Addis Ababa University

School of Graduate Studies

College of Natural Sciences

School of Information Science

Success Factors for Implementation of Enterprise Resource Planning System at Ethiopian Airlines

A Thesis Submitted to the School of Graduate Studies of Addis Ababa University in Partial Fulfillment of the Requirements for the Degree of Master of Science in Information Science

By

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ACRONYMS

ASAP	Accelerated SAP Methodology
BAPI	Business Application Programming Interface
BI	Business Intelligence
CRM	Customer Relationship Management
CSF	Critical Success Factor
DBMS	Data Base Management System
EIS	Executive Information System
ERP	Enterprise Resource Planning
FI	Finance
FICO	Finance and Controlling
GUI	Graphic User Interface
HCM	Human Capital Management
ICT	Information & Communication Technology
IT	Information Technology
ITEC	Information Technology Executive Committee
LOG	Logistics
MRP	Materials Requirement Planning
MSI	Master System Integration
OUM	Oracle Unified Modeling
PI	Process Integration
PMO	Project Management Office
R/3	Real-time / 3-Tier
SaaS	Software as a Service
SAP	Systems Applications Products in Data Processing
SOP	Standard Operating Procedure
UAT	User Acceptance Testing
Y2K	Year 2000

ABSTRACT

This research work finds out the factors that determine the success of an Enterprise Resource Planning (ERP) system implementation with particular reference to Ethiopian Airlines. An Enterprise Resource Planning system is a corporate wide information system which is used to integrate the business processes and resources of a company. When the business environment of a company increases and becomes complex, it is difficult to continue with the traditional decentralized information systems for timely decision making and other activities. In today's competitive business environment, ERP systems are found to be essential for companies to get competitive and strategic advantages.

Developing countries like Ethiopia are not yet benefiting much from ERP systems while these systems are widely adopted in the developed countries. However, demand to ERP is increasing to the developing countries also due to economic growth and globalization. On the other hand, implementation of ERP systems is a huge investment and is not an easy job. Successful ERP systems can boost a company's efficiency while failed ERP systems can damage its performance.

Implementation of ERP system is also affected by different organizational, social, economic, cultural, national and technical factors. So, it is important to identify contextual factors which can lead to successful ERP projects in Ethiopian context since Ethiopian situation is distinctive of developed nations.

This research takes the case of SAP ERP system implementation project at Ethiopian Airlines. The research is qualitative type case study which has mainly used interviews, observations and an online survey questionnaire as research tools and techniques. Purposive sampling is used to select interviewees and survey respondents among the project managers, team leaders, super users and project members. Data collected in this study is analyzed by inductive reasoning and triangulation of data from the different sources.

The result of this research found out twenty critical success factors for success of ERP systems. Factors such as project planning, top management support, project management and leadership, capability of consultants, change management and communication, organizational readiness and overall knowledge transfer are among the factors found to be critical for ERP system implementation in the Ethiopian context.

CHAPTER ONE

INTRODUCTION

1.1. BACKGROUND

Companies have been developing information systems which meet their specific business requirements. This needed to develop a custom code which is tedious process. Companies also used to have departmentalized systems, instead of corporate-wide enterprise systems, which cannot share information easily within the organization. This has resulted in data discrepancies which can cause time taking and inaccurate reports for decisions. This in turn affects organization level enterprise performance due to the absence of integrated information systems.

In today's age of globalization and competition, it is difficult for companies to continue with the traditional information systems described above. Any business industry demands companies to be cost effective. Companies need to analyze costs and profits on a product or consumer basis to be flexible and face ever changing business requirements[1]. However, there are some challenges holding companies back. Difficulty in attaining accurate information, lack of applications that improve existing business practices and bad interfaces are few of such challenges. Companies need paperless environments, planned resources and real time data interfaces and reporting through integrated business environments. Traditional disintegrated IT solutions cannot support such demands for real time integrations and decision making as businesses grow and become complex[1].

In order to eliminate business problems mentioned here, a new breed of software systems, named as Enterprise Resource Planning (ERP), is developed by software companies. Enterprise Resource Planning is an enterprise system which is meant to address such business situations. It is used to integrate the business processes and resources of a company. When the business environment of a company increases and becomes complex with the need of functional units for more inter-functional data flow for better and timely decision making, it becomes impossible to continue with the traditional and separated information systems here and there. The concept of ERP systems comes at this point mainly as a back office support for companies. It is used to integrate all business functions of a company as one single system. ERP systems are supported and powered by integrated software packages developed and provided by ERP solution vendors.

Unlike the traditional disintegrated pieces of information systems, ERP solution package is one integrated information system with different modules like finance, accounting, human resource management, supply chain, production planning and so on. These modules are integrated as one enterprise information system.

ERP systems give different strategic and competitive advantages to a company. They provide single point of data entry facility in such a way that when some data is maintained at a module of one end, it is immediately accessible with the modules at the other ends, thus reducing data entry efforts and redundancy. ERP system enforces a company to reengineer its business processes to fit with the ERP solution. According to Roman [2], ERP systems have the following benefits.

- Easier reporting and controlling facility
- Enhanced technology for the institution to help compete technologically
- Increased efficiency and effectiveness of processes
- Integrating and streamlining information.

Many countries, especially the developed ones have benefited the advantages of ERP systems by highly adopting these systems since early 1990s [3]. Developing countries are now adopting ERP systems like the developed ones. But, regardless of the ERP systems advantages and benefits mentioned here, developing countries like Ethiopia have not yet adopted and benefited much from such integrative information solutions [3] which are usually suited for organizations with large size businesses or services.

Implementation of ERP systems is not an easy job. While successful ERP systems can boost a company's efficiency, failed systems can be disastrous on the other hand. ERP systems are implemented according to the implementation methodology of the respective vendor. So, it is important to undergo such a research on factors which can lead to successful ERP projects in relation to implementation methodology.

1.2. STATEMENT OF THE PROBLEM

It is clear that ICT is considered as a strategic tool for services and businesses in different countries and governments. The same is true in Ethiopia. However it is difficult to continue with the traditional disintegrated information systems. In globalization, companies encounter business and technical challenges [4]. Globalization and economic growth demands

organizations to implement and benefit from ERP systems as their back bone systems. ERP is considered as mission critical strategy in globalization [4].

It is very rare to find or hear about ERP systems in Ethiopia until now regardless of the advantages of these systems. Literature and observations show that only few organizations are known to have acquired ERP systems in Ethiopia. ERP vendor companies such as SAP of German and Oracle from America are expanding their investment to African countries including Ethiopia. Conferences and workshops are hosted by the major ERP vendor SAP here in Addis Ababa recently. SAP has announced its renewed interest and focus on Ethiopian financial service in order to assist in improving business management and customer relations in Ethiopia [5].

On the other hand, in contrary to the advantages and benefits of ERP systems, the history of ERP implementation all over the world is not interesting news and it is more of a failure [1] [6]. The success of ERP implementation is classified in three categories as “Successful”, “Challenged” and “Failed” [7].

- Successful ERP project is the one which is within the budget, schedule and up to the expectations.
- Challenged ERP project is not within the project budget and schedule but the system is implemented and being used with minor problems and errors which can be corrected.
- Failed ERP is abandoned or not implemented and it is never used.

There are numerous reports of cases of ERP system implementation failures [8] [9]. In the early days of ERP, failure rates were said to average about 70% [10]. There are also huge financial losses and bankruptcies which are reported by IDG News Service [6] to be caused by ERP failures. According to the year 2014 ERP report of the past four years released by Panorama Consulting Solutions, most of the ERP projects are over budget, beyond schedule and under delivered [11] as shown in table 1.1. Panorama Consulting Solutions is an IT consulting firm specializing in ERP market around the world.

Table 1.1: ERP failure/challenges trend (source: Panorama Consulting Solutions, 2014)

Year	% of Cost Overruns	% of Duration Overruns	% of Receiving 50% or Less Benefits
2013	54%	72%	66%
2012	53%	61%	60%
2011	56%	54%	48%
2010	74%	61%	48%

Moreover, even if there are many attempts to discover the reasons and factors for failures of ERP implementation, the results are varying at different times and contexts. This is because ERP systems are complex, need huge budget investment [2] and company re-arrangements and the implementation success depends on different social, cultural and technical factors of the companies and countries. Zaglago et al. [12] mentioned that the successful implementation of ERP system in an organization can be affected by the culture within the organization which in turn is a characteristic of the culture within a particular society. They

added that implementing an Enterprise Resource Planning system is a major cultural change for any organization.

Since most of the studies conducted on ERP are also in the context of Western countries where the ERP systems are produced, it is not clear and confirmed if the critical success factors already identified are applicable to developing countries like Ethiopia [13].

Regarding researches on ERP system implementation in Ethiopian context, only two studies are conducted. Abiot and Jorge [14] tried to assess Ms-Dynamics ERP implementation in a private company. Derese [15] has conducted a study on Oracle ERP system at Ethio-Telecom, a government company. But, research on SAP ERP implementation in Ethiopia is not conducted. These Ethiopian companies have different business practices. In addition, the different ERP systems have their own unique implementation methodologies and technical requirements. This indicates that there should be more research on ERP in Ethiopian context.

So, when implementing such integrated and big ERP packages, assessing the factors which will affect the implementation and sharing experiences is crucial for developing countries like Ethiopia. Sharing lessons is one important tool for success of projects. Since Ethiopia is a developing country, it is difficult to accept huge budget losses and dissatisfaction of organizations and their customers which can be caused by delayed or failed ERP systems.

Therefore, it is the right time and worth doing this research in order to share a lesson to Ethiopian organizations about ERP implementation experiences in Ethiopian perspective. Accordingly, this research study attempts to answer the following main research question.

- What factors determine the success of ERP implementation projects (what must be fulfilled to make ERP projects a success)?

1.3. OBJECTIVE OF THE STUDY

The general and specific objectives of this study are as mentioned below.

1.3.1. General Objective

The general objective of this research is to investigate ERP implementation in the context of Ethiopia to identify critical success factors with the view to make recommendations on what must be done or fulfilled to improve the situations for the success of ERP systems.

1.3.2. Specific Objectives

The specific objectives of the study that can lead to achieving its general objective are listed as follows.

- To review literature about ERP systems in general and ERP systems implementation experiences of success and failure.
- To conduct detail interviews, discussions, observations, online questionnaire and document assessments about ERP success factors at Ethiopian Airlines.
- To conduct an online survey questionnaire in order to supplement and confirm the results of the interviews.

1.4. SIGNIFICANCE OF THE STUDY

This study has many societal, scientific and academic contributions as discussed below.

1.4.1. Societal contribution

The main significance of this study is knowledge and experience sharing about ERP systems implementation between organizations in Ethiopia. It is important to show best experiences (successes) and lessons learnt (failures). The study is vital in saving huge cost and to increase organizations and employees satisfaction which can be incurred and affected by delayed ERP projects or failures at all. As suggested by Abiot and Jorge [14], it is necessary to study and report more ERP implementations in Ethiopia.

Developed countries which have adopted ERP systems have many failure experiences and histories of ERP projects. But, this should not happen to Ethiopian organizations since it can seriously affect their entire business operations. Organizations must control and manage the system per their business logic instead of the system controlling and affecting the business or service activities.

So, the study results can be used as a reference and bench mark of ERP system implementation for Ethiopian context and environment. It helps organizations during project preparations, team and employee mobilization, ERP vendor selection, implementation partner identification, change management activities and other decisions which are demanded by enterprise resource planning systems implementations. ERP implementing companies can get ideas in risk identification, mitigation and setting contingency action plans. This study contributes for the development of local consultancy in ERP industry.

It is common to conduct post project lessons assessment and audits. In this regard, the research can serve as ERP project lessons assessment for Ethiopian Airlines.

1.4.2. Scientific contribution

The results of this study can be used to fill the literature gap on ERP in Ethiopian context and can be used as a reference for future research proceedings. It also has contributions for Ethiopian universities education system as input to revise their IT courses curriculum and incorporate ERP related sources and materials.

1.5. SCOPE AND LIMITATION OF THE STUDY

1.5.1. Scope

The scope of this research is bound to conducting a single-case study to investigate the critical success factors of ERP systems implementation by considering the case of SAP ERP project at Ethiopian Airlines even though the results of the study can be extended and applied to other organizations and ERP projects. The focus of the study is around the five main ERP modules which are fully implemented and being used at the case study company. These modules are as listed below.

- Finance and Controlling (FICO)
- Logistics and Supply Chain Management (LOG)
- Human Capital Management (HCM)
- Business Intelligence and Process Integration (BI and PI)
- SAP ERP portal

The scope of the study is also within the phases of ASAP ERP implementation methodology covering the period from the ERP project preparation up to the end or cutover of the project.

1.5.2. Limitation

Like any other research, this study has encountered the following limitations and constraints.

- Limited or no literature and research on ERP in Ethiopian context for reference.
- Time constraint of some interviewees and survey respondents due to busy office works.
- The overall time constraint of the research program.
- Limited availability and access to documents related to the ERP implementation project.

1.6. ORGANIZATION OF THE THESIS

The thesis report is arranged in five chapters. The first chapter starts with a general introduction about ERP systems. It explains the research problem, the need or significance of the research, its scope and limitations. Chapter two is detail literature review about ERP, critical success factors and ASAP methodology. The third chapter discusses in detail about the methodology of the research, data collection and analysis techniques and tools. Chapter four is about analyzing the data, discussion and evaluation of results. Finally, chapter five contains conclusions, suggestions and recommendations for future further works.

CHAPTER TWO

RELATED LITERATURE REVIEW

2.1 RELATED WORKS

There are many research works and literature conducted about ERP implementation all over the world and from different countries perspectives. Most of these works are about the failure factors of ERP systems. Ghosh [16] is one of such studies which tried to see ERP failures. Gordon (2010) has surveyed key issues in ERP system implementation. IDG News Service has listed and detailed 10 biggest ERP software failures and related financial loss in 2011 [6].

Bhagwani [17] has tried to review critical success factors in relation to implementation methodologies based on only assessment of previous research articles. Bhagwani has suggested extending such researches to case studies. Esteves has a research work which is about defining and analyzing critical success factors [18]. The research was based on only one case study and in Spanish context.

In Ethiopian context, there is very limited literature and research about ERP systems regardless of many ERP research works globally. The first attempt in this regard is the work of Tewodros [19] which just only discusses about the concept and design of ERP frame work and its implementation guideline at Gafat Engineering Company. This is just about ERP framework and it has no experiences of actual ERP implementation success and failures.

