PROBLEMS AND PROSPECTS OF ERP SYSTEMS IMPLEMENTATION IN SMALL AND MID SIZED PUBLIC SECTOR ENTERPRISES IN KERALA

**Thesis submitted to the
University of Calicut
for the award of the Degree of
DOCTOR OF PHILOSOPHY IN COMMERCE**

by

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Certificate

This is to certify that this thesis entitled **'Problems and Prospects of ERP Systems Implementation in Small and Mid Sized Public Sector Enterprises in Kerala'** prepared by **Mr. Mustafa K.,** for the award of the Degree of Doctor of Philosophy in Commerce of the University of Calicut, is a record of bonafide research work carried out by him under my supervision and guidance. No part of the thesis has been submitted for any degree, diploma, fellowship or other similar title or recognition before.

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Declaration

I hereby declare that this thesis entitled '**Problems and Prospects of ERP Systems Implementation in Small and Mid Sized Public Sector Enterprises in Kerala'** submitted to the University of Calicut for the award of the Degree of Doctor of Philosophy is an original record of research work carried out by me under the guidance and supervision of **Dr. Yakoob. C**., PG Department of Commerce, P.S.M.O College Tirurangadi.

I also declare that no part of this thesis has been presented for the award of any degree, diploma, fellowship, or other similar title or recognition of any University/Institution before.

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Mustafa K.

Contents

List of Abbreviations

ABAP	-	Advanced Business Application Programming
AI	-	Artificial Intelligence
APS	-	Advanced Planning and Scheduling
BI	-	Business Intelligence
BOM	-	Bill of Materials
BPC	-	Business Process Change
BPR	-	Business Process Re-Engineering
CFA	-	Conformatory Factor Analysis
CIO	-	Chief Information Officer
CIM	-	Computer Integrated Manufacturing system
CRM	-	Customer Relationship Management
CRM	-	Customer Relationship Management
CRP	-	Capacity Requirements Planning
CSF	-	Critical Success Factor
CSFs	-	Critical Success Factors
DBMS	-	Data Base Management System
EERP	-	Extended Enterprise Resource Planning
EME	-	Electronics and Mechanical Engineers
EOQ	-	Economic Order Quantity
EPM	-	Enterprise Performance Management
ERP	-	Enterprise Resource Planning
ERP	-	Enterprise Resource Planning
ESP	-	Equipment Support Plan
FA	-	Financial Accounting
FMCG	-	Fast Moving Consumer Good
GDP	-	Gross Domestic Product
GUI	-	Graphical User Interface
HR	-	Human Resources
IS	-	Information System
IT	-	Information Technology
JIT	-	Just In Time
KMS	-	Knowledge Management System

LOGINET	-	Logistics Network
MIS	-	Management Information System
MM	-	Material Management
MNC	-	Multi-National Company
MPS	-	Master Production Schedule
MRP	-	Material Requirement Planning
MRP	-	Manufacturing Resources Planning
MRP	-	Material Requirement Planning
MRP II	-	Manufacturing Resource Planning
OEM	-	Original Equipment Manufacturer
OPC	-	Organizational Process Characteristics
PLM	-	Product Lifecycle Management
PRO	-	Public Relations Officer
PSU	-	Public Sector Unit
R&D	-	Research & Development
ROI	-	Return on Investment
SaaS	-	Software as a Service
SAP	-	Systems, Applications & Products in Data Processing
SCM	-	Supply Chain Management
SCM	-	Supply Chain Management
SEM	-	Structural Equation Modelling
SMEs	-	Small to Medium Sized Enterprises
SOA	-	Service Oriented Architecture
STC	-	System & Technological Characteristics
TAM	-	Technology Acceptance Model

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Chapter I
Introduction

1.1.1. Background of the Study

Now organisations are investing big amounts in information technology (IT) systems to effectively coordinate and integrate their activities across their supply chains and to shape their way of conducting business. They are ready to invest huge amounts in IT by through implementing ERP software package with additional hardware infra sector.

The top global ERP giants, holds around 73% with SAP 40%, Oracle 22%, Sage 5%, Microsoft 3%, and SSA Global with 3% of the global market share. Earlier studies shows, 50% to 70% of worldwide ERP system implementations face problems and fail to achieve their desired objectives in time. The situation slowly improved and failure rate declaimed to less than 10%.

The chapter explains the ERP systems. This is followed by a section which focuses on the lack of ERP system literature regarding implementation issues, benefits, models to guide ERP system implementing firms.

1.1.2. Evolution of ERP

The ERP present form evolved from many stages of management information systems over the past 35 years. It begins from calculating materials requirements for manufacturing and end with complete automation of the entire organisation. MRP (Material Requirement Planning) developed during 1980's, which, later developed as Manufacturing Resource Planning (MRPII) and finally in 1990's the birth of ERP. It started with MRP and changed to MRPII and then gradually to Computer Integrated Management System (CIM). ERP systems now cover all functionalities both products and services of an organisation, regardless of the character or size. ERP systems now used in all manufacturing, non-

manufacturing, profit and non-profit organizations both products and invisible service sector and in governmental organisations. ERP began from MRP through routings of software architecture capacity planning as a standard software activity. ERP can now handle all the core and key departments and functionalities such as, accounting, invoicing, marketing, manufacturing, shipping and logistics, distribution, inventory, and customer relationship and satisfaction. ERP now controls and supports many business activities, such as manufacturing and production activity, sales and marketing, inventory and stores management, delivery and distribution, billing and collection, quality control and inspection, and human resource and payroll accounting management. Many companies found ERP systems implementation as a panacea for the Y2K problem they faced (whether real or illusion) in their legacy systems. Organisations got an excellent opportunity to move and replace their existing management information systems software with new ERP systems. The ERP vendors also took this opportunity (Y2K) for boosting their sales remarked as Y2K compliant solution. ERP systems may be disregarded or often incorrectly noted as back office systems blaming that customers are not directly involved. ERP systems are integrated into cross-functional and intra-enterprise systems. All functionaries and departments involved in manufacturing or production operations or providing services are integrated into one system. There exist special modules in all ERPs for accounting, marketing, manufacturing, warehousing, logistics, human resources, information technology and strategic management in addition to CRM and SRM.

