of the organization to measure the content validity. Subsequently, pilot study was conducted with selected users and the feedbacks were incorporated prior to disseminating the questionnaire to the respondents. Further, to measure the internal consistency of the questionnaire, reliability test was conducted using cronbach's coefficient alpha with a result of .917 which asserted the reliability of the instrument. Moreover, construct validity was conducted using principal component analysis (PCA), which declared that the constructs of the study explain 74.16% of the total variance of ERP post-implementation success.

In this study, expert validation and descriptive methods were used to evaluate the result (proposed framework) of the study. Accordingly, focus group discussion and survey questionnaires were the two ways used to gain expert validation. The overall rating of the proposed framework is 4.26 which represent the category of 'Very Good'.

Hence, the research process and result of this study is believed to be valid which indicates the usability and applicability of the output of the study.

This research is believed to produce results that can improve the utilization of ERP system in Ethiopian airlines, other sectors, and organizations. Finally, it is recommended to execute the proposed framework by focusing on organizational theme as a priority goal in order to improve the utilization of the system and attain post-implementation success.

Keywords: ERP, ERP Post-implementation, ERP utilization

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LIST OF ACRONYMS

ABAP – Advanced Business Application Programming

ACE – Achieving Competitive Excellence

BI – Business Intelligence

BPR – Business Process Reengineering

CFO – Chief Financial Officer

CIO – Chief Information Officer

COE – Center Of Excellence

CRM – Customer Relationship Management

CSF – Critical Success Factor

EMIS – Ethiopian Management Information System

ERP – Enterprise Resource Planning

ES – Enterprise Systems

ETHRIS – Ethiopian Human Resource Information System

FI/CO – Finance and Controlling

FICO – Financial and Controlling

GAS – General Accounting System

GL – General Ledger

HCM – Human Capital Management

ICT – Information Communication Technology

IEEE – Institute of Electrical and Electronics Engineers

IS – Information Systems

IT – Information Technology

KPI – Key Performance Indicator

LMS – Learning Management Solution

MCAS – Management Cost Accounting System

MRO – Maintenance Repair Overhaul

MSI – Master System Integrator

MSI –Master System Integrator

OCM – Organizational Change Management

OLA – Operational Level Agreement

PCA – Principal Component Analysis

PI – Process Integration

ROI – Return on Investment

SAP – Systems, Applications and Products in Data Processing

SBU – Strategic Business Unit

SLA – Service Level Agreement

SMS – Short Message Service

SPSS – Statistical Package for the Social Sciences

VP – Vice President

CHAPTER ONE

INTRODUCTION

1.1. Background

Businesses, such as the airline industry, that are operating in a global environment are making major information technology (IT) investments to both stay in business and win ever-changing competitive challenges. Accordingly, there is continuous improvement within industry to address this need by designing and developing computerized information systems for each function of a particular business. However, end-to-end processes are beyond the activities of one business unit; and as a result process oriented cross-functional information systems are required. In order to bring process oriented business functions and to sustain business competitiveness, organizations are realizing the keystone of their information systems is dependent on core enterprise systems such as an Enterprise Resource Planning (ERP) system (Pearlson & Saunders, 2010; Ononiwu, 2013).

The ERP system is a standard business management package that is comprises of a set of independent, integrated and configurable software modules with common database that allows information to be available in real time for all users (Ononiwu, 2013). These systems can be used to manage and create seamless integration to core business data and information flows across an organization. ERPs were designed to manage the fragmentation of information stored in silo information systems' databases, on a number of individual desktop, in various departments, or in business unit computers across an organization (Esteves, 2009). Such systems attempt to automate core business process areas such as finance and controlling (FI/CO), human capital management (HCM), logistics, procurement and manufacturing management business units of a firm in a structured manner.

During the past decade, organizations have invested in ERP system while there were different alternatives for information integration in business such as developing functional oriented computerized systems in-house. One of the significant reasons for the adoption of an

ERP system is to implement standardized best practice processes and integration of the business unit functions. The ultimate goal for the adoption of an ERP system is operational efficiency and business improvement which leads to better management, operations and real time information availability for decision making (Kouki et al., 2007; Ononiwi, 2013). In addition, organizations often implement ERP systems to replace legacy systems in order to manage competitive pressures that required more responsive systems with real time integrated information (Genoulaz & Millet, 2005). Business reasons for deploying ERP systems also include business process reengineering (BPR). BPR is a methodology used to adopt industry best practices that are embedded in ERP Systems that streamlines 'as-is' processes and create 'to-be' processes that fit the given implementation software architecture (Elragal & Al-Serafi, 2011). These ERP solutions are internationally-sourced packages offered by software vendors like SAP, Oracle, Peoplesoft, Baan, and Microsoft. They are purchased as off-the-shelf packages that can be configured depending on the organization's specific business needs. By far SAP, a German Company, is the most widely used enterprise system and has the lion's share of ERP market (Pearlson & Saunders, 2010).

In this research, Ethiopian Airlines is being considered for the case study to examine ERP utilization issues in the post-implementation phase. The study basically concentrated on the utilization and management of the implemented ERP system. The main reason that the study focused on post-implementation is that the return on information systems' investments can be gained only by effective utilization of the systems after the implementation. Several studies have shown that if the entire functionality of the implemented ERP system is not fully utilized, the organization cannot achieve the expected ERP business benefits (Davenport et al., 2004; Kouki et al., 2007; Esteves, 2009; Peng & Nunes, 2009; Ononiwu, 2013). Hence, addressing the post-implementation issues is critical for an organization.

Ethiopian Airlines is a global flag carrier of Ethiopia working in the airline industry. The airline was launched on December 21, 1945 and started its formal operation on April 08, 1946 by flying to Cairo. [1] The airline industry is one of the most turbulent, highly dynamic,

[1] Ethiopian airlines official website
http://www.ethiopianairlines.com/en/corporate/history.aspx (accessed on July 21, 2014)

hypercompetitive, unpredictable and overly sensitive to economic cycles in the global market. Over the past 60 plus years of service, Ethiopian Airlines has become a leading carrier of the African continent. Ethiopian Airlines currently reaches 81 international destinations and operates the newest and most state-of-the-art aircrafts being flown.[2]

Ethiopian Airlines achieved its vision 2010 and subsequently endeavors to achieve "Vision 2025". 'Vision 2025' is a 15-year strategic plan that has been executed and realized for the last four years. Currently, the organization is structured with seven strategic business units (SBUs) or profit centers: (1) Ethiopian Domestic and Regional Airline; (2) Ethiopian Passenger Airline, (3) Ethiopian Cargo; (4) Ethiopian Maintenance and Repair Overhaul (MRO); (5) Ethiopian Aviation Academy; (6) Ethiopian In-Flight Services; and (7) Ethiopian Ground Services. In line with its performance achievements, in December 2011 Ethiopian Airlines joined the biggest alliance (Star Alliance). (Ethiopian Airlines Website, access date Sep. 06, 2014).

Ethiopian Airlines, as a huge global airline, has clearly set in place its Information Communication Technology (ICT) strategy and implementation plan, to use readily available ERP system with best practices to automate major back office automation requirements of HCM, FI/CO, and Logistics. Moreover, the strategy also stated to implement master system integrator (MSI) which integrates modules and sub-modules of ERP, ERP to Non-ERP systems and Non-ERP to Non-ERP systems. In other words, a centralized process Integration (PI) provides a platform that allows different systems to communicate with each other using uniform technology. The ICT strategy also defines the targeted business value of using the ERP system, which includes integrated and consistent processes across the value chain. This integrated and consistent process offers a common interface requiring modest user education; simplified systems requiring modest technical skills; a consistent data model with common definitions and meanings; implementation of standardized best practices; and the creation of paperless environment (Ethiopian Airlines, 2011).

[2] Ethiopian airlines official website

http://www.ethiopianairlines.com/en/corporate/fleet.aspx (accessed on September 6, 2014)

In January 2013, Ethiopian Airlines has implemented SAP ERP system using a Big-Bang approach. The system has three main modules: (1) FI/CO; (2) Logistics (Supply Chain Management Solution); and (3) HCM. The ERP suite allows the company to implement a single integrated system by replacing incompatible legacy information systems. At Ethiopian Airlines, the SAP ERP package has replaced several legacy systems with silo databases such as; a) human resource information system (ETHRIS), b) general accounting system (GAS), c) management cost accounting System (MCAS), d) executive management information system (EMIS); and e) material resource planning systems. Moreover, the ERP system incorporates process integration (PI) tool which is used as master system integrator (MSI) to have real time integrated environment which can integrate all operational support systems of the airline. In addition, the ERP implementation also includes implementation of central data warehouse and business intelligence (BI) in order to enhance decision making capabilities of executive managers.

SAP has been in use since January 18, 2013; which was the "go-live" date of the system. The term go-live is used to refer to the day on which the real usage of the newly implemented ERP system would begin within an organization. The profiles of the organization are summarized in Table 1.

Table 1: Ethiopian Airlines' profile

Ethiopian Airlines Profile	
Industry Sector	Airline Industry
Number of Employees	About 8000
Type of ERP System Used	SAP
Implementation Go-live Date	January, 2013

There are two distinct and basic phases of adopting an ERP system into an organization. The first phase refers to the implementation stage in which the organization undergoes its transformation from old legacy systems. In this stage, blue print of the design, configuration, testing and "going live" milestones takes place (Ruivo et al., 2012). The second phase, sometimes called the second wave of ERP, refers to the subsequent actions in the post-implementation stage immediately following the go-live stage. In this stage, organizations start

running day to day operational business activities and begin to realize the full capabilities and benefits of ERP (Willis & Willis, 2002; Ruivo, et al., 2012).

The aim of this research is to study the technical, organizational, and operational issues of ERP system utilization. The research focuses on the post-implementation phase of an ERP system's deployment and proposes a post-implementation management framework that helps to improve the utilization of the system and achieve post-implementation success.

1.2. Statement of the Problem

The information system (IS) community has persisted to stress that the adoption of ERP systems can bring a wide range of potential benefits to organizations. Benefits have been identified such as: providing process oriented, rather than silo-functional based system which are designed to improve operational and management efficiency, offer operational cost minimization and enhance organizational flexibility (Gupta et al., 2004; Oliver et al., 2005; Bergstrom and Stehn, 2005).

Due to the above mentioned benefits, large organizations consider ERP system as the center of their IS development strategy. ERP system is also being considered as prerequisite for adopting other enterprise applications, such as Customer Relationship Management (CRM) (Ward et al., 2005).

ERP system implementation critical success factors (CSFs) and project management aspects have gotten much attention by both researchers and business practitioners. Conceivably, the focus on implementation CSFs is due to the fact that ERP implementation is one of the most time-consuming, resource intensive complicated, and risk filled IS projects with rampant implementation failures (Peng & Nunes, 2009; Ononiwu, 2013). Accordingly, ERP system implementation and project management related researches mainly cover the journey of project initiation to go-live of the system; which seldom addresses post-implementation issues (Schlichter, 2010). However, successful implementation of ERP is only a first step in the accomplishment towards achieving ERP success.

Scholars have shown that treating ERP implementation phase as an all-inclusive process spanning from the initiation to post-implementation system utilization limits the crucial and

holistic understanding of each of the phases on an ERP life cycle (Koouki et al., 2007; Peng & Nunes, 2009; Ononiwu, 2013). Indeed, ERP failure can occur at different stages of an ERP's life cycle including the post-implementation phase (Peng & Nunes, 2009). It has been argued that many organizations experience difficulties in achieving the projected business results during the post-implementation phase when the deployed ERP system is underutilized (Davenport et al., 2004; Esteves, 2009). Moreover, some of the issues that firms face during post-implementation phase are the effect of unrecognized or unresolved problems from pre-implementation and implementation phases. However, the firm needs post-implementation management since it has no control over these past errors and deficiencies (pan et al., 2009). In other words, organizations need a long-term view that ERP implementation is not the end of the journey; but rather the starting point of a long excursion towards innovation, continuous improvement, and flexibility (Willis and is, 2002).

Many firms consider the go-live stage as the final goal instead of a milestone. According to Peng and Nunes (2010), organizations often encounters a wide range of barriers and risks when using, maintaining, and enhancing ERP systems post go-live stage. The barriers and risks are not only technical aspects, but also and more importantly can be found in diverse organizational, operational, management, and strategic thinking areas (Peng and Nunes, 2010). The potential benefits that can be gained through an ERP system and the large financial commitment that it requires make it very important to understand and address the issues to facilitate the utilization of the system in an organization. This indicates that the ERP post-implementation stage should be critically managed to fully benefit from the potential of the implemented system (Koouki et al., 2007). Hence, ERP post-implementation emerges to be an interesting research topic and it is also being considered as the direction of the second wave of ERP research by IS researchers (Yu, 2005; Peng & Nunes, 2010; Pan et al., 2009).

Currently, there are limited researches of ERP system that are conducted in the context of Ethiopia. Abiot and Gomez (2012) conducted a case study examining the successful implementation of an ERP system at private company called Mesfin Engineering. Derese (2013) researched on ensuring successful ERP implementation by conducting a case study at Ethio-Telecom Oracle ERP system. Sintayehu (2014) examined the critical success factors of ERP implementation by conducting a case study at Ethiopian Airlines. Despite these studies, local

research attempts did not address post-implementation of ERP utilization and management issues on Ethiopian context. Even if successful ERP implementation is achieved; it is not a sufficient condition to fully benefit from the system's potentials. Rather, it also demands continued efforts during the post-implementation phase of the system to achieve after go-live success. In line with this, all of the above mentioned local SAP related researches recommended further study of ERP utilization and the business benefit realization during post-implementation phase of the system life cycle. Sintayehu (2014) mentioned that ERP usage related studies can give feedback for future ERP implementation projects and also facilitate better use of ERP systems. As recommended by ERP related local papers, ERP post-implementation success would be studied in order to utilize the system and achieve business results.

There are various ways of measuring an ERP post-implementation success. ROI can measure the business benefits achieved through an IT system. The other measurement can be evaluating the users' satisfaction upon the implemented system since it indicates the effective use of the system which leads to business value realization (Bradford & Florin, 2003; Ruvio, 2012).

This research under study is; therefore, geared towards studying and addressing the technical, organizational and operational issues of ERP post-implementation success. Moreover, the study proposed ERP post-implementation management framework which helps to maximize the utilization of ERP system and meet the targeted business value.

Hence, this research explores and answers the following research questions:

1. What are the technical, organizational, and operational issues Ethiopian Airlines encounters during the post-implementation phase of ERP system that affects effective utilization of the system?
2. What is the level of users' satisfaction on the effective utilization of ERP system during post-implementation at Ethiopian Airlines?
3. How does ERP factors (technical, operational, and organizational) relate with ERP post-implementation success in terms of users' satisfaction?

4. How can an ERP post-implementation management framework be designed to address the identified technical, organizational and operational issues and improve ERP system utilization?

1.3. Objective of the Study

1.3.1 General Objective

The general objective of the study is to investigate technical, organizational, and operational issues of ERP post-implementation management in the context of Ethiopian airlines and design a solution framework to address those issues.

1.3.2 Specific Objectives

To achieve the general objective of the study, the following specific objectives are identified.

- To identify technical, organizational, and operational ERP Post-implementation issues
- To measure the level of user satisfaction during ERP system post-implementation utilization
- To examine the relationship of ERP system utilization with technical, organizational, and operational factors in terms of user satisfaction
- To identify issues and components of an ERP post -implementation framework
- To design an ERP post-implementation management framework for addressing the identified technical, organizational, and operational ERP utilization issues
- To evaluate utility and effectiveness of proposed framework
- To draw conclusions and forward recommendations for further study

1.4 Significance of the Study

This study is believed to benefit both researchers and practitioners. Primarily, this study provides researchers a better understanding of ERP Post-implementation management by clearly identifying technical, organizational and operational issues; and proposing an ERP post-implementation management framework. This research is believed to produce results that can improve the utilization of ERP system in Ethiopian airlines, other sectors, and organizations.

Accordingly, it helps to achieve return on investment, reduce risk of failure by improving the potential for users to expand ERP exploitation; and ultimately maximize benefits achieved. Moreover, it is an academic exercise to fulfill the requirement of the program.

In today's competitive business environment, computerized information systems usage has played a key role in the business success model. Due to this, systems utilization is regarded as a major determinant of productivity and achieving competitive excellence (Chang, et al. 2008). Hence, the output of this research can be used as an input to define ERP use strategy and benefit realization roadmap considering the aspects of functionality, usability and adequacy to the organizational business processes.

It is also believed to offer a feedback to ERP implementation projects to consider after go-live issues as part of the implementation strategy.

1.5 Scope and Limitation of the Study

As the title implies the scope of this study is limited to post-implementation issues after the go-live stage of the ERP implementation. It mainly focused on identifying and evaluating the technical, organizational and operational issues of ERP utilization and also proposing a framework that can address the issues. Finally, the proposed framework is evaluated based on expert validation and output of focus group discussion. This study did not measure ERP post-implementation success using financial parameters owing to the intrinsic limitations in that approach.

This case study research is bound only in one organization, Ethiopian Airlines, ERP system post-implementation management since January, 2013 which is the go-live date of the implementation.

The accessibility of recent literatures that are published with in the last five years is limited which ultimately affects the researchers' understanding of the area and the current research findings.

1.6 Organization of the Thesis

This thesis report is organized into six chapters. Chapter one, the present chapter, is a general introduction to the problem and includes the objective of the research along with the significance and scope of the study. Chapter two is devoted to literature review. It discusses concepts of an ERP system in two sections. In the first section, the basic concepts of an ERP system are discussed in sufficient detail. In the second section, ERP post-implementation related international and local studies are reviewed and presented. In chapter three, the research methodology is described. Data presentation, analysis and discussions are presented in chapter four. In chapter five, the proposed ERP post-implementation management framework is presented along with the evaluation of the proposed framework. Finally, chapter six presented general conclusions and recommendations made based on observations and results from the study.

CHAPTER TWO

LITERATURE REVIEW

2.1. Overview

In this chapter the conceptual framework of ERP system is synthesized based on the availability of previous scientific researches. In addition, ERP Post-implementation related literatures are reviewed to analyze existing research and to clearly show the research gap to justify the significance of this study.

With the aim of searching for literature to understand the theoretical background of ERP, the researcher attempted to retrieve a group of articles. The search parameters and synonyms that were used to logically guide the search engines included ERP, ERP overview, ERP implementation, ERP implementation critical success factors and the ERP lifecycle. At the second stage, the researcher identified literatures that are related to ERP post-implementation. The articles were searched in Google, Google Scholar, Emerald Insight and IEEE using keywords listed in Table 2.

Table 2: Keywords used for searching literatures

Keywords Used for Searching Related works
ERP
ERP Overview
ERP implementation
ERP implementation critical success factors
ERP lifecycle
ERP post-implementation
ERP post-implementation issues
ERP post-adoption
ERP exploitation
ERP utilization
ERP post-implementation management framework
ERP business benefits achievement
ERP post-implementation success
IS management framework

2.2. The Concept of ERP

Nowadays, globalization has forced multi-national firms to face a stiff in the levels of competition and to operate in a more dynamic business environment. As a result, firms are engaged in adopting best business practices, with the notion of continuous design improvements, speeding up the product development life cycle, managing logistics channels and streamlining sourcing arrangements in order to manage such competitive pressures and environmental uncertainties. Organizations are profoundly investing in IT systems to effectively manage and integrate the activities of the firm across their supply chains and also shape up the way they conduct business to meet customers' as well as their own needs. One of the most popular and effective enterprise systems adopted by thousands of companies over the last two decades is the ERP system. While IT systems can bring benefits in general terms, ERP system offers additional benefits due to the larger and integrated scope of the system itself (Dijk, 2013).

In developed parts of the world like North America, Europe, and Asia-Pacific; most large businesses have implemented ERP system since the 1990s. Many organizations in these developed countries have stabilized ERP implementation and extended their ERP system to CRM and supply chain management. Many may have also shifted their attention away from implementation to effective system exploitation and integration. ERP vendors are now turning their attention towards developing continents and regions of the world such as Asia, South America, and Africa. On the other hand, firms in developing countries are mainly focusing on successful implementation and achievement of the early benefits from their ERP implementation.

Business firms collect, generate, and store vast amounts of data and information which is unthinkable when managing without computerized information systems. More importantly, in the absence of an ERP system, these vast amounts of data and information is spread across dozens or even hundreds of separate and mostly incompatible legacy computerized information systems; each handled by separate business units, regions and functions. Each of these silo legacy systems may provide important support for a particular business unit of an organization; however, enterprise-wide performance is hindered by the lack of integration (Davenport, 1998).

To view this concept with an example, if a firm's sales and marketing systems are not integrated with its financial systems, then management makes critical decisions based on the

decision maker's intuition rather than being based on a detailed understanding of product and customer profitability. With the same token, if a firm's sales and ordering systems cannot relate to its production-scheduling systems, then the manufacturing productivity suffers and ultimately can result in customer irresponsiveness. In addition to the above mentioned facts, there are also additional disadvantages such as: maintaining different information systems leads to huge costs- for storing redundant data, re-inserting and reformatting data from one system for use in another; and developing programs of communication links among systems to automate the data interface (Davenport, 1998).

ERP systems are primarily designed to solve the fragmentation of information in large business firms by integrating and standardizing processes flows of various functional units with the core concept of a single comprehensive database (Davenport, 1998). The database collects data and integrates it into different modular applications to virtually support the entire firm's business activities: across functions, business units, and across the world. To further explain the concept of ERP, various definitions that are published in literatures are discussed here.

ERP can further be described as an enterprise system with a suite of integrated software applications used to manage enterprise resources through company-wide business processes by using standard procedures, common database and data sharing among different functional areas with in and across organizations (Soltanzadeh & Khoshsirat, 2012).

Most modern ERP systems are commercial of-the-shelf solutions that are comprised of a set of independent, integrated, and configurable software modules with embedded best industry practices and business processes (Ward et al., 2005). The architecture of an ERP system facilitates seamless integration of information and information-based processes within and across diverse functional areas and geographic locations as it represents one database, one application, and a unified interface across the entire organization (Rashid et al., 2002). According to O'Leary (2001) an ERP system is defined as "ERP systems are computer-based systems designed to process an organization's transactions and facilitate integrated and real-time planning, production, and customer response". Davenport (1998) defines ERP as "ERP (enterprise resource planning systems) comprises of a commercial software package that promises the seamless integration of all the information flowing through the company-financial, accounting,

human resources, supply chain, and customer information". Hence, a system should have the following crucial features/ characteristics in order to be categorized as an ERP system:

- Different modules that automate various core organizational business processes such as finance, controlling, logistics, human resources, manufacturing, etc.
- Centralized and unified database for all business modules of the system
- Best business practices embedded on the business modules
- Seamless integration capabilities with in ERP modules and also other computerized systems of the firm
- Customization capabilities in order to cater for the specific needs of an organization that are not incorporated in the best Practices of the system
- Business Intelligence (BI) tools to enable decision-makers to have an enterprise-wide view of information they demand in a consistent, reliable and timely fashion

Davenport (1998), further illustrates the concept of ERP and its various modules with a diagram as shown in Figure 1.

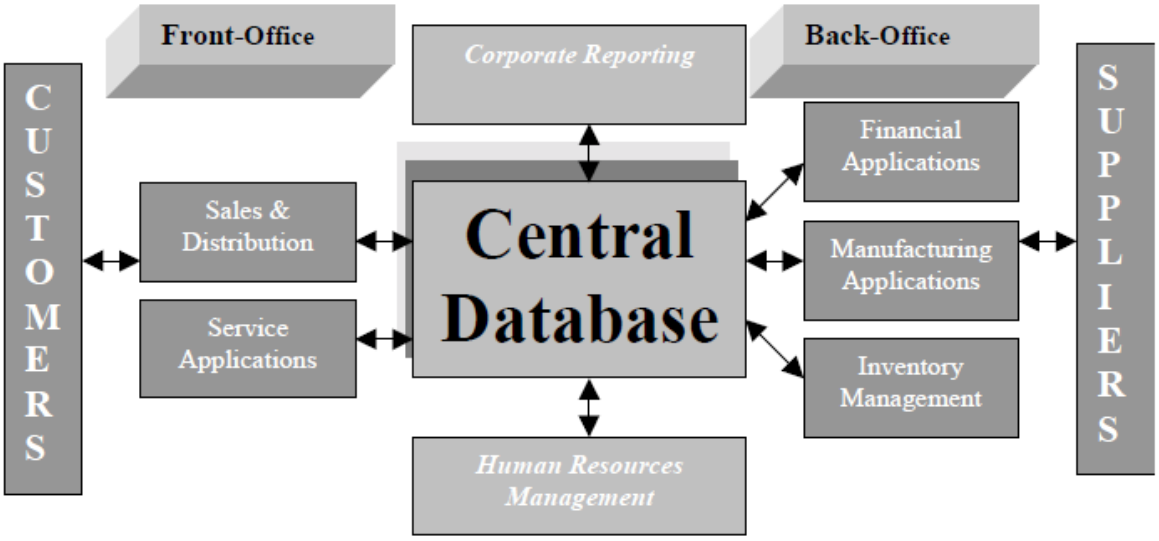

Figure 1: The concept of ERP Systems (Source: Davenport, 1998)

2.3. Modules of ERP System

ERP is known by its modular nature to manage diverse business processes across the organization under a unified database which facilitates integration and seamless information flow among the modules. ERP system consists of many standard enterprise software modules that can be individually purchased, based on what best meets the specific needs and technical capabilities of the organization.

An ERP module focuses on one area of business processes, such as HCM, FI/CO, logistics and sales & marketing. Even though the types and contents of ERP modules are different (from vendor to vendor) with some degree of specialty, the core modules remain the same across vendors (Gundogar et al., 2010). These core ERP modules are also comprised of different sub-modules depending on their functionality and specialty. In order to further elaborate ERP components, the modules of SAP ERP, which are incorporated under SAP R/3 package, is discussed since SAP is the leading ERP vendor in the world-wide market. Moreover, SAP/R3 is the ERP system implemented by the organization under this case study. Currently, SAP has 12 main modules that are fully integrated as can be seen below in figure 2.

Figure 2: Standard SAP ERP Modules (Source: http://www.saperp.com/general/sap-module-overview.html **Accessed on September 29, 2014)**

Financial Information (FI): this important core module is dedicated to handling all the accounting and financial needs of an organization. It provides comprehensive and consolidated financial reports, as well as the real time financial position of the firm that can be viewed by a financial or executive manager for better decision making. FI includes the general ledger (GL), accounts payable (AP), accounts receivable (AR), asset management (AM), cash management, banking, profitability analysis and budgeting and controlling sub-modules.

Controlling (CO): this module is dedicated to the control of the firm's flow of cost and revenue, provides all information needed by management for the purpose of planning, reporting, and decision making necessary to reduce risks. CO includes cost element accounting, cost center accounting, internal orders, activity-based costing (ABC), product cost controlling, profitability analysis, profit center accounting sub-modules.

Human Capital Management (HCM): handles various activities from hire to rehire that are related to effectively managing the most vital asset of a firm, its employees. It also integrates data and information that are related to employees with "other SAP modules" and external systems. This module incorporates several sub-modules such as, organizational management, personal administration, time management, payroll, e-recruitment, compensation management, personnel cost planning, benefits management, development training and event management, etc.

Material Management (MM): As the name implies this module is dedicated for procurement handling and inventory management. It is integrated with other modules such as PP (product planning), SD (sales and distribution), and QM (quality management).

Product Planning (PP): The purpose of PP is to ensure that manufacturing runs effectively and efficiently in order to produce products as per customers' demand. This module handles master data needed like bill of materials (BOM), routings and work centers.

Quality Management (QM): is dedicated for ensuring that all the necessary activities to design, develop and implement a product or service that are effective and efficient with respect to the system and its performance. It is the comprehensive solution that helps the company throughout the product life cycle and along the supply chain.

Plant Maintenance (PM): dedicated to cover the entire maintenance activities, supporting the Planning, Programming and Implementation optimally, by focusing on the availability of equipment, staff costs and Assurance. SAP's PM comprises of activities such as inspection, preventive maintenance and repairs in order to measure and restore the ideal condition of a technical system.

Project System (PS): aimed to support the planning, controlling and monitoring of long-term, highly complex projects to achieve targeted project goals by balancing time, budget and scope.

Sales & Distribution (SD): is part of logistics module that support customers through the processes of quotations, sales order and all the way towards billing the customer. This module is highly integrated with the MM and PP functional modules and allows firms to manage customers' sales price, check for open orders and forecast sales related activities. SD includes order management, sales management, sales planning, pricing, and after-sales-service sub-modules.

2.4. Phases of ERP Solution Life-Cycle

ERP systems are business-process-oriented rather than IT-oriented which makes their implementation bigger in scope than implementing a new IT system (Esteves & Pastor, 1999). In line with this, ERP adoption is considered as one of the biggest and most complex projects a firm could manage even though these projects can vary in size, structure, and methodology. This is due to the extensive requirement of effort, time, resources, and organizational changes (Haddara & Elragal, 2011).