The second ERP literature from Ethiopian perspective is that of Abiot and Gomez [14]. This study has discussed about a successful ERP Implementation in another Ethiopian private limited engineering company. The ERP system mentioned by the author is Microsoft Dynamics which has less market share and it is not well known and deployed as SAP and Oracle. In addition, the authors have not mentioned the detail factors encountered as challenges. They have just mentioned that problems encountered are cultural, business and technical.

They have proposed for more studies and reports on ERP implementations related to Ethiopian context for better experience sharing. The last study on ERP system in Ethiopia is the work of Derese [15] which is a case study at Ethio-telecom on Oracle ERP. Derese's study was a frame work for successful ERP project. He has tried to list critical success factors along pre-implementation, implementation and post-implementation phases of Oracle ERP. This was a framework for high level implementation guide. He rather suggested to further study the contextual factors in other organizations and with other ERP systems relating them with ERP implementation methodologies.

This study is in line with suggestions of many previous research works in the study area. As the type and management of critical success factors is different in context, a critical success factors approach is necessary. So, this study will try to make detail investigation and find out ERP implementation critical success factors and their importance level considering ASAP implementation methodology as a reference.

2.2 ERP OVERVIEW

Enterprise Resource Planning (ERP) is a process of managing all resources of an enterprise and their use in the entire enterprise in a coordinated manner. An enterprise resource planning application is an enterprise-wide package that integrates all business functions into a single system with a common database. Enterprise Resource Planning systems are software packages composed of different functional modules such as finance and controlling, human resources, sales, production, materials management and others. They provide cross-organization integration of data through imbedded business processes as shown in figure 2.1. Integration is the basic objective in ERP implementation. Controlling is the other main need of ERP systems.

For a software system to be called an ERP system, it must have the following essential characteristics.

- Multifunctional in scope and modular design comprising many distinct business modules such as finance, manufacturing, accounting, distribution, etc.
- Use centralized common database management system (DBMS)
- Integrated in that when a transaction or piece of data representing an activity of the business is entered by one of the functions, data regarding the other related functions is changed at the same time.
- Flexible and offer best business practices.
- Require time-consuming tailoring and configuration setups for integrating with the company's business functions.
- Financial and business information is often generated automatically by ERP systems based on data previously entered, without further human instructions and manipulations.

- ERP provides business intelligence tools like Decision Support Systems, Executive Information System and reporting for better decision making.

Figure 2.1: A typical ERP system (Source: http://www.koolgrapsite.com/tag/erp-systems)

ERP system is commonly viewed as a back-office support system. But practically it is also a front office system. Components or modules of an ERP system are divided into two as core ERP components and extended ERP components as in figure 2.2. Core ERP components are the traditional components which are included in most ERP systems and they primarily focus on internal (back-office) operations.

Extended ERP component are extra components that meet the organizational needs not covered by the core components and primarily focus on external (front-office) operations. Core ERP components are accounting and finance (FI), human capital management (HCM) and logistics

(LOG) which contains production and materials management. Extended components are modules such as business intelligence, customer relationship management and portal.

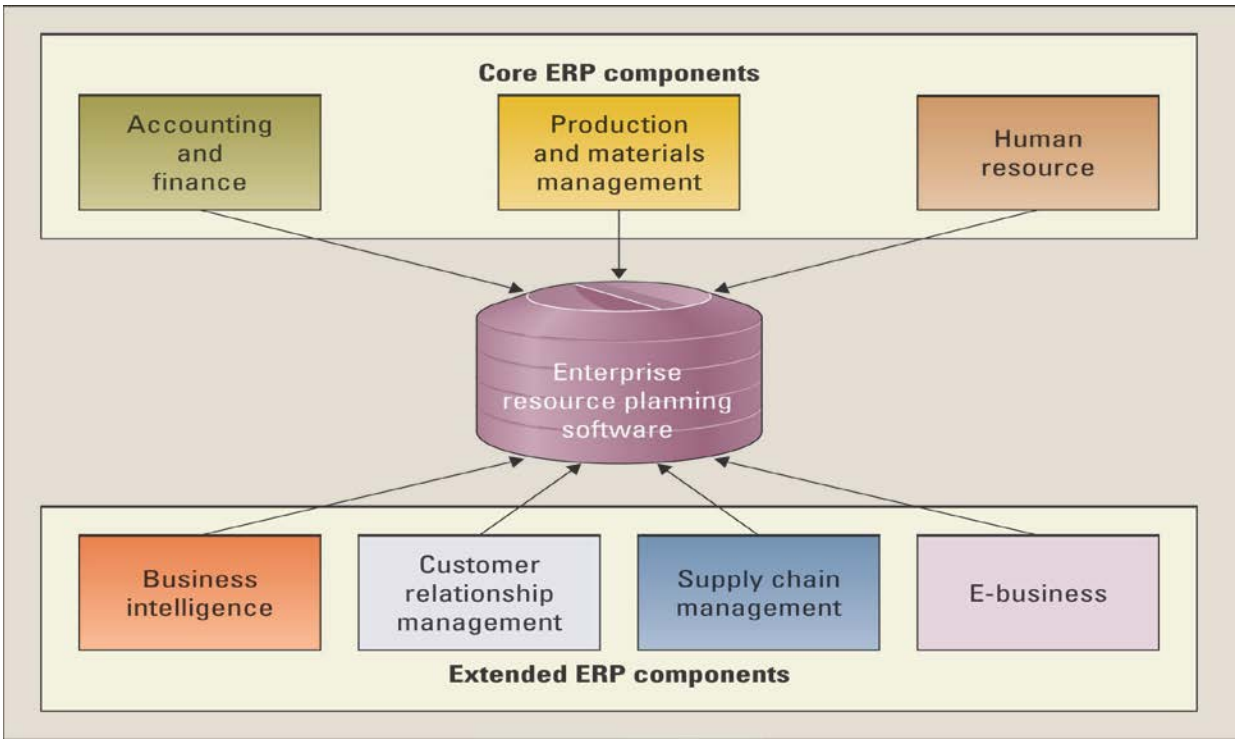

Figure 2.2: Core and extended components of an ERP system (Source: The McGraw-Hill Companies, Inc., 2013)

These core and extended ERP modules are themselves comprised of different sub-modules. Finance core module includes general ledger, receivables, payables, asset management and related sub-modules.

Payroll, personnel planning and time management are some of the sub modules in human resources core module while materials management and production planning are sub-modules of logistics core component. Some of the ERP main modules are explained as here below.

- **Financial Accounting - FI**

  This module collects all the data relevant to financial accounting into an integrated General Ledger [20]. It provides comprehensive and consolidated financial reports and integrates the different sources of financial data including Accounts Payable, Accounts Receivable, Asset Management and Treasury. It also provides up-to-date or real time information for enterprise-wide control and planning. The FI module is for external reporting purposes and it is compatible with the international accounting standards.

- **Controlling – CO**

  CO module includes a variety of planning and controlling tools for enterprises following a uniform system of reporting. It provides comprehensive reports to support most common cost-accounting issues. Controlling module is usually for internal reporting purposes.

- **Human Capital Management – HCM**

  HCM is the other common ERP module. ERP HCM module is used as the core employee record with details of personnel actions, benefits administration and payroll, position management and compliance with government regulations. HCM consists of three sub-modules namely Organizational Management (OM), Time Management (TM) and Payroll (PY).

- **Materials Management – MM**

  MM module supports the procurement or purchasing process to optimize the logistics chain within the enterprise. MM enables automated supplier evaluation and can lower procurement and warehousing costs with accurate inventory and warehouse management. It also integrates

invoice verification. Tools for inventory control and purchasing information help to identify trends and plan accordingly.

- **Production Planning – PP**

  This is a module which supports production planning, manufacturing processes, analysis and production control. PP covers the production process from the creation of master data to production planning, material requirement planning and capacity planning up to the production control and costing.

- **Project System – PS**

  Project system module coordinates and controls all phases of a project with direct cooperation with Purchasing and Controlling, from quotation to design and approval, to resource management and cost settlement.

The core and sub-modules of ERP system are summarized as in table 2.1 below.

In traditional IT systems, each of the system components are found separated as applications by their own with one database system for each of them. However, ERP system integrates all of the components through one central database which is common for all the modules as in figure 2.3 [21].

Table 2.1:Mainand sub-modules of ERP system

ERP Main Modules	Sub-Modules
Financials	• GL - General Ledger • AP - Accounts Payable • AR - Accounts Receivable • AM - Asset Management • Cash Management • Banking • Profitability Analysis • Budgeting and Controlling
Human Resources	• PY - Payroll • OM - Organizational Management • Personal planning • TM - Time management • Travel expenses • Training
Logistics & Operations	• MM - Materials Management • PP - Production planning • Materials planning (MRP) • Inventory management • Quality management • PS - Project System management • Shipping
Sales & Marketing	• Order management • Sales management • Sales planning • Pricing • After-sales service

Unlike the traditional function-oriented departmental systems, ERP systems are enterprise-wide and oriented towards processes instead of being function-oriented. Corporate computing with ERP systems allows companies to implement a single integrated system by replacing and re-engineering their mostly incompatible old traditional information systems.

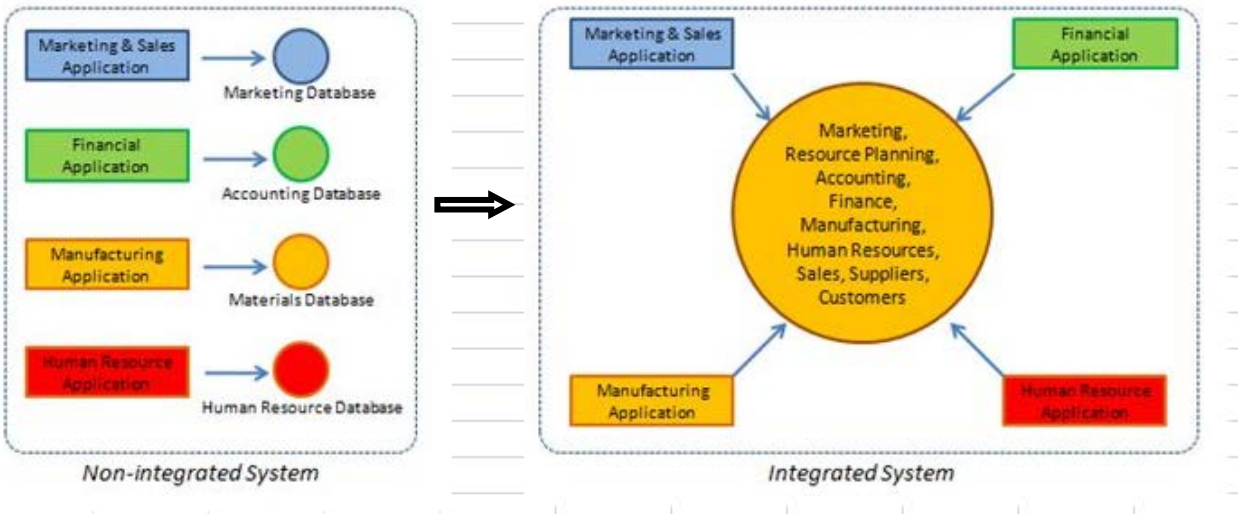

Figure 2.3: Non-integrated system versus integrated ERP system

*(**Source**: http://www.tutorialspoint.com/management_concepts/enterprise_resource_planning.htm)*

Table 2.2 below is a typical example of how ERP systems avoid manual processes and data redundancy which is common with the traditional non-ERP systems.

Table 2.2: Non-ERP system process versus ERP process (source: L. Olson)

Non-ERP system process	**ERP system process**
1. Salesperson enters customer order 2. Salesperson notifies CRM of order 3. CRM employee records order 4. Salesperson notifies accounting 5. Accounting employee records sale 6. Salesperson notifies warehouse 7. Warehouse employee records order 8. Warehouse employee notifies packing & shipping 9. Shipping employee records order 10. Shipping employee notifies procurement	1. Sales person enters customer order on sales order system (SOS) 2. SOS: 2.1. Notifies CRM 2.2. Notifies Accounting 2.3. Records sale in Accounting System 2.4. Notifies Warehouse 2.5. Records order on Warehouse Management System (WMS) 3. WMS 3.1. Notifies packing & shipping 3.2. Records order on Packing and Shipping System (PSS)

11. Procurement employee records order for raw materials replacement 12. Procurement employee notifies production to make more 13. Production employee records order	4. PSS 4.1. Notifies procurement 4.2. Records order for raw materials with Procurement Management System (PMS) 5. PMS 5.1. Notifies production to do more work 5.2. Enters manufacturing order on Production Planning System (PSS)

ERP systems are based on a relational database. Using a relational database and appropriate process design allows companies to capture data once and then make that data available for use throughout the firm; by all appropriate users [22]. ERP system mostly runs on a three-tiered client/server system with three layers of logic as diagramed in figure 2.4.

- **The presentation layer**

  This is a graphical user interface (GUI) or a web browser which allows users the ability to access and analyze information and system functions.

- **The Application layer**

  It consists of business rules, functions, logic, and programs where business processes and end-users interact with the system

- **The Database layer**

  This is the management of the organization's operational or transactional data. This is usually built up on industry standard relational database systems like Oracle or SQL server. There are three types of data in ERP systems namely master data, transaction data and configuration data.

- Master data is data in database tables which are used as references for day to day business transactions.
- Transaction data is data which contains the day to day business activities.
- Configuration data is data in tables which contain the settings and configurations of the system to suit and fit to the business logic of the company.