The 1960s, most of the previous researches viewed it from manufacturing side alone for the purpose of production planning scheduling, materials ordering and procurements, and shipping system of automated reorder point (ROP) were used. In late -1960s, computerised MRP Systems started with master file technology. The MRP system consists of Bill of Materials (BOM) with production reporting by computers used. During 1970s, started MRP II by upgrading MRP I. Additional facility in MRP II is the integration of Production Capacity and related requirements and reporting. It also had the ability of production plan scheduling and monitoring.

MRP systems run on a big mainframe or mini computers only. it has only limited integration and interaction among other functions.

The 1980's witnessed marvelous advancements and rapid developments in Information technology leading MRP II systems were integrated with other business systems used like integrated manufacturing System, just-in-time, electronic data interchange, and manufacturing execution systems. It has multi-user facility with multi-task capability and runs on almost all operating systems and platforms. The years 1990's, experienced the replacement of ERP systems from MRP II systems as an extended form of MRP II with human resources, sales and distribution (Marketing) and quality to create smooth, integrated information circulation and flows among the entire organisation. ERP systems use a common database and IT architecture linking and integrated with existing legacy systems, runs on multi-user networking environment and allowing simultaneous aggregation or/de-aggregation manipulating real-time data among the organisational functions. ERP systems are the backbone of IT infrastructure and its functionalities have extended to intra and inter-firm integration facilitating all IT-oriented business applications like Customer Relationship Management (CRM), electronic-commerce (E-Com) and Supply Chain Management (SCM).

During 2000's, the next-generation software, ERP II, evolved. This new generation software is web-based and known as 'Cloud ERP' which allows employees and all concerned suppliers and customers can interact in real-time basis to access a common database.

ERP Systems are synonymous as EAS (Enterprise Application Suite). When the ERP modules are using through the internet with browsing software and business data are stored on the internet or 'cloud'.

An ERP system, need to provide at least two functions in modules to integrate. For example, software which has to provide both accounting and payroll functions could be technically considered as an ERP package

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1.1.3. ERP Historical Account

ERP systems developed in the 1970's from the Material Requirements Planning systems (MRP). These systems evolved into the Manufacturing Resource Planning systems (MRPII). The four phases of ERP systems in history are:

➢ The 1960's – Inventory Control Software based on Traditional Concepts on Inventory.

➢ The 1970's developed Material Requirements Planning systems (MRP)

➢ During the 1980's - The concept of ERP II, and the MRP extension, Enterprise Resource Management (ERM) systems developed.

➢ During the 1990's - ERP II and Enterprise Resource Management (ERM) systems were further developed and extended to cover more areas like engineering, finance and accounts, human resources and payroll, and further distribution activities. Further, ERP systems added more technology aspects to the overall system development requirements. These having the characteristics of a distributed architecture, client/server and Object Oriented Programming. This scalability and their evolution towards including supply chain and customer relationship management operations provide the extension into customer and supplier environments. ERP II facilitates the basis for e-business and e-commerce with a collaborative environment

➢ During the 2000's Later the cloud computing brings a sea change in the way companies use technology.

➢ The cloud computing has three categories, such as;

1. "Infrastructure-as-a-service" (providing computing infrastructure on lease),

2. "Platform-as-a-service" (providing Cloud computing environment and storage on lease), and

3. "Software-as-a-service" (providing and hosting of software applications).

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Cloud assumes better or equal efficiency in respect of its cost, its reliability, and its inherent security.

1.1.4. ERP Background

Business organizations implementing information systems to reengineer their functionalities and activities to have a uniform and single information flow for their business activities. They are facing multiple challenges with rapid change, technical developments, tough competition, and a massive flow of information to obtain a competitive advantage. They try to find new ways of conducting their business as effective as possible. IS are largely responsible for meeting these challenges to improve their effectiveness and efficiency to compete in the market. Realizing the user's requirements and customer needs, leading software companies SAP, Baan, PeopleSoft, and Oracle have designed well-known integrated IS. The purpose of ERP is to control the company's internal and external information flow, managing data and information requirements of the entire organization. It enables them to operate and coordinate its activities and functions through a single data repository consisting of different modules. Each module depends on the company demands regarding functions and work methods.

1.1.5. Characteristics of ERP

The ERP systems begin as the de facto operating standards and represent ordinary and multi-level customized solutions that can include good practices which shows certain assumptions of firm's operation in general. It functions with a centrally stored single database. It is divided into modules and these modules works with modular applications. It integrates all functional activities and departments, all business branches and head offices in all parts of the world.

The important characterise are:

- Share single database in all modules integrated.

- All users can access common data

- Sharing internet and other network facilities through client-server system

- Open system network architecture enables the each modules to link or de-link without affecting other systems or modules

- Lightening the harsh rules and increase the facility of sharing intra-firm and inter-firm resources

- The total integration facilitates total coordination of business activities

- Integrated embedded system facilitates to view the processes combined with the use of technology

- Overall the management is facilitated by cognitive integration with language sharing and information from all functional departments together.

1.1.6. Definitions of ERP

According to some experts, "ERP is a collection of application modules for smooth managing all business activities". Other experts define ERP "as an integrated but complex business software system that integrates together and automates the main basic processes of a business". "ERP is the best enterprise-wide technology infrastructure solution."