The ERP adoption process, which is known as ERP life-cycle, has various stages during its whole life within the hosting firm. Each of the phases has an important contribution to the overall success of the system's adoption (Peslak et al., 2008). Several researchers have recommended their own process models to depict the ERP life-cycle phases which a firm encounters during an ERP system implementation (Esteves & Pastor, 1999; Ross & Vitale, 2000; Markus & Tanis, 2000). Among these models, the model developed by Esteves & Pastor (1999) is discussed in this study. This is due to the fact that the model is comprehensive enough to cover the whole life-cycle up to the retirement of system along with four dimensions that gives

viewpoints by which the phases could be analyzed. Moreover, it has been adopted by several studies (Peslak et al., 2008; Haddara & Elragal, 2011). This model has six phases that consists of different stages of an ERP system throughout its lifetime. These phases are: (1) adoption decision, (2) acquisition, (3) implementation, (4) use and maintenance, (5) evolution, and (6) retirement as can be seen in Figure 3. The dimensions are: change management, people, process, and product. Further, the model's phases and dimensions are briefly discussed next.

Adoption decision phase: In this phase business executives start to analyze the need for a new ERP system by considering the firm's business vision and strategy along with the expected business results of the system adoption. The main milestones of this phase are the definition of system requirements including its benefits and goals.

Acquisition phase: In this phase the ERP product is selected that best meets the business requirement of the firm with minimal code customization. Vendor and implementer selection criteria and contractual agreement are defined and analyzed in this phase. Moreover, making analysis of ROI is one of the important activities of this phase which sets the expected business value of the system.

Implementation phase: In this phase the ERP implementers/ consultants configure the system based on the business requirement blue print and also handle new developments, customization, and enhancements on the acquired ERP package according to the needs of the organization. The consultants avail implementation methodologies and also provide know-how and training to the organization.

Use and maintenance phase: This phase starts during the go-live date of the acquired ERP product and it consists of using the product in such a way that returns expected benefits and minimizes disruption. The functionality, usability, and adequacy of the system must be ensured and aligned to the organizational and business processes. Maintenance is also one of the important element on which malfunctions have to be corrected, special optimization requests have to be met, and general systems improvements have to be made.

Evolution phase: In this phase more capabilities are integrated to the implemented ERP system, providing new functionalities and benefits, such as supply chain management, customer relationship management, workflow, advanced planning and scheduling, and expanding the frontiers to external collaboration with other partners.

Retirement phase: in this phase organizations make a critical decision to substitute the ERP system with other computerized information system that gives competitive advantage to the organization considering the current and future needs. The retirement of the adopted ERP system emanates from the existence of better technologies or the inadequacy of the ERP system or new approaches to the business needs.

Esteves and Pastor (1999) defined four dimensions of areas of concern or viewpoints by which the different phases of the ERP life-cycle should be analyzed: These dimensions are: change management, people, process, and product. Further, the dimensions are discussed next briefly.

Product: This dimension focuses on a thorough understanding of the capabilities of the ERP product considering the functionality and technical aspects of the system. A better understanding helps to align the business strategy of the organization with the ERP product. It is also of help to determine whether the system is being used effectively, in accordance with the needs of the organization, and how it can best be applied to further extend the goals of the organization.

Process: This dimension focuses on understanding of the business processes known as best practices that are embedded on the ERP product. These best practices may force firms to go through business process re-engineering (BPR) in order to adopt the new business models and functional requirements of the ERP system which ultimately helps to achieve better performance. On the other hand, each organization has its own core capabilities and functionalities that must be catered by an ERP system for the competitive advantage of the firm. Moreover, an ERP system must facilitate the decision- making processes required to manage the organization's resources and functions.

People: This dimension refers to the people, their skills and roles in an ERP system life-cycle. These skills and roles must be developed in order to maximize system utilization, reduce risk, manage complexity, and at the same time facilitating organizational change. The other aspects that must be learned are dealing with contingencies, changing practices, and adapting to a new organizational structure and culture.

Change management: The body of knowledge of this dimension refers to proper handling of a complex change, like that associated with a big system, gets the right results, in the right timeframe, at the right costs. The change management approach focus on ensuring the acceptance and readiness of the new system so that the organization acquires the benefits of using the acquired system.

Figure 3: ERP Life-Cycle Framework (Source: Esteves & Pastor, 1999)

2.5. Benefits of ERP System

The most significant drivers of a huge investment in ERP solutions are its integration capability, standardization, and improvement of processes, easy information access, faster decision-making facilities, dissatisfaction with legacy systems, and business consideration (Esteves, 2009). According to Davenport (2000), the four key drivers of ERP adoption are corporate growth, improved customer service, efficient distribution system, and reduced

operational expenses. Davenport (2000) further stated that some types of benefits are likely to arise before others start; such as improved transactional processes and common data under a unified database appear prior to other benefits that are associated with improvements in management and decision making.

Shang and Seddon (2000) defined list of ERP benefits from a review of 233 cases published in ERP vendors' stories. They also classified the benefits into five benefit categories: operational, managerial, organizational, IT infrastructure, and strategic.

Operational Benefits

Cost reduction: ERP systems can remove redundant processes which results in cost reduction.

Cycle time reduction: ERP systems can facilitate employee support, customer support, and supplier support that leads to measurable cycle time reductions.

Productivity improvement: ERP systems can improve employees' productivity. This improvement can be measured by different metrics such as the number of customer served by employee or the number of products produced per employee.

Quality improvement: Accuracy and reliability can be improved. In other words, reductions in error rates and duplication errors can be achieved

Customer service improvement: The customer data is handled centrally in a unified manner regardless of the amount of data which makes it easier to deal with customer inquiries.

Managerial Benefits

Better resource management: an ERP system improves supply chain management which can lead to improved inventory management, reduced stock, and increased turnover. It can also help to better manage and utilize human resources based on their skills and experiences.

Better decision making: Due to the integrated nature of an ERP system it is possible to generate improved operative data that can be used by business managers to make better informed decisions about strategic planning and market responses.

Better performance control: Financial performance can be measured and controlled in different ways, either by customer, business, product, geography, or a combination of them which leads to an overall increase in operational management efficiency and effectiveness.

Strategic Benefits

Support business alliances: Alliances can be efficiently and effectively amalgamated with the organization's standard business practices.

Build cost leadership: ERP streamlines processes and shared services which makes it easier to achieve economies of scale.

Build external linkage: The system can easily be integrated with the systems of external parties such as business partners, suppliers, and distributors which improves business performance.

Enable worldwide expansion: A centralized world operation can be facilitated by the system that can handle global resource management and market penetration, allows operating in multi-currency, and the ability to provide solutions globally that are efficiently and cost effectively.

Customer service improvement: An ERP system can make it easier to deal with customer inquiries based on the centralized customer data available in the system.

Infrastructure Benefits

Increased business flexibility: The IT infrastructure that hosts ERP system supports stable and flexible business changes for the current and future expansions as well. This enables organizations to respond quicker, at a lower cost, and provide a range of options to internal as well as external changes.

IT cost reductions: ERP systems can lower costs by consolidating dispersed legacy systems since maintenance and integration of multiple legacy is costly.

Increased IT infrastructure capability: stable and flexible for the current and future business changes - ERP systems are stable; they are built on streamlined and standardized platforms. They promote continuous improvements and have global support. They bring flexibility with them

since they are built on modern technologies. Finally, they are extendable to other parties and expandable to a range of applications; and they are also customizable and configurable.

Organizational Benefits

Facilitate business learning and broaden employee skills: ERP systems can broaden employee's skills and facilitate shortened learning times.

Empowerment: ERP systems can facilitate providing value-added responsibilities to employees so that they can work autonomously. Moreover, it can be used to track accountability of employees based on their defined roles in the system.

Change culture with common vision – ERP systems are process based that promotes employees cross-functional and interdepartmental communication between employees. It also enables the vision to be consistent across different levels of the organization so that coordination and harmonization can be boosted.

Better employee morale and satisfaction: ERP systems' decision-making tools boost employees' problem solving capability which increases employee satisfaction and moral.

However, this study falls short of establishing the relationship between the benefits and the reasons for ERP implementation, or to define the point in time in which the various benefits are expected to materialize. Esteves (2009) attempted to explain ERP benefits realization along with the ERP usage stages of the organization by taking the time perspective in to account. The maturity levels or usage stages are:

Beginning: ERP implemented in the past 12 months;
Consolidating: ERP implemented for one to three years; and
Mature: ERP implemented for more than three years.

This study suggested that ERP benefits realization dimensions are interrelated and business executives should perceive benefit realization as a continuum cycle along the post-implementation phase. In this study, ERP benefits realization road-map was suggested which can be an input to develop a benefits management strategy to get the feel for the day-to-day and long-term ROI of ERP adoption.

Based on the findings, this study suggested that ERP benefits realization should be considered as a project that includes four main stages: prepare, realize, achieve, and auditing as can be seen in Figure 4.

Prepare stage: This stage of the road-map concerns the activities to prepare the realization and achievement of ERP benefits. Managers should concentrate in the initiation and development of activities including analyzing users' expectations that influences the next two stages.

Realize stage: In this stage most of the benefits that are related with operational, organizational and managerial dimensions are realized. Accordingly business managers can start showing the rest of the organization the potential of ERP system and its impact on the organization.

Achieve stage: This stage concerns the realization of the long-term strategic visions along with the progressive achievement of operational, organizational and managerial benefits. In other words, this stage ensures the full achievement of ERP benefits.

ERP auditing stage: The main objective of this stage is to perform continuous auditing analysis of the ERP benefits realization in each stage and to project ERP benefits for next stages. According to Esteves (2009) ERP benefits realization should be perceived as a continuum, across which managers need to constantly prepare, realize, and achieve ERP benefits for the next stages. Thus, after the "achieve" stage, business managers should re-visit the beginning of the road-map in order to monitor the benefits already achieved, but also to improve such benefits

Esteves (2006) also explained that "since a benefits realization approach measures results, identifies benefits gaps, and implements corrective action to address the gaps, it serves as a wealth of knowledge for future IT projects in terms of what the project struggled with, what went well, and what can be improved in the future". (P. 33)

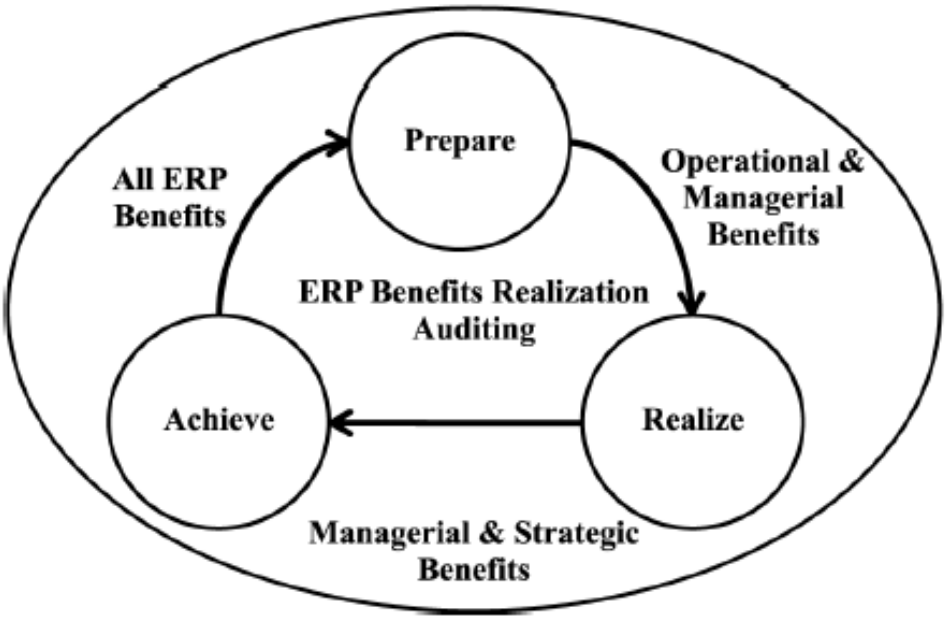

Figure 4: ERP benefits realization road-map (Source: Esteves, 2009)

2.6. ERP Post-Implementation Phase (Second Wave Research)

The post-implementation phase starts from go-live of the ERP system where the system is in operational use and lasts until the system retires to be replaced by a new one (Ruivo et al., 2012). In this stage, the responsibilities of implementation project team shifts to system users and the IT technical team. During post-implementation phase, normal business operations can be executed repeatedly without critical issues such as login issues, lacking performance, failing functionalities, etc. Hence, ERP post-implementation mainly focuses on utilizing, maintaining, and enhancing the implemented system to realize business benefits (Willis & Willis, 2002; Ruivo, et al., 2012; Ononiwu, 2013).

While ERP use refers to the daily usage of the system which is in production environment for the targeted business activities, ERP post-implementation success refers to the organization's ability to utilize ERP to create business results. In essence, ERP post-implementation success refers to the effective system utilization to enhance organizational goals (Davenport, 1998; Ifinedo, 2008). On the other hand, ERP implementation success refers to the

technical installation success of such systems wherein the measurement indicators mainly focuses on project management metrics, time estimate, cost overruns, scope etc.

According to Jasperson, et al. (2005), utilization is defined as the extent to which the features and capabilities of the system are used by end-users to perform a business task. By the same token, when end-users fail to utilize the full features of the adopted system, then the system is considered as underutilized. Even though an ERP system is also an IS, the findings of other IS studies that have investigated the system utilization would not be considered sufficient for ERP systems. Several researches have shown equating an ERP system to other IS prohibits the clear understanding of ERP system (Davenport, 2000; Yu, 2005; Ifinedo, 2008; Ononiwu, 2013). Ifinedo (2008) stated that ERP systems are different from other IT systems as their implementation incorporates technological, organizational, operational, managerial, and strategic components.

The realization of business values has often been assumed to be achieved automatically once the success of an ERP system implementation is achieved. However, successful implementation of an ERP system is only a first step accomplishment towards achieving ERP success in terms of realization of business results. In other words, ERP implementation is not the end of the journey, but rather, the beginning of the long road way towards innovation, improvement, and flexibility (Smyth, 2001; Willis & Willis, 2002; Yu, 2005; Koouki et al., 2007; Peng & Nunes, 2009; Peng & Nunes, 2010; Ononiwu, 2013). As with any IS, an ERP system should be exploited in order to realize the expected business values (Jasperson, et al., 2005).

According to Peng and Nunes, (2009), organizations often encounters a wide range of risks during an ERP system post-implementation phase which incorporates using, maintaining, and enhancing ERP systems after the go-live stage. These issues are not only the technical aspects, but are also, and more importantly can be found in diverse operational, strategic, and organizational areas (Peng and Nunes, 2010). Some organizations that have implemented ERP have failed to achieve the expected business values due to underutilization; while others have abandoned using the system even though the initial implementation was successful (Smyth, 2001; Willis & Willis, 2002, Peng & Nunes, 2009). Hence, ERP post-implementation emerges to be an interesting research topic and it is also being considered as the direction of the second

wave ERP researched by IS researchers (e.g. Willis & Wills, 2002; Yu, 2005; Kiriwandeniya et al., 2013; Pan et al., 2009).

There are various ways of measuring an ERP implementation success. ROI can measure the business benefits achieved through an IT system. The other measurement can be evaluating the users' satisfaction upon the implemented system. According to Ruivo (2012) and Bradford and Florin (2003), the level of user satisfaction is an important dimension that can indicate ERP post-implementation success. Ruivo (2012) further stated, user satisfaction indicates the effective use of the system which leads to business value realization.

2.6. The concept of framework and its representation

According to Hevner (2004), a purposeful IT artifact is the major results of an IS research. The main objective of these IT artifacts is to address an important organizational problem. The broad categories of IT artifacts include constructs, models, methods, and instantiations (Hevner, 2004).

As stated by Hevner (2004), constructs represent vocabulary and symbols; models represent abstractions and representations; methods incorporates algorithms and practices; instantiations stands for implemented and prototype systems. In relation with this, a framework is a model artifact that provides a broad overview or skeleton of interlinked items which helps as a guide to achieve a specific objective (Kiriwandeniya et al., 2013). According to Zachman (2003), a framework helps to analyze organizational subjects to leverage the required level of integration, reusability and interoperability towards the targeted result.

Various frameworks were reviewed from different studies researched by various authors in the past. To mention some of them, the works of Gundogar et al. (2010) who developed modules of ERP as an integrated package of several functions to enable organizational success; on the other hand, authors like Esteves & Pastor, 1999; Ross & Vitale, 2000; Markus & Tanis, 2000, designed a framework of post ERP implementation success as a serious of life-cycle phases from adoption decision phases to use and maintenance phases. Islam (2013) has designed a framework for e-learning by identifying the major challenges and proposing a list of solutions for the identified challenges. Kiriwandeniya (2013) proposed ERP post-implementation

framework with especial attention to Sir Lanka by analyzing success factors, procedures and best practices.

Furthermore, Esteves and Pastor (1999) emphasized management, people, process, and product as areas of concern a decision maker should consider during post implementation of ERP system. In addition to the various issues to be considered in the framework of ERP post implementation, Esteves (2009), in his latest work indicated the benefit realization framework of ERP.

Zachman has designed enterprise architecture framework using a two-dimensional matrix in which the column (abstractions) represents the operations and the row (perspectives) represents responsibilities of people. With the same token, Jafari et. al (2009) have analyzed the power of this two dimensional matrix of Zachman framework and applied in their research work to develop conceptual knowledge architecture model for an enterprise.

Finally, Post-implementation related literature reviews are presented in the next section and summarized in table 3.

2.7. Related Works

Kouki et al. (2007) have studied ERP assimilation determinants during post-implementation stage by conducting a cross-case study analysis in three large scale Canadian manufacturing firms. In this study, assimilation is defined as the magnitude to which the ERP system is used in a comprehensive and integrated way and becomes routinized and embedded in the firm's work process and value chain activities. Accordingly, assimilation was evaluated based on three criteria: (1) the significance and type of operational/managerial/strategic decisions taken using the system; (2) the significance and type of activities and processes supported by the system; and (3) the level of users' acceptance and dependability on the system.

The researchers used interviews and observations as primary sources of data collection whereas online archival and paper documentation were used as secondary sources of data. Accordingly, findings have shown different constructs that determine ERP assimilation. These constructs are categorized as technological, organizational and environmental factors.

The technological context refers to the ERP systems' attributes that might influence the acceptance rate of the system by its users and also the IT expertise which indicates the IT people competence in maintaining, updating and supporting the ERP system. The organizational context refers to the top management championship, strategic alignment, absorptive capacity and user involvement. Environmental context refers to consultants' effectiveness and vendor's support. In the post-implementation stage, consultant's effectiveness describes the external consultants' role during the system's upgrades. Vendor's support refers to the strategic relationship and the close fit between the system's vendor and the user organization that could be established between the vendor and the ERP adopting firm. Even though, the researchers' objective was to determine the ERP assimilation determinants during the post-implementation phase, the discussion mainly focused on testing the constructs against the firms' implementation phase prior to the go-live stage of the system. Moreover, the methodology used was qualitative study by interviewing four to five members from the case companies. The respondents were the vice presidents of IT and operational divisions only. However, the end users who directly use the system in a daily bases were not included in the survey. Hence, the current study attempted to use a combined approach of quantitative and qualitative techniques in order to address this gap and minimize bias. Finally, the researchers did not point out further researchable areas as a recommendation.

Peng & Nunes (2009) researched ERP post-implementation risks in China. The objective of the study was to identify, assess and explore potential risks that Chinese companies may encounter during the post-implementation phase. The post-implementation phase was comprised of using, maintaining and enhancing the ERP system.

The researchers adopted a deductive research design based on a cross-sectional case study on the State-Owned Enterprises (SOEs). In line with this, questionnaire was used as primary source of data collection. Based on critical literature review, the researchers proposed ERP post-implementation risk ontology. The ontology consists of a set of 40 ERP utilization risks that were categorized as operational, analytical, organization-wide and technical issues. Accordingly, the researchers established a questioner survey instrument based on the risk ontology and also conducted a survey on the selected Chinese organizations. As a result, the study confirmed that successful ERP implementation was not the end of the journey, but it was a beginning that requires a strategic approach to exploit the system and bring business results. In

other terms, firms face a wide range of challenges and risks when using, maintaining and enhancing their ERP systems during post-implementation.

The study identified the top ten prioritized risks based on the survey results, and from the majority of the risks that were from organizational categories. Hence, the study established that potential failure of ERP utilization can be attributed to organizational aspects and procedures; rather than to technical aspects. The researchers also recommended further research in different company types, regions and countries to bring a more holistic picture of ERP exploitation barriers. However, this study did not propose any solution or post-implementation framework apart from identifying and exploring the potential risks.

Kiriwandeniya et al. (2013) conducted a research on eight selected large scale manufacturing organizations with special reference to Sri Lanka. The main objective of the study was to develop a framework for successful ERP post-implementation by analyzing best practices, procedures, and success factors. The researchers defined the post-implementation stage as the time period on which a company initiates a major upgrade to its core modules. This limits the scope of the study on upgrading, which is only one of the activities of the post-implementation phase of an ERP system.

The researchers were motivated to focus on the post implementation phase of ERP since many Sri Lankan companies are investing a huge amount of resources to implement SAP. However, majority of the companies failed to reap the expected benefits of the system. Based on literature review the researchers developed a conceptual framework to show the independent variables that affect ERP post implementation success. The variables were: pre-implementation success, change management, top management Support, post implementation training, initial post-implementation benchmarking, maintenance of ERP, minimal customization and introduction of additional features in the post implementation phase.

The researchers used primary data through in-depth interviews, questionnaires and on-site observations. Moreover, past literature studies, journal articles, annual reports of the selected organizations, blog entries and e-books were also used as secondary data. Accordingly, the researchers utilized the primary and secondary data gathered from the case studies. Based on the analysis output, the researchers designed a framework represented as a collection of practices.

The researcher believed that the framework could assist large scale manufacturing organizations to achieve effective utilization of their ERP implementation. However, the case organizations are already classified as success and failure before conducting the research by considering the following criterion (1) the period of implementation (if time > 18 months then fail) and (2) perception of the users regarding success. Accordingly, the researchers categorized six of the eight case studies as "Success" and one as "Failure" and another one as "Moderate". This method suggested that the outcome of the research may have contained biases. In major constraint part of the literature, the researcher also mentioned that identifying six cases as success by the feedback of some unaware participants made the research outcome to be subjective to biasness. Hence, research lacks to clearly understand the impact of the variables independently on the post-implementation success. Moreover, the scope of the study was limited only on major upgrades of the already implemented core modules; which lacks to address ERP systems usage. As a recommendation, the researchers stated to conduct the case study in the context of service sectors and investigate the generalizability of the framework based on the output since the cases considered in this study are only manufacturing companies. Since Ethiopian Airlines is a service giving international organization, this study addressed the recommended research dimension.

A case study of selected process-related industries was conducted by Ononiwu in 2013. The main objective of the study was to examine and identify the inhibitors of the effective use of ERP systems. Companies such as Chemical, Food & Beverage, Pharmaceuticals, Metals & Mining, and Pulp & Paper industries in New Zealand were assessed. . In this research, 'effective use' of ERP system was interpreted as 'quality of use', which is an exploitive use of the system functionalities in order to meet the competitive advantages of the adopting organizations. The research adopted a Delphi technique to draw the experiences of a few ERP adopters. A Delphi technique provides a systematic way to collect expert opinions in a subjective environment of complex issues by conducting systematic and iterative discussions. Consequently, the findings of this research identified seven inhibitors that have had a negative impact on the effective use of ERP systems in process industries. According to the order of relevance, the study demonstrated non-collaborative training among employees, low absorptive capacity, and system misfit as the top most critical inhibitors of ERP utilization. Moreover, the study identified other inhibitors such as inadequate ERP expertise, ERP default attributes, lack of continuous improvement and

poor vendors support. However, the adopted technique of the study, Delphi method, has some limitations. Since it is an open discussion some participants might get influenced by the idea and decision of others. Due to this, the reliability of study might be affected since the researcher had to rely on the recommendations of other experts' group decision. Moreover, Delphi technique requires multistage probing that requires considerable time to manage iterative discussions until all participants reached to consensus. In line with this, the researcher mentioned that some of the participants inevitably dropped out without finalizing the three round iterative discussion processes which might affect the output of the study.

Currently, there are scarce research attempts made on ERP in the context of Ethiopia. Accordingly, three research studies were found that are explained below:

Boltena and Gomez (2012) presented experiences of a successful implementation by conducting a case study at private company called Mesfin Engineering found in Ethiopia. The main objective of the study was to examine the implementation of ERP system considering the key technical, business and cultural dimensions. The research was carried out within the selected organization by having an in-depth look at the issues behind the process. However, the success of the ERP adoption only considered with respect to the implementation activities which covers up to the go-live stage of the system. In this regard, the researchers also recommended further study on the issues of post-implementation period by taking into consideration the strategic needs and requirements for sustaining the effectiveness of ERP systems after the go-live stage.

Derese (2013) has conducted his MSc. thesis on ensuring successful implementation of ERP at Ethio-Telecom, a government company. The main objective of the study was to present experiences that are obtained from a successful ERP implementation project while the case study organization implemented Oracle ERP system. As a research methodology, the researcher used a case study approach with qualitative and quantitative methods. The researcher developed a framework that identified CSFs that needs to be addressed during pre-implementation, implementation and post-implementation phases. However, the study mainly focused on the implementation phase of ERP adoption even if the framework tried to address the three major phases. This is also supported by the researcher's recommendation which says "during testing CSFs for pre-implementation and post-implementation could not justify which could be attributed for lack of clarity by the respondents. Thus, these CSFs should be further studied". Besides, the researcher also recommended conducting a comprehensive empirical study to

further understand the direct and indirect relationships among the critical success factors and the actual benefits of ERP adoption.

Sintayehu (2014) has conducted his MSc. thesis on the CSFs of ERP implementation using a case-study at Ethiopian Airlines. The objective of the study was to investigate CSFs and sharing experiences to other Ethiopian organizations with similar context and environment. In his research methodology section, the researcher mentioned to conduct a qualitative type case study using interviews, observations and an online survey questionnaire as main data collection techniques. Accordingly, the study identified twenty factors to be critical for the success of ERP system's implementation in the context of Ethiopia. These factors are project planning, top management support, project management and leadership, capability of consultants, change management and communication, organizational readiness and overall knowledge transfer. Yet, this study falls short of addressing the post-implementation factors that determine the success of ERP assimilation to achieve business results out of the implemented system. The researcher also recommended a further research on Return on investment (ROI) of ERP system adoption and usage for better use of ERP systems and also to give feedback for future ERP implementation projects.

The above mentioned local research attempts indicated the gap of ERP post-implementation related researches that addresses post-implementation issues in order to contribute to the better utilization of the system. As a summary, the related works that are discussed above are presented in table 3.

Table 3: Summary of Related Works

Author, Title & Year	Objective/ Purpose	Approaches/ Methodologies	Key Findings	Recommendation & Future Work	Remark
Kouki, et al. Going Beyond ERP Implementation: An ERP Assimilation Cross-Case Analysis (2007)	To identify the determinants of ERP assimilation success during post-implementation stage	Qualitative Research Design using Case-study methodology used. Interview and observation as primary and documentation as secondary data sources	Technological, Organizational and environmental constructs defined with three contexts that have an impact on ERP assimilation	The research did not identify any future work	The discussion mainly focused on implementation phase rather that post-implementation phase of the selected three organizations The study didn't identify any model solution
Peng, G. C. & Nunes, M. Identification and Assessment of Risks Associated with ERP Post-Implementation in China. (2009)	To assess, explore and identify the potential risks that Chinese companies may encounter during the post-implementation phase of ERP adoption.	A deductive research design used based on a cross-sectional case study. Questionnaire used as primary source of data.	Identified 40 ERP utilization risks categorized under operational, analytical, organization-wide and technical issues. Organization barriers are the most critical to ERP exploitation.	Further research recommended in alternative type of company and region to get a holistic picture of ERP exploitation	The study did not propose any solution or post-implementation framework apart from identifying and exploring the potential risks.

Author, Title & Year	Objective/ Purpose	Approaches/ Methodologies	Key Findings	Recommendation & Future Work	Remark
Ononiwu, C. G A Delphi Examination of Inhibitors of the Effective use of Process Industry Enterprise Resource Planning (ERP) Systems: A Case Study of New Zealand's Process Industry (2013)	Examines the inhibitors of the effective use of ERP systems	A Delphi technique was adopted in order to draw the experiences of ERP adopters of the selected process industries	Non-collaborative training among employees, low absorptive capacity and system misfit are identified as the top most critical inhibitors	Further research recommended with other types of ERP software packages, other industries and research methodology and technique. A Delphi technique requires multistage probing with participants of varied expertise which did not succeed because they dropped out after the first iteration before the full scale process is finalized	The research technique of the study, Delphi method, has a limitation, since it is an open discussion, some participants might get influenced by the idea and decision of others. Moreover, some of the experts dropped out after the first round of the three level iteration process which might slightly affected the result
Kiriwandeniya, et al. Post Implementation Framework for ERP Systems with Special Reference to Sri Lanka (2013)	To identify the Success/ Failure Factors in ERP Post Implementation and propose a framework for successful post implementation of ERP Systems	Positivist Paradigm design used to carry out the research. Questioner and Interview as primary data collection and past literature studies, journal articles, and annual reports of the select organizations, blog entries and e-books were also used as secondary data.	A Framework derived based on the primary & secondary data gathered from the case studies.	As the study mainly concerned about large scale Manufacturing firms, the researcher recommended broadening the scope to Service Sectors and SMEs.	The organizations are already classified as success and failure prior to conducting the research which creates bias to clearly understand the impact of the variables independently on the dependent variable. The study defined post-implementation as major upgrading of the system which limited the scope and ERP 'Use' is not incorporated in the study.