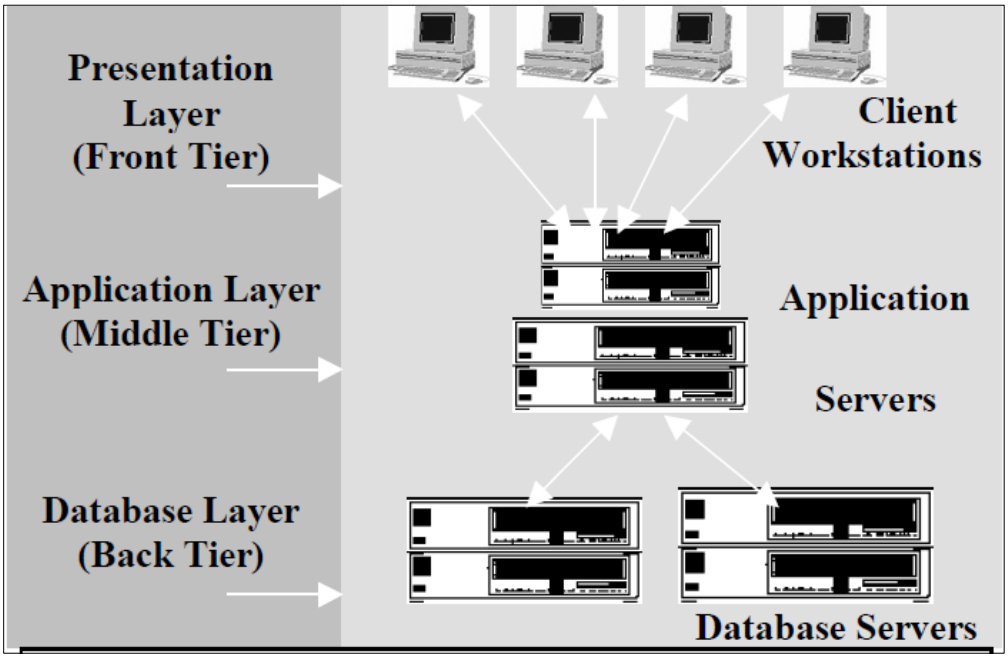

Figure 2.4: A three-tiered ERP architecture (Source: Rashid et al., 2002, Idea Group Publishing)

ERP system is used not only as operational or transactional system, but also as controlling and executive decision support system. According to Chung [23], the data and information in ERP systems is divided into three layers as operational system (transactional data entry layer), tactical system (controlling layer) and strategic or Executive Information Systems (EIS) layer as in figure 2.5.

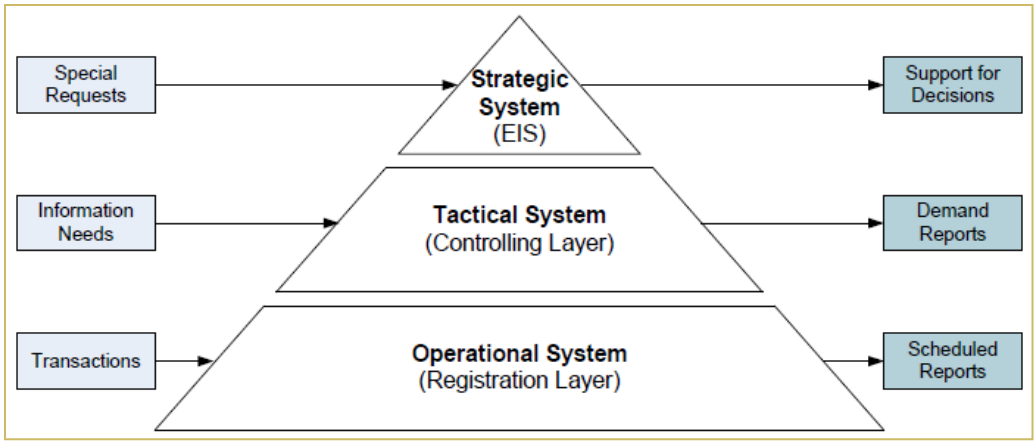

Figure 2.5: Data layers of an ERP system (source: Chung, 2007)

2.3 PROS AND CONS OF ERP SYSTEMS

There are different initiatives and reasons for acquiring ERP systems. ERP systems have the advantage of seamless integration between all parts and processes of a company, and this in turn gives the possibility of proper control [23]. They are used to control and reduce data redundancy and accuracy. Redundant tasks will be removed and the efficiency of the company increases.

The other advantage of ERP systems is that easier and timely reports functionality. Users can get self-services of data needs and access. They can run their own reports and have better access to their data and the ability to manipulate and report on this data.

The advantages of ERP systems are summarized as here below.

- Integrate financial information of different sources such as revenues, sales and cost.
- Standardize Human Resources information for simple tracking of employees time and benefits data.

- Standardize and speed up operating processes
- Reduce inventory and lower costs
- Integrated, on-line, secure, self-service processes for business
- Eliminate costly mainframe / fragmented technologies
- Empower and enable employees, partners, customers and suppliers as clearly demonstrated in figure 2.6.

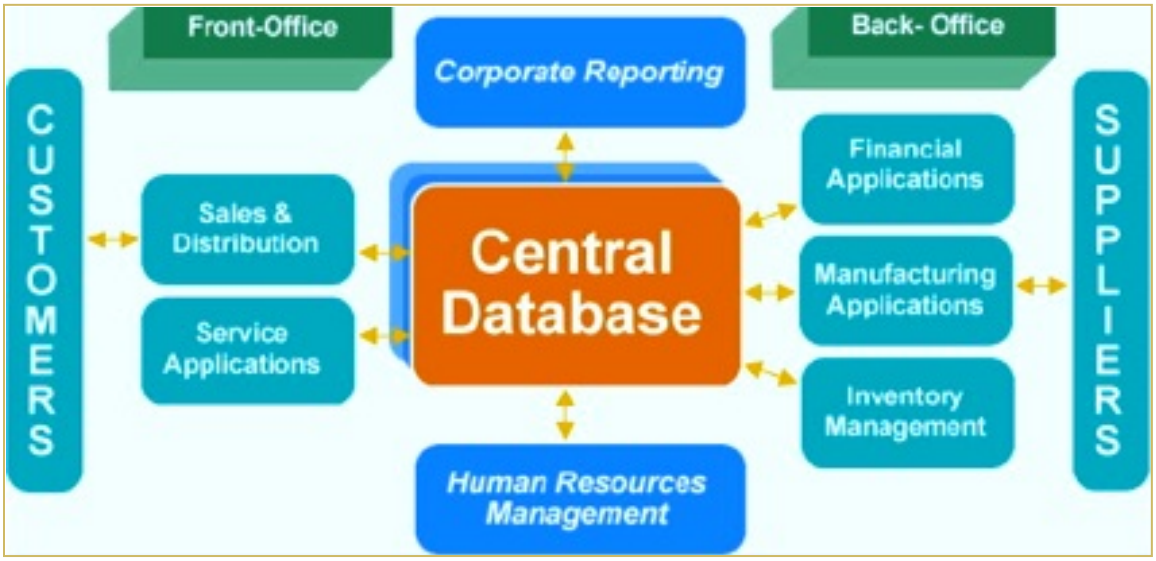

Figure 2.6: Architecture of ERP system(Source: http://www.maturski.org/EN-Management/Enterprise-Resource-Planning.html)

In general, compared to the traditional functional IT systems, ERP systems provide different benefits to a company and these benefits can be viewed in different dimensions as operational, managerial, strategic, IT infrastructure and organizational as in table 2.3.

Table 2.3: ERP System benefits in different dimensions

Dimensions	Benefits
Operational	o Productivity improvement o Cost reduction o Quality improvement o Customer satisfaction
Managerial	o Decision making o Resource management o Performance management
Strategic	o Business growth o Business cooperation o Business leadership
IT Infrastructure	o Business change flexibility o IT cost reduction o Increased IT capability
Organizational	o Common vision o Empowerment o Changing work patterns

On the other hand, ERP systems have some drawbacks and limitations. These systems are usually complex. Regardless of their long-term benefits and reduced maintenance costs, initial one time implementation is expensive. And even if data accuracy and integration is achieved by ERP systems, it is hard to correct or amend data once it is maintained in the system as it will affect many modules and processes. While ERP systems have more efficient methods, freedom and self-creativity practice with the system is minimal.

Limitations of ERP systems are discussed and summarized below.

- **Cost and length of implementation**

  Even if ERP systems can save costs in long term, initial implementation is too expensive. This cost depends on the scope and number of ERP modules which are selected and installed, size of the company, use of consultants, software license and hardware and length of the implementation time. As ERP systems are integrative and complex, it takes long time to implement these systems. ERP implementation costs millions of dollars and takes 1-3 years of time [24].

- **Business process re-engineering and customization**

  ERP systems are developed based on industry best practices. If these best-practice solutions in the ERP system do not match the business processes, then organizations are required to re-engineer their business processes to fit these best practices. However, changing all processes may lead to a loss of competitive advantage. Strategic processes which give competitive advantage to a company should not be changed. In this case, the ERP system must be customized and configured properly to fit the business processes.

  Configuration refers to setting and filling of parameters and tables in the system whereas customization is changing the code of the system. On the other hand, customization of the ERP software is limited and major change is not allowed. In addition, customization has problems related to upgrading. When the ERP software is upgraded by the vendor, all customizations may have to be re-checked. So, there should be clear and prior decision about the processes to be preserved and those to be re-engineered.

- **User interface and usage**

  ERP systems can be difficult to use. They are too restrictive and rigid (highly controlling) and do not allow much flexibility in implementation and usage. Moreover, users may have to go through many screens in order to maintain a single data set. This is because screens are developed based on the program flow and logic. It is when they are used more and more that ERP systems are appreciated by users.

- **Interoperability and interface**

  The system can suffer from the weakest-link problem. Inefficiency in one department or at one of the partners may affect other participants. So, the integrated links need high accuracy in other applications to work effectively. There are frequent compatibility problems with the various legacy systems of the partners.

- **Responsiveness**

  ERP systems have low response time to user actions and information requests. Due to the complexity and user interface screens, ERP systems usually take long time to respond to data entry and report generation processes.

2.4 ERP HISTORY

The history of ERP systems starts with efforts of automating inventory control systems in the1960s when most organizations designed, developed and implemented centralized computing systems for their inventory control systems [25]. Material requirements planning (MRP) systems were developed in the 1970s which involved mainly planning the product or parts requirements.

New software systems called manufacturing resources planning (MRP II) were evolved as an extension of MRP to shop floor and distribution management activities in the1980s with an emphasis on optimizing manufacturing processes by synchronizing the materials with production requirements.

In early 1990s, MRP-II was further extended to cover areas like engineering, finance, human resources, project management, which is almost the complete range of activities within any business enterprise. Hence, the term ERP (enterprise resource planning) was adopted. ERP implementation was expanded at this time mainly due to two reasons. The first reason is the release of SAP R/3 ERP version. The second reason was that many organizations implemented ERP as solution for the Y2K problem [26].

ERP vendors then continued to add more modules and functions on the core modules creating extended ERPs. ERP will continue to grow and expand. Some of the future developments in ERP are as follows.

- ERP as cloud computing and software as a service (SaaS) based on subscription instead of installed (localized) version.
- Availability of web-based and wireless (mobile) ERP systems
- Adoption of easy-to-install ERP systems
- Linkage to other software systems like supply chain management system, e-commerce and customer relationship management system.

The evolution of ERP is summarized in figures 2.7.

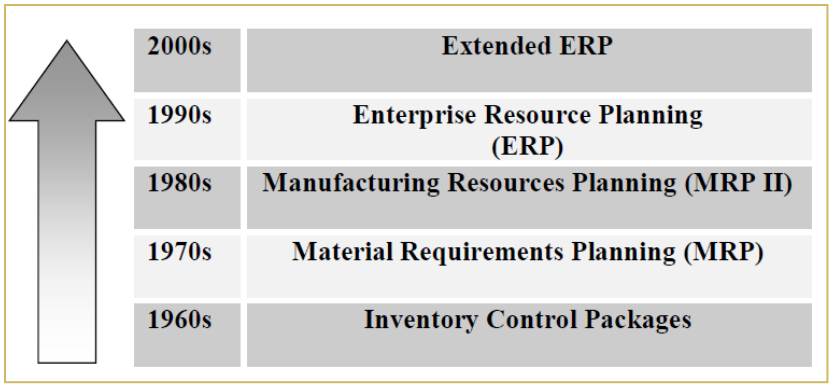

Figure 2.7: Evolution of ERP (Source: Rashid et al.)

There are a number of ERP system suppliers. SAP, Oracle and Microsoft are the biggest commercial ERP vendors. SAP (Systems, Applications and Products in Data Processing) was founded in 1972 by five former IBM engineers and has been considered a pioneer and leader in the ERP industry [25] [27]. Oracle, which is normally well known for database systems and applications, is another major ERP supplier since 1987 [25].

These vendors like SAP and Oracle which provide ERPs for large size companies are referred to as tier 1 vendors. Whereas those vendors providing ERPs for middle and small size enterprises are referred to as tier 2 and tier 3 vendors respectively. Major ERP products developed by tier 1 vendors are listed in table 2.4.

Table 2.4: Tier 1 or large ERP vendors with their ERP product name

ERP Vendor	ERP Package Product Name	Vendor Country
SAP AG	R/3 - Real-time 3-tier	German
Oracle	Oracle Financials (E-Business Suite)	America
Microsoft	Microsoft Dynamics	America

According to an independent report in 2013 by the ERP consulting firm in the United States, Panorama Consulting, SAP is the leader vendor in ERP systems with a 26% market share [28]. Oracle maintains a 17% market share while Microsoft takes 11% market share. The remainder is covered by the other medium (tier II) and small (tier III) ERP vendors as in figure 2.8. According to this report, duration of implementation time is 18.5 months for SAP, 22.5 months for Oracle and 12.5 months for Dynamics.

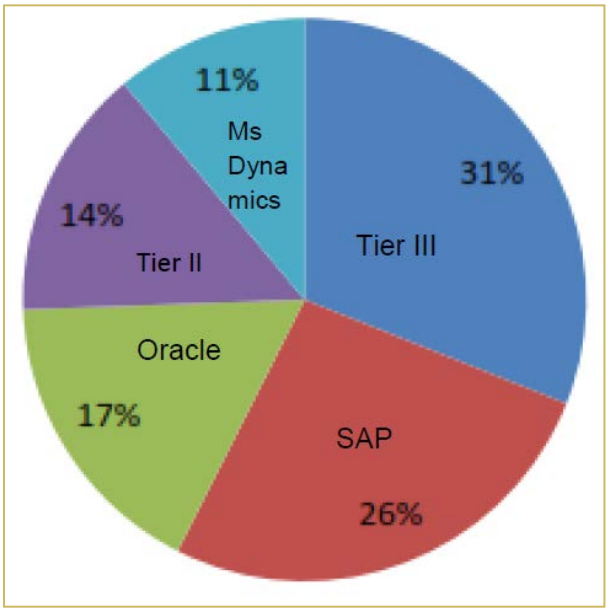

Figure 2.8: ERP market share by vendor (Source: Panorama Consulting Solutions, 2013)

2.5 CRITICAL SUCCESS FACTORS (CSFS) OF ERP PROJECTS

The integrated nature of ERP systems makes them complex and their implementation is not simple. ERPs are not just install-and-use systems. It takes some time to properly implement them. There are issues and challenges related to ERP projects. These systems are developed

based on many industry standard experiences. So, ERPs demand companies to re-engineer their working processes when there is a misfit between the business processes and the standards in the ERP system. But companies challenge the functionality of these systems by trying to customize to fit business processes instead of re-engineering.

Major Challenges in ERP Implementation are listed below.