The current ERP experts, Slater, (1999) and Davenport, (1998) synonymously used ERP as 'Enterprise resource management (ERM) systems'. It is also called or 'Business Systems (BS)' or 'Enterprise Systems (ES)'.

ERP systems are "applications with the capability to integrate functional areas and permits to share a centrally stored common database and with analysis tools. The definitions of ERP had widened with a lot of consecutive changes by incorporating SCM and CRM to inter-firm integration of applications.

In the early 2000s, the Gartner Group used ERP II for business strategies with industry-domain-clearly defined specific applications for augmenting the customer value and shareholders' expectation and value through optimising and

consecutive inter and intra-enterprise wide collaborative financial, operational and marketing processes (Gartner, 2002).

"ERP is the cross-enterprise-wide integration enhancements with extension processes, a verticalized representation of organisational functionalities, and IT architecture" Gould (2002).

The various terms, terminologies and descriptions denoted to define and explain ERP systems put forward to consider that the definition and scope of ERP have changed and developed over time, the term ERP has become the most wanted and common terminology in IT and used by researchers and practitioners to denote and indicate the integrated total business application software packages.

1.1.7. Modules of the ERP System

Basically, ERP system modules address three major processes, such as; finance, HR and logistics. Organisations are eligible to add additional modules or sub modules like as financial accounting, personnel administration, payroll management, personnel development, controlling, general or special logistics sub module with materials procurement, inventory management and control, process and production planning, sales, marketing and distribution. The firms can implement one or more modules with or without sub-modules with partial integration for addressing a set of activities. Firms like MNCs chose full integration to optimize the potential of the entire ERP fruit by deploying the entire modules and sub-modules available in an ERP system for tapping the full potential. Intra-firm deployments facilitate additional module deployments to the existing supply chain movement.

Popular deployment models include EDI, E-Commerce, CRM, SCM, PDM etc, (Ayers, 2001 and Tyler, 2002). Each module includes many sub-modules to access common a database of the organisation.

1.2. Significance of the Study

All ERP Implementation researches have been about the adoption of certain factors and processes. This research combines problems and prospects of ERP

Systems implementation in Small and Mid Sized Public Sector Enterprises in Kerala in a sophisticated and an innovative manner. The outcome of this research may be useful for Small and Mid Sized Public Sector company's managers/administrators/ decision makers in Kerala looking for ERP Systems applications. Some of the administrators and managers of Public Sector Enterprises may have limited knowledge to understand the complexities of the ERP Implementation. This research identifies the problems and bottlenecks along with the future prospects of ERP adoptions factors with them in different stages of ERP Systems implementation. Generally, the administrators and managers of Public Sector Enterprises have limited knowledge and skills to understand the complexities involved in the ERP Implementation.

Some studies were also focused on ERP solutions for evaluating the suitability of the ERP system with ERP vendors and consultants, or on Critical Success Factors (CSFs) or failure factors regarding ERP selection and implementation. The present study focused on Problems and Prospects of ERP Systems Implementation in Small and Mid Sized Public Sector Enterprises in Kerala, the area in which no previous studies were held. Moreover, previous literature shows that all those researches were on large enterprises or MNCs in the private sector, no such studies were done on ERP Systems deployments in Small and Medium Sized Public Sector Enterprises of Kerala.

The Technology Acceptance Model (TAM) is used to evaluate the impact of user satisfaction and enhancement of efficiency and effectiveness of ERP deployments.

1.3.1 Research Rationale

The justifications for this study are;

1. The integrated and sophisticated ERP Systems are popular with varied benefits, but at the same time, if it is not properly implemented and maintained, it will a miracle.

2.   Since ERP Systems are implemented firstly by large organisations with lot of complexity, the problems and challenges are identified from their side.

3.   Researches on ERP Implementation on PS SMEs of Kerala were limited

4.   At present, all type of small medium and large organisations are coming forward for ERP adoption with or without the knowledge of too many failures only because of ERPs inherent merits, especially total integration and reporting.

5.   The ERP software needs constant maintenance and upgrade, which may be a costly affair when the ERP vendor stops a particular version with or without the 'sunset dates',.

6.   After the 'sunset date' or discontinuance of the existing product, they stop the service and maintenance.

1.3.2 The Research Problem

The ERP applications enable the small and medium sized public sector enterprises of Kerala for overall development through increased business practices, productivity and supplier & customer relationships. It has the inherent capacity of integrating all business functions and brings process efficiency with clear and timely supplier and customer information.

The main challenges for small and medium sized public sector enterprises of Kerala for ERP adoption include the history of unsuccessful cases of ERP adoption or its bad publicity. They also had the fear of the limitation of standardisation business processes with limited knowledge and skills. It is now important as well as difficult for small and medium sized public sector enterprises of Kerala to go for ERP adoption

With the limited skill, knowledge and information, it a challenge for small and medium sized public sector enterprises of Kerala to get the required comprehensive selection criteria on ERP applications. They also require the

government support, financial support, industrial and technical knowledge support of the supplier and customer and knowledge about the extent of customization.

It also warrants the knowledge about the implementation factors, implementation stages, implementing teams, supervisors, managers and administrators of ERP implementing small and medium sized public sector enterprises of Kerala. Hence, a model is developed for ERP adoption in these public enterprises that enables the administrators control the implementation processes.

This study is important since it constructs and tests a literature and theoretically driven ERP system deployment model to enhance the understanding of ERP system concepts and associated implementation prospects and problems. This understanding may lead for enterprises to uplift their ERP systems and to meet the increasing demands of globalization successfully. Thus, the research problem is "Problems and Prospects of ERP Systems Implementation in Small and Mid Sized Public Sector Enterprises in Kerala".