Author, Title & Year	Objective/ Purpose	Approaches/ Methodologies	Key Findings	Recommendation & Future Work	Remark
Abiot, S.B. & Gomez J.M. A Successful ERP Implementation in an Ethiopian Company: A case Study of ERP Implementation in Mesfin Industrial Engineering Pvt. Ltd. (2012)	Examines key dimensions of ERP implementation issues with in the case company by focusing on business, technical as well as cultural issues	Case Study with Interview as the main source of data collection	Presents experiences of a successful ERP implementation projects based on the investigated case study.	Recommended to consider post-implementation period for sustaining the effectiveness of ERP implementation.	The implementation under case-study considered as - success by only considering the go-live of the system on time, on scope and on budget. However, the post-implementation system exploitation needs to be further studied as recommended by the researchers.
Derese, A. Ensuring Successful Implementation of Enterprise Resource Planning (ERP): The Case of Ethio-Telecom. (2013)	To develop/ design a framework to address factors for ensuring successful implementation of ERP in organizations	A case study with semi-structured interview as the main source of data collection used	A framework proposed on critical factors that need to be focused on each phase of ERP implementation	Additional case study research recommended studying the direct and indirect relationships among CSFs and the actual benefits of ERP implementation. Moreover, study on ROI of ERP utilization during post-implementation phase was also recommended	The study mainly focused on the implementation phase of ERP adoption even if the framework tried to address the three major phases namely pre-implementation, implementation and post-implementation

Author, Title & Year	Objective/ Purpose	Approaches/ Methodologies	Key Findings	Recommendation & Future Work	Remark
Sintayehu, D. Critical Success Factors for Implementation of Enterprise Resource Planning Systems: The Case of Ethiopian Airlines. (2014)	To find out the factors that determines the success of ERP implementation.	A case study with questioner as the main source of data collection used.	Identified twenty critical success factors of ERP implementation.	Recommended to study ROI of ERP system adoption and usage for better use of already implemented ERP systems.	The study addressed CSFs for the ERP implementation. Hence, Post-implementation success was out of the scope of the study

CHAPTER THREE

Research Methodology

This study has attempted to identify ERP system related technical, organizational, and operational issues encountered during post-implementation phase of the system in Ethiopian airlines. Moreover, it has made efforts to measure the level of user satisfaction in relation with ERP system utilization.

This chapter presents the methodology that is used to achieve the objective of the study. First, the general research approach is described. Then, the model of the research presented along with the constructs. Next, population of the study, sampling techniques, sample size, data collection instrument, data collection procedure, and pilot study are discussed. Finally, data analysis and presentation method is presented along with quality of research.

3.1. General Research Strategy

3.1.1. Research Approach

The general approach of this research is a case study in which a combination of quantitative and qualitative methods is used to collect and analyze data. Scholars asserted that a case study research can employ both quantitative and qualitative sources of data collection in order to best answer research questions (Yin, 2003; Luck, et al., 2006; Creswell, 2007). A case study is valued as a research method for its ability to examine a phenomenon in its real-life context. A great value of this method comes from its strength for exploiting the 'richness' of the situation which permits deeper insight of the subject under the study (Creswell, 2007). A case study can be conducted on a single or multiple cases. In a multiple case study two or more cases are considered for the empirical study for cross case comparison and also to gain the generalizability of the result. However, a single case study is suitable when the case is representative, critical, extreme or unique.

In this research, Ethiopian Airlines is considered as a case company to study ERP post-implementation, which basically concentrates on the utilization and management of the implemented SAP ERP system.

Ethiopian Airlines is selected for the case study since it implemented the three main modules of ERP (FICO, HCM and Logistics) along with BI and PI modules that can be considered as a full-fledged ERP implementation. These modules are expected to contribute to business results that can be harnessed as a result of process integration and availability of real-time information for decision making. The other reason is, as Ethiopian Airlines is a global organization (with a flavor of both international and local organizational cultures with an intensive use of IT) other Ethiopian firms can learn a lot from the experience of Ethiopian Airlines with respect to ERP system utilization and management. Besides, Ethiopian Airlines used the implemented ERP system for the last two years; which indicated the stabilization of the system and the real need of utilization related researches. Moreover, the researcher has worked for about 10 years in the organization with system development and IS management experience in the implemented SAP ERP and also older legacy systems. Hence, the exposure of the researcher in the organization can positively contribute to the success of the research. Accordingly, the study has a flavor of action research since the research setting is carried out by a researcher who works in the organization. According to Creswell (2007), action research has an immediate impact since it can be considered as fundamental part of day-to-day work by integrating the problem under the study with the real business activities of the organization.

Quantitative approach is convenient to reach more people with optimized time than qualitative approach. Hence, it provides the potential to mine large amounts of information from large populations with adequate level of accuracy.

For the purpose of quantitative analysis, a survey is conducted through a questionnaire to investigate technical, organizational and operational issues that affects utilization of SAP ERP system during post-implementation phase in Ethiopian Airlines. The questionnaire items are partially adapted from literatures as discussed in subsequent sections.

Qualitative approach is also used to explore attitudes, behavior and experiences through interviews to get an in-depth opinion. In addition to this, qualitative document analysis is used as

a secondary source of data to gain more information and support the findings reached by questionnaire survey and interview. Moreover, it helps for the purpose of triangulation.

Accordingly, based on the selected organization as case unit of analysis, the ERP system post-implementation success measured using users' satisfaction and technical, organizational, and operational issues affecting utilization of the system.

Based on the finding of the quantitative and qualitative analysis, a framework is designed that can address the identified issues in order to improve the utilization of the system and realize business values. In due course, various ways of framework representation were reviewed and the matrix representation found to be appropriate to show two way representations; the column of the matrix to represent core activities/ issues and the rows to represent management, people, process, and technology dimensions of the proposed solutions.

3.1.2. Research Model

Based on the extensive literature review, research model is defined as depicted in figure 5. The model illustrates the three main themes: technical, organizational and operational that influences the ERP post-implementation success. In each of the themes, relevant constructs are identified. Accordingly, the case company's effective utilization of the ERP system was evaluated based on the research model.

The model mainly adapted from three research studies with few modifications. According to Kouki et al. (2007), three main dimensions were identified that have an influence on ERP assimilation; the technological; the organizational and the environmental context factors. In line with this, independent variables were identified under the umbrella of each dimension. Nejib (2013) identified four main determinants of ERP systems success during post-implementation namely: Top management support, user's involvement, organizational fit and external support from vendors and support consultants. Ononiwu (2013) also defined a conceptual taxonomy of inhibitors of effective ERP systems use under the technological, organizational and environmental dimensions.

In this study, the environmental context is not considered as a main theme rather as a construct under the umbrella of technical theme, as evidenced from the participant observer. This is due to the fact that, ERP system is being supported by the internal IT team of Ethiopian Airlines. Since the users directly get the support from the internal IT team, the questionnaire survey didn't incorporate items that are related to environmental context; rather it is addressed through an interview conducted with the CIO and IT directors. On the other hand, operational theme is incorporated as an important component that influences ERP utilization. Accordingly, figure 5 illustrates the research model of this study which depicts the three themes along with their corresponding constructs.

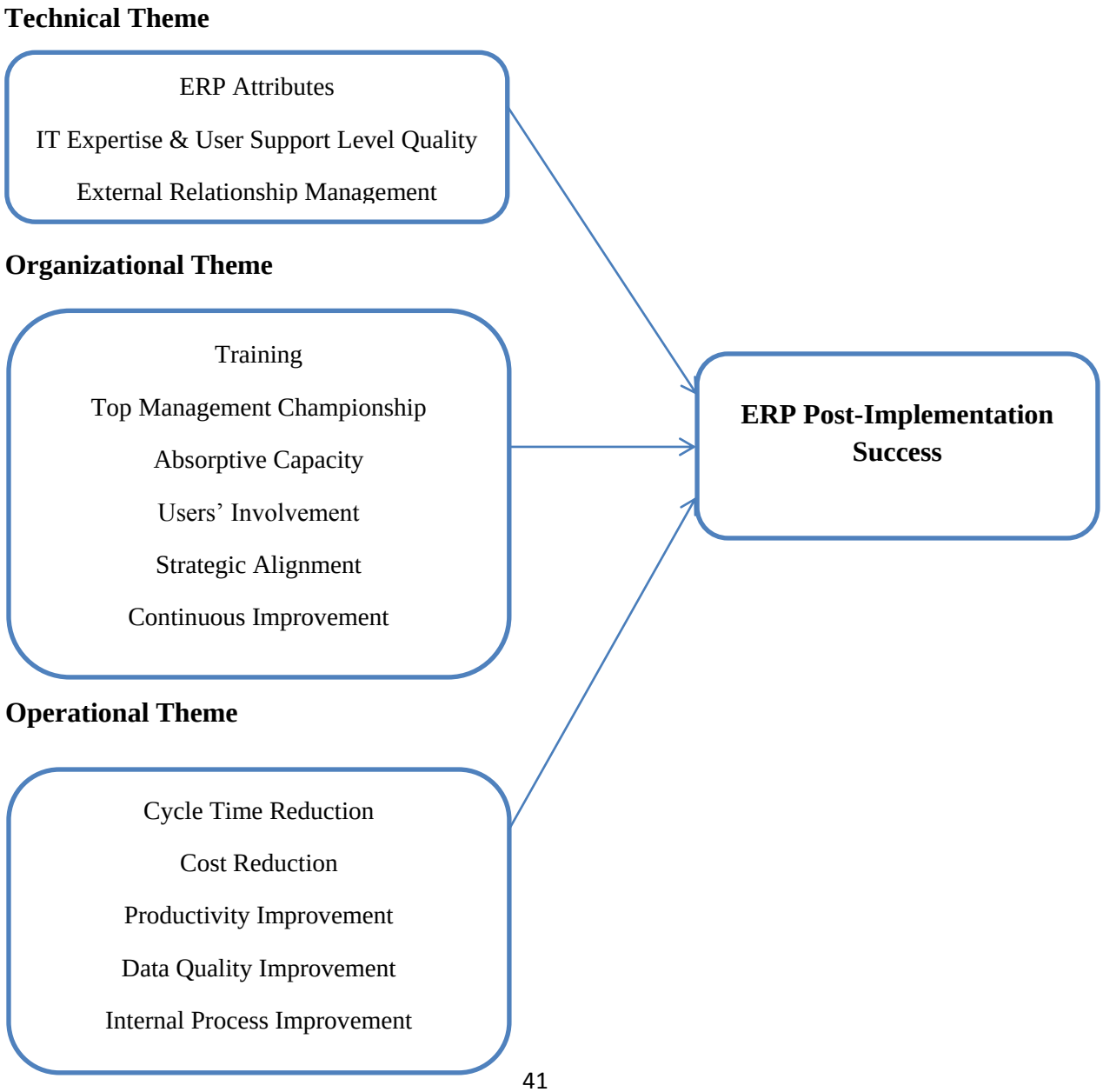

Figure 5: Research Model (adapted from: Kouki et al., 2007; Nejib, 2013; Ononiwu, 2013)

The constructs of the three themes are further described as below. Moreover, the sources of the questionnaire items that are designed to get data regarding the variables are discussed below:

Technical Theme

ERP attributes: describes ERP system's technical characteristics/ attributes that might influence the effective utilization of the system by its users (Kouki et al., 2007). It has been argued that ERP attributes affect the users' satisfaction and hence the effective utilization of the system.

According to Wu and Wang (2006), there are 11 ERP systems characteristic that have significant impact on effective system utilization. These are: ERP system timeliness, information accuracy, reliability, response time, flexibility, completeness, output requirement, ease of use, usefulness of the system to the users, relevancy of the information executed by the system and integrated nature of the system. The questionnaire items (1 to 10) under technical theme were drawn from Hakkinen and Himola (2008) to measure the role of ERP attributes on ERP post-implementation success.

IT Expertise & User Support Level Quality: describes the IT people competence and expertise in supporting, maintaining and updating the system to best align with the business. Moreover, it refers to the quality of the user support provided by the IT team that ensures effective system utilization (Kouki et al., 2007; Ononiwu, 2013). Accordingly, the questionnaire items (11 to 15) under technical theme were partially adopted from Hakkinen and Himola (2008) to measure the impact of IT expertise & user support level quality on ERP post-implementation success.

External Relationship Management: refers to the strategic relationship and the close fit between the ERP system vendor and the IT division of the user organization. Moreover, it refers to the relationship with the external consultants and the IT division during post-implementation

period (Nejib, 2013). This construct was not addressed in the questionnaire; rather by interview with CIO and Director Business Transformation of the case organization.

Organizational Theme

Training: training during post-implementation phase of an ERP system, ensures that users quickly become familiar with the system and business processes. Training allows users to take better advantage of the various functionalities and features included in the system continually (Kiriwandeniya et al., 2013; Ononiwu, 2013). Accordingly, the questionnaire items (1-3) under organizational theme were partially adopted from Hakkinen and Himola (2008); and items 4 to 6 were newly designed based on the reviewed literatures to measure the impact of training on ERP post-implementation success.

Top Management Championship: refers to the extent that top management supports and commits to the continuous ERP system utilization, upgrade and progress of the system in a direct or indirect way (Kouki et al., 2007; Jones et al., 2008). Top management championship is a critical recurrent factor which affects not only the implementation but also the post-implementation phase of an ERP system life cycle (Kiriwandeniya et al., 2013). Similarly, Kouki et al. (2007) indicated the demand of sustainable top management support as long as the system is operating, considering the continuous technological development of ERP systems and their endless requirements. Accordingly, the questionnaire items (7 to 11) under organizational theme were partially adopted from Jones et al. (2008) to measure the role of top management championship on ERP post-implementation success.

Absorptive Capacity: refers to the organization's commitment to encourage learning principally by training and putting in place procedures to capture, codify and disseminate ERP system related knowledge (Kouki et al., 2007; Ononiwu, 2013). The questionnaire items (12 to 16) were newly developed based on the reviewed literatures to measure the role of absorptive capacity on ERP post-implementation success.

User Involvement: in the context of ERP post-implementation phase, user involvement refers to the extent to which users understand how to perform their own business activities in the ERP system. Moreover, it refers to the users' understanding about how their own business activities fit into other department's business processes (Jones, et al., 2008). Accordingly, the questionnaire

items (17 to 21) under organizational theme were partially adopted from Jones et al. (2008) to measure the role of user involvement on ERP post-implementation success.

Strategic alignment: describes the continuous fit between the business strategy, organizational structure, the IT strategy and the implemented ERP system (Kouki et al., 2007). This construct is addressed through interview.

Continuous Improvement: describes to the continuous updates on the ERP system in order to address users' complexity issues, improve the system's flexibility and its business process adaptability (Ononiwu, 2013). Accordingly, the questionnaire items (22 to 25) were newly developed based on the reviewed literatures to measure the impact of continuous improvement of ERP system on post-implementation success.

Operational Theme

Cycle time reduction: refers to the contribution of ERP system in reducing time required for performing certain activities using the system and how the users' works become easier by eliminating overlaps. Accordingly, the questionnaire item (1) under operational theme was drawn from Hakkinen and Himola (2008) to measure the role of cycle time reduction on effective utilization of the system.

Cost reduction: refers to the capability of an ERP system to remove redundant business processes and also adopt best practices embedded in the system which results in significant cost reduction. Accordingly, the questionnaire item (2) under operational theme was newly developed based on the reviewed literatures to measure the impact of cost reduction on effective utilization of the system.

Productivity improvement: refers to the contribution of an ERP system to improve employees' productivity to produce better outcome. This productivity improvement can be measured by the quality improvement of employees' output, the efficiency of employees' decision making using the output of the system, and also the quality of the decisions they make in their work. In view of this, the questionnaire items (3 to 5) under operational theme were newly developed based on the reviewed literatures to measure the impact of productivity improvement on effective utilization of the system.

Data Quality improvement: describes to the data accuracy and reliability improvement gained mainly due to the centralized and unified database nature of an ERP system. In other words, it refers to the reductions in error rates and duplication data errors. Accordingly, the questionnaire items (6 to 8) under operational theme were drawn from Hakkinen and Himola (2008) to measure the role of data quality improvement on effective utilization of the system.

Internal Process improvement: describes the internal service level and intra-organizational communication improvements gained by the system. In view of this, the questionnaire items (9 and 10) under operational theme were newly developed based on the reviewed literatures to measure the impact of internal process improvement on effective utilization of the system.

3.2. Study Design

3.2.1. Research Population

The population of the study is Ethiopian Airlines operational employees, operational managers, directors and executives who directly use SAP ERP system modules (FICO, HCM, Logistics and BI) for their day to today operational, managerial and strategic business activities as well as decision making.

The respondents of the survey are operational level employees, supervisors and middle management members who use the SAP ERP system for core business activities of their respective business areas. For the qualitative study, executive management members and business directors are selected and interviewed to gather their experiences and insights.

According to SAP license data of Ethiopian Airlines, 7411 employees are registered as users of the system. Among these employees, 6435 of them use the system for administrative business activities and processes mentioned below:

Employee self-service (ESS); Employees' Time management and cross application time sheet (CATS); Employees' Performance Management System (PMS); Travel Management; Employees' Uniform Management; Ticket Benefit Management; Material reservation to charge materials from store for cost center consumption; Material reservations approval; Purchase

requisition creation; Purchase requisition approval by immediate supervisor before the document is submitted to purchasing section.

The employees who use SAP ERP system only for the above mentioned activities use other IT systems for their core day to day business activities of their respective sections. On the other hand, 976 employees who work in HR, Finance and Logistics divisions use SAP system for their main day to day business activities. Accordingly, 976 core users are considered as valid target population of the empirical study since they use SAP system as their major IT solution for their core business functionalities and decision making. Moreover, the core users also use SAP ERP system for the above mentioned administrative business activities. Hence, the target population of the study embraces 976 SAP ERP core users (N=976).

3.2.2. Sampling Techniques and Sample Size

In this study, proportional stratified sampling technique is used for the quantitative analysis in order to get proportional representative sample from the users of the three main SAP modules. The main purpose of using stratified sampling is to reduce bias and ultimately improve the precision level of the output of the study. The target population is stratified according to the core user population of main modules of SAP ERP system which are HCM, FICO and Logistics.

Based on the sampling formula (Chohran, 1977) shown below , sample size (n=63) determined by considering a target population of 976 core SAP ERP users with 90% confidence level and 5% confidence interval.

$$n_0 = \frac{(Z_{\alpha/2})^2 pq}{e^2}$$

$$n = \frac{n_0}{1 + \frac{n_0 - 1}{N}}$$

Where, N = Target Population

n_0 = Sample size

n = Calculated/Actual sample size

e = the desired level of precision, (taken confidence level = 90% where by $\alpha = 0.1$)

P = is estimated proportion of an attribute in the population (taken as 0.5 and q = 1-P = 0.5; for conservative estimate)

Z = normal curve that cuts an area α (the value read from statistical table)

Accordingly, the proportional sample size for HCM users is determined to be 13, FICO is 26, and Logistics employees are 23 based on the percentage of the strata from the total target population as can be seen in table 4.

Table 4: SAP ERP system users' classification

SAP ERP system users' classification and Sample Size			
SAP ERP Main Modules	**Number of Users**	**Percentage of the strata from the total target population size**	**Proportional sample size of the strata**
HCM	211	22%	14
FI/CO	398	41%	26
Logistics	367	37%	23
Grand Total	**976**	**100%**	**63**

Source: Own survey, 2015

For the qualitative study, purposive sampling technique is used to select business directors and executive management members. The researcher selected the interviewees purposefully who are believed to be appropriate key informants for the study. Based on the researcher's subjective judgment, the sample size for the qualitative study was initially determined to be 5. Later in the process, the data was saturated after four selected key informants are interviewed. According to Creswell (2007), saturation is the concept of analyzing the collected data and come in to a point at which the researcher can no longer find new information that adds value with respect to the intended goal. Hence, the interview is quitted after the four executive members are interviewed. Accordingly, the selected key informants are: chief

information officer (CIO), Director Business process transformation & continuity, vice president (VP) corporate HRM, and chief financial officer (CFO) of the organization.

3.2.3. Data Collection Instrument

The instruments used for collecting the required data were questionnaire, interview and document analysis. The data collection instruments are further described below:

3.2.3.1. Questionnaire

The data collection instrument was mainly developed from a synthesis of literatures that are relevant to meet objective of this study. A 5-point Likert scale questionnaire was used to obtain data from SAP ERP system users of Ethiopian Airlines. Accordingly, the scales were ranging from 1= strongly disagree to 5=strongly agree.

The questionnaire development involved a three-step process as described below:

First, the questionnaire items were selected from literatures that are relevant to measure the identified constructs depicted in the research model. Minor customizations were made to some of the questions in order to reflect the objective of the study. Moreover, some questions were newly developed based on the reviewed literatures. Secondly, the questionnaire was reviewed by focus group of three SAP leaders and senior IT quality assurance personnel who are working in the IT divisions of Ethiopian Airlines. The discussion with focus group helped to rephrase some questionnaire items to remove ambiguity and improve the response rate. Thirdly, the questionnaire was pilot tested by 14 SAP system users. The objective of the pilot study was to test whether the survey instrument provided consistent and accurate information. Accordingly, modifications were made on the questionnaire items based on the pilot study respondents' feedbacks; in order to reduce bias and maximize response rate. Most of the feedbacks were related to the layout of the questionnaire and the language used such as simplifying specific jargons and phrasing of various items. Further discussions with the pilot study participants helped to simplify the construction of certain questionnaire items.

3.2.3.2. Interview

Interviews are well suited when looking for opinions, experiences and privileged information from respondents in key positions (Creswell, 2007). In this study, semi-structured interview were used for qualitative data analysis. The interview outline was prepared with a list of subjects and questions drawn from the questionnaire. Moreover, vendor relationship management and strategic alignment related questions are addressed through interview since they were not covered by the questionnaire considering the users knowledge and experience.

The process has been started by contacting the selected executive managers, briefly describing the objective of the study and also sharing the interview outline through company e-mail. Based on the first briefing, an interview appointment was set at the interviewees' convenient time. Most of the interviews were conducted out of the normal office hours so that the informants can give an in-depth feedback without time constraint. The interviewees were conducted with in the span of 3 weeks and each interview took between 50 to 120 minutes. All the interviews were conducted in the interviewees' respective offices in order to keep the comfort of interviewees. The interview was started by a brief introduction regarding the objective, scope and expected benefits of the study. Next to this, interview has been conducted based on the prepared outline. Finally, the discussion outputs have been captured and on average an interview resulted in a report of four to five pages. The interview reports were presented to the respective interviewees within two to three days after the interview. This helped to get feedback from the interviewees when the conversation was fresh in the interviewer's mind and all the interviewees gave feedback regarding the report. The responses were very affirmative with few useful comments and corrections. Accordingly, remarks were processed into final interview result and reached in consensus with the interviewees prior to using the interview output in the qualitative analysis of the research.

3.2.3.3. Document Analysis

Document analysis was used to reinforce the analysis by referring different documents of Ethiopian Airlines. Some of the documents that were analyzed include: Ethiopian Airlines corporate strategy, IT strategy, and quality review audit documents of SAP ERP system.

3.2.4. Data Collection Procedure

Prior to preceding the data collection activity, the researcher conducted trend analysis of questionnaire response rate of Ethiopian Airline's Employees. In Ethiopian Airlines, market feedback analysis (MFA) is one of the tools used to conduct a survey to improve internal services and achieve competitive excellence (ACE). In due course, business units/sections disseminate online survey to other internal business units/sections to measure the customer satisfaction and identify improvement opportunities. According to the discussion held with few business managers, the response rate of the online MFA is only 50%. This might be associated with the tight work load of the employees, time constraints and the attitude of giving genuine feedbacks in online surveys. Based on the discussion, hard copy survey response rate is better than online surveys. Hence, two mechanisms were devised to maximize the response rate of the survey. Firstly, the number of the questionnaire distributed to the respondents was almost double (140) to the number of determined sample size which is 63. Secondly, the survey was implemented using a paper-based questionnaire to obtain a better response rate. This kind of data collection approach was preferred in order to provide briefing about the objective of the survey by organizing a group of employees from the same section/ department; which ultimately increases the response rates. Moreover, it helped to conduct appropriate follow-up reminders and support the respondents in any queries they had regarding the questionnaire items. The initial communication to the respondents include clear instructions of the questionnaire, promises of anonymity, and explaining how the output of the research can contribute to the utilization of SAP ERP system.

Accordingly, the questionnaire was hand delivered to 140 selected respondents physically by the researcher. Subsequently, continuous follow-ups conducted through phone and also visit to encourage the respondents to finalize the questionnaires timely with their genuine feedbacks.

After data is collected using survey instrument, logged and tracked on excel sheet. Eventually, Statistical Package for Social Science (SPSS) version 20 Software used to code all the required variables for the analysis. Accordingly, the questionnaire items were codded and the data imported to SPSS tool.

Data cleaning was conducted for possible omissions, missing items and errors and outliers. Of the total number of distributed questionnaires, 129 were collected. This indicates the

achievement of 92.14% response rate. Of the 129 responses collected, 5 responses deemed incomplete, leaving 124 usable responses that are ready for analysis of the study.

3.3. Pilot Study

A pilot study was conducted with a sample of 14 purposively selected SAP users in order to test the validity and reliability of the questionnaire. Moreover, it helps to ensure whether the instruments are free of ambiguity and irrelevant items. Pilot study is also valuable for controlling bias in data interpretation prior to disseminating the survey to the actual full-scale group. The pilot survey participants were selected from HR, FICO, logistics and IT audit units of the case organization. One to one discussion was held with the pilot study respondents prior to distributing the questionnaires. All of the participants filled the questionnaire, which indicated 100% response rate of the pilot study. Once the questioner was filled, the feedbacks were gathered from the participants. In accordance with the pilot test feedbacks, the questionnaire was amended to improve the clarity of the questions, minimize data interpretation bias and increase the likelihood of success. Further, to measure the internal consistency of the questionnaire, reliability test was conducted. Accordingly, cronbach's coefficient alpha was used as a reliability criterion with the help of SPSS. Accordingly, Cronbach's Alpha is the most common measures of the reliability of the internal consistency. As per Norman (2003, p.219), this coefficient ranges between 0 and 1, with a high value indicating a high level of consistency among the items. In view of that, the result (.917) obtained is greater than 0.70 which is the minimal alpha value to prove the internal consistency and reliability. Hence, the Cronbach's alpha test is an indication that the survey questionnaire's reliability and internal consistency to use for the study as can be seen in table 5.

Table 5: Reliability Statistics based on the Pilot test data

Reliability Statistics		
Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
.917	.917	50

Source: Own survey, 2015

3.4. Data Analysis and Presentation Method

After the data is collected from the identified areas of data sources, it is edited, organized and analyzed using SPSS based on appropriate statistical methods and tools. Descriptive statistics methods such as frequency distribution, mean calculation, cross tabulation and graphical representations are used to summarize the collected data. To analyze the significance of differences, inferential statistics such as chi-square, Kendall's tau-b, Spearman bivariate correlation and principal component analysis are used. Principal component analysis has criteria to test the reliability of the data prior to conducting automated software ranker and classifier. Accordingly data screening and sampling adequacy tests were conducted. The data screening was conducted using Correlation matrix (R-matrix) which contains the Pearson correlation coefficient between all pairs of survey questions including the level of significance. Moreover, Kaiser-Meyer-Olkin measure of sampling adequacy, Bartlett's test of sphercity, and anti-image correlation and covariance matrices were investigated. In addition to this, reliability analysis has been conducted using Cronbach's Alpha test to measure the reliability and internal consistency of the survey. Based on the above tests, the survey data is found to be appropriate for principal component analysis. In the process of conducting principal component analysis, automated software ranker was used to rank constructs contributing to ERP post-implementation success on the basis of their importance. Moreover, automated software classifier was used to help classifying the ranked factors contributing to ERP system post-implementation success.

Qualitative data is analyzed using open codding with narrative form. The analysis revealed post-implementation issues that are under study; examines the level of user satisfaction; identifies the correlation between ERP post-implementation utilization and the identified themes; and also determine the components of the proposed framework. Based on the output of the analysis and existing literatures, post-implementation framework is designed and evaluated accordingly.

3.5. Quality of Research & Evaluation of the Framework

The quality of a research can be evaluated using its reliability and validity. The reliability and validity of the study is further discussed below.