- Limitations of ERP technical capabilities.
- Inconsistency with existing business processes.
- Costs of implementation (hardware, software, training, consulting) and maintenance.
- Impact on organizational structure (front office, back office, product lines, etc.).
- Changes in employee responsibilities.

The challenges and issues are related to activities which are referred to as Critical Success Factors (CSFs). CSFs are project time activities which must be done right or mistakes which must be avoided for the success of the project. Studies by different researchers such as Bhagwani [17], Esteves [18] and others have identified and discussed different ERP critical success factors in different contexts. Some of these generic ERP implementation CSFs which are referred in literature are explained below and used as a benchmark. This study also tests these generic factors in the case of the study company in addition to finding out new and contextual factors.

- **Dedicated senior management support**

Executive management support and sponsorship is important for accomplishing project goals and objectives and aligning these with strategic business goals. Both top and middle level management must themselves involve in the project and be willing to allocate required organizational resources. Two ERP project roles directly related to top management are the roles

of project steering committee and project sponsor. Steering committee is a group of members from executive management and the project manager who reviews and decides on the progress and issues of the project. Project sponsor is the one who approves and funds the budget for the project.

- **Good project scope management**

This includes both scope definition and subsequent scope management and control. Some components of this factor are scope of business processes and business units involved, ERP functionality implemented, technology to be replaced and data interfaces. Project scope change must be managed properly as it may cause delays, cost and even conflicts between the company and the implementation consultants. Senior management must be informed of, decide and ensure any project scope changes such as delays in the schedule or requests for additional budget are managed and documented in a formal manner.

- **Effective organizational change management and business process re-engineering**

ERP implementation can cause changes to some or all processes and potentially changes to job roles, responsibility, departmental boundaries and organizational structure [17]. Any initiative which requires or brings about change carries with it a risk that the change will not be accepted by the organization and employees or customers for various reasons and as a result will prevent full realization of the planned project benefits. So, organizational, human resource and business process issues associated with an implementation must be considered and managed properly.

- **Project team composition**

Project team should incorporate all competences and skills that are expected to be necessary during the project. This might imply that the project team is composed of people with various education backgrounds, skills and professional experiences. ERP projects typically require some combination of members from business, information technology, vendor and consulting support. The structure of the project team has a strong impact in the implementation process.

- **User involvement and testing**

User participation refers to the behavior and activities that users perform in the system implementation process. Users participate in the defining of business requirements, help in the analysis of the ERP system configuration and in conversion/migration of data and testing of the system.

- **Project champion role**

This is the role of project sponsor or project manager [17]. The project sponsor is devoted to promoting the ERP project and has the ownership and responsibility to obtain the project resources. The project manager is required to plan, lead and control the project on the run in its several tasks.

- **Strong communication inwards and outwards**

All stakeholders of the ERP project must be communicated well so that they can be aware of any changes. They must assess how they will be impacted by changes in processes, policies, and procedures. Bhagwani [17] mentioned that one of the reasons for ERP implementation failures is poor communication between the team members. Poor communication includes failure to

announce the reason for the efforts and activities required in the project and continuing to advise the organization about the progress and importance of the ERP implementation.

- **Formalized plan and schedule**

It is necessary to have a well-defined plan and schedule for all the activities involved in the ERP implementation with an appropriate allocation of budget and resources. Usually, projects fail to finish the activities on time and within budget. To ensure the project completion per budget, plan and schedule, there should be close monitoring and controlling of time and costs.

- **Adequate training program**

The training plan should take into consideration both technical staff and end-users. Training scope will depend on the type of implementation approach selected. Some organizations use an in-house training approach (trainer employees) while others prefer using training consultants.

- **Usage of appropriate consultants**

Consultants should have the knowledge of the ERP modules being implemented and be well experienced in the industry in which the client company operates. This is used to prevent costly mistakes from occurring which could have been avoided otherwise. The number of staff, how and when to use external consultants appropriate to the ERP implementation needs must be determined and decided. The usage of external consultants will depend on the internal know-how that the organization has during the project time. Mostly, ERP systems are implemented with the help of consultants.

- **Empowered decision makers**

Project team members must be empowered to make prompt decisions and there will be no project delays. Since delays, small or large, can have an impact on these long-term ERP projects, organizations should attempt to make decisions as rapidly as possible.

- **Appropriate ERP implementation strategy**

A good implementation strategy is required for a successful ERP project. A poor implementation strategy will not only result in higher implementation cost but may also lead to a product that can break the company processes. Management must decide how the software package is to be implemented. There are different approaches to ERP implementation strategy such as big-bang (all at once end to end),skeleton or phase-wise which are incremental and module-wise. The advantages and disadvantages of these approaches should be assessed and decided.

- **Avoid customization**

The organization implementing ERP should try to adopt the processes and options built into the ERP system by default instead of modifying the ERP to suit the particular business practices of the respective organization. ERP products are tested working solutions based on industry experiences. Customization or any changes to the product is not supported by the vendors. Customization should always be taken into account when approved and decided. Customization should be avoided as much as possible.

- **Adequate infrastructure and interfaces**

IT infrastructure must be reliably available well in time both for the pre-implementation and the post-implementation stages of ERP. On the other hand, usually ERP systems do not provide all

the functional requirements of an organization. Therefore ERP vendors have a complete program of interfacing with third-party (other non-ERP products) products to allow organizations having special expertise and products. So, interfaces must be configured well and tested according to the user's needs.

- **Adequate legacy systems knowledge**

Legacy systems are the old business and IT systems prior to the ERP that contain the existing business processes, organizational structure and culture, and information technology. These are the main source of information for ERP implementation. When implementing an ERP it is necessary to decide which legacy systems will be replaced and the need to interface with those legacy systems for which the ERP does not provide an adequate replacement. However, it is not appropriate to imitate the logic of the legacy systems by modifying the new ERP system.

2.6 ACCELERATED SAP (ASAP) ERP IMPLEMENTATION METHODOLOGY

ERP system goes through different life-cycle stages during its whole life within the hosting organization [29]. The complete ERP life-cycle is divided into six generic stages as described here below and shown in figure 2.9. These stages are adoption decision phase, acquisition phase, implementation phase, use and maintenance phase, evolution phase and retirement phase.

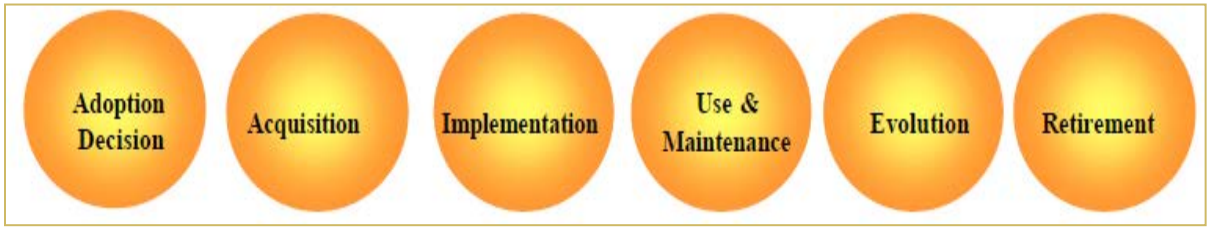

Figure 2.9: ERP life-cycle stages (Source: Esteves and Pastor, 1999)

- **Adoption decision phase**

  In this phase, the need for ERP system is reviewed and decided while selecting an information system which best addresses the critical business challenges and improve the organizational strategy. It is in this stage that the system requirements, its goals and benefits are defined. Analysis of the impact of ERP adoption at a business and organizational level is done here.

- **Acquisition phase**

  Acquisition phase is selection of ERP product system which best fits the requirements of the organization and minimizes customization needs. Consulting company is selected in this phase to help in the next phases of the ERP life-cycle. Issues of price, training and maintenance services are analyzed and a contractual agreement is defined here. Return on investment analysis of the selected product should also be done in acquisition phase.

- **Implementation phase**

  In this phase, the acquired ERP system is customized, parameterized and adapted to the needs of the organization. This phase is usually done with the help of consultants and implementer partners who provide implementation methodologies, know-how and training.

- **Use and maintenance phase**

  This is the stage when the system must be used in a way that returns expected benefits and minimizes disruption. This is referred to as Establishment Period, the period after go live

until the system gets stabilized. In addition, once a system is implemented it must be maintained to correct malfunctions and optimize its functionality.

- **Evolution phase**

  Evolution phase is the integration of more capabilities to the ERP system and expanding it to incorporate new benefits and functionalities

- **Retirement phase**

  This phase is the time when decision is made to replace the ERP system with other information systems due to its inadequacy to the current needs of the organization or availability of new technologies.

As mentioned in chapter one, the scope of this research is on only the first three phases of ERP life-cycle covering the phases of project decision and preparation up to implementing and cut over of the ERP project. ERP systems are usually implemented by following standard implementation methodologies from the product vendors. Project implementation methodology includes steps, procedures, methods, tools and techniques used to implement the project. So, even if organizations and consultants may have their own ERP implementation methodologies, they usually follow the respective ERP vendor's methodologies. This is because of the reason that ERP implemented in an organization must be recognized and supported by vendors. Consultants on the other hand want to be accredited and certified by the ERP vendors.

ERP vendors have developed methodologies which can facilitate and help for fast implementation of their products at client organizations. SAP's Accelerated SAP (ASAP) and Oracle's Oracle Unified Modeling (OUM) are such methodologies to mention.

Accelerated SAP is a methodology used to implement SAP ERP as fast as possible. As it is used as a reference in this research, it is explained here in detail. It is developed based on deep experience of implementing SAP ERP in many industry businesses.

ASAP methodology contains a roadmap with checkpoints and milestones. ASAP roadmap has five phases (figure 2.9a/b) namely: Project Preparation, Business Blueprint, Realization, Final Preparation and Go-live &Support.

Figure 2.10a: Phases of ASAP ERP implementation methodology(scn.sap.com/docs)

Figure 2.10b: ASAP roadmap (Source: scn.sap.com/docs)

Phase I: Project Preparation

This phase provides initial planning and preparation for the implementation which includes project plan, project scope and project team organization. In this phase the initiation of the ERP project which includes the overall goals, detailed task plans and processes is formally announced to the company. Main activities in the project preparation phase include a project kick-off meeting and Project team standard meeting.

Phase II: The Business Blueprint

This is the requirements specification phase. The purpose of this phase is to create the business blueprint, which is a detailed documentation of the results gathered during requirements workshops and meetings. It will allow the implementation project team to clearly define their scope and only focus on the ERP processes needed to run the organization business. The Business Blueprint covers business strategy, organizational structure, general settings, master data and the documentation of business processes.

Phase III. Realization

The purpose of this phase is to implement business and processes requirements identified on the business blueprint. It involves configuration of the system using guidelines decided in the Business Blueprint. Testing the system is important during this phase. Configuration is done in a two-step procedure.

Initially, baseline configuration is done which involves general configuration options such as global settings like currencies master data, the most important processes and the organizational structure. The second and final configuration involves configuring other

processes, printing options and background processing. Here, the consultants validate and update the configuration and demonstrate processes. The project team updates the business process procedures and performs unit functionality tests and end-to-end integration tests.

Phase IV: Final Preparation

In this phase, testing and end user training is completed with system management and cutover activities to finalize the readiness to go live. Furthermore, the Final Preparation phase serves to resolve all critical open and pending issues. Here, it is essential to announce the training and cut-over plan to all stake holders. Each user must participate in the relevant trainings. Upon successful completion of this phase, business is ready to run in the ERP system.

Phase V: Go Live and Support

This phase is when the actual installation takes place and the system comes into use. The term Go-Live is used to refer to the day on which real usage of the new ERP system is started. This is used to move from a pre-production environment to live production operation. At this point, support for the users is essential since most problems are likely to arise at the beginning. Support organization or team, initially as a command-post, must be set up for end users to provide starting and long-term support in the system's establishment period, which is the period until it is stabilized. This phase is used to monitor system transactions and to improve overall system performance. Finally, the completed project is closed.

There are checkpoints and a signing-off at the end of each of the phases. Once deliverables and milestones of one phase are completed and signed-off between the concerned parts, activities to

the next phase are started. These activities and milestones of ASAP phases are described and summarized as in table 2.5.

Table 2.5: Activities and deliverables of the phases of ASAP

ERP ASAP Phases	**Major Milestones / Deliverables**
Phase 1 – Project Preparation	➢ Project Kickoff meeting
Phase 2 – Business Blueprint	➢ Workshops to gather business requirements with the company's functional leads. ➢ Creation of the detailed business blueprint document ➢ Determination of changes to initial project scope and time schedule if required ➢ Project phase review and sign-off.
Phase 3 – Realization	➢ Software installation and customization based on the business blueprint. ➢ Data cleansing and migration ➢ System setup and testing ➢ Definition of training and cutover plan ➢ Project phase review and sign-off
Phase 4 – Final Preparation	➢ Key-user and administrator training ➢ System readiness for go-live ➢ Completion of cutover activities
Phase 5 – Go Live &Support	➢ Full production ERP implementation

CHAPTER THREE

RESEARCH METHODOLOGY

Research methodology is the set of processes, methods, tools and techniques deployed and used to conduct a research and reach to the final output of the study. The methods and techniques used for this research are explained here below.

3.1 LITERATURE REVIEW

Detailed and focused literature review is done to understand more about Enterprise Resource Planning concepts and ERP systems technical and business/service framework. More research works conducted on ERP implementation experiences in developing countries are reviewed. General critical success factors mentioned in literature are discussed as a benchmark. This study is trying to identify critical success factors in Ethiopian context along with implementation methodology. So, Accelerated SAP (ASAP) methodology is used as a reference here for the study. This ASAP and its phases are reviewed and explained briefly.

3.2 CASE STUDY AS RESEARCH METHOD

This research is a qualitative type case-based exploratory study. This type of research method is considered for this study by the following reasons and justifications. First, this type of research aims to identify key issues and variables and it is suited to exploration of issues in depth [30]. Exploratory case study is used to understand what happened within a case by looking beyond descriptive features and studying the respective context [31].

Case study is therefore used as a method of research for this study. A case study is an in depth study of a particular situation or phenomenon in a real world life rather than a sweeping statistical survey [32]. Rather, case study makes analytical generalization in which concepts and implications are developed to contribute to rich insights [33]. And thus, the results of a case study of some organization and context can be extended and applied to other similar organizations and contexts.

As clearly stated in [33], case study method is the most widely used qualitative research method for researches in information systems. According to Baxter and Jack [34], case study is important especially in situations when the focus of the study is to answer why and how questions and when the researcher wants to cover contextual conditions relevant to the phenomenon under study.