The exploration and analysis of research methods, design and setup is important to understand before the objectives of this study in detail. The objective of this study being to analyse the factors relating to ERP adoption, deployments and implementation in small and mid-sized public sector enterprises of Kerala and propose a strategic ERP adoption model to assist small and mid-sized public sector enterprises for successful implementation of ERP Systems.

1.4. Scope of the Study

Scope and context of the study

This dissertation is defined by the following boundaries and considerations:

1. The focus of this research is on the study on problems and prospects of ERP Systems implementation on small and medium sized public enterprises in the state of Kerala. The reason for the selection is that adoption of ERP systems implementation is a burning topic because of its complexities and failures. Thus by looking at SMEs in the public sector of Kerala, this study may provide future lights in this area of research. Moreover, the operational

environments of the public sectors enterprises are entirely different and the findings of the study definitely add knowledge to this area of research.

2. This study concentrates on ERP Systems' basic functionality and implementation stages comparing the benefits of different ERP systems.

3. This study covers only ERP implementation on small and medium sized enterprises especially on the Kerala public sector.

4. This study also tries to bring in to light the ERP implementation life-cycle in this research. Because the ERP technology and the research area are subject to deep and dynamic change frequently. Further to implementation and ERP became live, there may be a dead-lock and delay on actions targeted for achieving the full capabilities and benefits of installed processes.

5. Earlier studies reveal that 60% to 70% of the deployments are failure after implementing 80% to 90% of the software. But the present literature shows a revival registering 80% to 90% success and ERP vendors and consultants trying to make it 100%. The cost reduction to the extent of 30% to 50% is offered with doubling the functionalities and benefits.

6. The organisational context is subject to continuous change to adapt to the ever changing environmental context like new competitors, new governmental policies and regulations, wonderful change in Information and Communication Technology (ICT), with other external environmental changes, etc.

1.5. Objectives of the Study

The important **objectives** of the study are:

1) To identify the problems and prospects associated with the ERP system implementation in small and medium sized public sector enterprises of Kerala.

2) To enhance the effectiveness of ERP systems implementation in small and medium sized public sector enterprises of Kerala through SWOC analysis

exploring the reasons for opting a particular ERP (Strength), hindrance factors of ERP adoption (Weakness), influencing factors/ variables for future ERP adoption (Opportunities) and special care areas to be taken care of while adopting ERP (Challenges).

3) To reduce the problems and risks associated and related to the ERP system implementation failure through examining the level of satisfaction with involvement and training given to the implementing team, executives and end users.

4) To examine the current ERP awareness in small and medium sized public sector enterprises of Kerala

5) To identify the Organisational, People and Technical Factors and other critical success factors (CSF) influencing the implementation of ERP and suggest such measures for the smooth and successful implementation of ERP system software in PSUs in Kerala.

6) To develop an ERP implementation success model for Small and Mid-Sized PSUs of Kerala.

7) To bring to light the benefits reaped on ERP adoption in Small and Mid-Sized PSUs of Kerala.

The study on ERP implementation problems and prospects for all public sector undertakings are equally important. It seems to be little researches carried on for the successful ERP implementation of SMEs in Kerala PSUs .This study looking for achieving this objective by proposing an ERP implementation model to identify and guide for the ERP implementation in these enterprises.

1.6. Research hypothesis

The following hypotheses are also developed and tested with suitable statistical tools:

H_{01}: Some *factors negatively influence* on ERP implementation

H_{02}:   There is *no association* between the *satisfaction levels of users and training* given to them

H_{03}:   There is *no association* between the *satisfaction level and active involvement* of employees in the ERP implementation

H_{04}:   There is *no influence on Organisational Factors* while implementing ERP system in small and medium sized public sector enterprises of Kerala.

H_{05}:   There is *no influence* on *People Factors* while implementing ERP system in small and medium sized public sector enterprises of Kerala.

H_{06}:   There is *no influence* on *Technical Factors* while implementing ERP system in small and medium sized public sector enterprises of Kerala.

H_{07}:   There is *no influence* on other *Critical Success Factors* while implementing ERP system in small and medium sized public sector enterprises of Kerala.

H_{08}:   The variables related to *Cost, Time, Technical, Efficiency, Manpower and General benefits are* not *dependent* on ERP adoption in Small and Medium PSUs of Kerala

1.7. Operational Definition and Concepts

1.7.1 Definitions of ERP

ERP has been defined by researchers and practitioners in different ways; some describe ERP as a collection of applications that can be used to manage all of an enterprise's business activities. Other experts define ERP as an integrated but complex business software system that integrates together and automates the main basic processes of a business. "ERP is the best enterprise-wide technology infrastructure solution."

Slater, (1999) and Davenport, 1998) remarks that ERP systems are 'Enterprise resource management (ERM) systems', or 'Enterprise Systems (ES)', or 'Business Systems (BS)'. ERP systems are further described as applications that integrate functional areas and allow functions to share a common database and

business analysis tools. The definitions of ERP had lot of consecutive changes to incorporate inter-firm integration of both front and back office business applications like Supply Chain Management and Customer Relationship Management. In the early 2000s, the Gartner Group coined the term enterprise resource planning II (ERP II) to refer to business strategies and a set of industry-domain-clearly defined specific applications for augmenting the customer value and shareholders' expectation and value through optimising and consecutive inter and intra-enterprise wide collaborative financial, operational and marketing processes (Gartner, 2002).

"ERP is the cross-enterprise-wide integration enhancements with extension processes, a verticalized representation of organisational functionalities, and IT architecture" Gould (2002).