3.5.1. Reliability of the research

Reliability measures internal consistency of the subjects in the survey items. In other terms, if an object is measured multiple times using the same instrument, nearly the same result should be found each time with little or no measurement error (Kerlinger and Lee, 2000). Cronbach's coefficient alpha is broadly used as reliability criterion.

In this study, since a standard survey questionnaire was not used, conducting pilot study became paramount to ensure the reliability and validity of the questionnaire items. Accordingly, pilot study was conducted prior to distributing the survey to the actual survey participants. The Cronbach's alpha coefficient (.916) indicated that the survey questionnaire is reliable since it is greater than 0.7 which is the minimal alpha value. Subsequently, the reliability test conducted again using the full scale data and the result (.969) revealed the internal consistency and reliability of the survey instrument. However, it is possible to get large value of alpha by having large number of items which leads to bias of the reliability. Hence, it is found relevant to test the reliability of each of themes (technical, organizational, and operational) in order to get more reliable result. Accordingly, further reliability analysis was conducted with Cronbach's alpha result of technical (.914), organizational (.943) and operational (.923). Thus, the study is reliable based on the obtained result of the reliability tests.

3.5.2. Validity of the research

According to Kerlinger and Lee (2000), validity can be measured in the form of content and construct. Content validity assesses how well the survey instrument items address the problem being investigated. In order to assess the content validity of this research, ERP subject matter experts evaluated the items of the survey questions and also the interview outline. Accordingly, the instruments were revised based on the subject matter experts' feedback collected through a focus group discussion.

Construct validity is an assessment of the constructs whether they measured the dependent variable or not. In this study, principal component analysis is used to assess constructs' validity, rank the constructs based on their importance to ERP post-implementation

success. The study revealed that out of 50 variables only one variable is eliminated which indicates the validity of the constructs.

3.5.3. Framework Evaluation Approach

Evaluation, via well-executed method, is considered as an important element of IS research process to demonstrate the utility, quality, and efficacy of a design artifact. An IT artifact need rigorous evaluation with respect to functionality, completeness, reliability, usability, fit to the organization, and other relevant quality attributes prior to using it to the intended goal (Hevner, 2004).

According to Hevner (2004), an IT artifact can be evaluated by observational, analytical, experimental, testing, expert validation, and descriptive methods. These evaluation methods can be applicable depending to the type of the study at hand. In this study, expert validation and descriptive methods are used to evaluate the proposed framework. Accordingly, focus group discussion and survey questionnaires are the two ways used to gain expert validation. Moreover, descriptive method is used to describe the utility of the proposed framework by building a convincing argument for the artifact's utility.

CHAPTER FOUR

Data Presentation, Analysis and Discussion

In this chapter, data obtained from various sources are presented, analyzed and discussed based on the specific objectives and in line with the existing theory. The first section incorporates quantitative data presentation, analysis and discussion and the second part consists of the qualitative data analysis and discussion. In the first section, characteristics of the respondents, utilization of SAP ERP module and sub-modules, ERP post-implementation utilization issues, and the level of user satisfaction are also presented, analyzed and discussed. Moreover, the finding of principal component analysis is discussed in order to identify the determinants of ERP post-implementation success. In the second section, qualitative analysis and discussion is presented according to the data obtained through the interview which was conducted based on the interview questions outline. Moreover, triangulation is conducted by referring the findings of quantitative analysis in the qualitative discussion and vice versa.

4.1. Quantitative Data Presentation, Analysis and Discussion

4.1.1 Characteristics of the respondents

The survey questionnaire gathered demographic data that may have some implication on ERP post-implementation success. The demographic data is pertaining to job position, total number of work experience and the SAP modules, and sub-modules the respondents use for their day to day business activities. In this section of the chapter, the characteristics of the sampled respondents are first discussed.

4.1.1.1. Distribution of Respondents by Department/ Section

The data pertaining to the distribution of the respondents by department/ section characteristics are shown in Figure 6. The sample size from each department/ section was determined based on the number of SAP users in that specific business unit who work on SAP ERP system for the core business activities. Accordingly, around 10% of the respondents were

from purchasing department followed by Receivables & collection control, and Payroll with close to 6% each based on the total number of users. This implies good representation of each of the business units of Ethiopian airlines based on the proportional size of the target population; which helps to get reliable information and minimize bias.

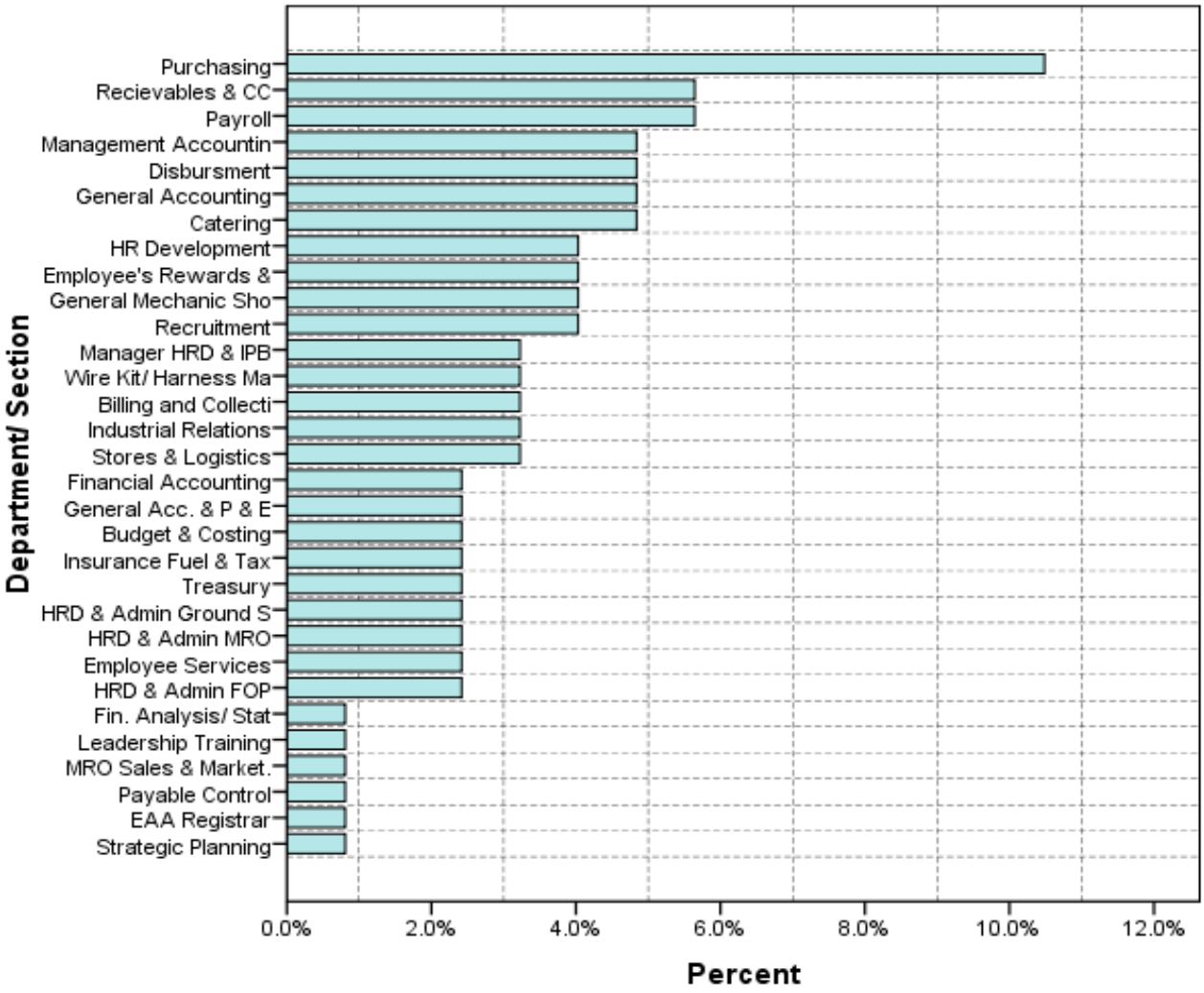

Figure 6: Distribution of the respondents by department/section (Source: Own survey, 2015)

4.1.1.2. Distribution of Respondents by job position

The distribution of the respondents with respect to their current position in the organization is depicted in Figure 7. Considering the population of SAP users, the majority are non-management staffs as compared to the number of the users who are in management position.

Accordingly, more than half of the respondents (N =77) belong to non-management category which constitute close to 62% of the total respondents. The next highest category of respondents (N= 26) is supervisor and constitute 21% of the sample. Managers (N = 13) and lead (N = 8) account for 10.5% and 6.5% of the sample respectively. This indicates that the survey incorporates employees with different levels of positions to ensure the representation of the sample and also to investigate the impact of the position of an employee on ERP post-implementation success.

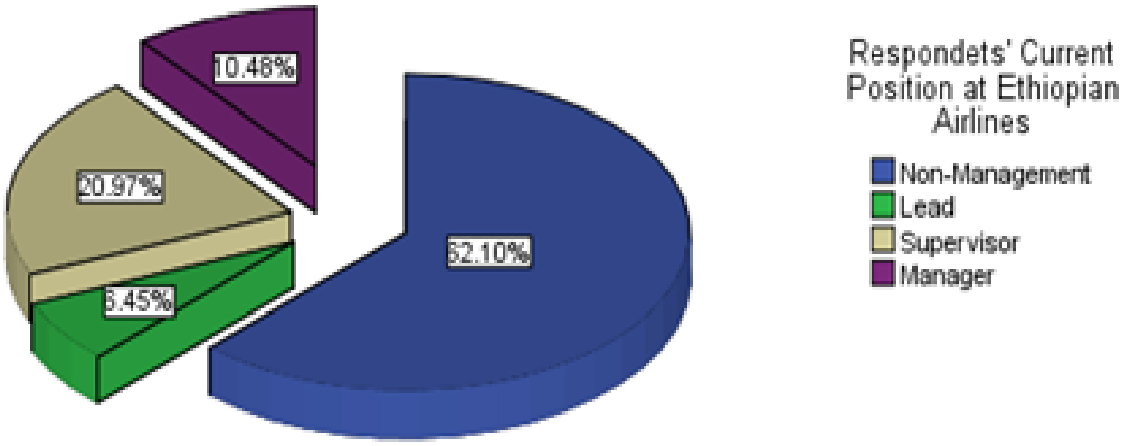

Figure 7: Current job positions of the respondents (Source: Own survey, 2015)

4.1.1.3. Distribution of Respondents by Service Year

Service year is an important determinant factor in explaining how well the employee performs in an organization. Accordingly, the service year related data of the respondents is captured by the questionnaire. This helps, to investigate whether ERP post-implementation success can potentially be affected by the experience of the employees in the organization. The work experience of the respondents in the organization is summarized in table 6 as can be seen below. As indicated in the table, close to 77% of the respondents are with service year of ten and less than ten years, from which close to 34% are with an experience between six and ten years. This implies the survey incorporated respondents with sufficient experience in the organization to understand business processes and experience both on legacy systems and in SAP ERP system; and also respondents with little or no experience on the legacy systems. This indicates

the representativeness of the sample considered in this study. Moreover, it helps to analyze the impact of employees' service year on ERP post-implementation success.

Table 6: Experience of the respondents working in Ethiopian Airlines

Service year of the respondents in the organization			
Service year	**Frequency**	**Percent**	**Cumulative Percent**
< 2 years	17	13.7	13.7
2-5	37	29.8	43.5
6-10	42	33.9	77.4
11-15	11	8.9	86.3
>15	17	13.7	100.0
Total	124	100.0	

Source: Own survey, 2015

4.1.2 Extent of use of SAP Module and Sub-Modules

As mentioned in the methodology chapter under research population section, SAP ERP system has functionalities that facilitates administrative business activities and processes such as; Employee self-service (ESS), CATS, PMS, Travel Management, Employees' Uniform Management, Ticket Benefit Management, Material reservation to charge materials from store for cost center consumption, Material reservations approval, Purchase requisition creation, and Purchase requisition approval by immediate supervisor before the document is submitted to purchasing section.

These above mentioned functionalities are used almost by all users of SAP ERP system. Hence, a respondent is considered as a user of two or more modules if he/she uses more than one module for the core business activities of his duties other than the administrative functionalities of the system. With this understanding, the majority of the respondents use single SAP module and users of FI/CO, HRM, and Logistics modules accounts 37%, 34%, and 26% respectively. As indicated in Figure 8, there is no strong trend in the organization to use different modules simultaneously. This indicates the need for training and awareness creation workshops; which can be considered as one of the initiatives among others to improve users' understanding on cross-functional business relationships.

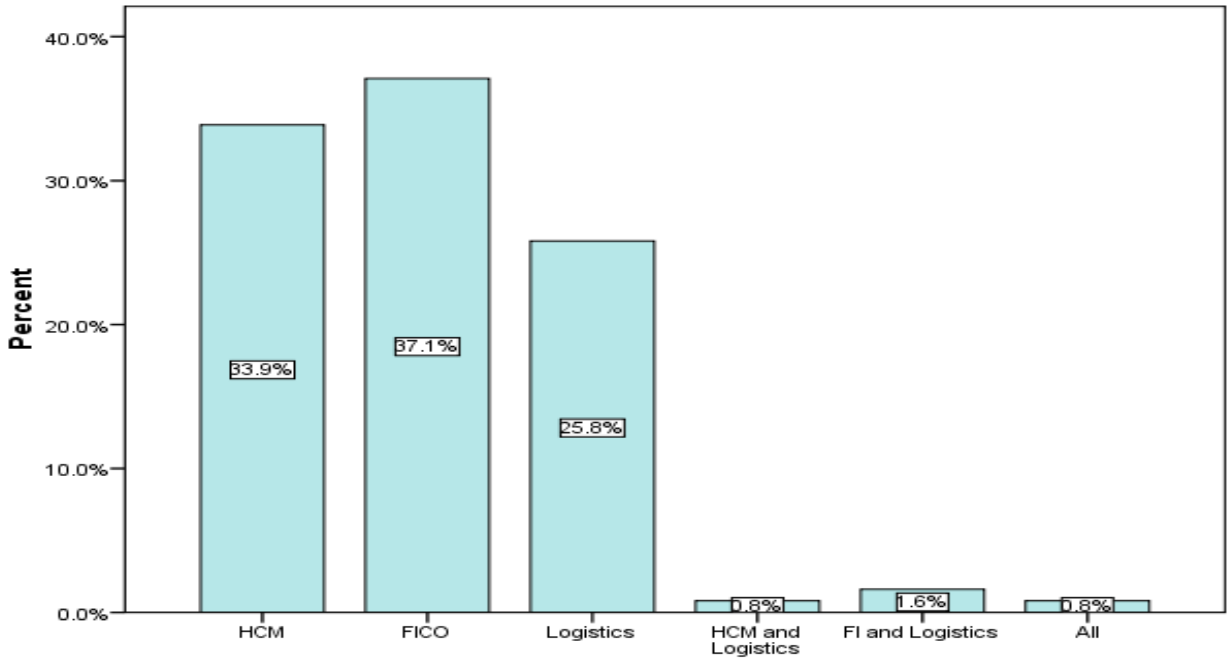

Figure 8: Extent of use of SAP modules ((Source: Own survey, 2015)

Within each of the above SAP ERP system modules there are sub-modules. The top 10 frequently used out of the total 37 sub-modules are summarized in Table 7 as shown below. The table excludes portal, CATS, TLM, PMS, and TM sub-modules since they are used by all respondents for administrative activities. Personnel Administration (PA) module is used by 25% of the respondents. The reason is majority of the HR activities such as managing employees' master data are handled using PA module. Some of the activities are hiring, employees' promotion, transfer, demotion, basic pay, allowance and license related payment of employees is handled by PA module. The next frequently used sub-module is material management (MM), which account for 17.74 % of the total respondents. The reason is the respondents from purchasing have the largest number as discussed in section 4.1.1 which was proportionally drawn from MM users target population. The third frequently used sub-module is e-recruitment which consists of 12.9 % of the total respondents. The reason is, the HR activity is currently decentralized and resides in 7 core business units of the organization. Hence, respondents were drawn from each decentralized HR units in order to get a good representative and unbiased output. Accounts payable (AP) and direct operating cost (DOC) sub-modules are being used by

11.29 % of respondents each. Each of the other remaining sub-modules is used by less than 10 percent of the respondents according to the proportionated target population.

Table 7: The top 10 frequently used SAP ERP system sub-modules

Sub-module	Frequency	Percent
Personnel Administration (PA)	31	25.00%
Materials Management (MM)	22	17.74%
E-Recruitment (EREC)	16	12.90%
Accounts Payable (AP)	14	11.29%
Direct Operating Cost (DOC)	14	11.29%
Accounts Receivable (AR)	11	8.87%
General Ledger (GL)	11	8.87%
Banking (BK)	9	7.26%
Sales and Distribution (SD)	8	6.45%
Payroll	7	5.65%

Source: Own survey, 2015

4.1.3 ERP Post-Implementation Utilization Issues

4.1.3.1. ERP Post-Implementation Utilization Issues: Technical Issues

As indicated in the research model, there are three constructs that are investigated in relation with technical theme. These are ERP attributes, IT expertise & user's support level quality and external relationship management. External relationship management was addressed only through interview considering that the right informants of the construct are IT managers. Based on this, CIO and Director Business Transformation of the case organization are interviewed to address external relationship management and its qualitative analysis and discussion is presented in section 4.2 of this chapter.

The issues of ERP post-implementation in the context of technical theme constructs are analyzed and discussed below.

ERP Attributes

It has been argued that ERP system's technical attributes play a significant role in users' satisfaction and hence the effective utilization of the system (Wu & Wang, 2006; Kouki et al.,

2007). There are various technical issues that deserve attention to improve the effectiveness of the utilization of the system. The technical ERP attributes in broad include ERP system timeliness, information accuracy, reliability, response time, flexibility, completeness, output requirement, ease of use, usefulness of the system to the users, relevancy of the information executed by the system and integrated nature of the system (Wu & Wang, 2006). In line with this, the questionnaire rating of the components of the ERP attribute construct is summarized using table 8 and also further discussed in the subsequent paragraphs.

Table 8: ERP attributes construct (Percentage distribution and Mean)

ERP attributes associated with SAP system	Strongly Disagree	Disagree	Undecided	Agree	Strongly Agree	Mean
Accuracy & reliability of information	5.6	21.8	21.8	41.1	9.7	**3.27**
Up-to-date information	4.0	19.4	20.2	45.2	11.3	**3.40**
Comprehensiveness of information	14.5	37.9	12.9	31.5	3.2	**2.71**
Usefulness and relevance	0.8	10.5	10.5	58.9	19.4	**3.85**
Swiftness and easiness to learn the system	24.2	28.2	14.5	23.4	9.7	**2.66**
System's response time to user activities	17.7	26.6	12.1	38.7	4.8	**2.86**
Flexibility in terms of system use	15.3	40.3	21.0	21.0	2.4	**2.55**
Flexibility to meet new business requirements	14.5	33.1	34.7	16.1	1.6	**2.57**
Improvement of information systems' integration	4.0	12.1	16.1	56.5	11.3	**3.59**
Usefulness of the system in user's work	0.8	7.3	8.9	58.1	25.0	**3.99**

Source: Own survey, 2015

The system's technical characteristics significantly impacts the end user's satisfaction and, by the same token, the effective utilization of the system and its post implementation success (Moore & Benbasat, 1991; Wu & Wang, 2006; Kouki et al., 2007). The quality of ERP attributes is examined through the technical characteristics of the system mentioned above. The aggregate mean (mean of the mean) result for the ERP attribute construct is found to be 3.145, which is rated in the agreement category. Among ERP attribute related variables addressed in the questionnaire, flexibility of the system in terms of system use and meeting new business requirements have the lowest mean value. This indicates that majority of the respondents disagreed to the flexibility of SAP ERP system that is being utilized in Ethiopian Airlines. In today's business, organizations are operating in a dynamic competitive environment and changing business processes; which demands flexibility in the business and also systems that

automate the business processes. In line with this, several scholars considered flexibility as an essential attribute of ERP systems (Gupta & Kohli, 2006; Kouki et al., 2007). Hence, ERP system should be flexible enough to meet new business processes and addition of modules (system components) to support supplementary business functions (Shehab et al., 2004; Kouki et al., 2007).

Majority of the respondents (53%) disagreed to the comprehensiveness of the information they get from SAP ERP system. This implies that the level of information derived from the system doesn't respond to user's need; which entails users to further manipulate data from different sources and compile the required information. More than half of the respondents (52%) disagreed to the swiftness and easiness of the SAP ERP system to learn how to use the system. This implies the demand of training intervention and appropriate knowledge sharing communications, which can be considered as one of the initiatives among others, to improve the utilization of the system.

The system's response time is another important factor that determines the utilization of the system (Wu & Wang, 2006; Kouki et al., 2007; Ononiwu, 2013). In line with this, only 43% of the respondents replied that the response time of the system is satisfactory. The response time of ERP system transactions can be affected by several reasons. One of the reasons is the data size growth as the business transactions of the organization increases. This indicates the importance of continuous performance monitoring of the system to proactively follow-up response time and apply technological solutions to resolve the performance issues. The other reason that affects response time is the way the programming code is developed both for the SAP standard and also custom programs. In the case of standard programs, the vendor releases SAP notes, patches and upgrade programs to improve the software components with performance issues. Hence, applying the notes, patches and upgrades can improve response time related issues. On the other hand, IT development team of Ethiopian airlines is responsible to review and optimize the software codes in the case of custom programs that are developed by the internal team. Moreover, the development team should adhere to development standards like modularization techniques for the new custom programs as well.

Data accuracy is another important attribute that determines ERP post-implementation success. According to the survey, the existence of data accuracy is agreed only by 50.8% of the respondents.

ERP systems have been considered as a solution for poor data integration by replacing silo legacy systems (Davenport, 1998; Knolmayer & Röthlin, 2006). On the other hand, data problems may get intensified when using ERP systems since the modules of ERP system are intricately linked to each other, which indicates poor quality data input in one module can affect the functioning of other modules negatively (Park & Kusiak, 2005). Moreover, data accuracy is affected not only by the usage of ERP system but also other corporate systems that are integrated to the ERP system across the value chain. Inaccurate data impacts an organization negatively in various ways. It leads to increased running costs, inefficient decision-making processes, lower performance and lowered users satisfaction (Haug et al, 2011).

Poor data quality can lead to wrong strategic business decisions which have negative economic impact in the organization (Knolmayer & Röthlin, 2006). On the other hand, detecting and correcting errors increases operational costs related with time and other resources. Haug et al (2011) also stated "Business intelligence (BI) projects often fail due to dirty data, so it is imperative that BI-based business decisions are based on clean data". This indicates that the data accuracy awareness trainings and workshops are required to educate the user community of Ethiopian airlines to help them realize the impact of their specific activities in the cross-functional value chain. Moreover, data governance strategy should be defined to improve the data accuracy continually.

Hence, ERP system's flexibility, response time, data accuracy, comprehensiveness of the information found in ERP based and BI reports, and swiftness with respect to learning the system are technical attributes related issues that are identified for improvement.

IT Expertise & Users' Support Level Quality

IT team expertise and users' support level quality is one of the important factors to the effective utilization of the system. This is due to the fact that the system needs continuous support, maintenance and upgrading to align the system with the business needs and changes (Hakkinen & Himola, 2008). In line with this, the questionnaire rating of the components of the

IT expertise and user support level quality construct is summarized in table 9 and also further discussed in the subsequent paragraphs.

Table 9: IT expertise & user support level quality construct (Percentage distribution and Mean)

IT Expertise & User Support Level Quality related variables	Strongly Disagree	Disagree	Undecided	Agree	Strongly Agree	Mean
Help desk responsiveness to solve system related problems	25.8	39.5	21.8	9.7	3.2	**2.25**
User support regarding SAP system	21.0	31.5	29.8	16.9	0.8	**2.45**
Change requests regarding system functionality	17.7	40.3	27.4	13.7	0.8	**2.40**
Change requests regarding configuration master data	19.4	35.5	30.6	14.5	0.0	**2.40**
Change requests regarding user authorizations	7.3	20.2	21.8	41.1	9.7	**3.26**

Source: Own survey, 2015

In order to assess technical theme issues, respondents were asked for their view with respect to IT team expertise and user support level quality. The overall mean value of this construct (2.25) has lower rating than ERP attributes construct (3.145). Hakkinen & Himola (2008) examined the impact of information quality, system quality and user support level quality on the perceived effects of the system. The empirical study indicated similar result with this study in which the user support level quality has lower mean value than the information and system quality. This implies that, since majority of the ERP attributes are embedded on the system while purchased from the vendor, the quality of the user support requires substantial efforts to support users and also improve the attributes of the system.

SAP end users contact help desk to report any question, incident or a problem that they are facing in relation to SAP system. Majority of the respondents (65%) disagreed to the responsiveness of Help desk which exhibited the lowest mean result (2.25) from the entire technical theme variables. This indicates that the resolution of an incident or a problem takes longer time due to Help desk responsiveness. As help desk is the first point of contact for end users, well trained people, properly defined support processes, and standard service management technology should be adopted to improve the support processes. In the same context, prompt user support regarding SAP system has a mean result which is below 3. Moreover, change requests

regarding system functionality and configuration master data have mean result of 2.4 which lies under ‘disagree’.

Several scholars asserted that the level of IT expertise required by ERP systems is higher than the expertise required supporting in-house developed legacy systems (Kouki, 2007; Hakkinen & Himola, 2008; Ononiwu, 2013). This change demands a highly educated, skilled and trained IT team. Even if there are initiatives undertaken by the organization to train the IT team, it still needs additional efforts to improve the support service quality and enhance the IT team’s expertise. Ononiwu (2013) empirically asserted that inadequate ERP expertise is one of the inhibitors of the effective use of ERP systems. Similarly, Peng & Nunes (2010) identified lack of well-trained in-house IT specialists to be one of the ERP exploitation barriers; that prevents firms from effectively monitoring, maintaining and improving the system in the long term.

The aggregate mean (mean of the mean) result for the IT expertise & user support level quality construct is found to be 2.552, which is rated in the ‘disagree’ category. This implies that IT team expertise and user support level quality constructs are the major technical issues identified as a gap for the success of ERP system post-implementation utilization in Ethiopian Airlines. This outcome is in consistent with other scholars’ findings. For instance, Ononiwu (2013) examined and identified the major inhibitors of the effective use of ERP systems. In due course, the research empirically analyzed and found inadequate ERP expertise has lower mean result than ERP default attributes. Similarly, Hakkinen & Himola (2008) found that IT expertise and user support level quality are the major issues of technical theme.

4.1.3.2. ERP Post-Implementation Utilization Issues: Organizational Issues

The organizational theme consists of training, top management championship, absorptive capacity, user involvement, strategic alignment, and continuous improvement constructs. The overall score of organizational related variables has exhibited lower mean result (2.94) than technical and operational related variables. This finding is in line with other researchers’ findings which indicate that ERP post-implementation barriers mainly originated from organizational issues; which thus are more important than technical problems (Davenport, 1998; Peng & Nunes,

2009). The issues of ERP post-implementation in the context of organizational theme constructs is analyzed and discussed below.

Training

Several researchers, including Jones et al. (2008), Hakkinen and Himola (2008), Ruivo et al, (2012), Kiriwandeniya (2013) and Ononiwu (2013) assert training of the users is considered as one of the main determinants for successfully adopting, using and realizing benefits from ERP systems. Jones et al. (2008) further explained that, it looks reasonable to expect that users who had received insufficient training would be less likely to explore the functionality of the system for a broader and deeper usage. Accordingly, respondents were asked about SAP system training with respect to its quality, duration, and material sufficiency. In addition to the formal training, the survey attempted to investigate whether users take initiative by themselves to explore the system and improve their understanding. They were also requested the knowledge dissemination methods effectiveness for adopting new functionalities and changes. Moreover, the survey attempted to evaluate the users' understanding of the system's advantages and capabilities. The questionnaire rating of the components of the training construct is summarized in table 10 and also further discussed in the subsequent paragraphs.

Table 10: Training (Percentage distribution and Mean)

Training Related Variables	Strongly Disagree	Disagree	Undecided	Agree	Strongly Agree	Mean
Quality of SAP training	28.2	45.2	12.9	12.1	1.6	**2.14**
Duration of SAP training	23.4	49.2	16.1	9.7	1.6	**2.17**
Training material sufficiency	21.0	37.9	18.5	21.8	0.8	**2.44**
Proper circulars to adopt the change	12.9	46.0	21.0	18.5	1.6	**2.50**
Awareness of SAP system's advantage and capabilities.	8.9	23.4	30.6	29.8	7.3	**3.03**
Explore the SAP system to look for new ways	13.7	34.7	22.6	24.2	4.8	**2.72**

Source: Own survey, 2015

According to the survey, training is one of the low rated from all organizational theme constructs. The quality and duration of SAP system training was not accepted by most of the respondents (73%). As the training material is also related with the quality of the training, more than half of the respondents (58%) disagreed to the sufficiency of training material. Training can

help users to be aware of the system's functionality, advantages and capability. If the training is aligned with the system and the business process, users can utilize the system fully in their day to day business activities. The type, content and, duration of the training should be defined by considering the end users IT knowledge and capability. Moreover, the training materials should fit with end users' unique business environment and context and be customized to the organization's requirements and needs.