Success factors which are critical for ERP implementation in different contexts can only be found out with detail investigation studies of real life scenarios or cases. Hence, this research is a single case study of ERP implementation at Ethiopian airlines.

3.3 CASE SELECTION AND SAMPLING

Ethiopian Airlines is selected as a case for this study. This company was selected based on two reasons. The first reason is that Ethiopian Airlines is the only government organization which is identified to have acquired large SAP ERP recently. The second reason is that the business experiences and services of Ethiopian Airlines are multi-functional which can be shared by

different organizations in Ethiopia. So, it is found appropriate and suitable to conduct the case study at this company.

Sampling is the process of selecting units or individuals from a population which can be included in the study, for instance, to answer interview questions or respond to survey questionnaires. There are different sampling techniques such as probability sampling, random sampling, convenience sampling and purposive sampling. For this research, purposive sampling technique is used as this is a qualitative case study. According to [35], case study almost always uses purposive sampling. The objective of a case study is not to find out how often something occurs in a population, instead what occurred and why it occurred. In case study, the sample units must have the potential and richness in information to be key informants for the study. According to [36], purposive sampling is virtually synonymous with qualitative research.

Likewise, purposive sampling is found appropriate and used for this case study. First, initial discussions were made with the ERP project managers and concerned parts at Ethiopian Airlines. This, in addition to assisting to get overview of the ERP project and the company, has helped to identify individuals who have detail exposure with the project and who can be contacted as the key informants of this study. Based on this, ten key informants were purposefully identified and selected for the interview questions.

Similarly, twenty-four individuals were selected as respondents for the survey questionnaire. Twenty-two of them have responded to the survey while there are two non-responses. These individuals are selected as key informants and respondents based on their involvement, exposure and role in the ERP project and in the company in general in relation to the project. The list

consists of project managers, team leaders, project team members, super users, IT staff and business process staff with their regular role or position ranging from non-management, subject matter expert, management and so on.

3.4 DATA COLLECTION TECHNIQUES AND TOOLS

Appropriate and basic sources of data for case study are interviews, documentation, archival records, direct observation, participant observation and survey questionnaire. Case study mostly uses qualitative data collection methods with interviews, observations, and document analysis. However, quantitative methods (surveys) can also be used in a case study. Qualitative methods are concerned with words and meanings whereas quantitative methods are concerned with numbers and measurements. Hence, various data collection techniques and multiple data sources are used for case study research.

The main data collection techniques used for this research are interviews. The other techniques used here are observation and document analysis. To supplement and triangulate the results of interviews, observation and document analysis, a survey questionnaire is used for this study.

So, primary data sources of this research are interviews, observation, participation and surveys whereas secondary data sources are reviews of documents, literature and the Internet. All data collection techniques and tools used in this study are explained as below.

3.4.1 Interviews

Interviews are used as the main sources of primary data in this detail investigative study. Preliminary discussions were made with project managers and members. The purpose of the study was explained to them. After this, interviewees were identified based on their role in the ERP project and in the company. They are project managers, team leaders, team members, super users, business managers and experts.

Ten key informants appropriate for this study were selected and listed from each of the main ERP modules implemented (finance and controlling, human capital management, logistics, business intelligence), from IT and from other users and auditing. At the same time, interview questions which can be used to gain detail information were developed and prepared based on the purpose of the research. Initial interview questions were discussed and reviewed with pilot interviews.

Then, about fourteen semi-structured interview questions were listed. Interviews can be in three formats. Unstructured interview questions, semi-structured interviews and structured interviews. Unstructured interviews are open discussions and the interviewee usually takes the lead. These types of questions are not appropriate since the scope of the study will not be controlled. Structured interviews on the other hand are closed questions which are accompanied with short answers. These cannot be used to get detail investigative information. Semi-structured interviews are preferable for this type of case study since they allow detail discussions still controlling the scope of the study. Interviewees are allowed to discuss clearly and in detail while being within the scope. For this, semi-structured interviews were used in this research.

Once the interview questions were ready and ten key interviewees were identified, an email was sent to them requesting for an interview or discussion schedule. The purpose of the study was mentioned and explained in the email. In addition, over view of the general interview guiding questions (appendix 1) was included stating about the following points. These general questions are used to lead to the success factors finding.

- The intensions and objectives of the company to implement the ERP system
- The strengths and weaknesses / challenges of this project
- What should be fulfilled for ERP success in Ethiopian context?
- Any ideas and comments on the ERP project

Detail interview questions were not sent in advance since doing this will make the interviewees to be prepared for short answers only. Immediately after the email, interviewees were contacted in person or called by telephone to explain about the objective of the email in case they are not clear and to set appropriate date and time for the discussion. They appreciated the purpose of the study and were willing for the discussion. Even, some of them have themselves called and arranged appropriate schedule.

Ten detail interviews and discussions were conducted in person. Some additional information was also asked by telephone call. The interviews and discussions have lasted for one hour duration on average. These interviews are conducted both in Amharic and English languages for easy understanding and communication. Points and issues raised during one interview session were used as input and counter checking for the next interview sessions. Even, additional discussions were made with some of the interviewees for more clarifications.

The interviewees were asked during the pilot discussions if the interviews can be recorded and they showed that this is not their preference. In addition to this, the researcher has believed that asking them in advance for recording will make them to be reserved from detail interview questions. Due to this, there is no recording of interviews. Notes were taken in English during the interviews. Just after each interview session, the notes were reviewed and summarized.

At the end of all the interviews, success factors mentioned as important for the ERP project were listed out and reviewed. The list was sent to some of the interviewees for comments and inputs. Based on this, some of the factors were combined, some others were redefined. Finally, twenty success factors were listed out as the result of the interviews.

3.4.2 Observation and Participation

The other sources of primary data in this study are observations and participations. In conducting case studies, direct observation is a situation in which the researcher or investigator makes a site visit and collects data from the study area. Participatory observation is an observation in which the researcher actually participates in the events being studied and related activities.

The researcher has made observation on how the ERP system is being used and the users' impression and usage of the system. This has given insights to what is necessary for ERP system implementation. ERP systems especially like that of SAP are complex and their user interfaces are not as simple as the traditional systems we are familiar with. ERP systems get user appreciation as they are used more and more. Based on this, some of the users are observed to appreciate the ERP system while some others are not yet comfortable with the system.

In addition to observations, the researcher has attended and participated different workshops and conferences hosed by the global ERP vendors. These workshops have given understandings about ERP systems as a whole, the need for them, their demand in Ethiopia and about the conditions to be fulfilled for such ERP systems.

3.4.3 Document Review

Documents and the Internet were reviewed and assessed as additional sources of data and for understanding about the case study company and the ERP project. The company's website was assessed for the profile and history of the company. Even if detail literature review is done, there is limited or no research or document on ERP implementation in Ethiopian context especially regarding the SAP ERP.

3.4.4 Survey Questionnaire

Survey questionnaire is the other primary data source used for this research. Harris and Brown [37] have explained that structured survey questionnaires and semi-structured interviews are often used in studies to generate confirmatory results with interviews being in depth exploratory while surveys being confirmatory. Based on this, the questionnaire is used for this study mainly to supplement the interviews by adding some breadth and rank the level of success factors importance for ERP implementation. An online free website survey tool (www.esurveyspro.com) is used to design and distribute the questionnaire. Simple tables and Microsoft Excel 2010 sheets are used to summarize this survey data.

The success factors which are identified in the interviews and prepared on the survey questionnaire for ranking are listed below.

1. Project planning and strategy
2. Change management and communication
3. Top management support and commitment
4. Project management and leadership
5. Clear user requirement and need assessment
6. Capability of consultants and implementers
7. Project scope management
8. Training, documentation and knowledge transfer
9. Team composition, dedication and retention
10. Data preparation and migration
11. Incentives and celebration of milestones
12. Organizational culture and readiness
13. Users involvement and system testing
14. Quality control and feedback
15. Business process change and less customization
16. Adequate infrastructure and facilities (internet, laptops, project rooms, refreshments)
17. Trust and harmony between project team partners
18. Basic IT capability of users and team members
19. Appropriate integration and interfaces
20. Establishing ERP support team

Some of these factors are related to the nine knowledge areas of generic project management (project management, scope management, schedule management, cost management, risk management, communication management, integration management, human resource management and procurement management).

As indicated in appendix 2, a five point level Likert scale was used for each of the twenty factors to select their importance with the value of selection points as shown here below.

1 = Not important

2 = Less important

3 = Neutral

4 = Important

5 = Very Important

To facilitate the survey process in a cost effective method, an online free survey (paperless) questionnaire was used. Using online survey tools has many advantages over the traditional paper questionnaires. It saves time and cost, it is easy to design and develop, easy and comfortable for the respondents to fill it. Survey results can also be displayed in detail or in summary just in the progress of the survey process. It is possible to go to a specific response number automatically with such tools. Online survey responses have date and time of completion. However, care must be taken when using online surveys to control and protect the results since, for example, duplicate responses can affect the final results.

There are various online survey tools. The researcher has reviewed and compared these different tools. Finally www.esurveyspro.com was used for this research. The researcher has selected this tool due to the following functionalities and advantages.

- This tool is free for basic functionalities
- It is easy to understand, setup, design and develop the survey questions
- The researcher has password to control and protect the setup of the source questionnaire.
- It automatically controls duplicate responses once it is completed as this will distort the results

- Easy user interface for respondents to fill the questionnaire
- Easy to print the responses data
- The questionnaire can be easily closed or paused and re-opened at any time as required to control the process
- Only the survey website link is sent to respondents without requiring them to subscribe or other preconditions
- It is possible to select and display a specific response automatically if required.
- The tool controls respondents not to skip or leave specific questions un-answered or un-selected.

The twenty factors were set up on the online survey questionnaire. In addition to the twenty questions, the survey has one last open question to accept any comments or any other factor which the respondents think is critical for ERP implementation. The website link of the survey was sent for few individuals as pilot survey for connectivity tests and comments.

In the meantime, survey respondents were purposefully selected as explained in the previous sections still with their role and exposure to the ERP project. Those selected are with rich information and understanding about the ERP project not to include respondents which are not aware of the complete project as this can affect the detail investigation.

As mentioned earlier, twenty-four key respondents were selected. The link to the survey link was sent to these respondents by email explaining the purpose and objective of the questionnaire. Most of the respondents have completed it immediately. Except time constraints, there was no difficulty of using the online survey by the respondents. Follow ups were made to the rest of the

respondents in person and telephone. Only one reminder follow ups were made since repetitive reminders will not make respondents at ease and hence will affect the final result.

Finally, Twenty-two of them have responded to the survey with two non-responses as shown in appendix 3. Some of those who responded have added comments. The online survey was open for a week and then it was closed for analyzing the results.

3.5 DATA ANALYSIS METHODS AND TECHNIQUES

According to Rowley [38], there are no predefined procedures to analyze case study results and thus an alternative approach needs to be adopted in exploratory case studies. Data in this study is analyzed by categorizing and comparing the results continuously until a convergence level. The concept of inductive reasoning and grounded theory is adopted here for this analysis.

Unlike the deductive reasoning which is top-down or general-to-specific, inductive reasoning starts with specific observations in the data to find patterns and regularities and finally ends with developing general conclusions or theories [39]. Grounded theory is an inductive reasoning approach to data analysis which starts by understanding the situation and context to discover a theory which grounded or implicit in the data itself [40]. The grounded theory approach gives priority to the data and the context under study [41].

Based on these concepts, data analysis in this study started together with the data collection process. Notes were taken in each interview. Name and role of the interviewee and date and time of the discussion was recorded in the notes. The notes were reviewed and summarized daily or

just after the interviews. Reviews of the preceding discussions were used as input and comparison in the other interviews. The main concern in the content of the notes was about the critical success factors and why these factors are important. Categories were created for the factors. Each critical factor mentioned in the interviews is listed under the respective category if already exists or else a new category is created. The interviews and the factors categorization and analysis continued until the convergence of the factors and results.

Data triangulation is the other technique used for data analysis in this research. One of the strengths of case studies compared to other methods is that evidence data can be collected from multiple sources [38]. Triangulation is using evidence from different sources to validate and confirm the same finding. For this study, triangulation is used to compare results of the interviews, online survey and observations.

CHAPTER FOUR

DATA ANALYSIS AND DISCUSSION

4.1 OVERVIEW OF ETHIOPIAN AIRLINES

Ethiopian Airlines (Ethiopian) is a commercial airline with full government ownership and it is usually known as the flag carrier of Ethiopia [42]. The airline was founded on December 21, 1945 and started its first formal operation on April 08, 1946 with a flight to Cairo.

Ethiopian has become one of the leading carriers in Africa during the past sixty-five plus years [42]. The airline has also become one of Ethiopia's major industries and a veritable institution in Africa by operating at the forefront of technology and the newest fleets. Ethiopian commands the lion's share of the pan African network and gives flight services to many international and domestic destinations with several domestic and outstation (outside the country) branch offices [42].

According to www.ethiopianairlines.com, Ethiopian Airlines is currently in a fast growing pace with firm strategic plans, vision and mission. Since 2010, the airline has designed a fifteen years vision named as "Vision 2025". By the year 2025, Ethiopian Airlines will be the most competitive and leading aviation group in Africa by providing safe, market driven and customer focused Passenger and Cargo Transport, Aviation Training, Flight Catering, Maintenance Repair and Overhaul (MRO), Ground Services, Domestic and Regional services.

In order to achieve its vision 2025, Ethiopian has started transformation of its various units including the operation services, human resource management and capacity, information technology and others. The existing IT system and infrastructure was not able to support the fast growth of the airline. The company used to have different information systems from the beginning and most of the business units are assisted with information systems. However, the overall IT system was in a situation which lacks integration between these different systems.

So, to enable and drive this vision 2025 of fast growth, the airline launched "Business IT Transformation" project. This was to transform and update all information systems in the airline, both front office operational and back office systems such as the flight operations support system, maintenance and repair support system, passenger and cargo management systems, revenue accounting systems, and the back office financial, human resource and materials management systems. This was an overall huge IT project named as Master System Integration (MSI) including wide area network (WAN) upgrade and expansion to connect to the remote and out station branch offices of the airline to enable accessibility from anywhere.

The MSI project was a big project in which the Enterprise Resource Planning (ERP) back office system implementation project was only a part of it.

4.2 ERP IMPLEMENTATION AT ETHIOPIAN AIRLINES

As discussed in section 4.1 and per the interviews, ERP system was decided to be implemented at Ethiopian Airlines as part of its IT transformation project to upgrade and replace the existing back office support systems mainly the financial support system, human resource management

system and the general purchasing and materials management support system. Basically, the goal of the ERP system implementation project was to accomplish three main objectives.