"An ERP System is a full-fledged integrated business management information system integrating all functional departments and processes of an enterprise. It organises and controls men, materials, money and machine and integrates operational processes and information flows for its optimum use"

1.7.2 Critical Success Factors for ERP System Implementation

Generally, ERP Implementations have reported success, but there are many failures in instances also. The organisations experience so many technical, managerial, and organizational difficulties while implementing ERP in an organisation. In order to overcome these constraints, firms may adopt an approach of 'CSF-based ERP System' implementation. Researchers identified certain Critical Success Factors (CSFs) that the organisation needs to focus which will achieve the success of implementation easily. (Davenport, 1998; Bingi, Maneesh, & Jayanth, 1999; Padmanabhan, 1999). These Factors are inter-dependent and critical for implementation process hence later researches focused on development of a framework to support the ERP system. Realising the different CSFs, they are very important in different phases of the ERP project.

1.7.3 ERP System Implementation and Performance

Studies in this respect reveal that the organisational performance will be enhanced due to successful ERP System implementation. The centrally stored single database huge quantity of data shared among all functions and departments. The fragmented data stored in different locations may leads to less productivity and performance (Davenport, 1998).

1.7.4 Systems Approach to ERP

Increased efficiency found in implementing a single module or with sub-modules (Klauset al., 2000; Hitt, Wu, & Zhouo, 2002). The overall system approach in this regard is to implement either the whole modules or the required modules with essential customisation according to the organisation needs in order to optimize benefits. These studies suggest that the integration of modules will increase business performance over time. All ERP studies confirm the enhanced benefits on successful implementation. But for complete benefits, it requires a total system approach by implementing the whole modules systematically.

Diagram No: 1 Systems Approach to ERP

1.7.5 Need for Research

ERP development is a recent origin and a regarded as a new field. The empirical research work on ERP is lacking. Latest developments in ERP technologies and frequent cases of implementation failures and delays demands need for ERP research. Some of the studies were focussed on short-term effective management. But actual benefit seeking from the ERP deployment is the overall organisational efficiency of the total organisation. Now the research attitude is totally changed towards long-term analysis ERP benefits rather than specific operational and usage issues. Most of the research studies scrutinized the issues separately but lacks systematic studies. In the absence of a conceptualized ERP model, there is a weak foundation for experimental research work. Now important areas and modules are identified selected, benefits are listed and scrutinised, specific factors associated with these are identified and examined.

1.7.6 General Model of ERP System Implementation

This is a humble effort to fill the gaps found through the review of the literature. This study considered the benefits and impacts of critical success factors of ERP system implementations. It requires change in performance when the organisation tries to implement more modules. The organisation can increase the performance through updating more useful modules. The global market indicates rising competition and global pressure among ERP

A good theoretical model of ERP implementation is warranted due to long and uncertain implementation delays with field testing

This research tries to enhance the understanding and builds and tests a theory-based ERP system implementation model for reducing the problems occurred during the implementation and the future prospects. This understanding may lead for enterprises to uplift their ERP systems and to meet the increasing demands of globalization successfully.

1.8. Methodology

It is a fact that methodology is an important yardstick and cornerstone used to measure the scientific nature of research. The methodology identifies the source of data, overall research plan and research questions.

The methodology accepted and followed in this research is briefly explained below.

1.8.1. Method of Research

The study is designed as exploratory and descriptive based on both primary and secondary data.

The primary data was done with field study using a survey methodology to obtain data from selected Small and Mid Sized Public Sector Enterprises in Kerala.

The survey was implemented using a variety of methods like, postal mail, email, Google forms, direct supply of questionnaires and personal interviews.

The data analysis was done with variety of statistical techniques.

The general data on investment, turnover, number of employees, IT setup, rural or urban in ERP adopted, and non-adopted enterprises classified using the frequency distribution.

Simple Correlation technique also used to analyse the factors and all the dependent and independent variables.

Independent sample 't-test' was used for testing the Influence of Organisational, People and Technical Factors while implementing ERP.

The statistical techniques and tests like techniques of univariate analysis (ANOVA) and multivariate techniques like factor and regression analysis were also used.

It establishes the research strategy through the philosophical assumptions with the empirical research techniques for achieving the objectives of this study. The research design with its scope and limitations were also defined.

1.8.2. Source of Data

Both the secondary and primary data have been collected and used for this research.

1.8.3. Primary Data:

Primary data, also called as first hand data contains information that has been collected specifically for investigation at hand. It is collected by the researcher for his own specific research. There are various methods for primary data collection such as observation, experimentation, questionnaire, schedules and interviews and case study.

Primary data for this study has collected with the help of questionnaires, Google forms, emails and direct contact and interview with ERP implementing team users like members, managers, administrators and employees of the small and medium public enterprises. These respondents represent from the members of the implementing team of the top management, implementing team mangers and ERP users at different levels of the implementing company.

1.8.4. Secondary Data:

Secondary data is the information has gathered and collected by people or agencies in response to some other problem rather than the current problem. The data was primary data for the previous researcher or one who collected and becomes secondary data for others or someone else who later uses this data.

The secondary data sources are publications of central, state and foreign governments, reports and publications of the national and foreign institutions and organisations, reports of the national statistical agencies like department of statistics in the RBI, Report of The Comptroller and Auditor General of India on Public

Sector Undertakings and international statistical organisations, journals, books, magazines, newspaper, and reports.

The secondary data gathered for this study was with the help of URLs (web sites) of the small and mid-sized public enterprises of Kerala State and other relevant sources, Report of The Comptroller and Auditor General of India on Public Sector Undertakings and from the previous research thesis works conducted, journals, books, magazines, newspapers, Company reports including annual reports. Various online thesis repositories like "shodhganga", "indcat" "e-ShodhSindhu", "shodhgangotri" and various e-services and e-journals of INFLIBNET, other famous online journals sources like Emerald insight, Ebsco, Springer, Jstor etc, also have been contributed.