SAP audit has been conducted by an international SAP audit firm in August, 2014. According to SAP audit output, education and training is one of the findings labeled as high risk area. Based on the audit finding, neither the SAP support team nor the SAP end-users have received any SAP system training since go-live. Thus, lack of training created negativity towards the SAP system and users assume that the system cannot do what they want on their job (Design Review of SAP Solution Detailed Report of Findings and Recommendations Education, August 2014). The audit report indicated that, SAP support team cannot provide the required level of support because of their skill levels. As a result, support tickets stay open for long time and end users do not get a solution to the problems which causes in a negative perception on users that the SAP system is not working or cannot address the business requirements. Training related finding of this study is also consistent with other scholars (Hakkinen & Himola, 2008; Ononiwu, 2013; Kiriwandeniya et al., 2013) that the end users should be properly trained to utilize the system and ensure ERP post-implementation success. Hence, the survey feedbacks mainly indicate training is one of the improvement areas for ERP system utilization.

The aggregate mean (mean of the mean) result for the training construct is found to be 2.5, which is rated in the 'disagree' category. Thus, the content, duration and, material of SAP system training needs to be revisited; quality checked by IT quality assurance team of Ethiopian airlines based on defined metrics. In addition to this, training roadmap should be revisited to clearly show the training requirements for new entrants and also existing end users recurrent and refresher courses.

Top Management Championship

ERP system passes through continuous technological developments and endless requirements due to dynamic business changes and demands. Thus, top management

championship should be sustained not only in the implementation (project) phase but also while the system is operating. In order to evaluate the top management championship, this study used two different approaches. The first approach was through the survey questionnaire in which; respondents were requested the commitment of their immediate supervisors in using, training, discussing regarding SAP system with their subordinates. The second approach was evaluating the commitment of top management members who participated on the interview. The percentage distribution and the mean result of top management construct components is presented below in table 11 based on the questionnaire ratings.

Table 11: Top management championship (Percentage distribution and Mean)

Top Management Championship related Variables	Strongly Disagree	Disagree	Undecided	Agree	Strongly Agree	Mean
Immediate supervisor allows time to attend SAP related training	17.7	33.9	20.2	24.2	4.0	**2.63**
Immediate supervisor allows time to attend SAP business process related training	15.3	38.7	24.2	17.7	4.0	**2.56**
Discussion with supervisor on the impacts of SAP impacts on the job	9.7	30.6	18.5	34.7	6.5	**2.98**
Discussion with supervisor about their tasks fit on the 'big picture' of SAP business process	6.5	32.3	30.6	25.8	4.8	**2.90**
My immediate supervisor uses SAP modules that I am currently using	3.2	22.6	12.1	50.8	11.3	**3.44**

Source: Own survey, 2015

The respondents were asked about the championship of their supervisors to discuss the impact of SAP system on their activities and tasks; in which significant number of respondents (40%) did not agree on it. It is also attempted to evaluate the commitment of the supervisors on conducting discussion forums with their subordinates about how their tasks fit in the big picture of the entire SAP business processes. In this regard, only 30% of the respondents agreed the commitment of their immediate supervisors. With the same token, the respondents were asked regarding their immediate supervisor's willingness in allowing them to attend SAP related training; in which only 26% of the respondents agreed the commitment of their supervisors. This indicates that supervisors needs further awareness to realize the impact of training on their subordinate's knowledge regarding the system; which ultimately affects the utilization of the system and post-implementation success. Moreover, the aggregate mean (mean of the mean)

result for the top management championship construct is found to be 2.902, which is rated in the 'disagree' category.

It has been argued by several scholars that top management championship is the most crucial factor affecting the success of not only ERP implementation but also post-implementation utilization (Jones et al., 2008; Kouki et al., 2007; Peng & Nunes, 2009; Kiriwandeniya et al., 2013). The end users should understand the integrated nature of ERP system and realize the value of their activities in the entire process of system and also the organization. This helps to improve data quality by making users aware of the impact of input errors on the entire system's data quality and top management decision making. Supervisors can play this leading role by educating their subordinates about integrated nature of the system so that they can understand where their activities fit in the big picture of the ERP process. However, the survey result revealed that there is insufficient support and commitment by the supervisors to create an educated subordinates/ team through the above mentioned initiatives. One of the reasons attributed is the awareness level of the supervisors themselves in the big picture of the system's contribution to their improved business process and achieving business results (Jones et al., 2008). Thus, top management commitment is one of the improvement opportunities to improve utilization of the system by the end users.

Absorptive Capacity

Table 12 provides finding regarding absorptive capacity related scores received from the ratings of the respondents. It is also further discussed in the subsequent paragraphs.

Table 12: Absorptive capacity (Percentage distribution and Mean)

Absorptive Capacity related variables	Strongly Disagree	Disagree	Undecided	Agree	Strongly Agree	Mean
EAL uses tools and services to disseminate best practices	2.4	35.5	23.4	33.9	4.8	**3.03**
EAL knowledge sharing system for SAP related changes	4.8	41.9	25.8	21.8	5.6	**2.81**
EAL procedures to document and communicate changes of SAP system	3.2	37.1	33.1	22.6	4.0	**2.87**
EAL has structurally defined central coordinating office	4.0	30.6	29.0	31.5	4.8	**3.02**
EAL staff members are encouraged to share SAP related ideas	10.5	26.6	25.8	31.5	5.6	**2.95**

Source: Own survey, 2015

The aggregate mean (mean of the mean) result for the Absorptive capacity construct is found to be 2.936, which is rated in the 'disagree' category. Ethiopian airlines use different services and tools to disseminate SAP system related knowledge. However, the survey indicated that only 39% of the respondents agreed to it. This would suggest that the knowledge and learning dissemination tools and services are ineffective to address all levels and types of users. Moreover, the respondents were asked whether staff members are encouraged to share SAP related knowledge. Accordingly, only 37% of the survey participants agreed to employees' knowledge sharing culture on SAP system.

Knowledge transfer is one of the strategic initiatives of the organization (EAL Vision 2025 and Strategic Road Map, 2009). In line with this, there are coaching initiatives started in the organization to structure and standardize knowledge sharing in business unit/ sections level (HCM Strategy, 2010). ERP, being a complex system, imposes a heavy learning curve and proper management of the system related knowledge sharing and communication (Ononiwu, 2013). In line with this, computer literacy also determines the learning capacity of employees; especially when the knowledge is disseminated through technological channels like portal and e-mail. This limitation result in resistance to change and also slow adoption for continuous changes of the system (Kouki et al., 2007).

Kouki (2007) also pointed out the importance of organizations' commitment to encourage learning and knowledge management by putting in place procedures to capture, codify, and disseminate ERP related knowledge. He also empirically investigated it in three case companies; in which the assimilation of ERP system was realized to be impacted by the management of existing knowledge and also new knowledge acquiring and dissemination. Hence, ERP system related knowledge management should be defined as one of the basic elements of SAP system post-implementation success. In line with this, several scholars emphasized to sustain organizational change management (OCM) not only during implementation phase but also throughout the SAP system's life time (Lee & Lee, 2004; Kouki et al., 2007; Ononiwu, 2013). One reason for this is the inevitable continuous change of the system that demands continuous learning and change from the people side as well. In other words, ERP system often requires underlying cultural shift along with the technical shift to keep the end users aligned with the ongoing continuous improvement process.

User Involvement

User involvement is another critical element that determines post-implementation success (Kouki et al., 2007; Jones et al., 2008). The survey questionnaire attempted to examine the level of user involvement in relation with SAP system. Accordingly, the percentage distribution and mean result of the respondents' rating is depicted in table 13.

Table 13: Responses on user involvement (Percentage distribution and Mean)

User Involvement related variables	Strongly Disagree	Disagree	Undecided	Agree	Strongly Agree	Mean
Understanding of cross-functional work process	0.0	11.3	16.9	56.5	15.3	**3.76**
Fitness of task(s) I perform to the overall work process	0.8	8.9	15.3	61.3	13.7	**3.78**
Understanding of other departments task to activities carry out	0.0	10.5	16.9	51.6	21.0	**3.83**
Understand the task(s) that serves as an input to other departments'	0.0	9.7	20.2	54.8	15.3	**3.76**
I understand the overall work process that my task(s) is part of.	0.8	13.7	16.9	54.0	14.5	**3.68**

Source: Own survey, 2015

The user involvement is examined through the level of their understanding about the cross-functional work process of SAP system. Most of the respondents (72%) agreed that they understand the cross-functional nature of SAP system. Furthermore, the aggregate mean (mean of the mean) result for the user involvement construct is found to be 3.762, which is rated in the agreement category. Though the data shows a positive result, user involvement considered as one of the improvement areas to enhance organizational data quality. In other words, SAP system users should know the input-output relationship of various business sections across the business value chain. This demands to have process oriented mentality rather than silo thinking so that users can be aligned with ERP, a process based system.

According to Jones et al. (2008), user involvement in understanding cross-functional business relationship determines the level of the system utilization. In other words, users should know how their own business activities fit into other department's business processes. Hence, OCM needs to be structurally in place to manage organizational changes and learning in coordination with center of excellence (COE) team. In due course, super users can be nominated

from different units of the organization and train them to boost employees' engagement on the system. The super users of each section can be the leaders to facilitate SAP related organizational learning and utilization by facilitating the engagement of end-users.

Continuous Improvement

ERP systems can generate a significant business value for organizations immediately after the initial go-live stage (Davenport, 1998). However, the full potential of the system can be realized through time, as the firm learns how to take advantage of the system's capabilities (Deloitte consulting, 2010). In line with this, the survey questionnaire attempted to examine the efforts of the organization's continuous improvement. Accordingly, rating of the components of the continuous improvement construct is summarized in table 14 and also further discussed in the subsequent paragraphs.

Table 14: Continuous improvement (Percentage distribution and Mean)

Continuous improvement related variables	Strongly Disagree	Disagree	Undecided	Agree	Strongly Agree	Mean
System update to improve complex functionalities	10.5	36.3	32.3	20.2	0.8	**2.65**
System update to improve the performance	12.1	33.1	33.1	19.4	2.4	**2.67**
System update to improve the system's flexibility.	14.5	35.5	29.0	20.2	0.8	**2.57**
System update to improve business process adaptability.	12.1	32.3	31.5	21.8	2.4	**2.70**

Source: Own survey, 2015

In general, the continuous improvement variables rating of the respondents leaned towards disagreement; and also the aggregate mean (mean of the mean) result is 2.647. A total of only 21% of respondents indicated that there is a continuous update on the system to improve complex functionalities. This continuous update represents improvement on the system functionalities. Similarly, only 22% of the respondents agreed to continuous update of the system to improve performance. By the same token, the continuous system's update to improve the flexibility and business process adaptability agreed only by 21% and 24% of the respondents respectively. This affirms that the need to continually improve the system to address users' complexity issues, improve performance and flexibility. Moreover, the system needs continuous improvement to adapt business process changes. This concurs with the literature that found lack

of continuous improvement as one of the inhibitors of the effective use of ERP systems (Ononiwu, 2013).

Ethiopian airlines established COE team under IT business transformation department with primary objective of providing the structure and culture for continuous improvement and benefits realization. This team creates an important link between the business, the ERP solution, and the IT division to achieve continuous improvement. Deloitte consulting (2010) also emphasized the need of continuous improvement for ERP post-implementation success. For Ethiopian airlines, as it is for many companies, moving to ERP brought a significant change from siloed legacy systems and processes. This demands a continuous effort to fully engage the users with the process oriented system and improve data quality. According to Deloitte consulting (2010), the huge magnitude of change and learning that comes along with SAP implementation limit firm's ability to incorporate the change and realize business results at the same time. Hence, organization's focus on continuous improvement and business result realization, driven by COE team, is critical to harvest the most out of the ERP system investment.

4.1.3.3. ERP Post-Implementation Utilization Issues: Operational Issues

The operational theme consists of cycle time reduction, cost reduction, productivity improvement, data quality improvement, and internal process improvement constructs. The overall score of operational related variables has exhibited higher mean result (3.021) than technical and organizational related variables. The rating of the components of the operational theme is summarized in table 15. Further, the issues of ERP post-implementation in the context of operational theme is analyzed and discussed in the subsequent paragraphs.

Table 15: Operational Theme (Percentage distribution)

Operational factors associated with SAP system	Strongly Disagree	Disagree	Undecided	Agree	Strongly Agree	Mean
SAP improved the efficiency of my work	8.1	29.0	13.7	38.7	10.5	**3.15**
SAP achieved a significant cost reduction.	6.5	20.2	33.1	31.5	8.9	**3.16**
SAP improved the quality of my work	5.6	28.2	17.7	41.9	6.5	**3.15**
SAP increased the efficiency of	4.0	30.6	25.0	33.9	6.5	**3.08**

decision making						
SAP improved the quality of decisions I make in my work	6.5	29.8	22.6	35.5	5.6	**3.04**
Incorrect data input discovered by SAP system	21.8	30.6	17.7	25.8	4.0	**2.60**
SAP users understand the concept and the value of integrated data	17.7	24.2	25.0	30.6	2.4	**2.76**
Data accuracy and integrity improved by using the system	11.3	25.8	21.8	38.7	2.4	**2.95**
SAP improved the possibilities for cross functional communication & internal service	5.6	22.6	25.8	41.1	4.8	**3.17**
SAP system improved internal coordination of business activities.	4.0	28.2	24.2	36.3	7.3	**3.15**

Source: Own survey, 2015

Cycle Time Reduction

Cycle time reduction is one of the operational benefits expected to be achieved through ERP system (Shang & Seddon, 2000; Peng & Nunes, 2009; Esteves, 2009). As a result, it improves post-implementation success by improving the efficiency of users on utilizing the system. Accordingly, the respondents were asked whether the SAP system has improved their work efficiency through cycle time reduction. In view of this, the achievement of cycle time reduction was agreed by 49.2% of the respondents with mean value of 3.15. Though this shows that cycle time reduction is being achieved by the organization, it also indicates the need for further improvement. Scholars strongly argued the impact of cycle time reduction in users' engagement to effectively utilize the system (Hawking, et. In this regard, Hakkinen and Himola (2008) also asserted that cycle time reduction can encourage users to use an ERP system effectively since the users' works can become easier by eliminating overlaps.

Cost reduction

Respondents were asked to evaluate whether their business units achieved a significant cost reduction through the SAP system. As can be seen in table 15, the percentage distribution of agreed respondents for the survey question of cost reduction is 40.4%. The overall mean result of cost reduction variable is rated 3.16 which lies under 'agreed' category. Scholars argue organizations can achieve cost reduction benefits from the go-live date of an ERP system (Hawking, et al., 2004; Hakkinen & Himola, 2008; Peng & Nunes, 2009). This is due to the capability of an ERP system to remove redundant business processes and also embedded best

practices that can be utilized starting from the go-live date. Hence, the achievement of cost reduction, through process improvement, contributes to the ERP system post-implementation success. Though Ethiopian airlines has achievement on cost reduction, further improvement can be achieved subsequently. The COE team can play a significant role on business process improvement and refinement in collaboration with functional business units, SAP support and IT development team.

Productivity improvement

Responses were received from respondents regarding the contribution of an ERP system in improving productivity and producing better outcome. Based on the survey, close to half of the respondents (48.4%) agreed to the quality improvement of their output through SAP system. Moreover, the respondents were asked regarding the efficiency and quality of decision making they achieved through SAP ERP system; in which only 40% of the respondents agreed to it. Productivity improvement is also one of the operational benefits argued to be achieved at the early stage of an ERP system post-implementation phase (Hawking, et al., 2004; Hakkinen & Himola, 2008; Peng & Nunes, 2009). As a result, users can utilize the system effectively which leads to post-implementation success. Thus, as empirically investigated, the productivity improvement is another concern area that needs to be addressed to improve the utilization of the system.

Data Quality improvement

Respondents were asked to evaluate the data quality and integrity improvement achieved by the SAP system. As can be seen in table 15, the percentage distribution of agreed respondents for the survey question of data accuracy is only 41%. Furthermore, the aggregate mean (mean of the mean) result for the data quality improvement construct is found to be 2.77, which is rated in the disagreement category. Literatures argue that data accuracy and reliability improvement can be gained mainly due to the centralized and unified database nature of an ERP system (Shang & Seddon, 2000; Hakkinen & Himola, 2008; Peng & Nunes, 2009; Esteves, 2009). However, the data quality can be affected by the data that comes from other systems across the value chain as well. As the survey result of data quality improvement construct revealed, it is one of the operational issues that demands improvement for ERP post-implementation success.

Internal Process improvement

In order to assess the internal process improvement achieved through an ERP system, respondents were asked for their view with respect to cross-functional communication and coordination of business activities. Accordingly, close to 46% of the respondents, agreed the improvement of the cross-functional communication & internal service through the SAP system. Additionally, the aggregate mean (mean of the mean) result for the internal process improvement construct is found to be 3.16, which is rated in the agreement category. As the data indicates, there are internal process improvements achieved by the SAP system utilization. However, as compared to the potential of an ERP systems promised by literatures, the organization under the study needs extra effort in internal process improvement aspect. In line with this, several scholars mentioned internal process improvement as a quick win with in few months of the system go-live (Davenport, 1998; Esteves, 2009; Peng & Nunes, 2009). When internal process improvement achieved, users gets encouraged to effectively utilize the system which ultimately contributes to post-implementation success. Hence, internal process improvement can be considered as one of the issues of ERP system post-implementation in the dimension of operational theme.

As a summary, the below paragraphs summarize the technical, organizational and operational issues that are identified based on the empirical study:

According to the finding, issues of continuous improvement and training constructs of organizational theme demand prior attention in post-implementation phase. Moreover, top management championship, absorptive capacity and user involvement constructs of the organizational theme issues should be addressed to improve ERP system utilization and post-implementation success.

Flexibility, comprehensiveness of the information found in ERP based and BI reports, response time of the system and data accuracy ERP attributes found to be the most critical issues that should be addressed to ensure ERP post-implementation success. IT expertise and user support level quality is another critical issue of technical theme.

Even though the ERP system facilitated achieving operational benefits since go-live, the finding indicated that further improvement is required in this aspect as well. Among the constructs of operational theme, Data quality improvement is the major issue that needs to be addressed.

4.1.4 Level of User Satisfaction in ERP System

The level of satisfaction with the ERP system is crucial indication of ERP system post-implementation success (Bradford and Florin, 2003; Hakkinen & Himola, 2008; Ruivo, 2012). The level of users' satisfaction associated with ERP system is summarized in table 16.

Table 16: Respondents' overall level of satisfaction with the system

Levels of users' satisfaction in SAP system		
	Frequency	**Percent**
Not at all Satisfied	10	8.1
Not Satisfied	50	40.3
Neutral	25	20.2
Satisfied	37	29.8
Very Satisfied	2	1.6
Total	124	100.0

Source: Own survey, 2015

According to the data shown above, the majority of the respondents which accounts close to half of the total respondents are not satisfied with the system. More specifically, only around 31 % of the respondents are satisfied with the system. The reasons which accrued to the majority unsatisfied users are investigated in the discussion that follows from the perspective of the technical, organizational or operational themes. Accordingly, the variation in the level of satisfaction across the different type of SAP module used frequently and experience of the employees is investigated further.

Table 17 shown below indicates whether there is association between respondents' current position and their satisfaction in the SAP system. If there is significant difference in the level of satisfaction and job position difference can be seen between the count and expected count. As depicted in the table in each of the cells there is statistically insignificant difference in

the numbers. Therefore, there is no strong variability in the level of satisfaction across the different positions of the employees.

Table 17: Cross tabulation between respondent's level of satisfaction in ERP system and current position of the respondents in the organization

Level of satisfaction in SAP system * Respondents current position in Ethiopian Airlines. Cross-tabulation							
			Respondents' current position at Ethiopian Airlines.				Total
			Non-Management	Lead	Supervisor	Manager	
Level of satisfaction in SAP system	Not at all Satisfied	Count	5	2	3	0	10
		Expected Count	6.2	.6	2.1	1.0	10.0
	Not Satisfied	Count	33	4	9	4	50
		Expected Count	31.0	3.2	10.5	5.2	50.0
	Neutral	Count	16	0	5	4	25
		Expected Count	15.5	1.6	5.2	2.6	25.0
	Satisfied	Count	22	2	8	5	37
		Expected Count	23.0	2.4	7.8	3.9	37.0
	Very Satisfied	Count	1	0	1	0	2
		Expected Count	1.2	.1	.4	.2	2.0
Total		Count	77	8	26	13	124
		Expected Count	77.0	8.0	26.0	13.0	124.0

Source: Own survey, 2015

In addition to the above test, the existence of association can be checked using chi-Square tests as presented below in table 18. The null hypothesis of the test is non-existence of association between the variables under consideration. The asymptotic significance indicates failure to reject the null hypothesis. Therefore, consistent with the above result, there is statistically insignificant difference in the level of satisfaction of ERP users across different positions in Ethiopian airlines. This implies that, the data fails to indicate ERP users' level of satisfaction difference is as a result of the different positions employees hold.

Table 18: Chi-Square Tests between level of satisfaction and current position of the respondents

Chi-Square Tests			
	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	9.321[a]	12	.675
Likelihood Ratio	10.935	12	.534
Linear-by-Linear Association	.659	1	.417
N of Valid Cases	124		

Source: Own survey, 2015

In the same way it is possible to test if there is any significant difference in the level of satisfaction due to the work experience of the users. As can be seen in table 19 below, the study failed to reject the null hypothesis that states there is no statistically significant difference in the level of ERP user satisfaction and years of service. This implies that work experience difference makes statistically insignificant difference in users' level of satisfaction.

Table 19: Chi-Square Tests between level of satisfaction and service year of the respondents

Chi-Square Tests			
	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	11.100[a]	16	.803
Likelihood Ratio	12.157	16	.733
Linear-by-Linear Association	.089	1	.765
N of Valid Cases	124		

Source: Own survey, 2015

The same result can also be seen between level of satisfaction and utilization of specific SAP ERP modules as presented below in Table 20. There is statistically insignificant difference in the level of satisfaction across the respondents using different SAP ERP modules.

Table 20: Chi-Square Tests between level of satisfaction and frequency of SAP module usage

Chi-Square Tests			
	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	19.308[a]	20	.502
Likelihood Ratio	19.360	20	.499
Linear-by-Linear Association	.282	1	.596
N of Valid Cases	124		

It is also possible to use Kendall's tau-b and Spearman's Bivariate correlation coefficients to see the association between variables that involves ranked data. As the result shown in table 21 depicts, the study fails to reject the null hypotheses that states no correlation between the level of satisfaction and service year, job position, and SAP module usage, respectively. Furthermore,

though not significant, there exist inverse association between level of satisfaction and work experience of the employee in the organization. This implies that the experienced employees who worked on the previous legacy systems for longer years are more change resistant than the users with lesser work experience. This is also supported by Kouki (2007) that the users with more experience in the legacy systems that are silo based can hardly adopt the process oriented nature of an ERP system.

Table 21: Kendall's tau-b and Spearman's bivariate correlation test

	Test Type		Respondents current position	SAP module used frequently	Service year
Level of satisfaction in SAP system	Kendall's tau_b	Correlation Coefficient	.046	.017	-.019
		Sig. (2-tailed)	.562	.828	.806
	Spearman's rho	Correlation Coefficient	.055	.020	-.022
		Sig. (2-tailed)	.546	.826	.812
		N	124	124	124
**. Correlation is significant at the 0.01 level (2-tailed).					

Source: Own survey, 2015

The finding of the user satisfaction analysis indicated that more than half of the users are not satisfied with the system. According to scholars, user satisfaction is vital to realize the benefits of ERP system through effective system use (Bradford and Florin, 2003; Hakkinen & Himola, 2008; Ruivo, 2012). Hence, ERP post-implementation issues should be addressed in order to improve user satisfaction and ultimately achieve ERP post-implementation success.

4.1.5 Overall Theme's Descriptive Analysis (technical, organization and operational)

Descriptive analysis (mean and standard deviation) was conducted on the dimensions of SAP effectiveness as measured by users' level of satisfaction which is depicted below in table 22. Based on the statistical result, operational theme obtained a highest score in the mean agreement rating by the respondents in describing user satisfaction level with mean of 3.02 and standard deviation of 0.8 implying employees generally have above mean expectation to agree on the operational effectiveness of SAP system. On the other hand, technical and organizational

theme have the second and the third score below the expected mean value of 2.95 with standard deviation of 0.7; and 2.94 with standard deviation of 0.65 respectively. This implies that their disagreement on the SAP system post-implementation success, of which organizational effectiveness of SAP system is the least one. Based on this fact finding, it can be safely possible to infer that SAP system utilization in Ethiopian airlines has organizational issues.

Table 22: Descriptive analysis of ERP success factors

Theme	(Sample Size))n	Minimum	Maximum	Standard Deviation	Standard Deviation
Operational	124	1.00	4.70	3.0202	.84208
Technical	124	1.47	4.53	2.9484	.71134
Organizational	124	1.36	4.64	2.9439	.65385
User Satisfaction Level	124	1	5	2.77	1.021
Valid N (listwise)	124				

Source: Own survey, 2015

4.1.6 Determinants of ERP Post-Implementation Success – Principal Component Analysis

In order to determine whether all the scales used in this study have construct validity, to identify representative variables in the subsequent analysis and evaluate the factors determining SAP ERP system post-implementation success, principal component analysis (PCA) has employed. The PCA technique is very helpful to reduce the size of independent variables (dimensions) especially when the number of variables considered is very large. Additionally, in the context of this study, it helps to calculate factor loadings that provide rankings of determinants of ERP post-implementation success. PCA also helps to avoid multicollinearity countered in using regression, and reduce a data set to a more manageable size while retaining as much of the original information as possible.

Automated software (ranker) was used to rank factors contributing to ERP system post-implementation success on the basis of their importance. In addition, automated software (classifier) was used to help classifying the ranked factors contributing to ERP system post-implementation success into categories. Accordingly, before classifying the ranked factors, prior

reliability test has been undertaken. The first body of output concerns data screening, assumption testing, and sampling adequacy.

Data screening and sampling adequacy tests

R-matrix (or correlation matrix) which contains the Pearson correlation coefficient between all pairs of questions can be produced including the level of significance. In order to conduct PCA, it is required to have variables that correlate fairly well, but not perfectly. Moreover, any variable that correlate with no others should be eliminated. That is, consider variables with correlations greater than .3 and less than 0.9. In case the coefficient is greater than .9 a problem could arise because of multicollinearity in the data. The test result shows that, except one, all questions in the analysis correlate reasonably well with all others and none of the correlation coefficients are excessively large; which shows multicollinearity is not a problem in this study. Therefore, only one question is eliminated (My immediate supervisor uses SAP modules that I am currently using) at this juncture.

In addition to the above test, the Kaiser–Meyer–Olkin (KMO) measure of sampling adequacy, Bartlett's test of sphericity and the anti-image correlation and covariance matrices need to be investigated. The anti-image correlation and covariance matrices providing the same information as KMO helps to test sampling adequacy for specific variables. Kaiser (1974) recommends the KMO statistic a bare minimum of 0.5 and the values between 0.5 and 0.7 are considered average; values between 0.7 and 0.8 are considered good; values between 0.8 and 0.9 are considered great; and values above 0.9 are considered superb (Hutcheson & Sofroniou, 1999). As indicated in the table 23, for the data under consideration the KMO value is 0.887, which falls into the range of being great, so the study has confidence that the sample size is adequate for PCA.

Table 23: KMO and Bartlett's test

KMO and Bartlett's Test		
Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		.887
Bartlett's Test of Sphericity	Approx. Chi-Square	5.147 E3
	df	1225
	Sig.	.000

Source: Own survey, 2015

It is also possible to have the KMO values for individual variables as produced on the diagonal of the anti-image correlation matrix. In the same way the value should be above the bare minimum of 0.5 for all variables (and preferably higher) and if there is any variables with values below 0.5 then should be excluded from the analysis. For the data considered here, all values are above 0.5, which indicates the adequacy of the sample size for each of the variables considered. Bartlett's measure tests the null hypothesis that the original correlation matrix is an identity matrix. In order to conduct PCA, there must be a relationship between the variables with significance value less than .05. Accordingly, the level of significance of the relationship is tested and the result is .000 as depicted in table 22. Therefore, the null hypothesis is rejected which implies the correlation matrix is not an identity and PCA is appropriate.

Reliability analysis

Reliability of the survey is one of the requirements that should be fulfilled before PCA is conducted. As can be seen in table 24, the Cronbach's alpha test result is .969 which indicates that there is high level of consistency among the items.