These three objectives of the ERP project were:

1. To have best practice industry standard back office system
2. To have real time integrated environment which can integrate all the operational support systems of the airline including those non-ERP systems like passenger management system (Sabre), flight operations system, maintenance and repair (MRO), revenue accounting systems and medical services support system.
3. To have one central data warehouse system to get the right business intelligence (BI) and dashboard tool instead of having many decentralized database servers.

Since the main MSI project was a huge investment, there was a need for consulting companies to implement the project. IT executive Committee (ITEC) was also established in the company to decide on business and budget issues for this major project. Decision of ERP as back office system was part of the IT strategy.

SAP AG, an ERP vendor company, was selected to deliver the ERP system product. ERP system implementation is not just an IT project. It is mainly a business process project. For this reason, vendor consultants and implementers were also considered for better implementation of the project. To this end, SAP's Africa partner, SAP South Africa was selected as implementer partner for the ERP system.

This ERP project was named as “Project Nisir”, with the term “Nisir” being the Amharic translation of the word eagle, which is the strongest bird. This term was decided to be used for two major objectives. The first is to show the need for major change like the eagle undergoes in its life to survive for several years. The other objective is to mobilize all resources and attention needed for the project by using the Amharic version of the term eagle and referring to the Ethiopian perspective.

The ERP project is implemented with the ASAP implementation methodology which is explained in chapter two as having five phases of sign-off milestones. The project had a project structure depicted in high level as in figure 4.1 and team members were selected with specified roles from both the client company (Ethiopian) and the implementer company.

The following roles were included in the project structure.

- Project sponsor (top management) to fund or approve budget to the project
- Project steering committee comprised of executives, project managers from both sides (client and implementer) to discuss on issues and follow up progress of the project
- Project managersboth from the client company and the implementer
- Project management office (PMO) to facilitate the project (project administration)
- Team leaders from each functional modules and technical aspects
- Project team members

The implementer’s project members were working both on-site at client’s office and from off-site by remote connection as required for proper cost management.

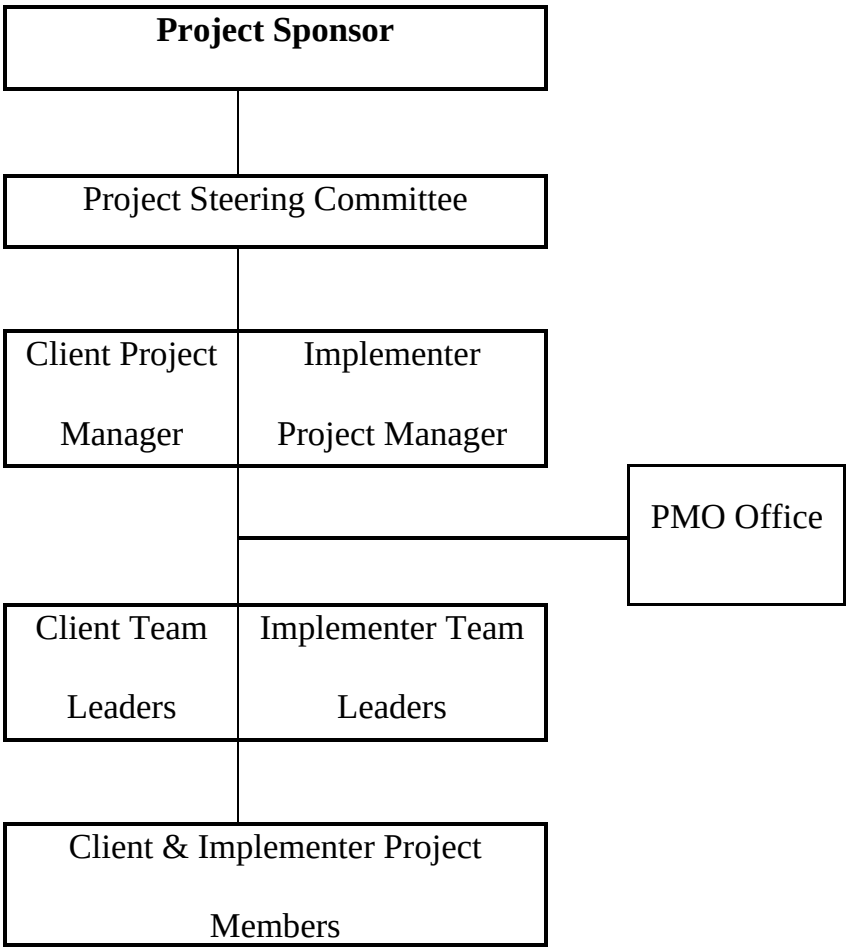

Figure 4.1: High level diagrammatic description of the ERP project

An independent non-vendor ERP implementer, Inter Globe Technologies (IGT), was also involved in the implementation of this project.

Initially, the project was planned to be implemented in a big-bang all at once approach. However, to facilitate the project completion, a phased approach strategy was decided at this time. It was decided that operational ERP modules to be implemented first while the incremental modules like that of SAP portal were reserved to be completed a little bit later. This has actually helped to move the project forward.

The project progressed through the ASAP phases of Realization and Final preparation and it went live to production system on January 2013 with the operational modules of finance, human capital management, logistics and business intelligence and integration.

After a couple of months support from IGT, the internal SAP ERP support team has taken over to support the system. This team is composed of staff from IT and functional units since ERP is more of a business process system. Some months later, Phase II of the project was continued with SAP Portal module implementation and this phase has also completed as of February 2014.

4.3 INTERVIEW RESULTS

According to all the interviewees, the concept of ERP system is interesting and the overall system implementation is good. The three basic objectives of this ERP project, which are business process standardization, integration and central data warehouse, are started with the ERP system with encouraging results even though these have still to be enhanced and extended. The main functionalities and achievements of this ERP system are discussed as follows.

- **Business process standardization**

  Human capital management system is now relatively more standardized compared to the previous legacy system. Time management process is fully controlled and supported by the system. This time management module in the ERP system is integrated with the separate non-ERP time control (clock-in clock-out) system which is called KABA and installed at the company.

- **Process integration and interface**

  Process integration refers to the synchronization of processes between and across the different modules of both ERP and non ERP systems. Interface refers to the interfacing and uploading of data from one module to the other. SAP ERP has functionalities called Business Application Programming Interfaces (BAPIs) for smooth communication and integration with other non-ERP systems.

  Accordingly, this ERP system has assisted in integration of processes and interfaces. The ERP system can integrate processes automatically to the non ERP MRO system. When purchase orders are created in the MRO system, automatic integrations are possible in the ERP finance module.

  In addition, the ERP time management system is integrated with the non ERP Medical support system. When employees are on sick leave absences, it is automatically reflected in the time management module of the ERP system. Data interfaces are possible with the passenger management system, revenue accounting systems and flight operations system.

- **Data warehouse and business intelligence**

  A central data ware house system is developed to store data from all the systems in the company. This has helped for business intelligence and availability of historical data. Strategic reports can be generated by users and top management whenever required.

- **Improved financial and operational reports and month end closing periods**

  The system has enabled the company for flexible and enhanced month end financial closing periods compared to the legacy (old) systems. In addition to the accuracy of reports, it is

possible to get reports daily and weekly, rather than monthly only, online instead of manually processed and hard copies. Top management and other users can easily access the reports online from the system. According to the interview discussions, this in turn helps for better and fast business decisions.

- **Workflow and paperless environment**

  One basic and new advantage of this ERP system is approval through workflow creating enhanced and paperless environment. Purchasing approvals are done by the system keeping and passing through different approval levels. In time management, daily attendance and annual leave absences are approved by work flow automatically through the system. Same is true for approval and control of budget. Employees' performance appraisal is also processed through the SAP portal module.

- **Easy remote system usage and accessibility by portal Internet**

  The system can be directly accessed by remote and outstation branch offices and they can do regular activities with the system.

  Every Employee of the company can access the system with the SAP portal using browsers instead of installing the main ERP modules. Employees can display their pay slips with portal, they can request annual leave, apply for training and other activities with this portal module using browsers. This SAP portal is integrated with the main ERP modules and its data sources are these modules.

On top of these findings, success factors and experiences of the ERP project were discussed in detail during the interviews. As it is stated previously, twenty success factors were identified to be important in this ERP project. Some of the factors were mentioned repeatedly by the interviewees as being very critical. Among these, change management and communication, project management and leadership, project planning and scope, team capability and retention, implementers' capability, and training and knowledge transfer are the factors most mentioned in the discussions. All the factors are discussed in detail next in the perceptions section.

4.4 SURVEY DATA RESULTS

The twenty factors identified as important for ERP success were distributed on survey questionnaire for confirmation and importance ranking by twenty-two respondents. Most of the survey responses were with "Important" and "Very Important" ranking as can be seen from the survey results summary in tables 4.1 and 4.2 and the details in appendix 3.

Table 4.1: Summary of the online survey questionnaire results: by number of respondents

Critical Success Factor	Not Important	Less Important	Neutral	Important	Very Important
Project planning and strategy				**2**	**20**
Change management and communication			**2**	**4**	**16**
Top management support and commitment				**3**	**19**
Project management and leadership				**3**	**19**
Clear user requirement and need assessment		**1**	**0**	**1**	**20**
Capability of consultants and implementers			**1**	**2**	**19**
Project scope management		**1**	**1**	**4**	**16**
Training, documentation and knowledge transfer				**3**	**19**
Team composition, dedication and retention		**1**	**0**	**4**	**17**
Data preparation and migration				**10**	**12**
Incentives and celebration of milestones		**1**	**2**	**14**	**5**
Organizational culture and readiness			**1**	**8**	**13**
Users involvement and system testing			**1**	**5**	**16**
Quality control and feedback			**1**	**5**	**16**
Business process change and less customization			**3**	**10**	**9**
Adequate infrastructure and facilities		**1**	**1**	**9**	**11**
Trust and harmony between project team partners			**2**	**6**	**14**
Basic IT capability of users and team members		**1**	**1**	**11**	**9**
Appropriate integration and interfaces			**1**	**6**	**15**
Establishing ERP support team				**5**	**17**
Total Responses	**0**	**6**	**17**	**115**	**302**

There was no factor selected as “Not Important” at all.

Table 4.2: Summary of the online survey questionnaire results: by % of respondents

Critical Success Factor : %	Not Important	Less Important	Neutral	Important	Very Important
Project planning and strategy	0.00	0.00	0.00	9.09	90.91
Change management and communication	0.00	0.00	9.09	18.18	72.73
Top management support and commitment	0.00	0.00	0.00	13.64	86.36
Project management and leadership	0.00	0.00	0.00	13.64	86.36
Clear user requirement and need assessment	0.00	4.55	0.00	4.55	90.91
Capability of consultants and implementers	0.00	0.00	4.55	9.09	86.36
Project scope management	0.00	4.55	4.55	18.18	72.73
Training, documentation and knowledge transfer	0.00	0.00	0.00	13.64	86.36
Team composition, dedication and retention	0.00	4.55	0.00	18.18	77.27
Data preparation and migration	0.00	0.00	0.00	45.45	54.55
Incentives and celebration of milestones	0.00	4.55	9.09	63.64	22.73
Organizational culture and readiness	0.00	0.00	4.55	36.36	59.09
Users involvement and system testing	0.00	0.00	4.55	22.73	72.73
Quality control and feedback	0.00	0.00	4.55	22.73	72.73
Business process change and less customization	0.00	0.00	13.64	45.45	40.91
Adequate infrastructure and facilities (internet, laptops, project rooms, refreshments)	0.00	4.55	4.55	40.91	50.00
Trust and harmony between project team partners	0.00	0.00	9.09	27.27	63.64
Basic IT capability of users and team members	0.00	4.55	4.55	50.00	40.91
Appropriate integration and interfaces	0.00	0.00	4.55	27.27	68.18
Establishing ERP support team	0.00	0.00	0.00	22.73	77.27

Only six factors (clear user requirement and need assessment, project scope management, incentives and celebration of milestones, adequate infrastructure and facilities, basic IT capability of users and team members, and team composition, dedication and retention), each has one selection as “Less Important”. Team composition, dedication and retention was however considered as one of the very important and critical success factors during the interviews. And other six factors (Project planning and strategy, Top management support and commitment, Project management and leadership, Training, documentation and knowledge transfer, Data preparation and migration, Establishing ERP support team) have selections only as “Important” and “Very Important”. These factors are those with high frequencies during the interviews.

The twenty success factors are sorted as in table 4.3 based on their overall average value of survey results. According to this list, the factors sorted at the top are Project planning and strategy, Top management support and commitment, Project management and leadership, Training, documentation and knowledge transfer, Clear user requirement and need assessment, Capability of consultants and implementers. These are still in line with the results of the interview discussions. The overall cumulative average value of all the factors is 4.62 on a 5-point scale with 4.91 and 4.05 as maximum and minimum individual average values respectively.

Twenty factors are identified as critical success factors during interview sessions. On the other hand, survey results show that all these factors are very important all with average value of more than 4 on 5-point level. This indicates two basic findings. The first is that, the interview discussions are conducted in detail and exhaustively to find out the ERP critical success factors. The other finding is that the results of the interviews and survey questionnaire converge to each other indicating that factors cited many times in interviews are also ranking high in the survey.

Table 4.3: Summary of the online survey questionnaire results: sorted by average value

Critical Success Factor	Average Value (on 5-point scale)
Project planning and strategy	4.91
Top management support and commitment	4.86
Project management and leadership	4.86
Training, documentation and knowledge transfer	4.86
Clear user requirement and need assessment	4.82
Capability of consultants and implementers	4.82
Establishing ERP support team	4.77
Team composition, dedication and retention	4.68
Users involvement and system testing	4.68
Quality control and feedback	4.68
Change management and communication	4.64
Appropriate integration and interfaces	4.64
Project scope management	4.59
Data preparation and migration	4.55
Organizational culture and readiness	4.55
Trust and harmony between project team partners	4.55
Adequate infrastructure and facilities (internet, laptops, project rooms, refreshments)	4.36
Business process change and less customization	4.27
Basic IT capability of users and team members	4.27
Incentives and celebration of milestones	4.05
Overall Average	**4.62**

4.5 DISCUSSION ON FINDINGS OF CRITICAL SUCCESS FACTORS

Perceptions or observations of the critical success factors are discussed here for each of the twenty factors based on the interviews and the survey results. The four factors namely Incentives and celebration of milestones, Quality control and feedback, Basic IT capability of users and team members, and Establishing ERP support team are contextual success factors identified in this steady as they are not mentioned in the literatures reviewed.