1.8.5. Research Design and Techniques

The research design for this study was done in four phases. The initial phases give the understanding of the design and end with the validation of the models with research findings.

1 Phase One:

This phase consists of five steps aimed at for attaining understanding of the topic of the research is discussed below.

Step 1: Preliminary Literature Review

Preliminary literature review had been done for a close associate with the previous research work on ERP systems. It aims at giving direction for the data collection instruments construction and enduring safety regarding overloading of data.

Step 2: Data Collection Instrument

A preliminary questionnaire had been developed based on insights gained from the preliminary literature review for required information.

Step 3: Administration of Questionnaire

For using the pilot study, a request with questionnaire has been distributed to respondents of Small and Medium sized Public Sector Enterprises of Kerala State through email.

Step 4: Pilot study Data Analysis

The results of the pilot study had been analysed for identifying similarities, differences, and data patterns. The findings and insights from the preliminary phase had been used to prepare and refine the questionnaire. Based on this a Google form and interview schedules had been developed for the final field study.

Step 5: Update and Revision of Data Collection Instrument

The refined questionnaire enabled data collection and reduces or avoided the ambiguity and misunderstanding.

2 Phase Two: Qualitative Research

This phase focus on an in-depth analysis of data chosen from Small and Medium sized Public Sector Enterprises of Kerala State for understanding and how it influence ERP implementation and its upgrades.

Step 1: Extended Literature Review

With the preliminary research findings, an in-depth literature review has been done to support the development of the conceptual model.

Step 2: Development of a Conceptual Model

With these reviews and the initial findings of the pilot study, a basic conceptual model was developed.

Step 3: Data Collection Instrument Development

The previous step developed a semi-structured questionnaire for interviews and field study.

Step 4: Selection of sample organisations

Done with the help of standard sampling practices considering the unique nature of the organisations.

Step 5: Data Collection

The first field study has been conducted in Steel Complex Limited (SAIL SCL), a Small and Medium sized Public Sector Enterprises in Calicut city of Kozhikode District. The required data collected from the company's official documents, reports, and minutes of meetings through interviews, structured and semi-structured questionnaire.

Step 6: Qualitative Data Analysis

This study used a common data analysis methodology widely used by grounded theory researchers including frequency distribution, percentages, mean score, variance and standard deviation, Chi-square, Multiple Regression, MANOVA, Network Analysis Technique (PERT Analysis), Critical Path Method (CPM) and Structural Equation Modeling (SEM) Techniques. Statistical Package for Social Science (SPSS) and MS Excel was used to analysis the data.

3 Phase Three: Quantitative Research: The aim of this phase has been statistical generalization of phase one research findings by testing the data availed through the survey instrument with the developed hypothesis. It can provide suggestions for the enhancements of the benefits of ERP Implementation to the organisation and its stakeholders.

Step 1: Development of Testable Propositions

In order to testing and analysis, statistically testable propositions were developed and used.

Step 2: Sample Selection

The samples were collected from the whole population of Kerala State owned Small and Medium sized Public Sector Companies implemented and/ or

looking for implementing ERP systems in the immediate future. The respondents targeted includes top administers, managers, employees who work as front end data entry operators and users.

Step 3: Administration of Questionnaire

The questionnaire with covering letter had been sent through posts and emailed to the selected units. Administering the questionnaires personally and over mobile phones had been provided with the facility of follow-up interviews. The second field study used structured interviews for data collection.

Step 4: Quantitative Data Analysis

Descriptive and inferential statistical tools were used to analyse the data with the help of Microsoft Excel and SPSS. The collected data has been tested with standard statistical analysis tools both parametric and non-parametric techniques

4 Phase Four: Model Development

With these reviews and the initial findings of the pilot study, a basic conceptual model was developed. The same had been updated with quantitative research findings. The model has been validated with standard grounded theory with extended literature.

1.8.6. Population and Sampling Design

1.8.6.1. Population

The population for the purpose of this study consists of all the PS SMEs in Kerala which has implemented or not implemented ERP System Software. It includes stakeholders of Small and medium sized public sectors enterprises of Kerala. These stakeholders include ERP implementing team members, managers, administrators and user employees. The Small and medium sized public sectors enterprises of Kerala State were selected from the official list of 130 total public sectors enterprises listed in the Kerala Govt official website and updated by Comptroller and Auditor General of India on Performance Report for the Year

Ended 31 March 2016. These include 113 working Government companies and 4 Statutory Corporations. 15 units are non-functioning or defunct PSUs.

Table No: 1.1

Classifications of PSUs of Kerala

Nature or Type of ownership	Total
Government Companies	109
Statutory Corporations	4
Defunct Units	17
Total	**130**

Source: **Report of the comptroller and auditor general of India on public sector undertakings for the year ended 31 March 2016**

Table No: 1.2

Criteria for classification of MSMEs.

Enterprise (Type)	Investment in Plant and Machinery/ Investment in Equipment	
	Manufacturing	**Service**
Micro	Up to Rs 25 lakh	Up to Rs 10 lakh
Small	Above Rs 25 lakh up to Rs5 crore	Above Rs 10 lakh up to 2 crore
Medium	Above Rs 5 crore up to Rs 10 crore	Above Rs 2 crore up to Rs 5 crore

1.8.6.2. Sampling Design

The sampling unit consisted of ERP implementing Small and Mid Sized Public Sector Enterprises in the Kerala State of India.