Table 24: Overall reliability test

Reliability Statistics		
Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
.969	.968	50

Source: Own survey, 2015

It is possible to get a large value of alpha by having large number of items instead of the reliability of the scale (Field 2005, p. 668). Hence, investigating the reliability of each of the themes (technical, organizational, and operational) is crucial to get a more reliable result. In view of that, further reliability analysis is conducted for each of the themes as indicated in table 25. The result indicated that the survey is internally consistent for each of themes (technical, 0.914; organizational, 0.943; operational, 0.923) confirming that PCA can be appropriate for this study.

Table 25: Reliability test of technical, organizational, and operational themes

Reliability Statistics			
Factors	Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
Technical	.914	.915	15
Organizational	.943	.944	25
Operational	.923	.925	10

Source: Own survey, 2015

Factor Extraction, Rotation and Score

Not all factors are retained in an analysis and only factors that are statistically important should be retained. The eigenvalues associated with a variate indicate the substantive importance of that factor and only factors with large eigenvalues are retained. There are three different ways to test for factor extraction. The three criteria often provide different solutions. In these situations the communalities of the factors need to be considered. In principal component analysis, it can be started with communalities of 1 with all factors retained (Here the default Kaiser's recommendation of eigenvalues over 1 is considered for retention). The test indicates that all variables are retained in the PCA.

Furthermore, the interpretability of factors can be improved through rotation. Rotation maximizes the loading of each variable on one of the extracted factors while minimizing the loading on all other factors. This process makes it much clearer which variables relate to which factors. The exact choice of rotation option depends on researcher's decision that the underlying factors should be related. If there are theoretical grounds to think that the factors are independent (unrelated) then it is possible to choose one of the orthogonal rotations (for instance, varimax). However, if theory suggests that the factors might correlate then one of the oblique rotations (direct oblimin or promax) should be selected. In this particular study, since there are theoretical grounds for supposing that factors might correlate, then direct oblimin has been selected. The result of loading is, therefore, presented as follows with the maximum iteration for convergence is set to 40.

Table 26: Loading results from extraction and rotation

Extraction Sums of Squared Loadings			Rotation Sums of Squared Loadings
Total	% of Variance	Cumulative %	Total
20.10	41.02	41.02	5.55
3.24	6.61	47.63	8.63
2.42	4.94	52.57	8.18
1.58	3.23	55.80	5.94
1.53	3.13	58.93	8.29
1.51	3.08	62.00	8.19
1.32	2.69	64.70	7.05
1.27	2.59	67.29	9.16
1.19	2.42	69.71	3.43
1.12	2.28	71.99	7.87
1.06	2.17	74.16	7.80

Source: Own survey, 2015

Once a factor structure has been found, it is important to decide which variables make up which factors. Factor loadings are a gauge of the substantive importance of a given variable to a given factor. Therefore, using these values to place variables with factors is found to be valid.

The factor scores allow saving factor scores for each case in the data editor. These scores can then be used to identify groups of participants who score highly on particular factors. As discussed above, since there is theoretical reason for some sort of correlations between factor scores then the regression method is found to be appropriate.

It is possible to assess the statistical significance of a factor loading (after all, it is simply a correlation coefficient or regression coefficient); however, there are various reasons why this option is not as easy as it seems (Stevens, 2002: 393).

Typically, researchers take a loading of an absolute value of more than 0.3 to be important. However, the significance of a factor loading depends on the sample size. Stevens (2002) produced a table of critical values against which loadings can be compared. To summarize, he recommends that for a sample size of 50 a loading of 0.722 can be considered significant; for 100 the loading should be greater than 0.512; for 200 it should be greater than 0.364; for 300 it should be greater than 0.298; for 600 it should be greater than 0.21; and for 1000 it should be greater than 0.162. These values are based on an alpha level of .01 (two-tailed),

which allows for the fact that several loadings are needed to be tested (see Stevens, 2002, for further detail). In this particular study, the sample size is between 100 and 200; therefore, a loading of 0.4 is considered. Accordingly, the PCA is conducted with final pattern matrix shown below in table 26. Accordingly, PCA produced an output on the selected 49 variables, which make a contribution of 74.16 of the total variance of ERP post-implementation success.

Table 27: Pattern Matrix

	Pattern Matrix[a]		
Category	**ERP System Utilization Determinants**	**Loadings**	**Total Variance Explained**
Continuous Improvement	System update to improve the system's flexibility.	.603	41.02
	System update to improve business process adaptability.	.571	
	System update to improve the performance	.557	
	System's reaction time (Response time) to user activities	.476	
User Involvement	Understanding the task(s) that serves as an input to other departments'	.917	6.61
	Understanding of other departments' task to activities carry out	.873	
	I understand the overall work process that my task(s) is part of.	.821	
	Fitness of task(s) I perform to the overall work process	.797	
	Understanding of cross-functional work process	.791	
Training	Duration of SAP training	-.774	4.94
	Quality of SAP training	-.771	
	Proper circulars to adopt the change	-.588	
	Training material sufficiency	-.577	
	Awareness of SAP system's advantage and capabilities.	-.436	
Absorptive Capacity	Ethiopian airlines has procedures to document and communicate changes of SAP system	-.706	3.23
	Ethiopian airlines has structurally defined central coordinating office	-.669	
	EAL knowledge sharing system for SAP related changes	-.477	
	System update to improve complex functionalities	-.407	
Top Management Championship	Discussion with supervisor on my tasks fitness to SAP system	.807	3.13
	Discussion with supervisor on SAP impacts on my work	.804	
	Encouragement to attend training sessions	.707	
	Allowance of time to attend SAP related training sessions	.668	
IT Expertise and User Support Level Quality	SAP support to solve SAP system related problems	-.763	3.08
	User support regarding SAP system use promptly	-.727	
	Change regarding system functionality	-.702	
	Change regarding configuration master data	-.639	
	Change regarding user authorizations (Permissions)	-.516	

Flexibility	Flexibility in terms of system use	.680	2.69
	Flexibility to meet new business requirements	.620	
	Comprehensiveness of information	.487	
Operational Efficiency	SAP achieved a significant cost reduction.	-.793	2.59
	SAP improved the quality of my work	-.767	
	SAP improved the efficiency of my work	-.703	
	SAP increased the efficiency of my decision-making	-.604	
	SAP improved the quality of decisions I make in my work	-.474	
Usefulness of the system	Usefulness and relevance	.684	2.42
	The functions and features of SAP in my work.	.675	
Process Integration	SAP improved the possibilities for cross functional communication & internal service	.703	2.28
	SAP system improved internal coordination of business activities.	.692	
	SAP users understand the concept and the value of integrated data	.567	
	The integration of information systems in EAL.	.464	
Data Quality of the System	Accuracy & reliability of information	-.788	2.17
	Up-to-date information	-.748	
	Data accuracy and integrity improved by using the system	-.486	
	Incorrect data input discovered by SAP system	-.442	
Extraction Method: Principal Component Analysis. **Rotation Method: Oblimin with Kaiser Normalization.** **Rotation converged in 36 iterations.**			

Source: Own survey, 2015

As depicted in table 27, after the factor loading, the variables are categorized to the new construct groupings. Table 27 indicates that the top 5 ranked determinants of ERP system post-implementation success are in the categories of organizational theme; which make the highest contributions (58.93%) of the total variance explained. This result is in accord with the study of other scholars that proclaimed the importance of organizational constructs in the overall success of ERP system. It has been argued and empirically asserted that the organizational dimension appeared to have much more of an underlying impact on the success of ERP system than the technology (Davenport, 1998; Peng & Nunes, 2009). Although the ERP system post-implementation success determinants of technical (10.36%) and operational (4.84%) theme have the lower contribution than the organization theme, their overall total percentage contribution of 15.23% is not negligible. In addition, the result in table 27 shows the rankings of ERP post-implementation determinants on their independent contributions to the corresponding category which further discussed in the subsequent paragraphs.

As per the output of the PCA, 41% of the total variation of ERP post-implementation success is explained by continuous improvement construct. This indicates that continuous improvement is a construct with high impact to the overall ERP post implementation success. As discussed in section 4.1.3.2, several literatures asserted the essentiality of continuous improvement for business realization through ERP systems (Deloitte consulting, 2010; Ononiwu, 2013; Kiriwandeniya et al., 2013). In line with this, the recently established CEO team of Ethiopian Airlines can derive the continuous improvement efforts in collaboration with IT team, change management, and all respective user departments.

According to the PCA finding, the next highest determinant construct of post-implementation success is user involvement. As shown in table 26, user involvement makes contribution of 6.61% of the total variance. This indicates that as the users' level of understanding regarding the process oriented nature of the SAP system increases, the ERP post-implementation success is believed to get improved by 6.61%. Thus, user involvement is the second important construct that can make a significant improvement on the post-implementation success.

Training is ranked the third determinant construct of ERP post-implementation success, which explains 4.94% of the total variance. Moreover, the PCA result indicates that absorptive capacity and top management championship are the fourth and fifth determinants with 3.13% and 3.13% variance explanation respectively.

In general, the PCA output reveals post-implementation success determinants in a ranked manner; which helps to prioritize and address the issues based on their total contribution share. From this analysis, it can be noted organizational theme constructs have the highest contribution in the overall variation of ERP post-implementation success.

4.1.7 ERP Post-Implementation Success – Correlation Analysis

As depicted in the Table 28, SAP post-implementation success was measured by level of user satisfaction. In this case, employees of Ethiopian Airlines who are active users of the SAP system, is affected by the issues of organizational, operational and technical themes.

Accordingly, overall correlation is run between level of user satisfaction as a measure of SAP post-implementation success and factors affecting SAP system success: namely; organizational, technical and operational themes.

Therefore, the correlation analysis between the three independent variables, Technical, Organizational and Operational themes and the dependent variable, overall satisfaction level on SAP post-implementation success are found to have statistically significant relationship (r=.775**,p<.000, for Technical theme; r=.671, p<.000, for Organizational theme, and r=0. .809, p<0.000 for Operational theme).

Table 28: Correlation analysis of ERP Success factors with user satisfaction

Table : Correlations Results of SAP Dimensions on User Satisfaction					
		User Satisfaction Level	**Technical Theme**	**Organizational Theme**	**Operational Theme**
User Satisfaction Level	Pearson Correlation	1	.775**	.671**	.809**
	Sig. (2-tailed)		.000	.000	.000
	N	124	124	124	124
Technical Theme	Pearson Correlation	.775**	1	.759**	.807**
	Sig. (2-tailed)	.000		.000	.000
	N	124	124	124	124
Organizational Theme	Pearson Correlation	.671**	.759**	1	.716**
	Sig. (2-tailed)	.000	.000		.000
	N	124	124	124	124
Operational Theme	Pearson Correlation	.809**	.807**	.716**	1
	Sig. (2-tailed)	.000	.000	.000	
	N	124	124	124	124
**. Correlation is significant at the 0.01 level (2-tailed).					

Source: Own survey, 2015

However, the fact that there is significant positive relationship between dependent and independent variables does not indicate or measure the cause effect relationship. Hence, beyond correlation analysis, regression analysis is conducted to measure the cause effect relationship between user level of satisfaction on SAP system post-implementation success and SAP effectiveness dimensions (technical, organizational and operational themes).

Table 29 shows the analysis of model summary on coefficient of determination (R^2), and overall correlation among the dependent and independent variables.

Table 29: Analysis of model summary on coefficient of determination (R2), and overall correlation among the dependent and independent variables

Table: Model Summary				
Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.836[a]	.700	.692	.567
a. Predictors: (Constant), OPERATION, ORGANO, TECHNO				

Source: Own survey, 2015

4.2. Qualitative Data Analysis

In addition to the quantitative study, qualitative data analysis is conducted to supplement and enrich the findings obtained from the survey. Accordingly, interviews have been conducted with 4 executive management members, to gather data regarding ERP system post-implementation. Moreover, it also helped to discuss ERP system related issues that Ethiopian Airlines encountered during post-implementation phase in the dimensions of technical, organizational and operational themes. Accordingly, the interview output has been analyzed by conducting open codding as presented below.

The interviewees were requested regarding the strategic alignment (continuous fit) between business strategy, organizational structure, the IT strategy and the implemented ERP system. All the interviewees replied that there is an alignment between business and IT strategy. In line with this, one of the interviewee replied acquisition of an ERP system emanated from the IT strategy which ensures the alignment of the system with the business strategy to accommodate existing business need as well as the future growth of the airline.

However, two of the interviewees explained that SAP system is not fully aligned with the organizational structure. In this regard one of the interviewee replied *"This is due to the fact that the system is process driven, whereas the organizational structure of Ethiopian Airlines is functional driven. Even though there are improvements made to align the organizational structure with the system, it still needs further improvements"*. Another interviewee recommended *"... the continuous fit between the business strategy, organizational structure, the IT strategy and the ERP system needs to be worked out further".*

Another question raised was to evaluate the main 11 attributes of the ERP system which are timeliness, information accuracy, reliability, response time, flexibility, completeness, output requirement, ease of use, usefulness of the system to the users, relevancy of the information executed by the system and integrated nature of the system.

All of the interviewees replied that the system fulfills the required ERP attributes or characteristics in a general context. Majority of the interviewees emphasized that as long as the system is being used worldwide by big profitable organizations successfully, it can be easily inferred that the system's architecture is well defined. However, in the context of Ethiopian airlines, there are a lot of improvement opportunities in relation with the ERP attributes as described next.

Three of the participants replied that information accuracy and completeness characteristics of the system is impacted not only in using SAP system itself but also by the data received from other systems through integration. One of the participants explained *"In order to bring integrity of the systems, OCM should be structurally in place to create the required level of change on how users handle data in their day to day business activities. This will help to improve the data accuracy, completeness and timeliness".* This is in accord with the quantitative finding regarding data accuracy, completeness and timeliness. According to the quantitative analysis, half of the survey participants responded that they are encountering data quality problem. Thus, information accuracy and completeness is one of the issues of ERP post-implementation success from ERP technical attribute constructs.

Another attribute described by the respondents is comprehensiveness of the information they get from the system. In this regard, one of the informants explained that the system lacks the comprehensiveness of reports and information that are required for decision making. As a result, they are obliged to consolidate data from different sources and manipulate it on other tools like excel in order to get the desired content. Similarly, the quantitative analysis revealed that majority of the respondents (53%) disagreed to the comprehensiveness of the information executed from an ERP system. This indicates that comprehensiveness of the information users get from the ERP system is another ERP attribute related issue that needs to be addressed in order to facilitate rational decisions making.

Response time is another important attribute explained by three of the informants. One of the interviewees said *"... as the transaction of the organization increases, the data size is also*

exponentially increasing which has an impact on the performance of the system. This indicates the need of technological interventions to improve the performance of transactions with critical performance issues". Moreover, the system needs real time monitoring of transactions to closely identify performance issues so that solutions can be devised accordingly.

In line with this, scholars have empirically asserted the impact of ERP attributes in the utilization of the system during the post-implementation phase (Wu & Wang, 2006; Kouki et al., 2007. Moreover, the result of ERP attribute construct is in accordance with the finding of the survey. Hence, SAP ERP attributes/ characteristics demands continuous improvement to increase the utilization of the system and also accommodate the continuous business need. Moreover, ERP attribute issues can be improved not only by improving the technological (the software itself and infrastructure) aspect of the system but by working on the people and process as well.

With regard to IT expertise, one of the respondent replied that the level of IT expertise that the ERP system generally requires in the dimension of support, development as well as technical infrastructure areas is huge. On the other hand, the IT team of Ethiopian Airlines is mainly supporting the system with expertise acquired through supporting the earlier legacy systems, minimal training and also by self-initiated browsing and reading. One of the interviewees pointed out *"... As a result, the current level of IT expertise and user support level quality is not in the required level to resolve the problems and enhancement considerations that are queued for the last two years".*

The demand of highly qualified IT professional was also confirmed by ERP post-implementation researchers (Kouki, 2007; Hakkinen & Himola, 2008; Peng & Nunes, 2010; Ononiwu, 2013). Ononiwu (2013) further explained inadequate ERP expertise to be one of the inhibitors of effective utilization of ERP systems.

Regarding users' support level quality, majority of the interviewees commented as one of the improvement area as it has a direct relationship with the IT expertise quality. In other terms, IT expertise is one of the determinant factors to provide ERP related support service with standard quality. In this regard, one of the interviewee replied, "*The support strategy and the level of IT expertise required is not defined and structured yet. Besides, the type of users and the required level and type of support needs to be re-structured*".

As per the comment of one of the interviewees, the support strategy should be studied and defined to the extent of defining whether external support is required or not. The interview added *"If required, the level of support that needs an external expertise should be defined along with the outsourcing strategy"*. According to one of the interviewee, the support strategy can also define the required level of expertise for the internal IT team which helps to study and define the necessary training roadmap. Based on the training roadmap, the IT team can be trained and get certified with the required level of expertise which helps to improve the current SAP related IT support level quality. One of the interviewee commented, "*In addition to the people's aspect, users' support level quality improvement needs defined support process, procedures, policies and a proper technology that facilitates the defined process".* Hence, the result of the interview is in line with the questionnaire finding which confirms its being major technical issue in Ethiopian Airlines. Several scholars also identified IT expertise and user support level quality as a major determinant for the success of ERP system post-implementation utilization (Kouki, 2007; Hakkinen & Himola, 2008; Peng & Nunes, 2010; Ononiwu, 2013).

External relationship management is being handled by the IT division of the case organization. Accordingly, two of the interviewees from IT division were asked regarding external relationship management in relation with SAP ERP system (relationship with vendor and consultants).

One of the interviewee replied, *"We have a good relationship with SAP Company, the vendor of SAP ERP system, so this helps to get the vendor's support in the form of technical assistance, software updates, emergency maintenance and other support services".* It was also mentioned that Ethiopian airlines already has maintenance agreement with SAP to get upgrades, patches and expert support on major SAP ERP system related issues. However, both interviewees asserted that unlike the positive relationship established with the vendor, Ethiopian Airlines didn't utilize all the available opportunities from the vendor after the go-live stage. SAP service market place utilization could be one example that is not utilized by Ethiopian Airlines even if it is part of the agreement.

SAP service market place is a support solution provided by the vendor for supporting business applications, analytics solutions and platform support, including software download, license key requests, customer messages and SAP Notes database (2015, March 10). Retrieved from https://support.sap.com/. One of the interviewee commented that the internal IT expertise

should be in a position to demand technical services such as applying patch upgrades or 'SAP Notes' from the vendor and implement accordingly for the continuous improvement of the system.

In line with this, one of the interviewees commented that the relationship with the vendor has further improvement after the recent SAP audit conducted by an external organization. During the audit exercise, the audit firm was providing professional advice on how to improve the relationship and exploit all the benefits based on the support agreement. As a recommendation, the interviewees pointed out to revisit the license agreements and utilize all possible services that are complementary with the license fee; by engaging with the vendor and also the account manager responsible for Ethiopian Airlines. Moreover, they mentioned to identify improvement opportunities of the system and negotiate with the vendor to get the services in a reasonable price.

Another question raised was regarding the end users training in terms of content, quality and duration. Moreover, they were requested to comment on the sufficiency and completeness of the training materials. It is mentioned that, as a strategy, system related trainings are defined as part of required trainings to be delivered by Ethiopian Aviation Academy (EAA) prior to engaging the employees to their duties. However, this strategy is not yet implemented fully. As a result, employees are being briefed by their colleagues regarding the system when they start working on SAP system. This kind of training might be enough to start working the day to day activities on a given transaction, but the employee cannot be in a position to understand the end to end process and cross-functional impact of those specific transactions. Moreover, SAP related recurrent trainings are required to the existing employees to refresh and improve their knowledge towards the system and embedded business processes.

One of the interviewee remarked, *"Training is still one of the major areas in which critical improvement is required. The training content and duration should be revisited along with the training strategy. Besides this, the training materials should also be reviewed based on the available course content development technologies and tools"*. Moreover, the important point raised along with the training materials is the preparation of quality audits based on a predefined metrics so that the quality can be ensured prior to using the materials for the actual training. Another important element mentioned was revisiting the mode of training in order to address different types of users with different IT expertise.

Several scholars mentioned lack of appropriate training as one of the barriers that hinder ERP post-implementation success (Jones et al., 2008; Hakkinen and Himola, 2008; Kiriwandeniya et al., 2013; Ononiwu, 2013). Moreover, the finding is in line with the survey results and also the SAP audit findings. Thus, revisiting the training strategy and its implementation can improve training related gaps so that employees can be equipped with the required knowledge before they get onboard to the actual job. Moreover, recurrent training roadmap should be defined in order to train already existing employees to refresh their knowledge and also provide new functionalities of the system. It was also recommended to analyze and define training requirements for different levels of users along with the content, duration and mode of training.

The interviewees were also requested regarding the initiatives that are being undertaken to encourage SAP related learning and knowledge. One of the interviewees mentioned *"... there have been initiatives carried out to facilitate learning and knowledge sharing such as releasing articles through e-mail, portal and SPP for newly defined business processes and/or changes".* However, these communication mechanisms cannot suitably address all types of users. Due to this, there is a communication barrier and the desired learning and knowledge outcome is not achieved yet. Hence, effective way of communication method should be studied and selected based on the employee IT proficiency level, experience and work area.

One of the interviewee recommended "*OCM should be structurally in place in the organization not only in implementation phase but also throughout the life of the SAP system considering the fact that the system is in a continuous change".* Moreover, it is recommended to reinforce SAP productivity pack (SPP) to develop high-quality e-learning and support materials to help maximize the users' proficiency and skills in using the SAP solution confidently and competently.

SPP can help to build interactive, collaborative e-learning environments, reducing the need for classroom training. On the other hand, the knowledge sharing mechanisms needs to be revisited in order to address users with different level of IT proficiency. The results obtained through interview are in line with the questionnaire findings. ERP system often requires underlying cultural shift along with the technical shift to keep the end users aligned with the ongoing continuous improvement process (Deloitte consulting, 2010). Hence, SAP related

learning and knowledge sharing is one of the organizational issues to be addressed to ensure ERP post-implementation success.

The senior managers were also asked concerning the level of users' cross-functional oriented thinking. All of the interviewees replied that the process oriented thinking is not matured organization wide as expected. This requires continuous learning, awareness creation and change management. The process-oriented thinking is required not only for SAP users but also the users of other systems and generally organization wide due to the integrated nature of the business processes and computerized systems across the value chain.

In this regard, one of the interviewees replied *"... the center of excellence (COE) team which is established recently under IT division should work hard with OCM to define processes with all stakeholders and educate employees about cross-functional relationship and process-oriented mind set paradigm shift"*. Moreover, one of the interviewee recommended nominating and empowering super users who can train, motivate and lead SAP users to create better understanding of the system.

It was also mentioned that, users should clearly understand the SAP best practices that are embedded on the system. Eventually, the knowledge of integration and data accuracy get improved and ultimately improve user satisfaction and utilization of the system. Therefore, users should understand the impact of their activities in other modules/ systems. This understanding helps users to ensure the data quality in each level so that the entire corporate data will be dependable to make real time rational decisions as required.

Interviewees were also requested for their opinion regarding continuous improvement initiatives that are undertaken so far to ensure continuous ERP system utilization, upgrade and progress of the system. Continuous improvement is critical in order to address users' complexity issues, performance issues, improve the system's flexibility and its business process adaptability. Moreover, it consists of business processes and people side continuous improvements as well.

According to one of the interviewees, SAP ERP related continuous improvement efforts are progressing. SAP Audit has been conducted by an external audit firm to assess the design of the implemented SAP solution. Moreover, the interviewee said *"The audit exercise helped to identify and evaluate design and implementation issues and also present clear actionable recommendations for further continuous improvement"*.

Moreover, one of the interviewee replied that there are initiatives made to ensure continuous improvement of ERP system. The major initiative is the establishment of Center of Excellence (COE) team (under business transformation & continuity department) to work on the continuous improvement of the organization through automation and utilization of already existing systems.

COE is organized to work as an umbrella in collaboration with other sections to realize change management, training and learning to bring business transformation through process improvement, IT-business fit and systems' utilization. In addition to this, one of the interviewees stressed the demand for improvement of knowledge transfer across the organization regarding SAP system. In this regard, continuous change management and capacity building are recommended to improve users' readiness, knowledge and skill so that the users can utilize the system optimally which results the return on investment.

In this regard, COE team has already started working on mega processes refinement, identifying non-automated business processes, evaluating the utilization level of different systems, and identifying actionable items in collaboration with ACE team. Even though the COE team is working towards continuous improvement, the concept is complex to be addressed in the required level and pace. This is due to the fact that continuous improvement requires joint effort of various departments/ units such as SAP development team, basis team (infrastructure support team of SAP), SAP support team, organizational change management, top management support, respective business departments/ units and COE team. Hence, strengthening the capability of COE team along with the proper coordination and relationship with other units helps to ensure continuous improvement in the organization.

In addition, one of the interviewee mentioned, "Ethiopian Airlines can use the already existing maintenance agreement with the vendor to get all patches, upgrades and improvements of the system as part of continuous improvement. However, it should be noted that strengthening the capability of the IT team is mandatorily required to apply the mentioned technical improvement opportunities".

It was also mentioned that the continuous improvement needs to address the people, process and technology perspective. The continuous improvement of 'people' side can help to improve the expertise of the users as well as the IT team. This demands structured training, knowledge sharing mechanisms and skill development. The continuous improvement of 'processes' can help to achieve streamlined and effective processes across the value chain. The

'technology' improvement can ensure to continually revisit the software and the hardware (including the servers) to improve the attributes of the system so that the ultimate business realization can be achieved.

Hence, the continuous improvement needs a defined measurement metrics for every dimension of improvement areas. Accordingly, the improvement should be measured and audited continually. Besides this, ERP system requires simplified processes, so the continuous improvement should be worked not only from the perspective of the system but also from the aspect of business possesses as well. The interview finding of continuous improvement is in agreement with the findings of the survey result and the PCA output, which revealed the need of high priority and attention to this construct.

Lastly, the interviewees were asked about the operational contribution of SAP ERP system from the perspective of cycle time reduction, cost reduction, productivity improvement, data quality improvement and internal process improvement. All of the interviewees agreed that the organization is achieving operational contributions by using SAP ERP system. Best practices that are embedded on the system are realized starting from the 'go-live' date.

The system also creates paperless environment through workflow process of SAP which ensures productivity improvement and cost reduction. This improves the earlier process that involved paper to approve business activities in different business functions. It is also mentioned that the financial closing cycle is shortened from 12 days to 5 days. The other improvement achieved is the integration of the systems that creates real time integration even though it demands further improvement especially in relation with data quality'.

In this regard, one of the interviewee said *"Even though, the business intelligence tool is in place, executives cannot fully rely on the system due to data quality and completeness issues. As a result, executives do not have all the required real time information to make critical business decisions which ultimately affects the growth of the organization".*

As a recommendation, they stressed that by working on the people's side of the system such as adhering to compliance and working on data quality can create improvement on the system. The interviewees also recommended working on benchmarking of other international organizations that use SAP to measure whether Ethiopian Airlines is continually finding value propositions from ERP system considering time as a parameter. Hence, working on continuous

improvement in the dimension of people, process and technology can improve the business value realization.

Finally, one of the respondents recommended continuing this research in a longitudinal manner in order to measure the improvements achieved with relatively longer time intervals so that additional improvement opportunities can be coined out.

CHAPTER FIVE

PROPOSED ERP POST-IMPLEMENTATION MANAGEMENT FRAMEWORK

In this chapter, the proposed ERP post-implementation management framework is presented in a high level representation and two dimensional matrix form. Moreover, this chapter addressed the evaluation of the proposed framework in order to ensure its applicability, efficacy and usefulness. The framework is designed based on the findings of the study and related literatures in order to provide an answer to the fourth research question. In the first section, the proposed framework is presented and the evaluation of the proposed framework is discussed in the second part of the chapter.

5.1. Proposed Framework

Based on Hevner (2004), there is a seven step guideline to be followed in order to work on IS researches with an output of IT artifacts. He also recommended researchers to use their creative skills and judgment to determine when, where and how to apply each of the guidelines in a research under investigation. Accordingly, the guidelines are used in this chapter with respect to the context of this study.

In the first guideline of design science, it is stated that the output of an IS research shall be a purposeful IT artifact created to address a critical organizational problem (Hevner, 2004). Accordingly, in this study, a framework is considered as a purposeful IT artifact that can address ERP utilization issues and improve post-implementation success.

The second guideline, Hevner (2004) indicated that the relevance of the problem must be substantiated so that the designed artifact can be a solution to important and relevant business problems. In this study, the relevancy of addressing the problem is demonstrated in the problem statement and research questions (section 1.2).

A framework is a model artifact that provides a broad overview or skeleton of interlinked items which helps as a guide to achieve a specific objective (Kiriwandeniya et al., 2013). According to Zachman (2003), a framework helps to analyze organizational subjects to leverage

the required level of integration, reusability and interoperability towards the targeted result. In addition to the various issues to be considered in the framework of ERP post implementation, Esteves (2009), in his latest work indicated the benefit realization framework of ERP.