1. Project planning and strategy

Project planning is the main success factor finding in this research. It is necessary to plan all aspects before starting the project. This refers to the planning of resources, team members, training, implementation methodology, what modules to implement and related activities. It was discussed that the impact of this factor during the ERP project was high. A project which is not planned well can be delayed and create confusions. For instance, it is discussed that there were training schedule overlaps, multiple assignments of team members on different roles, trainings and workshops. The project plan should also be feasible and logical. Ambitious and rush plan or schedules can affect the quality of the implementation.

2. Change management and communication

Change management is relatively new term specially in the Ethiopian project management environment. ERP project management can be seen from two aspects, technical and people side. The technical side is traditionally known as the project management. Change management refers to the people side management in ERP projects. It was the other number one discussion item as

critical success factor in the interviews. It was mentioned that even if this factor was given high attention during the start of this ERP project, it didn't continue and was not effective. There was training of change agents who can serve as "project champions", those who can promote and facilitate the implementation of the project. But this didn't go further and was left aside.

Per the interview discussions, change management is a very important factor which should incorporate the following activities and steps for a successful ERP project.

- The need for change of the system in the company should be well communicated to create awareness to all concerned stakeholders. If well communicated, middle and operational managers can be willing to release resources and project team members for the project. This is used to avoid any confusion in the progress of the project.
- It needs to create desire of all concerned for acceptance and support of the project by showing or explaining the positive effects and impacts of the change due to this project.
- Change management should mobilize all resources for the project.
- Teach and share knowledge and skills to all on how to do and participate in the project.
- Facilitate and initiate change of policies and procedures and make them as standard operating procedures (SOP). By this, the change is institutionalized.
- And finally, it is necessary to reward in one hand and enforce on the other hand these changes to be implemented for the project.

3. Top management support and commitment

Top management is the owner and sponsor of the project. Top management should actively participate and be visible in the project by approving fund and resources to facilitate the

implementation. As clearly stated by one of the interviewees, “tone at the top” is very important in ERP projects. As ERP is huge investment, it should be considered as one of the main operational activities of the company. Middle management should support the project by releasing and allocating appropriate staff and resources for the project. Top management involvement was mentioned to be high in this project as sponsor and involving in the project steering committee.

4. Project management and leadership

Project management and leadership is critical for ERP success. In this case study project, there were project managers and team leaders from both the client and the implementer in parallel. But, one of the sides should take the upper hand leadership. Some of the interviewees explained that project leadership is an issue to be studied further on who should lead the project.

Whether the project management and leadership should be from internal client company or from the implementer, from IT or from functional users, must be researched in the future. There might be strong project managers for other information systems projects. This doesn’t mean that they can also succeed managing ERP projects since ERP project management is different in that it is more a business process project as explained earlier.

5. Clear user requirement and need assessment

User requirements and need/gap analysis should be done exhaustively at the beginning of the project. Each of the business processes must be included in the request for proposal. Changing requirements now and then can delay the implementation and even causes reworks and backward activities affecting the overall project budget and implementation. Survey respondents also

commented that it is necessary to understand the business impact and the purpose of the system to the organization.

"The organization should understand the business impact and the purpose of the system to the organization."

6. Capability of consultants and implementers

Consultants and implementation partners are usually required to implement ERP projects. They can be either ERP product vendor consultants or other independent implementation partners. For this ERP project, the vendor consultants (SAP South Africa) have been involved at the beginning. But later, other independent partners (IGT) have taken over.

Research results show that vendors or consultants should have high technical and business knowledge and experience especially in the field of the client company's business. They must demonstrate and confirm previous implementation success history in a related business industry of the client. Their staff should be dedicated and possess high profile. They should not change their project staff now and then. This can affect the project progress, quality, training and knowledge transfer. It is mentioned that consultants sometimes ask users what they want while users expect consultants to bring best practices. As being consultants, they should deliver best industry standard business practices.

Due attention should be given when selecting vendors and consultants / implementers. Usually, organizations select these partners based on implementation cost and price.

However, interviewees insisted that it must be based on professionalism and experience instead of price.

"…it must be by professionalism and experience instead of cheap price, otherwise the cost will be paid later."

7. Project scope management

Scope management is discussed as one critical success factor because if the scope of the project is not defined in advance, the project will not move forward. Project scope must be first defined well and care should be taken to move within this scope. Otherwise, it can delay the project and increase project cost. Interviewees from technical staff explained that project scope change causes change on infrastructure setup and requirement which is another huge expenditure. The system can also be under delivered if not maintained per the scope. If there is a need for scope change during the project, it must be with high level top management approval.

8. Training, documentation and knowledge transfer

This is very critical factor in ERP implementation since ERP system is relatively new and complex. Training should be properly planned and defined. This is broad issue to be studied further. The type, content, duration of the training must be clearly arranged and controlled. Respondents stressed that sufficient training to users is mandatory. ERP training has different levels (level 1, level2, level 3 trainings).

So, formal and exhaustive training must be given to the respective roles in the project (for users, for support team, for technical/infrastructure team). Due attention should be given to documentation and knowledge transfer. The client company should be aware that the main

purpose of using external consultants or implementers should be knowledge transfer and they must be willing and open in this regard. Appropriate user guides, manuals and support documents should be delivered by the consultants and approved by the client for completeness. Some of the consultants project staff may work remotely off-site for better cost management. But this has been observed to have impact on knowledge transfer. Thus, qualified consultants should be on-site with the internal project team members.

9. Team composition, dedication and retention

It is the human or people aspect of a project that determines its success the most. Project members must be selected carefully and must be assigned dedicated and retained until the project completion. In summary, interviewees pointed out that the team composition and formation should be based on the following conditions.

- Project members should be the main process owners of their respective business units.
- They should have legacy systems knowledge and understanding.
- They must have high language and communication skill and should not be introvert. They must be able to express and explain what they need or what is needed from them.
- They should be empowered to decide immediately on issues encountered in the project.
- Project team composition should be from IT, functional units and others.
- Members should be released from regular office tasks and fully assigned on the project.
- They should be retained until project completion. Team change and turnover can highly affect the project. When new members come into the project, it is a rework and difficult for them to catch up.

It was discussed that in this ERP project, team members from IT and functional units were working as one combined team. Some interviewees expressed this as team strength and success since it has avoided the culture that assumes such information systems projects are IT department responsibilities. ERP is not just an IT project. So, the team should be composed of both technical and functional staff. Project members should be empowered to decide on issues appropriately instead of escalating and waiting or deciding on common consensus.

10. Data preparation and migration

Data migration from old legacy systems to the new system is common task during information system projects. This data which is to be migrated to the ERP system is master tables data, historical data or outstanding balance transaction data. Sources for this data can be old legacy systems, non-ERP system or even it should be prepared manually if there are no established sources. So, data should be prepared, cleansed and formatted from the old legacy systems and other non- ERP systems for smooth data migration process in the ERP project. Data migration is decisive factor in ERP project. If data is not ready for testing or to be migrated, the project can be paused. Easy-to-use formats and templates for data preparation and loading should be ready in advance.

11. Incentives and celebration of milestones

ERP project requires team members to work dedicated full day and extended hours even after office hours and on day-offs. The experience can be considered as important benefit for their career. However, the project work may create stress on project ream members and in turn could

decrease their morale. So, the project plan should include incentives to team members and major milestones of the project should be celebrated.

Leadership and support from upper management and project leaders should encourage project staff and increase their morale. This is recognition of the efforts of the project members and encourages them for better participation in the project. Discussion participants expressed that without these arrangements, team members will move to other opportunities leaving the project. Even, they can get better benefits such as overtime payments and others in normal office duties. So, comparable incentives should be arranged in the project.

12. Organizational culture and readiness

Organizational culture and readiness of all concerned stake holders is referred as one of the factors which highly determine ERP success. Business processes and all resources should be ready prior to the project starting. Culture, discipline, attitude of employees and project staff is critical factor for the successful ERP implementation. Interviewees insisted on the decisiveness of this factor.

13. Users involvement and system testing

Interview results also show that user involvement and system testing is critical in ERP system. Usually, information systems projects are left as IT department responsibility. This trend is not appropriate for ERP systems. Users should highly involve to support and give feedbacks, test the system and confirm acceptability.

The ERP system should be tested well with proper test scenarios before the go-live of the system. There are three types of system testing: unit test, integration test and user acceptance test (UAT). Unit testing is the testing of functionality of individual modules in the ERP system. Integration test is checking the interface and integration between the different modules end to end. User acceptance test is the final system acceptance testing and confirmation from users. Errors and malfunctions not corrected here can be life time problems of the system. So, users' involvement is very important. There was high user involvement and testing in this ERP project. However, some cases are observed to be not well tested before the go-live of the system.

14. Quality control and feedback

Quality control is one of new factors identified in the interviews of this study as to be very important. There should be a project team for project auditing, quality control and assurance and feedback activities. The system should be checked if implementation is per the requirements and the blue print design. Training types, contents and documentation must be controlled to be up to the standards.

Project team status and profiles should be checked and controlled. Implementers' project staff should come through proper and controlled procedures. When there are team changes, the quality control team should check all required on the newly coming members. Feedback mechanism should be available to share information and comments both upward and downward (from staff to management and from management to staff).

15. Business process change and less customization

ERP systems are built on best practices that are applied in the industry. Implementing an ERP system involves reengineering the existing business processes to the best business process standards [43]. So, the benefit of ERP comes from reengineering the company's existing way of doing business. The ERP system should be adopted without customization as much as possible. Customization or adding new program code to the ERP system is not good as it is cost incurring. Customization should be minimized as much as possible and the best practices of the ERP system must be adopted to reduce the costs of customization and future maintenance and upgrade expenses.

Not recognizing the impact the ERP system would have on business processes is one of the main reasons for ERP system failure [44]. Organizations should focus on process changes when implementing ERP systems. The business processes of the company must be re-engineered to utilize the ERP system functionalities in full. ERP is about processes and not just automation.

However, when a specific business process is found to be a competitive advantage for the company, customization must be done rather than changing such business processes. In this ERP project of the case study, custom programs have been developed and incorporated to the ERP system using the SAP ERP programming language called Advanced Business Application Programming (ABAP). Generally, the selected ERP system must be the right fit for the specific business industry of the client company as stated by the interviewees and respondents.

16. Adequate infrastructure and facilities (internet, laptops, project rooms, refreshments)

As ERP system is huge project which needs mobilization of much resources both staff and logistics, there should be adequate infrastructure. Integration and interconnectivity is the central purpose of ERP. Laptops, training rooms and refreshments are required to be readily available to facilitate the project. Network and internet is very critical as discussed in the interviews of this study.

17. Trust and harmony between project team partners

Project staff, both internal and the consultants or implementers, and all concerned stake holders must be synchronized and coordinated for the project success. There should be agreement and respect between them. One should understand and cooperate with the other instead of blaming each other and avoiding responsibilities. There might be cultural diversity between the internal and external team. They must respect and accept this diversities and work forward for one and successful goal of the ERP.

18. Basic IT capability of users and team members

It is mentioned that project members must be owners of business processes. They may know the processes very well. But due to their work environment and nature, they may not have familiarity with IT basic functionalities and tools. Project staff may not be all on the same level in their IT skill. In addition to this, ERP system is complex in functionality and user interfaces. This needs basic IT training and skill of project members and system users so that the project

implementation and the overall transformation can be smooth. It was explained that such trainings are conducted accordingly during this ERP project.

19. Appropriate integration and interfaces

For the ERP system to be successful and meet its goals, it should have appropriate integrations and data interfaces within its modules and with non-ERP systems. The different ERP modules should be properly configured for smooth integration and other non-ERP systems must be ready or enhanced to integrate or interface with the central ERP system.

20. Establishing ERP support team

Internal or in-house ERP system support team should be established to take-over the ERP system support from the implementers. The implementers cannot and should not continue with the company for long time after the implementation. Per the interviews and the observations in this study, the support team is established as one major section in IT department. Staff members in this support section are selected from IT and each of the functional units (finance, logistics/purchasing and human resources). Since ERP is a business process system, it needs multi-functional support team.

However, the team was established after the go live of the project. It was discussed that this support team should be formed hand in hand with the ERP project process for better knowledge transfer and smooth take-over of the system. It is also commented that such team should have high technical and functional capability.

This study has identified twenty critical success factors for ERP implementation along the ASAP implementation methodology as shown in figure 4.2.

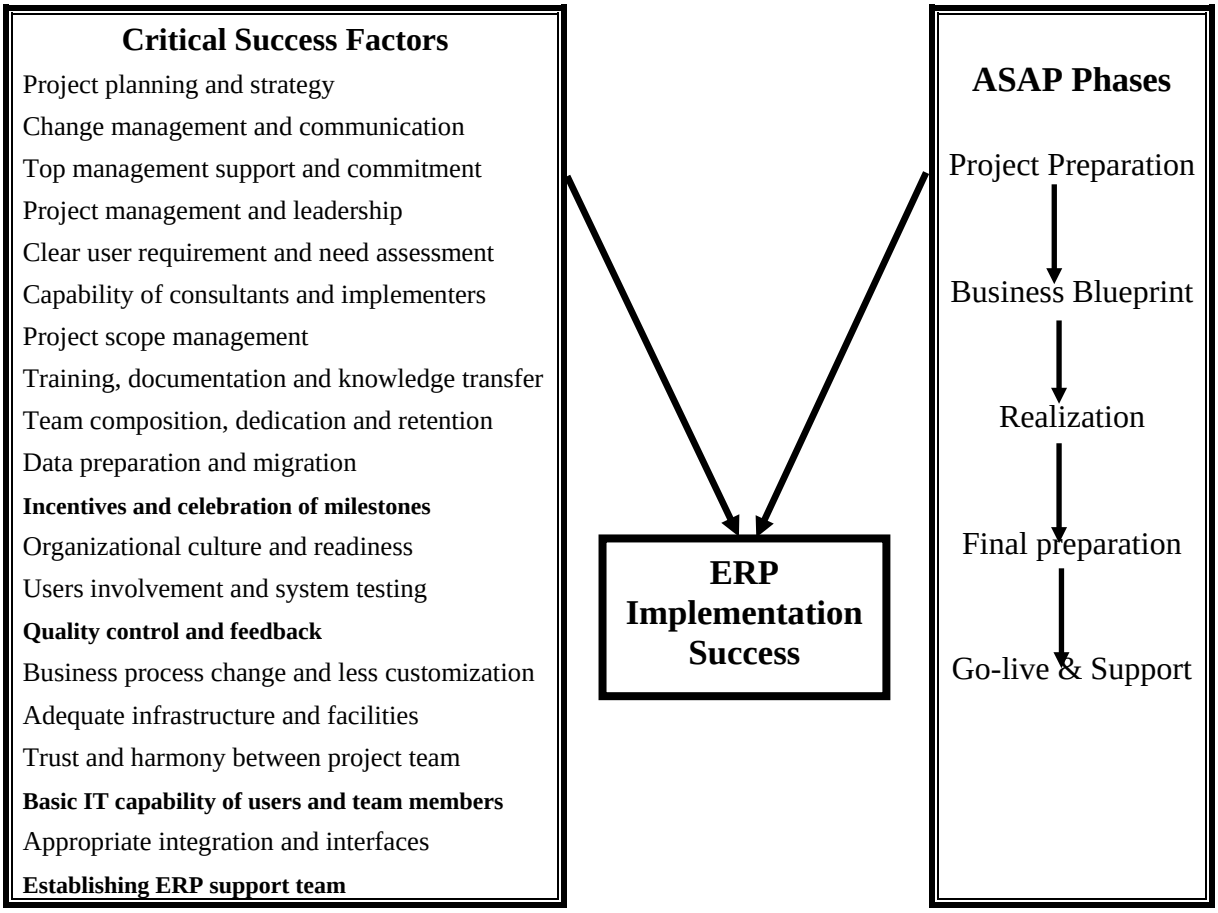

Figure 4.2: ERP critical success factors model along the ASAP methodology

4.6 VALIDITY AND RELIABILITY EVALUATION OF THE RESULT FINDINGS

In a research of case study, validity and reliability of findings must be confirmed. Validity of a research is the accuracy or correctness of the results or findings. Reliability on the other hand is to what extent can research findings be repeated or replicated if other studies are conducted using the same methodology. One way to increase validity and reliability is data triangulation. Data

triangulation is using multiple data sources and collection techniques. Merging and converging of research data collected from different sources and techniques can eliminate any biases in the study and increases reliability of the findings.