Different sampling designs were used for collecting data from users and ERP Implementing team members. Simple Random Sampling Technique for selecting ERP Implementing Public sector small and medium units and purposive sample for selecting the users from these selected units. 420 samples were collected from 15 units selected at random from the official list.

Table No: 1.3

Selection of Sample Units & Users of PSUs

Sl. No.	Name of PSU	No. of responses			
		Team	M/A	ERP User	Total
1	Keltron Component Complex Limited	3	12	27	42
2	Kerala Feeds Limited	3	12	28	43
3	Kerala Financial Corporation	3	12	31	46
4	The Travancore Cements Limited	3	12	23	38
5	Steel Industrials Kerala Limited	3	10	21	34
6	Kerala State Industrial Development Corporation Limited	3	10	16	29
7	Kerala State Handloom Development Corporation Limited	3	10	18	31
8	SAIL-SCL Kerala Limited (Steel Complex Ltd)	3	10	17	30
9	Kerala State Industrial Enterprises Ltd	3	6	19	25
10	Kerala State Drugs & Pharmaceuticals Limited	3	5	15	23
11	Keltron Electro Ceramics Limited	3	5	20	28
12	Kerala State Warehousing Corporation	3	10	20	33
13	Kerala State Women's Development Corporation Limited	2	2	2	6
14	Kerala State Minorities Development Finance Corporation Limited	2	2	2	6
15	Bakel Resorts Development Corporation Limited	2	2	2	6
	Total	**42**	**120**	**258**	**420**

Selection of Sample Size

For determining the sample size of public sector SMEs in the Kerala state and number of users for the sample, the following statistical formula was used:

Sample size

$$n = \frac{Z^2 \times \sigma^2}{e^2}$$

$$= 1.96^2 * 1.307^2 / .125^2$$

$$= 419.994$$

Rounded to 420

Where:

n	=	Size of the sample
Z	=	Standard Variate at a given confidence level (1.96 for 95% Confidence level)
σ	=	Standard Deviation of population
e	=	Acceptable Error

Based on the above formula, 15 PS SMEs and 420 users were selected.

1.8.6.3. Instruments for Data Collection

A structured questionnaire has been designed. The Google Form was created and sent to ERP users through e-mail. Postal mail, direct supply of questionnaires and personal interviews were also used to collect the required data.

1.8.6.4. The Method of Analysis and the Variables Used

The focus of this research is on the study on problems and prospects of ERP Systems implementation on small and medium sized public sector enterprises in the state of Kerala. For this purpose, different instruments and variables have been used

in the study for data analysis from a different perspective. The method of analysis and the variables used are briefly discussed below.

1.8.6.5. Pilot Study

The questionnaire has been tested with 30 users in three PS SMEs. The pilot study has been conducted in Steel Complex Limited (SAIL SCL), Keltron Electro Ceramics Ltd Kuttippuram and Kerala State Industrial Enterprises Limited, Calicut Airport, three Small and Medium sized Public Sector Enterprises in Kozhikode and Malappuram Districts, Necessary modifications were done on the questionnaire and interview schedule based on the pilot study.

1.8.6.6. Reliability Test

Reliability test is the measure to test the true score and consistency of the respondents who provide data and information. The statisticians having the standard view that reliability of the data can be tested with the 'Cronbach Alpha'. The minimum standard score fixed for social science research is 0.70 and anything above 0.70 will be reliable. The present study collected all the required data from known population with limited number and thereby maximum reliability is ensured.

1.8.6.7. Content Validity Test

Validity refers to a global assessment of our measurements based on the evidence available. Validity can be:

1) Content validity
2) Criterion validity
3) Construct-related validity

1.8.6.8. Validity testing of a Research Instrument.

All the validities were tested with the appropriate tool with the data presented in 5 point Likert Scale.

1.8.6.9. Randomness Test

The primary data for the purpose of this study was collected from three types of stakeholders selected from 15 randomly selected Small and Mid Sized Public Sector Enterprises in Kerala. 420 samples were collected from 15 units selected at random from the official list with equal probability of being included in the selection of sample. It assumes the randomness of data.

1.8.6.10. Tools Employed for Data Analysis

Confidence Interval test: The purpose of confidence interval test is to check how confident respondents are in giving answers. In this research, it was conducted to check the validity of the research tool about to attitude towards ERP use. **ANOVA** is used to test know there exist any statistically significant differences among an independent variable with two or more groups of a dependent variable in a continuous or ordinal variable. Here, this test is applied to study the effect of Working Place, Total no. of years worked, No. of years worked in the current job, No. of years worked with ERP system and in the Company, on factors that affect the utilization and better use of ERP solutions.

Confirmatory Factor Analysis (CFA): CFA is used to represent all the constructs in the scale along with their variables in the measurement model for analysing the validity of the construct of the scale. It is mainly used when the structure of the scale is already developed.

Network Analysis Techniques: Programme Evaluation Review Technique (PERT) and Critical Path Method (CPM) were used to determine the time required to complete the ERP implementation and analysed the implementation programmes and schedules.

Structural Equation Modelling (SEM): SEM is a statistical tool for analyzing the dependence relationships among cause and effects in a set of constructs represented by multiple measurable variables in a single model. SEM uses the concept of both regression analysis and exploratory factor analysis. This research tries to examine

the path significance and magnitude of the hypothesis and its effects on the proposed model with SEM.

Statistical Package

The collected data had been analysed with SPSS and Microsoft Excel. The SEM diagrams are prepared with the help of SPSS Amos software. The collected data have been analysed by applying mathematical and statistical measures like percentages, mean score, variance and standard deviation, non-parametric tests such as Chi-square test, Independent sample t-test, One-Way ANOVA, Factor Analysis, regression analysis, Network Analysis Techniques like PERT, CPM and SEM.