In view of the above, different researchers designed frameworks in different ways. For instance Islam (2013) has developed framework for E-learning simply by identifying the major challenges and proposing corresponding solutions for each challenges without defining directional boundary. With the same token, Al-Mashari, Al-Mudimigh and Zairi (2002) developed taxonomy of the critical success factors in ERP implementation process based on critical factor approach. That is, the critical factors have been exhaustively identified and categorized with some label of groupings to define the taxonomy. In relation to this, Kiriwandeniya et al., (2013) dealt with ERP framework by analyzing best practices, procedures and success factors. On the other hand, Zachman has developed architectural framework using a two dimensional matrix (people and operations) (Jafari, Akhavan and Nouranipour, 2009). Zachman framework consists of matrix in rows and limited columns to illustrate different layers of abstraction.

In line with this, Jafari et. al (2009) have analyzed the power of this two dimensional matrix of Zachman framework and applied in their research work to develop conceptual knowledge architecture model for an enterprise. Hence, this study used matrix framework representation for the proposed solution and exhibit the two dimensional aspects of the framework.

In this study, the designed framework is named ‘ERP Post-Implementation Management Framework’. As can be seen in figure 9, the high level representation of the framework indicates the core issues/ activities that are proposed to be executed to ensure ERP post-implementation success.

As depicted in the picture using yellow color, continuous improvement, user involvement, training, and absorptive capacity are organizational theme related core issues that are incorporated in the framework. Likewise, the core issues of technical theme are depicted in blue color. These are: system performance improvement, ERP system enhancement/ customization process improvement, enhanced user support level quality, facilitate rational

decision making, system flexibility, process integration improvement, external relationship management, elevation of data quality and system upgrade.

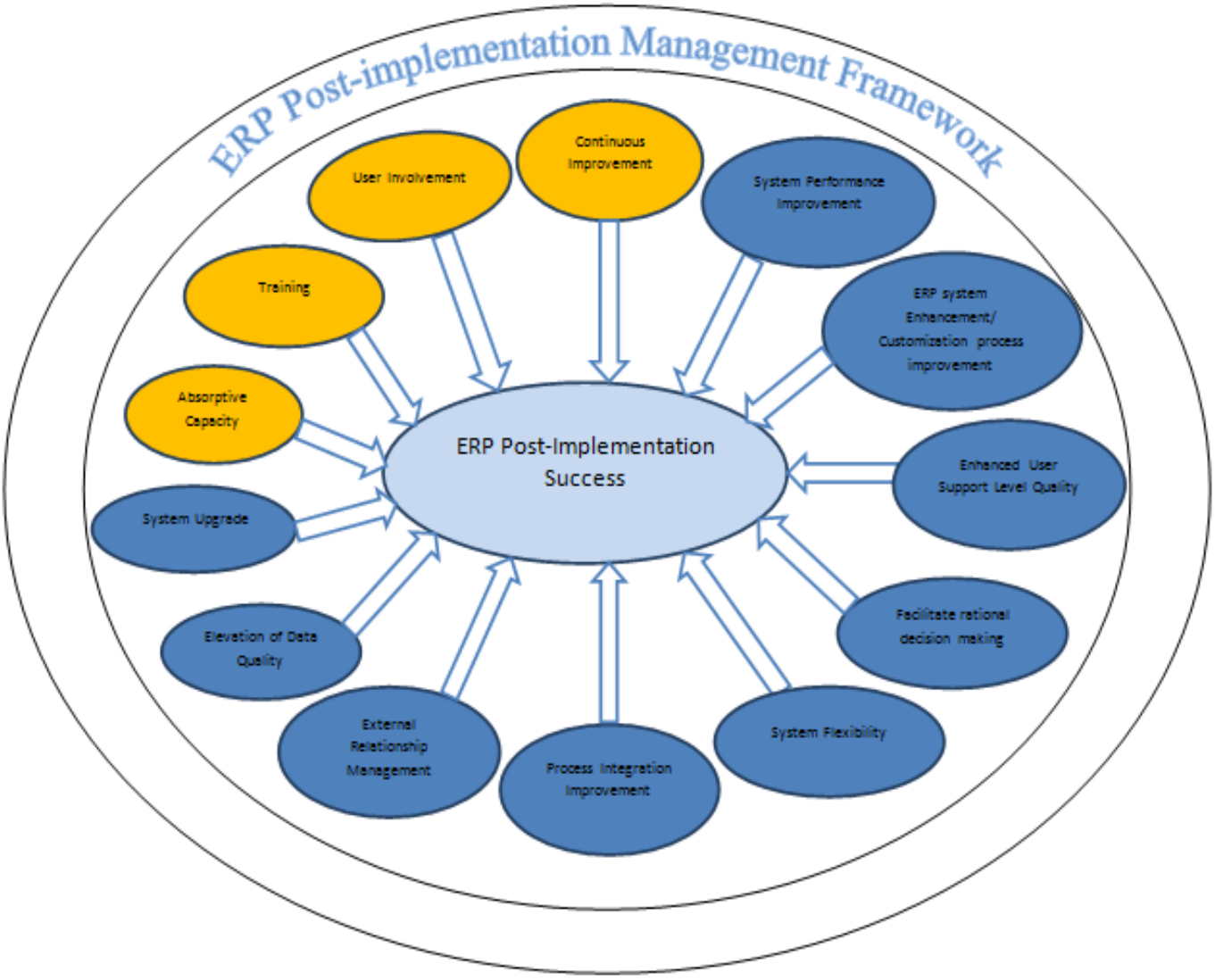

Figure 9: High level ERP Post-implementation management framework

For further understanding and a detailed representation of the concepts, a matrix framework is designed to exhibit the two dimensional aspects of the framework. Accordingly, the framework presents core issues/ activities from four perspectives (Management, People/users, Process and Technology) that are recommended to be executed in the post-implementation phase of an ERP system in order to improve the utilization and achieve business results.

The first dimension of the matrix (vertical) represents the core issues/ activities to be executed and the second dimension (horizontal) represents the management, people, process, and technology perspectives of the proposed solutions for the identified core issues/ activities. The people, process and technology perspectives provide a holistic view of the entire organization to make the right choices in managing the core activities/ issues identified in the framework. The post-implementation success of an ERP system requires coherence among the management rules, technology, the business processes, the procedures, and the competency and practices of the employees (Genoulaz & Millet, 2005). Similarly, other scholars also asserted that people, process and technology are important aspects of an ERP system and other information systems as well (Esteves & Pastor, 1999; Injazz & Popovich, 2003; Nair, et al., 2011).

In line with this, information technology infrastructure library (ITIL) framework uses people, process and technology as a cornerstone to provide a holistic view of IT services management (ITIL, 2008). ITIL is a set of practices for IT service management that focuses on creating an alignment between IT services with the needs of business. ITIL considers people, process and technology as a '3 legged stool' of IT service management in which the balance of the three keeps the stool solid and usable. This indicates concentrating only on the technology or the others wobbles the stool which represents the failure of the IT service management. In ITIL, it is also stated that the three do not have to be in ultimate maturity to a successful IT service management; rather they have to grow together in a balanced manner to ensure the IT service improvement.

Even if management is part of people, this study represented management as a separate dimension. This is by considering the fact that management championship is an important critical success factor across the entire life cycle of an ERP system. In line with this, Somers and Nelson (2004) conducted cross-case study in 116 organizations and found that top management championship is highly important in initiation, adoption and also post-go-live phase of an ERP system. Similarly, Nejib (2013) identified key determinants associated with post-implementation success. Among the identified determinants, top management support was more important particularly during the post-implementation phase. Moreover, other scholars also indicated the importance of top management championship across the life cycle of an ERP system (Davenport, 1998; Ifinedo, 2008; Kouki, et al., 2007; and Staehr, 2010). Staehr (2010) examines the role of

managerial agency in achieving business benefits from ERP systems during post-implementation period. It contributed to the existing body of knowledge of the role of managers in realizing business results through an ERP system. Similarly, Kouki, et al. (2007) identified that management championship is the most predictive determinant of ERP system success. Hence, representing 'management' as one dimension can give more visibility; and clearly show the responsibilities of management with respect to each identified core activity/issue that should be addressed during post-implementation phase of an ERP system. Further, the four dimensions are briefly described to give better clarity of the proposed framework.

Management: This dimension refers to the role and the actions of management team members at all levels that had the authority to make decisions regarding ERP system post-implementation utilization improvement and success. This includes business and IT managers and also executive management team members (Staehr, 2010).

People/ Users: This dimension refers to the employees, their skills and roles responsible for carrying out the daily tasks in the organization associated with organizational goals. These skills and roles must be developed in order to maximize system utilization, reduce risk of failure, manage complexity, and at the same time facilitating organizational change (Nair et al., 2011).

Process: This dimension represents the set of logically related tasks to be done in order to achieve a defined business outcome. With the same token, a process is the way work gets done in an organization (Nair et al., 2011).

Technology: This dimension refers to the computer hardware and software techniques, methods and tools required in the execution of the core activities defined in the proposed framework.

The contents of the matrix were sourced from the findings of the quantitative and qualitative study and syntheses from previous researches. To illustrate this, the subsequent paragraphs explain how the training component of the framework derived from the finding of the study.

Training is one of the core issues attempted to be addressed in proposed framework. As the quantitative study indicates training is one of the low rated construct from organizational theme. Moreover, in the qualitative study, the interviewees explained that training is one of the

major areas in which critical improvement is required. The PCA result also identified training as the third determinant construct of ERP post-implementation success which explains 4.94% of the total variance.

The qualitative study revealed that ERP system related training strategy should be revisited for further improvement which becomes part of the framework in management perspective. The study also shown the necessity of recurrent training for the existing employees to refresh their knowledge and also educate them in the new functionalities and embedded business processes of the system. According the quantitative and qualitative finding results, the training process needs to be redefined to improve the training content, duration, preparation, delivery and evaluation. Moreover, the study indicated the demand of using appropriate technology like SPP and also user training dissemination/ e-learning tools.

Accordingly, the proposed framework attempted to categorize the above mentioned findings in management, people, process, and technology perspectives in order improve ERP system related trainings which contributes to the better utilization of the system and ERP post-implementation success.

Table 30: The Proposed ERP Post-implementation Management Framework

ERP Themes	Core issues/ Activities	Management	People	Process	Technology
Organizational	Continuous Improvement	Establish ERP use Strategy Identify KPIs based on the business strategy and process requirements Monitor and evaluate continuous improvement to measure the progress of system use Develop remediation strategies for low performing areas Establish Organizational Change Management (OCM) unit Establish OCM team Invest on continuous improvement infrastructure (tools, training, expert consultancy, expert review, etc.) Allocate all the required resources for continuous improvement Encourage employees to consider new ways to use ERP to improve productivity and increase customer service Reward employees for finding new ways to improve their output	Contribute to the identification of best practice and benchmarking Record ERP related issues for further improvement Trained COE and OCM team working as continuous improvement experts Educated and continuous improvement aware users	Benchmarking best practice business processes Improve mega processes to achieve the intended goal Tie ERP with company continues improvement tool, ACE Constantly evaluating and improving processes in the light of their efficiency, effectiveness and flexibility	Develop automated continuous improvement assessment and reporting Support business improvement by technology. Ensuring the technology is open and scalable to easily incorporate the business improvement.

ERP Themes	Core issues/ Activities	Management	People	Process	Technology
		Benchmarking of other international organizations in the value proposition of ERP system			
	User Involvement	Adopt and demonstrate top management championship in educating organization wide users to have process-oriented thinking Establish service and operational level agreement Establish super users Motivate super users	Train users on input-output relationship of business processes Create awareness sessions of cross-functional business relationships Comply with procedures, operational level agreements	Map business Processes and define input-output relationships Business integration processes	Use collaboration tools such as Enterprise portal, e-mail, Learning management solutions (LMS), Solution manager
	Training	Improve ERP system related training strategy Allocate required resources for training Plan for recurrent training	Trained and knowledgeable users	Training process (needs assessment, preparation, delivery and evaluation)	Use course content development technologies and tools e.g. SPP User training dissemination/ e-learning tools such as LMS

ERP Themes	Core issues/ Activities	Management	People	Process	Technology
	Absorptive Capacity	Establish knowledge management strategy Adopt championship on knowledge management Foster knowledge sharing culture	Comply with knowledge management procedures	Knowledge Management process Define procedure(s) to document and communicate ERP system related changes	Use knowledge management system/ technological tools
Technical	External relationship management	Establish External relationship management strategy Improve the awareness of the IT team to demand vendor's support on technical services as per the license and support agreement	Collaborate with vendors and external consultants Provide required resources and assistance to the vendors and external consultants	Vendor relationship management process	Utilize IT support solutions provided by the vendors e.g. SAP market place
	Enhanced User Support Level Quality	Establish ERP system support strategy Establish support structure Plan for support team capacity building Define the level of IT expertise and the training roadmap required to support the ERP system	Trained service desk team to work as a single point of contact and handle level 1 tickets Trained ERP support team	Establish user support processes, procedures, policies, and service or operational level agreements (OLA/ SLA) Change request Management process Configuration management process Event, Incident, Problem and user authorization management processes	Adopt appropriate technology to automate the management of user support processes e.g. SAP Solution Manager

ERP Themes	Core issues/ Activities	Management	People	Process	Technology
	ERP system Enhancement/Customization process improvement	Establish ERP system Enhancement/ customization strategy Establish change steering committee Develop ERP system IT developer expertise through training and knowledge sharing workshops	Trained ERP system IT developers Adhere to ERP system development (adopted or established) standards	ERP systems development/ enhancement processes Utilize the development infrastructure	Use system tools of program checks e.g. Extended program check option in the SAP ABAP workbench Utilize the testing tools of the development environment
	System Performance improvement	Define Performance Evaluation Metrics Define data archiving strategy Build IT development team expertise to review and optimize custom software codes with performance issues Build the capacity of IT technical (BASIS) team to apply technological solutions released by vendors	Trained and skillful IT team Adhere to development standards Apply technological solutions	Define system performance follow-up policies, procedures and Service level or operational agreements (SLA/ OLA)	Revisit the infrastructure specification Adopt system monitoring and alerting technological tools Implement notes, patches and upgrade programs to improve software components with performance issues
	Elevation of Data Quality	Establish and execute data governance strategy Establish data governance team Educate users on data quality (accuracy, completeness, and timeliness)	Adhere to data quality procedures and standards Trained users with a knowledge of input output relationship of processes	Define data model Define standards to improve data quality	Develop data validation programs Provide wrong data correction mechanisms

ERP Themes	Core issues/ Activities	Management	People	Process	Technology
	Facilitate rational decision making	Define operational, tactical and strategic KPIs Create user awareness education on the relevance of existing reports Build IT development and BI team expertise on reports development Provide user training to enable them to design and develop ad-hoc reports	Trained and knowledgeable IT development and BI developers Build reports based on the defined KPIs Utilize existing reports Trained and knowledgeable users in utilizing self-service reporting utilities	Defining report analysis, design and development standard	Use BI tools Use ERP systems standard reporting tools Build self-service reporting facility
	ERP system's Flexibility	Higher management buy-in of the best practice business value embedded in ERP system Demonstrate regularly to users the advantages of the best practices implemented on ERP system Educate users regarding the functionalities of the system Train users to change old legacy system thinking by teaching the fruits of the new system	Develop custom programs by adhering to development standards Use the functionalities of the system Comply with the best business practices	Old legacy system process and the new industry standard process comparison mapping. Gap analysis of old legacy VS the industry best practice processes	Improve ERP system through configuration and software code enhancement
	Process Integration Improvement	Establish service oriented process architecture Develop organizational culture supportive of business process management	Trained users on cross-functional business processes and process-oriented thinking	Enterprise wide business process mapping	Utilize the capabilities of PI technological tools Design service oriented architecture that supports the business process

ERP Themes	Core issues/ Activities	Management	People	Process	Technology
		Develop organization wide process-oriented thinking			
	ERP system Upgrade	Define ERP system post-implementation upgrade strategy Allocate valuable resources to post-implementation upgrade projects (Time, Money and personnel) Define change management strategy	Contribute to the success of the upgrade project	Change management process Project management process Define project progress communication guideline	Adopt project management IT solutions e.g. Solution Manager

5.2. Evaluation of the proposed framework

5.2.1 Framework Evaluation Approach

A framework, as a model artifact, needs to be evaluated in order to demonstrate its quality, utility and efficacy. This helps to improve the framework in an iterative manner to ensure the quality of the proposed solution so that it can solve real world business problems (Hevner, 2004).

Hevner's third guideline of design science defined that an IT artifact can be evaluated in terms of fit with the organization, functionality, completeness, reliability, usability, and other relevant quality attributes. An artifact can be evaluated by observational, analytical, experimental, testing, expert validation, and descriptive methods (Hevner, 2004). In this study, expert validation was used to evaluate the proposed framework along with descriptive method.

Expert validation is chosen to gain different views of the ERP system experts who work in Ethiopian Airlines in various positions. The ERP system knowledge of the experts along with their expertise in IT is believed to be crucial to gain valuable inputs. Moreover, majority of the experts have ample years of experience in the case organization and management position which adds value to their holistic view of the proposed ERP post-implementation management framework. It is also believed that the experts' experience in Ethiopian Airlines can help to evaluate the framework whether it fits to the organization or not. According to Hevner (2004) fit to the organization can be one of the criteria to evaluate an IT artifact.

As Hevner (2004) stated in the fifth guideline of design science research relies upon rigorous evaluation and re-construction of the design artifact in order to verify the research contributions stated in the fourth guideline. Even though the proposed framework is not rigorously evaluated tested, the evaluation consists of two rounds. The first round of expert validation was a focus group discussion with the selected ERP experts. The objective of the focus group discussion was to discuss the first draft framework with respect to its completeness, correctness, and clarity; and identify possible improvements opportunities. Appendix F describes the participants and setup of the focus group discussion. Subsequently, individual discussions had been conducted with the experts to have detailed discussion and gather additional feedbacks.

Based on the experts' feedbacks, the proposed framework was revised to improve its completeness, clarity and correctness. Hevner (2004) also indicated the importance of communication of the design artifact to both technology-oriented and management-oriented audiences in the last (seventh) guideline of design science research.

After revision of the proposed framework, a second round of expert validation was conducted through a questionnaire shown in Appendix G to gather individual evaluation of the improved framework regarding the completeness, clarity and correctness of the revised framework. In this phase, additional IT division employees were invited to participate on the survey by providing a brief explanation regarding the proposed framework. A web-based questionnaire is prepared using free online survey and questionnaire tool called 'Kwiksurveys'. The content of the questionnaire is derived from the evaluation criteria recommended by Hevener (2004) which consists of fit to the organization, comprehensiveness, reliability, clarity, correctness, and usability quality attributes.

First, a personalized e-mail has been sent to the selected IT division employees with a hyperlink (http://kwiksurveys.com/s/LIZJfAXS) to the questionnaire and an attachment of the revised framework. The questionnaire availed online by considering the fact that all participants are from IT division with a good IT knowledge. Secondly, a group SMS is forwarded to all the respondents in order to encourage them to fill up the questionnaire timely. Subsequently, the respondents were further encouraged to provide their genuine feedbacks through their personal cell-phone. Accordingly, all the invited 19 participants completed the survey. Hence, the response rate of the framework evaluation survey is 100%. The survey data is exported from Kwikssurveys website to excel and then copied to SPSS software for analysis purpose. The evaluation result is further analyzed in the next section.

5.2.2 Evaluation result of the proposed framework

In order to evaluate the consistency of the survey, Cronbach's alpha reliability test is applied and the result is depicted in table 31. The value of the coefficient alpha (0.767) indicates that the survey is reliable since it is greater than 0.7.

Table 31: Reliability Statistics based of the Proposed ERP Post-implementation Management Framework

Reliability Statistics	
Cronbach's Alpha	N of Items
.767	11

Descriptive analysis (mean and standard deviation) of the survey result is computed as can be seen in table 32. The mean result of the evaluation variables is found to be greater than 3 which indicated that the respondents agreed on the clarity, completeness, usefulness, correctness of the proposed framework. The overall rating of the proposed framework is 4.26 which represent the category of 'Very Good'. This indicates that the IT experts participated on the evaluation survey confirmed completeness, correctness and clarity, applicability of the proposed framework.

Table 32: Mean and standard deviation of the Framework Evaluation Survey

Descriptive Statistics					
	N	Min.	Max.	Mean	Std. Dev.
The proposed framework is comprehensive in terms of coverage.	19	3	4	3.74	.452
The organization and presentation of the framework is suitable.	19	4	5	4.32	.478
The objective of the four dimensions (Management, People, Process and Technology) is comprehendible.	19	4	5	4.89	.315
The content of the proposed framework is complete.	19	3	4	3.68	.478
The content of the proposed framework is correct.	19	4	5	4.89	.315
The content of the proposed framework is clear.	19	3	5	4.32	.671
The objective of the framework is comprehensible.	19	4	5	4.26	.452
The proposed framework is applicable.	19	4	5	4.47	.513
The applicability of the proposed framework can improve ERP post-implementation success.	19	4	5	4.58	.507
The implementation of the proposed framework fits with the organization.	19	4	5	4.79	.419
Overall rating of the proposed framework	19	3	5	4.26	.562
Valid N (listwise)	19				

The completeness of the contents of the proposed framework scored the lowest mean value (3.68) among all quality attributes used to measure the framework. This indicates the need for further improvement of the framework to ensure the completeness of its content. Similarly, the comprehensiveness of the framework in terms of its coverage needs further improvement as it scored the second lowest mean result (3.74) as can be seen in table 32.

The evaluation result indicated that, the correctness of the framework has the highest mean value (4.89) which revealed that majority of the experts strongly agreed to it. Similarly, the understandability of the objective of the four dimensions (Management, people, process and technology) are strongly agreed by majority of the experts with mean result of 4.89. The correctness and understandability shows the applicability of the framework and it can be easily converted to practice in the organization. In terms of the applicability of the framework, the mean result (4.47) lies under the category of 'strongly agreed' by the majority of the experts.

Thus, the results of correctness, understandability, and applicability revealed the validity of the framework to be implemented in the case organization in order to address technical, organizational and operational issues of ERP system post-implementation. In other terms, the research contributions is asserted based on the two round evaluations as stated by Hevner (2004) in the fourth guideline of design science research.

In addition to the above analysis, in the subsequent paragraphs it is attempted to assess the quality of the framework with respect to other ERP post-implementation framework.

Kiriwandeniya et al., (2013) designed a framework for ERP post-implementation success with especial attention to Sir Lankan large manufacturing enterprises; as briefly explained in related works section of this study. The researchers identified pre-implementation success, maintenance of ERP, minimal customization, initial post-implementation bench-marking, change management, top management support, and training as components of the framework. However, the framework did not address some key determinants as compared to the research output of this study. For instance, continuous improvement, user involvement, ERP system knowledge management, external relationship management, system performance improvement, elevation of data quality, facilitating rational decision making, flexibility, and process integration improvement are additional core issues identified in this study as major activities that determine

ERP post-implementation success. Apart from identifying the key determinants mentioned above, the research of Kiriwandeniya et al. (2013) did not attempt to explain how this core issues can be improved. On the other hand, this study attempted to explain what actions to be carried out for each identified core issues or activities. Moreover, this study proposes solutions for the identified core issues by considering multiple dimensions (management, people, process and technology) in order ensure the holistic view of the solution.

This study, not only identifies the core issues/ activities that determines ERP post-implementation success but also provided a detailed explanation of required actions that needs to be done in the perspectives of management, people, process and technology with respect to each identified core activity. Based on the above analysis, it can be inferred that the proposed framework can improve the management and utilization of ERP system and achieve post-implementation success. Moreover, the comprehensiveness of the framework along with the completeness of its content can be considered as an improvement area to further develop the framework so that it can serve its intended goal.

CHAPTER SIX

CONCLUSION AND RECOMMENDATIONS

This chapter presents conclusions drawn from the study, some recommendations based on the evidences presented during the course of the study and also suggestions for future research.

6.1. Conclusion

Many of internationally operating organizations consider ERP systems as an essential information systems solution to survive and prosper in today's competitive business environment. Ethiopian airlines, one of an international airline company, implemented ERP system in January, 2013; in order to adopt best practices imbedded on the system, streamline real-time process-integration, facilitate decision making by availing real-time information, and improve efficiency and effectiveness of the organization.

ERP adoption has three major phases: pre-implementation, implementation and post-implementation. The success of an ERP system is determined by the success of each of the phases including post-implementation phase. Even though ERP implementation success is a pre-requisite for post-implementation success, it is not a sufficient condition for fully reaping the potential benefits of the system. Rather, it demands continued efforts during the post-implementation phase of the system to achieve post-implementation success. Hence, investigating and addressing ERP post-implementation issues is crucial.

In this study, Ethiopian Airlines is considered as a case organization to examine the management and utilization of the implemented ERP system during post-implementation phase. This study was set out to investigate the technical, organizational, and operational issues of ERP post-implementation in Ethiopian Airlines and design a framework for addressing the identified issues and ensure ERP post-implementation success. The study has also sought to measure the level of user satisfaction during post-implementation phase as it is one of the indicators of IS success.

In order to best answer the research questions and achieve the objective of the study, a combination of quantitative and qualitative methods are used. This approach is used in order to validate the findings of the quantitative analysis using the output of the qualitative study and vice versa.

In due course, extensive literature review was conducted to define a research model which consists of the relevant constructs of organizational, technical and operational themes. The technical theme comprises three constructs namely: ERP attributes, IT expertise & user support level quality, and external relationship management. Under organizational theme, six relevant constructs were identified that determines ERP post-implementation success. These are training, top management championship, absorptive capacity, user involvement, strategic alignment, and continuous improvement. In relation to operational theme, cycle time reduction, cost reduction, productivity improvement, data quality improvement and internal process improvement constructs were identified.

The data collection instruments were prepared based on the research model. The questionnaire consists of 50 variables under the umbrella of the identified constructs. Some of

the questionnaire items were partially adapted from reviewed literatures and the rest were newly designed to meet the objective of the research. Consequently, the content of the interview outline has drawn from the subjects of the questionnaire items. Moreover, document analysis has been conducted to get additional information of the aforementioned constructs. The utilization of both quantitative and qualitative approach helped to triangulate the findings and get better output.

In summary, by way of answering the research questions, the study has been able to: (1) identify the technical, organizational, and operational issues of ERP post-implementation in Ethiopian Airlines, (2) measure the level of users' satisfaction on the effective utilization of the system, (3) prioritize them for management's attention, and (4) propose ERP post-implementation management framework to improve the identified core issues.

Based on the analysis and the findings, the following conclusions are drawn from the study:

- The PCA finding produced an output on the selected 49 variables, which make a contribution of 74.16 of the total variance of ERP post-implementation success.
- The PCA output reveals post-implementation success determinants in a ranked manner; which helps to prioritize and address the issues based on their total contribution share.
- Organizational issues are the most critical determinants of ERP post-implementation success. The empirical study indicated that, the overall mean score of organizational theme variables is lower than technical and operational related mean variables. Hence, it is concluded that organizational issues are affecting ERP post-implementation success in Ethiopian Airlines.
- As per the PCA output indicated, 41% of the total variation of ERP post-implementation success is explained by continuous improvement construct. Thus, the study identified continuous improvement as the top most important determinant of ERP system post-implementation success.
- User involvement is the next highest determinant construct of ERP post-implementation success. Based on the PCA result, 6.6% of the ERP post-implementation success variance is contributed by user involvement. Since ERP system is process-oriented, it demands process-oriented thinking of the users to better understand the impact of their activities across the value chain. Hence, user involvement determines the system utilization and data quality and the ERP post-implementation success.

- Training is one of the low rated construct of organizational theme. On the other hand, several scholars asserted that training is the main determinant to properly utilize the system and realize business benefits. The PCA output also confirmed that training is the third determinant construct of ERP post-implementation success which explains 4.94% of the total variance. Accordingly, it can be concluded that training is one of the organizational constructs which affected the utilization of ERP system.
- According to the survey result, ERP system related absorptive capacity of Ethiopian Airlines is not in the required level. Hence, it can be inferred that the knowledge management procedures, tools and services used to disseminate best practices needs improvement. Even though, knowledge sharing is one of the strategic initiatives, the study indicated that it needs further improvement to capture, codify and disseminate ERP system related knowledge.
- Top management championship plays a significant role in the success of an ERP system during post-implementation phase. In line with this, the proposed framework is designed by considering 'management' as one of the dimensions used to explain the solution with respect to the identified core issues/ activities. This helps to define the roles and actions and decisions of management team members with respect to identified core activities and issues.

- The technical attributes of an ERP system determines its utilization level by the users. Technical theme was found to be the second most important determinant that affected the post-implementation success of ERP system in Ethiopian airlines.

- The survey result indicated that ERP system flexibility is the lowest rated constructs of technical theme and ultimately affected ERP post-implementation success. When a system is flexible, use and meeting new business requirements is believed to be facilitated to achieve the intended business results. Hence, this indicates that the improving the flexibility of the system, improves ERP post-implementation success as also asserted by the PCA result.
- The study disclosed that the ERP system is not giving a comprehensive report for both management and non-management employees. In addition, the level of data quality also affects the comprehensiveness of the reports and ultimately the quality of decision making. As a result, the level of information derived from the system is not sufficient to make real time decision making. This entails users to further manipulate and compile data from different sources to get the desired information. In order to compete in the international

business world, organizations must position themselves to quickly access all the required information and make judicious business decisions. Hence, reports' comprehensiveness is identified as one of the improvement areas to better utilize the ERP system and ensure post-implementation success.