Validity and reliability of the findings of this research are guaranteed by the following steps.

- Since ERP implementation is new to Ethiopian environment, this research work is to the interest of all who participated in the study. The research topic and title was discussed and reviewed with different individuals and project members at the case study company.
- A lot of literature is reviewed and referred to get deep understanding of ERP systems and the implementation projects from different countries contexts.

- Interviews are the major data collection sources and techniques of this study. For this, key informants are identified from all roles, positions and experiences of the ERP project. Interview questions and points were tested and refined by pilot interviews. Ten interviewees were conducted exhaustively with due attention from the participants and until the convergence of results from the different informants.

- Factors and issues identified from the interviewees are summarized and reviewed again with different informants and then refined with comments from these reviews.
- The interview results are supplemented and counter-checked with an online survey questionnaire which was completed by twenty-two respondents out of twenty-four participants identified. The questionnaire was designed to be easy for the respondents.

- The survey questionnaire was conducted using an online website survey tool. This has helped for easy filling of the survey by the respondents saving their time to give due concern to it. The online tool is protected and secured. It is also used to control duplicate responses. This contributes for increasing the validity and reliability of survey results.
- The participants both for the interviews and the survey questionnaire are those with adequate experience and exposure to the ERP implementation project at the case study company. They were selected carefully and purposefully with discussions and pilot interviews with the project managers and appropriate informants.

- The interviews and survey questionnaire were conducted and completed within logical time by the participants themselves without the need of repetitive reminders and follow ups. This shows that the results are per the emphasis given by the participants.
- The researcher's observation of the processes and the ERP project implementation is used to confirm the results of the study.
- The final thesis report is refined based on review comments and feedback from different individuals and those who participated in the interviews and survey questionnaire.

CHAPTER FIVE

CONCLUSION AND RECOMMENDATIONS

5.1 CONCLUSION

This case study research has attempted to answer what factors are critical to determine the success of ERP system implementation. It has conducted and presented results of detail investigation of ERP implementation considering the case of ERP system project at Ethiopian Airlines. The purpose and objective of the study is to identify success factors which are critical to ERP implementation especially in the case of Ethiopia in which there is no or little ERP adoption.

The study has conducted detail interview discussions, online survey questionnaire, observations and documents review and finally identified twenty critical success factors important for the success of ERP implementation. Success factors such as project planning and strategy, top management support and commitment, project management and leadership, training, documentation and knowledge transfer, clear user requirement and need assessment, capability of consultants and implementers, change management and communication, team composition and retention and organizational culture and readiness are high ranking findings of this study as to be critical for ERP. This research has also identified relatively new contextual success factors such as establishing ERP support team, quality control and feedback, basic IT capability of users and team members and incentives and celebration of milestones.

Though this is a single case study, the results are with detailed and deep analysis. So, the results of this study can be generalized and extended to be applied and shared by other organizations in Ethiopia with similar contexts and environments. In addition, the research can be used to contribute to the ERP literature and educational curriculum in Ethiopia.

5.2 RECOMMENDATIONS

As explained in this research, ERP systems are important and bring competitive advantages to organizations. ERP demand is also coming to many organizations in Ethiopia. So, the researcher recommends and suggests the following points and further research works.

- Other Ethiopian organizations planning to implement ERP system can consider the success factors identified in this study as input for managing their ERP project.
- Ethiopian Airlines can also use this study as post project lessons assessment.
- More single and multiple case studies of ERP implementation should be conducted in Ethiopian organizations to strengthen the findings of success factors.
- Each ERP critical success factor can be a research topic for further research. For instance, project management should be studied in detail to develop better frame work.
- Return on investment (ROI) of ERP system adoption and usage should also be studied to give feedback for future ERP implementation projects.
- Training and knowledge transfer on ERP system is one of the success factors identified in this study. School of Information Science can contribute in this regard by incorporating adequate ERP courses in the curriculum.

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APPENDICES

Appendix 1: General Interview Guiding Questions

Questions which are used to guide the semi-structured interviews and lead to finding out the success factors:

- In your understanding, what are the intensions and objectives of the company to implement the ERP system?
- In your opinion, what are the strengths and weaknesses / challenges of this project?
- What do you think should be fulfilled for ERP success from your experience in Ethiopian context, culture and so on?
- Any ideas and comments of your experience on this project.

Appendix 2: Online Survey Questionnaire

Importance of Factors for the Success of ERP System Implementation

Would you please select the importance of each factor for ERP implementation success in your opinion. (click to select)

1. Project planning and strategy *
○ Not Important ○ Less Important ○ Neutral ○ Important ○ Very Important

2. Change management and communication *
○ Not Important ○ Less Important ○ Neutral ○ Important ○ Very Important

3. Top management support and commitment *
○ Not Important ○ Less Important ○ Neutral ○ Important ○ Very Important

4. Project management and leadership *
○ Not Important ○ Less Important ○ Neutral ○ Important ○ Very Important

5. Clear user requirement and need assessment *
○ Not Important ○ Less Important ○ Neutral ○ Important ○ Very Important

6. Capability of consultants and implementers *
○ Not Important ○ Less Important ○ Neutral ○ Important ○ Very Important

7. Project scope management *
○ Not Important ○ Less Important ○ Neutral ○ Important ○ Very Important

8. Training, documentation and knowledge transfer *
○ Not Important ○ Less Important ○ Neutral ○ Important ○ Very Important

9. Team composition, dedication and retention *
○ Not Important ○ Less Important ○ Neutral ○ Important ○ Very Important

10. Data preparation and migration *
○ Not Important ○ Less Important ○ Neutral ○ Important ○ Very Important

11. Incentives and celebration of milestones *

○ Not Important ○ Less Important ○ Neutral ○ Important ○ Very Important

12. Organizational culture and readiness *

○ Not Important ○ Less Important ○ Neutral ○ Important ○ Very Important

13. Users involvement and system testing *

○ Not Important ○ Less Important ○ Neutral ○ Important ○ Very Important

14. Quality control and feedback *

○ Not Important ○ Less Important ○ Neutral ○ Important ○ Very Important

15. Business process change and less customization *

○ Not Important ○ Less Important ○ Neutral ○ Important ○ Very Important

16. Adequate infrastructure and facilities (internet, laptops, project rooms, refreshments and so on) *

○ Not Important ○ Less Important ○ Neutral ○ Important ○ Very Important

17. Trust and harmony between project team partners *

○ Not Important ○ Less Important ○ Neutral ○ Important ○ Very Important

18. Basic IT capability of users and team members *

○ Not Important ○ Less Important ○ Neutral ○ Important ○ Very Important

19. Appropriate integration and interfaces *

○ Not Important ○ Less Important ○ Neutral ○ Important ○ Very Important

20. Establishing ERP support team *

○ Not Important ○ Less Important ○ Neutral ○ Important ○ Very Important

21. Any other factor you think is important for ERP success

Click ' Finished ' to complete.

Thank you for responding to our survey.

Appendix 3: Results of the Online Survey Questionnaire

1. Project planning and strategy	% of Respondents	Number of Respondents
Not Important	0.00%	0
Less Important	0.00%	0
Neutral	0.00%	0
Important	9.09%	2
Very Important	90.91%	20
Number of respondents		*22*
Number of respondents who skipped this question		*0*

2. Change management and communication	% of Respondents	Number of Respondents
Not Important	0.00%	0
Less Important	0.00%	0
Neutral	9.09%	2
Important	18.18%	4
Very Important	72.73%	16
Number of respondents		*22*
Number of respondents who skipped this question		*0*

3. Top management support and commitment	% of Respondents	Number of Respondents
Not Important	0.00%	0
Less Important	0.00%	0
Neutral	0.00%	0
Important	13.64%	3
Very Important	86.36%	19
Number of respondents		*22*
Number of respondents who skipped this question		*0*

4. Project management and leadership	% of Respondents	Number of Respondents
Not Important	0.00%	0
Less Important	0.00%	0
Neutral	0.00%	0
Important	13.64%	3
Very Important	86.36%	19
Number of respondents		*22*
Number of respondents who skipped this question		*0*

5. Clear user requirement and need assessment	% of Respondents	Number of Respondents
Not Important	0.00%	0
Less Important	4.55%	1
Neutral	0.00%	0
Important	4.55%	1
Very Important	90.91%	20
Number of respondents		*22*
Number of respondents who skipped this question		*0*

6. Capability of consultants and implementers	% of Respondents	Number of Respondents
Not Important	0.00%	0
Less Important	0.00%	0
Neutral	4.55%	1
Important	9.09%	2
Very Important	86.36%	19
Number of respondents		*22*
Number of respondents who skipped this question		*0*

7. Project scope management	% of Respondents	Number of Respondents
Not Important	0.00%	0
Less Important	4.55%	1
Neutral	4.55%	1
Important	18.18%	4
Very Important	72.73%	16
Number of respondents		*22*
Number of respondents who skipped this question		*0*

8. Training, documentation and knowledge transfer	% of Respondents	Number of Respondents
Not Important	0.00%	0
Less Important	0.00%	0
Neutral	0.00%	0
Important	13.64%	3
Very Important	86.36%	19
Number of respondents		*22*
Number of respondents who skipped this question		*0*

9. Team composition, dedication and retention	% of Respondents	Number of Respondents
Not Important	0.00%	0
Less Important	4.55%	1
Neutral	0.00%	0
Important	18.18%	4
Very Important	77.27%	17
Number of respondents		*22*
Number of respondents who skipped this question		*0*

10. Data preparation and migration	% of Respondents	Number of Respondents
Not Important	0.00%	0
Less Important	0.00%	0
Neutral	0.00%	0
Important	45.45%	10
Very Important	54.55%	12
Number of respondents		*22*
Number of respondents who skipped this question		*0*

11. Incentives and celebration of milestones	% of Respondents	Number of Respondents
Not Important	0.00%	0
Less Important	4.55%	1
Neutral	9.09%	2
Important	63.64%	14
Very Important	22.73%	5
Number of respondents		*22*
Number of respondents who skipped this question		*0*

12. Organizational culture and readiness	% of Respondents	Number of Respondents
Not Important	0.00%	0
Less Important	0.00%	0
Neutral	4.55%	1
Important	36.36%	8
Very Important	59.09%	13
Number of respondents		*22*
Number of respondents who skipped this question		*0*

13. Users involvement and system testing	% of Respondents	Number of Respondents
Not Important	0.00%	0
Less Important	0.00%	0
Neutral	4.55%	1
Important	22.73%	5
Very Important	72.73%	16
Number of respondents		*22*
Number of respondents who skipped this question		*0*

14. Quality control and feedback	% of Respondents	Number of Respondents
Not Important	0.00%	0
Less Important	0.00%	0
Neutral	4.55%	1
Important	22.73%	5
Very Important	72.73%	16
Number of respondents		*22*
Number of respondents who skipped this question		*0*

15. Business process change and less customization	% of Respondents	Number of Respondents
Not Important	0.00%	0
Less Important	0.00%	0
Neutral	13.64%	3
Important	45.45%	10
Very Important	40.91%	9
Number of respondents		*22*
Number of respondents who skipped this question		*0*

16. Adequate infrastructure and facilities (internet, laptops, project rooms, refreshments and so on)	% of Respondents	Number of Respondents
Not Important	0.00%	0
Less Important	4.55%	1
Neutral	4.55%	1
Important	40.91%	9
Very Important	50.00%	11
Number of respondents		*22*
Number of respondents who skipped this question		*0*

17. Trust and harmony between project team partners	% of Respondents	Number of Respondents
Not Important	0.00%	0
Less Important	0.00%	0
Neutral	9.09%	2
Important	27.27%	6
Very Important	63.64%	14
Number of respondents		*22*
Number of respondents who skipped this question		*0*

18. Basic IT capability of users and team members	% of Respondents	Number of Respondents
Not Important	0.00%	0
Less Important	4.55%	1
Neutral	4.55%	1
Important	50.00%	11
Very Important	40.91%	9
Number of respondents		*22*
Number of respondents who skipped this question		*0*

19. Appropriate integration and interfaces	% of Respondents	Number of Respondents
Not Important	0.00%	0
Less Important	0.00%	0
Neutral	4.55%	1
Important	27.27%	6
Very Important	68.18%	15
Number of respondents		*22*
Number of respondents who skipped this question		*0*

20. Establishing ERP support team	% of Respondents	Number of Respondents
Not Important	0.00%	0
Less Important	0.00%	0
Neutral	0.00%	0
Important	22.73%	5
Very Important	77.27%	17
Number of respondents		*22*
Number of respondents who skipped this question		*0*

21. Any other factor you think is important for ERP success

Number of Respondents	8
Number of respondents who skipped this question	14