- The study indicates that Ethiopian airlines didn't get the required level of support from the SAP vendor after the go-live stage. It can be concluded that the level of external relationship management affected ERP post-implementation success since the organization is not getting the required level of technical assistance, software updates, maintenance and other services from the vendor of SAP ERP.
- Response time of the system is one of the technical issues that need continuous improvement during the post-implementation phase. As the transaction of the organization increases, the size of the data also grows exponentially; which impacts the performance of the system. Moreover, the way the standard and custom programs are developed also affected the performance of the system. Hence, system performance issue is one of the improvement areas that need attention in order to improve the utilization of the system.
- The study shown that data and information quality (accuracy, completeness, and timeliness) determines the utilization of the system. According to the qualitative study, the data quality is being affected not only the way the ERP system being used but also by the data received from other systems of the organization through process integration. Consequently, the data error affects the quality of decision making which ultimately impacts the business and growth of the organization.
- The IT team expertise and user support level quality has the lowest rating in the survey. This was also confirmed by the qualitative analysis result. In line with this, the IT help desk is not responsive enough to facilitate the resolution of issues that are reported from users. Moreover, change requests regarding system functionalities are taking long time which dissatisfies the users and affect the post-implementation success. Hence, IT team expertise and user support level quality is one of the inhibitors of the utilization of the system which demands further improvement.
- User satisfaction level on ERP post-implementation at Ethiopian airlines was found to be below average. As a result it can be concluded that majority of the users are not satisfied with ERP system during the post-implementation phase of the system.

6.2. Recommendations

Based on the findings of this study and the conclusions drawn, the following recommendations are forwarded for practice and knowledge (further research).

6.2.1 Recommendation for Practice

The result of this study is believed to provide guidance to managers, IT professionals and consultants concerning the core activities which can influence positively the utilization of ERP system and realize the intended business benefits. The proposed framework is supposed to provide insight for the possible solutions in the dimensions of management, people, process and technology for the determinants that are most problematic and critical for the overall ERP post-implementation success.

Ethiopian airlines should improve the utilization of the system and attain post-implementation success by focusing more on organizational theme as a priority goal. Accordingly, execution of the proposed framework is recommended in order to improve the utilization of the implemented ERP system and achieve continual business results to ensure ERP post-implementation success. In order to exercise the proposed framework, it is recommended to follow a phased approach by first focusing on the organizational theme constructs as mentioned above. It is believed that improving organizational issues can help to improve the technical issues and achieve operational, management and strategic benefits through the implemented system. Further, the following recommendations are forwarded on how to execute and practice the proposed framework considering the major issues that this study addressed:

- Top management championship is vital to continually ensure ERP post-implementation success. Their support is critical not only during implementation phase but also more importantly during post-implementation phase. Instead of viewing top management championship as a single construct, it should be viewed as one of the four dimensions in improving the identified core issues in the framework. Hence, top management has a stake in each of the core issues/ activities identified in this study. As a recommendation, ERP system progress monitoring steering committee should be established and top management should be

lead of the committee. This helps to get continuous feedback, follow-up the progress and also identify improvement opportunities. In addition to this; top management members should participate on international ERP related industry meetings, conferences and trainings in order to uplift their knowledge regarding responsibilities in relation with ERP system.

- According to the PCA output, continuous improvement construct explains 41% of the total variation of ERP post-implementation success. Thus, continuous improvement needs to get the required level of attention by considering its high impact to the overall ERP post-implementation success. Hence, management should comprehend the importance of continuous improvement and give top priority to it. OCM unit should be established in the organization to work with newly established COE team by focusing on continuous improvement initiatives of the ERP system.
- Improving training and absorptive capacity should get the required level of attention considering their contribution in the utilization of the system. Users of the system should get appropriate training on the system and also more importantly on the business processes and input-output relationship. In due course, users can understand not only how to use the system but also the end to end business process relationships and realize the impact of their activities on the entire business value chain. This helps to boost the process-oriented thinking of the employees, elevate data quality of the system and facilitate rational decision making. With the same token, IT experts should get the required level of training in the dimension of support, development and technical infrastructure area in order to improve IT expertise and user support level quality.
- Knowledge management and fostering knowledge sharing practice should be streamlined and executed to acquire, codify and disseminate ERP related knowledge which ultimately improves user involvement and acquire the organizations ERP related knowledge.

- Once the organizational issues get the required attention and addressed as per the above recommendations, management, OCM, COE and IT team should work on improving technical attributes of the system and improve the user support level quality.

- Data should be considered as corporate asset and data and information quality (accuracy, completeness, and timeliness) improvement should get proper attention and appropriate actions. In line with this, management should establish and data governance strategy and

exercise accordingly. Moreover, data governance team is recommended to be established in order to improve organization wide data quality by defining the required data model and also educate users.

- Ethiopian airlines should utilize all possible services from the vendor that are complementary with the license fee by engaging with the vendor and the assigned account manager. Moreover, management (specifically IT management) should improve external relationship management by revisiting already existing license agreements with the vendor.

6.2.2 Recommendation for future research

As part of further future researches, the following are the researcher's suggestions for knowledge.

- **Measuring ERP Post-Implementation success using ROI**

ROI can measure the business benefits achieved through an IT system. Hence, it is recommended to measure the impact of the implemented ERP system using ROI, identify gaps and address the issues accordingly.

- **Impact Assessment Study**

The impact assessment of the proposed framework is recommended to be researched in order to assess the consequences of the framework with respect to its contribution on the overall improvement and success of ERP post-implementation. Based on the output of the assessment study, the framework can be enhanced by identifying improvement opportunities through impact assessment study.

- **Research on other sectors, multiple organizations and other ERP system products**

This research is conducted by considering Ethiopian airlines as a single case organization. Since Ethiopian airlines is in a service sector conducting the research in other sectors such as Ethiopian based manufacturing firms can give a robust output. Moreover, instead of single case, multiple case-studies can give a holistic picture of ERP post-implementation success issues. In addition to this, conducting ERP post-implementation related research on

organizations with other ERP system package (e.g. Oracle, Peoplesoft, Baan and Microsoft) can also help to get all-rounded solutions of ERP system utilization issues.

- **Further improve the proposed framework**

In this study, ERP post-implementation issues are identified using a one-time survey and qualitative study. However, conducting longitudinal study can help to conduct the survey and improve the proposed framework iteratively by using continuous evaluation and feedback mechanism. This helps to improve the utility and quality and efficacy of the designed framework by rigorously demonstrating a well-executed evaluation method.

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APPENDICES

Appendix A: Letter of Request

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Addis Ababa University
College of Natural Sciences
School of Information Science

Ref: SIS/22/14/07
Date: -December 3, 2014

To: Ethiopian Airlines
Addis Ababa

Subject: Request for Cooperation

Dear Sir / Madam

Student Elsa Taddele (ID: GSR/1025/05) is a graduate student in the Department of Information Science, Addis Ababa University.

She is currently conducting research on **ERP-Post-Implementation Management Framework:- The Case of Ethiopian Airlines**

This is therefore, to request for your assistance in providing data /information required for his research.

With regards

Solomon Teferra (PhD)
Head, School of Information Science

Kenean!
Please handle
12. 01. 2015

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Appendix B: Questionnaire Survey

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 Science, I am undertaking a research on "ERP Post-Implementation Management Framework: The Case of Ethiopian Airlines" at Addis Ababa University. I have accordingly prepared this survey questionnaire. The objective of the survey is to investigate technical, organizational, and operational issues that are affecting the utilization of the SAP ERP system in the post-implementation phase at Ethiopian Airlines.

This research is believed to produce results that can improve the utilization of SAP ERP in Ethiopian Airlines, other sectors and organizations.

Your honest responses to each question and statement are extremely valuable to the outcome of this research. The questionnaire survey will take approximately 25 minutes to complete and the results of the survey will be used for the purpose of academic research only. Hence, all responses will be kept in strict confidentiality and hence would not affect any one in any case.

Your dedication is most valued and appreciated and I would like to take this opportunity to thank you in advance for your kind participation, genuine and on time response to the questionnaire.

Thank you again!

Elsa Taddele

1. Please mark on the SAP module that you use frequently for your tasks and activities of your current position.

   _____ HCM _____ FI/CO _____ Logistics

2. Please specify the specific sub-modules that you use frequently for your tasks and activities of your current position by ticking **(√)** in front of the sub-module.

SAP ERP Modules & Sub-modules implemented at Ethiopian Airlines					
FI/CO Sub-modules		**HCM Sub-modules**		**Logistics Sub-module**	
	Fixed Asset Accounting (AA)		Organization Management (OM)		Materials Management (MM)
	Accounts Payable (AP)		Personnel Administration (PA)		Sales and Distribution (SD)
	Accounts Receivable (AR)		E-Recruitment (EREC)		Production Planning and Control (PP)
	Banking (BK)		Payroll		Project Systems (PS)
	Controlling (CO)		Compensation		Quality Management (QM)
	Direct Operating Cost (DOC)		Cross Application Time Sheet (CATS)		Plant Maintenance (PM)
	General Ledger (GL)		Time & Leave Management (TLM)		
	Investment Management (IM)		Payroll		
	Real Estate Management (REFX)		Performance Management System (PMS)		
	Travel Management (TM)		Career and Succession Planning (CS)		
	Transfer Pricing (TP)		Training and Events Management (TEM)		
	Treasury (TR)		Uniform Management (UM)		
	Cost Center Accounting (CCA)		Personnel Cost Planning (PCP)		
	Profit Center Accounting (PCA)		Portal		
	Cost Element Accounting (CEA)				
	Internal Order (IO)				
	Profitability Analysis (PFA)				
	Financial Supply Chain Management (FSCM)				

General Instructions

1. In this questionnaire, SAP refers to the ERP system and its modules that are already implemented and being used by Ethiopian Airlines. **For the purposes of this questionnaire, please consider the term 'SAP' to specific modules/ sub-modules that you use frequently for your day to day activities/ tasks.**
2. Please answer this questionnaire consistently with respect to the SAP system modules/sub modules and the department which you are most familiar with and that you know the best. Kindly base your answers on the current SAP status and not on anticipated future results.
3. If you are using more than one sub-module, please consider the following. Either fill a separate questionnaire or provide average values.
4. Please draw a circle on the appropriate responses to the questions using the following Likert scale:

    1 = Strongly Disagree
    2 = Disagree
    3 = Undecided
    4 = Agree
    5 = Strongly Agree

A. Technical Theme

	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
1. SAP provides accurate and reliable information.	1	2	3	4	5
2. SAP provides up-to-date information.	1	2	3	4	5
3. SAP provides comprehensive information (e.g. the level of data responds to my needs, there is no need to compile data from different sources).	1	2	3	4	5
4. The information and related reports that SAP provides are useful and relevant to my work.	1	2	3	4	5
5. It has been swift and easy to learn how to use the system.	1	2	3	4	5
6. SAP has a quick response time (the system's reaction time to user activities is short).	1	2	3	4	5
7. SAP is flexible in terms of system use (e.g. it is easy to modify the content and format of the system and related outputs).	1	2	3	4	5
8. SAP system is flexible enough to be properly modified to meet new business requirements	1	2	3	4	5
9. SAP implementation has increased the integration of information systems in EAL.	1	2	3	4	5
10. The functions and features of SAP are highly useful in my work.	1	2	3	4	5
11. SAP support (Help Desk) is organized in a good and efficient way to solve SAP system related problems quickly.	1	2	3	4	5
12. I am able to receive user support regarding SAP system use promptly in a satisfactory manner.	1	2	3	4	5
13. Requests for change regarding system functionality are responded promptly.	1	2	3	4	5
14. Requests for change regarding configuration master data are responded to promptly.	1	2	3	4	5

	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
15. Requests for change regarding user authorizations (Permissions) are responded to promptly.	1	2	3	4	5

B. Organizational Theme

	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
1. The quality of SAP training has been sufficient to use the system effectively.	1	2	3	4	5
2. The duration of SAP training has been sufficient to use the system effectively.	1	2	3	4	5
3. I am satisfied with the training material regarding SAP system use.	1	2	3	4	5
4. When new system functionality is added, proper circulars are disseminated so that I can adopt the change without any difficulty.	1	2	3	4	5
5. I am fully aware of SAP system's advantage and capabilities.	1	2	3	4	5
6. Beyond the normal everyday job, I explore the SAP system to look for new ways to perform my business process activities and tasks.	1	2	3	4	5
7. My immediate supervisor allows me the time to attend SAP related training sessions.	1	2	3	4	5
8. My immediate supervisor encourages me to attend training sessions that address broader issues than the SAP system itself (e.g. business processes/ center of excellence related workshops).	1	2	3	4	5
9. My immediate supervisor discusses with me about how SAP impacts my work processes or tasks.	1	2	3	4	5
10. My immediate supervisor discusses with me about where my tasks fit in the "big picture" of SAP business processes.	1	2	3	4	5

	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
11. My immediate supervisor uses SAP modules that I am currently using for my job.	1	2	3	4	5
12. EAL uses tools and services to disseminate best practices/ Changes/ new developments.	1	2	3	4	5
13. EAL has a knowledge sharing system which continually gets updated for SAP related changes and new developments.	1	2	3	4	5
14. EAL has a clearly defined procedure that requires documenting and communicating changes of SAP system.	1	2	3	4	5
15. EAL has structurally defined central coordinating office to capture and codify new SAP related knowledge.	1	2	3	4	5
16. EAL staff members are encouraged to share SAP related ideas/ knowledge in all directions (with peers/ upward/downward).	1	2	3	4	5
17. I understand how the task(s) I perform can be an input into the next task(s) in cross-functional work process.	1	2	3	4	5
18. I understand how the task(s) I perform fit into the overall work process.	1	2	3	4	5
19. I understand the task(s) of other departments that are an input to the activities I carry out.	1	2	3	4	5
20. I understand the task(s) that serves as an input to other departments' processes.	1	2	3	4	5
21. I understand the overall work process that my task(s) is part of.	1	2	3	4	5
22. SAP system is continuously updated to improve complex functionalities of the system.	1	2	3	4	5
23. SAP system is continuously updated to improve the performance (response time) of the system.	1	2	3	4	5
24. SAP system is continuously updated to improve the system's flexibility.	1	2	3	4	5
25. SAP system is continuously updated to improve business process adaptability.	1	2	3	4	5

C. Operational Theme

	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
1. SAP has enabled me to improve the efficiency of my work (e.g. reduced time required for performing certain tasks, has made work easier, eliminated overlaps).	1	2	3	4	5
2. SAP has enabled EAL to achieve a significant cost reduction.	1	2	3	4	5
3. SAP has enabled me to improve the quality of my work (e.g. has improved the outcomes of my work, has enabled me to perform new tasks)	1	2	3	4	5
4. SAP has enabled me to increase the efficiency of my decision-making (e.g. I can make decisions at a faster pace).	1	2	3	4	5
5. SAP has enabled me to improve the quality of the decisions I make in my work (e.g. has increased the quantity and quality of information required for decision making).	1	2	3	4	5
6. Incorrect data input can be instantly discovered by SAP system.	1	2	3	4	5
7. SAP users understand the concept and the value of integrated data in EAL.	1	2	3	4	5
8. Data accuracy and integrity has been improved by using SAP system	1	2	3	4	5
9. SAP has improved the possibilities for cross functional communication and the internal service level of departments within EAL.	1	2	3	4	5
10. SAP system has improved internal coordination of business activities.	1	2	3	4	5

	Not at all Satisfied	Not Satisfied	Neutral	Satisfied	Very Satisfied
Overall, how do you rate your satisfaction level in SAP system?	1	2	3	4	5

Demographic Information

1. Name (Optional) _____
2. Department/ Section _____
3. Which of the following best represents your current position in Ethiopian Airlines?

   _____ Non-Management _____ Lead _____ Supervisor

   _____ Manager _____ Director _____Senior Management

4. Please indicate your seniority/ Service year in Ethiopian Airlines

   _____ < 2 years _____ 2-5 years _____ 6-10 years

   _____ 11-15 years _____ > 15 years

Appendix C: Interview Outline

1. How do you see the overall acquisition of SAP to meet the strategy/ business requirement of Ethiopian Airlines?
2. Is there an alignment (continuous fit) between the business strategy, organizational structure, the IT strategy and the implemented ERP system?
3. How do you see the ERP attribute for the success of utilization?
4. How do you measure the IT expertise & user support level quality? What improvement opportunities do you propose to improve the IT expertise & user support level quality? What is your recommendation?
5. How do you rate ET's external relationship management in relation with SAP? (Relationship with Vendor and consultants)
6. How do you see SAP related trainings in terms of content, quality and duration? How about the training materials?
7. What kind of initiatives do you make to ensure continuous ERP system utilization and upgrade and progress of the system?
8. What kind of initiative is there to encourage SAP related learning and knowledge?
9. Is there a means to place procedures to capture, codify and disseminate ERP system related knowledge?
10. Are the already existing knowledge sharing mechanisms helping users to get new knowledge of SAP such as how to use a new functionality of the system?
11. Is the impact of one business activity on other business units known well (The level of users' cross-functional (process-oriented) thinking)?
12. How do you see the continuous improvement of ERP system in order to address users' complexity issues, performance issues, improve the system's flexibility and its business process adaptability? What kind of initiative do you make for the continuous improvement?
13. Comment on the operational contributions of ERP system in Ethiopian Airlines. It can be seen from the perspective of Cycle time reduction, Cost Reduction, Productivity Improvement, Data Quality Improvement, Internal Process Improvement, etc.

Appendix D: Mean and standard deviation of the Survey

Descriptive Statistics			
	N	Mean	Std. Deviation
Accuracy & reliability of information	124	3.27	1.085
Up-to-date information	124	3.40	1.051
comprehensiveness of information	124	2.71	1.153
Usefulness and relevance	124	3.85	.881
Swiftness and easiness to learn the system.	124	2.66	1.331
System's reaction time to user activities	124	2.86	1.245
Flexibility in terms of system use	124	2.55	1.062
Flexibility to meet new business requirements	124	2.57	.981
The integration of information systems in EAL.	124	3.59	.980
The functions and features of SAP in my work.	124	3.99	.841
SAP support to solve SAP system related problems	124	2.25	1.049
User support regarding SAP system use promptly	124	2.45	1.031
Change regarding system functionality	124	2.40	.961
Change regarding configuration master data	124	2.40	.962
Change regarding user authorizations (Permissions)	124	3.26	1.111
Quality of SAP training	124	2.14	1.015
Duration of SAP training	124	2.17	.952
Training material sufficiency	124	2.44	1.076
Proper circulars to adopt the change	124	2.50	.992
Awareness of SAP system's advantage and capabilities.	124	3.03	1.089
Explore the SAP system to look for new ways	124	2.72	1.123
Allowance of time to attend SAP related training sessions	124	2.63	1.151
Encouragement to attend training sessions	124	2.56	1.076
Discussion with supervisor on SAP impacts on my work	124	2.98	1.144
Discussion with supervisor on my tasks fitness to SAP system	124	2.90	1.015
My immediate supervisor uses SAP modules that I am currently using	124	3.44	1.062
EAL uses tools and services to disseminate best practices	124	3.03	.995
EAL knowledge sharing system for SAP related changes	124	2.81	1.015
EAL procedures to document and communicate changes of SAP system	124	2.87	.937
EAL has structurally defined central coordinating office	124	3.02	.992
EAL staff members are encouraged to share SAP related ideas	124	2.95	1.111
Understanding of cross-functional work process	124	3.76	.849

Fitness of task(s) I perform to the overall work process	124	3.78	.822
Understanding of other departments task to activities carry out	124	3.83	.881
Understand the task(s) that serves as an input to other departments'	124	3.76	.830
I understand the overall work process that my task(s) is part of.	124	3.68	.916
System update to improve complex functionalities	124	2.65	.947
System update to improve the performance	124	2.67	1.002
System update to improve the system's flexibility.	124	2.57	.997
System update to improve business process adaptability.	124	2.70	1.020
SAP improved the efficiency of my work	124	3.15	1.187
SAP achieved a significant cost reduction.	124	3.16	1.055
SAP improved the quality of my work	124	3.15	1.082
SAP increased the efficiency of my decision-making	124	3.08	1.033
SAP improved the quality of decisions I make in my work	124	3.04	1.070
Incorrect data input discovered by SAP system	124	2.60	1.202
SAP users understand the concept and the value of integrated data	124	2.76	1.143
Data accuracy and integrity improved by using the system	124	2.95	1.096
SAP improved the possibilities for cross functional communication & internal service	124	3.17	1.018
SAP system improved internal coordination of business activities.	124	3.15	1.041
Level of satisfaction in SAP system	124	2.77	1.021
Valid N (listwise)	124		

Appendix E: Correlation between factors and level of satisfaction

	Level of satisfaction in SAP system				
	Kendall's tau_b		Spearman's rho		
	Correlation Coefficient	Sig. (2-tailed)	Correlation Coefficient	Sig. (2-tailed)	N
Accuracy & reliability of information	0.46	0.00	0.52	0.00	124
Up-to-date information	0.42	0.00	0.47	0.00	124
comprehensiveness of information	0.51	0.00	0.58	0.00	124
Usefulness and relevance	0.32	0.00	0.36	0.00	124
Swiftness and easiness to learn the system.	0.50	0.00	0.59	0.00	124
Systems reaction time to user activities	0.46	0.00	0.54	0.00	124
Flexibility in terms of system use	0.41	0.00	0.47	0.00	124
Flexibility to meet new business requirements	0.51	0.00	0.57	0.00	124
The integration of information systems in EAL.	0.46	0.00	0.52	0.00	124
The functions and features of SAP in my work.	0.26	0.00	0.30	0.00	124
SAP support to solve SAP system related problems	0.50	0.00	0.58	0.00	124
User support regarding SAP system use promptly	0.57	0.00	0.65	0.00	124
Change regarding system functionality	0.59	0.00	0.67	0.00	124
Change regarding configuration master data	0.57	0.00	0.65	0.00	124
Change regarding user authorizations (Permissions)	0.33	0.00	0.39	0.00	124

Table: Technical

	Level of satisfaction in SAP system				
	Kendall's tau_b		Spearman's rho		
	Correlation Coefficient	Sig. (2-tailed)	Correlation Coefficient	Sig. (2-tailed)	N
Quality of SAP training	0.49	0.00	0.56	0.00	124
Duration of SAP training	0.49	0.00	0.56	0.00	124
Training material sufficiency	0.37	0.00	0.44	0.00	124
Proper circulars to adopt the change	0.47	0.00	0.56	0.00	124
Awareness of SAP system’s advantage and capabilities.	0.32	0.00	0.39	0.00	124
Explore the SAP system to look for new ways	0.24	0.00	0.27	0.00	124
Allowance of time to attend SAP related training sessions	0.40	0.00	0.48	0.00	124
Encouragement to attend training sessions	0.43	0.00	0.50	0.00	124
Discussion with supervisor on SAP impacts on my work	0.32	0.00	0.37	0.00	124

Discussion with supervisor on my tasks fitness to SAP system	0.34	0.00	0.39	0.00	124
My immediate supervisor uses SAP modules that I am currently using	0.12	0.13	0.13	0.14	124
EAL uses tools and services to disseminate best practices	0.44	0.00	0.49	0.00	124
EAL knowledge sharing system for SAP related changes	0.40	0.00	0.47	0.00	124
EAL procedures to document and communicate changes of SAP system	0.42	0.00	0.48	0.00	124
EAL has structurally defined central coordinating office	0.39	0.00	0.46	0.00	124
EAL staff members are encouraged to share SAP related ideas	0.36	0.00	0.41	0.00	124
Understanding of cross-functional work process	0.25	0.00	0.28	0.00	124
Fitness of task(s) I perform to the overall work process	0.29	0.00	0.33	0.00	124
Understanding of other departments task to activities carry out	0.22	0.00	0.25	0.01	124
Understand the task(s) that serves as an input to other departments'	0.25	0.00	0.28	0.00	124
I understand the overall work process that my task(s) is part of.	0.29	0.00	0.33	0.00	124
System update to improve complex functionalities	0.60	0.00	0.68	0.00	124
System update to improve the performance	0.62	0.00	0.70	0.00	124
System update to improve the system's flexibility.	0.53	0.00	0.61	0.00	124
System update to improve business process adaptability.	0.58	0.00	0.67	0.00	124

Table: Organizational

	Level of satisfaction in SAP system				
	Kendall's tau_b		Spearman's rho		
	Correlation Coefficient	Sig. (2-tailed)	Correlation Coefficient	Sig. (2-tailed)	N
SAP improved the efficiency of my work	0.55	0.00	0.62	0.00	124
SAP achieved a significant cost reduction.	0.56	0.00	0.64	0.00	124
SAP improved the quality of my work	0.58	0.00	0.64	0.00	124
SAP increased the efficiency of my decision-making	0.61	0.00	0.68	0.00	124
SAP improved the quality of decisions I make in my work	0.62	0.00	0.69	0.00	124
Incorrect data input discovered by SAP system	0.47	0.00	0.55	0.00	124
SAP users understand the concept and the value of integrated data	0.47	0.00	0.55	0.00	124
Data accuracy and integrity improved by using	0.53	0.00	0.60	0.00	124

the system					
SAP improved the possibilities for cross functional communication & internal service	0.58	0.00	0.65	0.00	124
SAP system improved internal coordination of business activities.	0.59	0.00	0.66	0.00	124

Appendix F: Expert Validation focus group Discussion

Wednesday May 13, 2015, 05:30 – 08:45 P.M.

Organizer: Elsa Taddele

Participants (Experts at Ethiopian Airlines)

- Wondwossen Tadesse – Director Business Transformation & Continuity
- Getinet Tadesse – Director Corporate Systems
- Miretab Teklay – Manager Business Intelligence & Process Integration
- Meraf Daniel – Manager SAP ERP support
- Tilahun Mulugeta – Manager Systems and Database Administrations
- Seble Abera – Manager IT Audit
- Bethlehem Mengistu – Senior ICT Quality Assurance Officer
- Meron Alemu – Manager Center of Excellence

Focus group discussion setup

- The objective of the focus group discussion was to discuss the draft framework with ERP experts, with regard to completeness, correctness and clarity. Moreover, the purpose was to gather improvement areas emanated from the discussion.

Agenda

- 05:30 P.M. Opening
- 05:40 P.M Presentation on the problem statement, objective, and research design of the study
- 05:55 P.M. Presentation on the matrix representation of the framework
- 06:10 P.M. Discussion on the contents of the framework with the participants comments
- 08:45 P.M. Closure

Venue

- IS conference room

Appendix G: Proposed Framework Evaluation Survey

Addis Ababa University

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 Science, I am undertaking a research on "ERP Post-Implementation Management Framework: The Case of Ethiopian Airlines" at Addis Ababa University. Based on the focus group discussion held on May 13, 2015, I have amended the proposed framework and accordingly prepared this survey questionnaire. The objective of the survey is to evaluate the proposed framework with respect to its comprehensiveness, clarity, completeness, correctness, and applicability.

This research is believed to produce results that can improve the utilization of SAP ERP in Ethiopian Airlines, other sectors and organizations.

Thank you for your dedication to provide your genuine feedback regarding the proposed framework.

Thank you again!

Elsa Taddele

General

1. The proposed framework is comprehensive in terms of coverage

○ Strongly Disagree ○ Disagree ○ Neutral ○ Agree ○ Strongly Agree

2. The organization and presentation of the framework is suitable.

○ Strongly Disagree ○ Disagree ○ Neutral ○ Agree ○ Strongly Agree

3. The objective of the four dimensions (Management, People, Process and Technology) is comprehendible.

○ Strongly Disagree ○ Disagree ○ Neutral ○ Agree ○ Strongly Agree

4. The objective of the framework is comprehensible

○ Strongly Disagree ○ Disagree ○ Neutral ○ Agree ○ Strongly Agree

Regarding the content of the framework

5. The content of the proposed framework is clear.

○ Strongly Disagree ○ Disagree ○ Neutral ◉ Agree ○ Strongly Agree

6. The content of the proposed framework is correct.

○ Strongly Disagree ○ Disagree ○ Neutral ○ Agree ○ Strongly Agree

7. The content of the proposed framework is complete.

○ Strongly Disagree ○ Disagree ○ Neutral ○ Agree ○ Strongly Agree

Regarding utility and applicability of the framework

8. The proposed framework is applicable.

○ Strongly Disagree ○ Disagree ○ Neutral ○ Agree ○ Strongly Agree

9. The implementation of the proposed framework fits with the organization.

○ Strongly Disagree ○ Disagree ○ Neutral ○ Agree ○ Strongly Agree

10. The applicability of the proposed framework can improve ERP post-implementation success.

○ Strongly Disagree ○ Disagree ○ Neutral ○ Agree ○ Strongly Agree

DECLARATION

I declare that the thesis is my original work and has not been presented for a degree in any other university.

_____

Date

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

_____

Advisor