1.9.1 Period of Study

This study was conducted during the period 2014 to 2018

1.10. Limitations of the Study

The constraints of the study mainly noted are:

- Most of the PSUs are not managed well because of the poor managerial staff and frequent transfers due to political intervention. So it is quiet difficult to get required primary data.

- **Secondary Data:** The data about specific literature on ERP implementation was missing in different sectors. All PSUs are completely relying on website data provided in their URL. It lacks published research studies on the topic. Better statistical techniques could also have been employed to carry out a comparative analysis of ERP implementation in various sectors, but could not be used as availability of data was a constraint.

- **Possibility of bias in respondents answers due to political intervention:** The PSUs are managed by political leaders of both ruling and opposition parties; there exists the possibility of politically biased answers by respondents.

- **Generalization of the results:** The study was confined to Small and Mid-sized Public Sector Enterprises of Kerala State and the findings may appy to other states where similar infrastructure and political atmosphere exists. Since the secondary data collected from more than one source, there may be slight discrepancies between one source and another on the same variable.

- **Unanswered Questions:** Some questions in the questionnaire remain unanswered either due to lack of understanding of the subject or because of reluctance to share information.

1.11. Chapter Scheme

The research report has been presented in six chapters as shown below:

Chapter 1: Introduction

The first chapter deals with the introduction, research problem, significance and scope of the study, objectives of the study, hypothesis, operational definition of terms and concepts, methodology and database, limitations and the chapter scheme.

Chapter 2: Review of the Literature

This chapter shows the review of literature regarding various aspects and areas of ERP and its implementation in order to identify the research gap for continuing the research.

Chapter 3: Conceptual Framework of the Study

The third chapter explains the concept and theoretical aspects of ERP and related topics, it includes, the definition, characteristics, critical success factors of ERP implementation.

Chapter 4: Implementation of ERP from administrators, users and beneficiaries perspective

This chapter gives a detailed assessment and analysis of data collected from ERP Implementing Company Teams, ERP Implementing Company administrators,

employees, users and beneficiaries.

Chapter 5: Summary, Findings, Suggestions and Conclusion

This chapter deals with the summary of the findings, suggestions and conclusion with the further insight for further research.

Works Cited

1.   White, R. E. (2008). Post-implementation evaluation of enterprise resource planning (ERP) systems. *University of North Texas*.

2.   Zrimsek, B. (2002). ERP II: The Boxed Set. *Gartner Group, Stamford, CT Mar4*

3.   Ramayah, T., Roy, M. H., Arokiasamy, S., Zbib, I., & Ahmed, Z. U. (2007). Critical success factors for successful implementation of enterprise resource planning systems in manufacturing organisations. *International Journal of Business Information Systems*, *2*(3), 276-297.

4.   Gould, L. S. (2002). ERP: complexities, ironies, and advances. *Automotive Design & Production*, *114*(7), 44-46.

5.   Beretta, S. (2002). Unleashing the integration potential of ERP systems: the role of process-based performance measurement systems. *Business Process Management Journal*, *8*(3), 254-277.

6.   White, R. E. (2008). Post-implementation evaluation of enterprise resource planning (ERP) systems. *University of North Texas*.

7.   Poston, R., & Grabski, S. (2001). Financial impacts of enterprise resource planning implementations. *International Journal of Accounting Information Systems*, *2*(4), 271-294.

8.   Shih, Y. Y., & Huang, S. S. (2009). The actual usage of ERP systems: An extended technology acceptance perspective. *Journal of Research and Practice in Information Technology*, *41*(3), 263.

MUSTAFA K. "PROBLEMS AND PROSPECTS OF ERP SYSTEMS IMPLEMENTATION IN SMALL AND MID SIZED PUBLIC SECTOR ENTERPRISES IN KERALA." THESIS. PG DEPARTMENT OF COMMERCE, P.S.M.O COLLEGE TIRURANGADI, UNIVERSITY OF CALICUT, 2019.

Chapter II
Review of Literature

2.1. Introduction

This chapter brings an understanding of the existing status of studies in the related area with successful ERP implementation in various organisations. It further contains an analytical revelation of the literature, sequenced by expected contributions of the study. The present study relates to the Indian State of Kerala, but the literature survey extends globally.

The literature reviewed in this research is classified and presented in the following three categories:

➢ Literature related to the Conceptual framework of Enterprise Resource Planning.

➢ Literature related to Enterprise Resource Planning Implementation.

➢ Literature related to Critical Success Factors of ERP Implementation.

2.2. Conceptual Framework of Enterprise Resource Planning

Davenport (1998) exhibited an ERP system as a product of software package that can be bought 'off-the-shelf' by a firm for integrating and sharing organisational information and business processes related within and across the functional areas. This definition stressing the integration of entire processes or activities and functionalities, between various organisational networks, in particular, functional areas or divisions within an organisation like finance and accounts, marketing, sales and distribution material & stores procurement, inventory control, human resources development and payroll. Davenport overemphasizes the integration aspect and establishing that ERP is more than a software but it is an overall package. Another perspective is that ERP systems which are fundamental for

conceptualizing best practices. He argues that acquiring an ERP software much more than purchasing any other software. ERP is not purchasing, but acquiring the software vendor's 'best practices'.

Deloitte (1998) defined ERP system as a business software package that allows an organisation to automate and integrate substantially all major business processes. It shares a centrally stored common database in the server. It practices in all departments across and between the entire organisations. It accesses information from the system on an online and real-time basis and provides to the entire business activities.

Keller & Teufel (1998) BPR system analyst needs to carefully examine the existing structure, procedures and business. It can be purchased or built in house. Replacement of the existing business structure and processes are the primary goal of BPR, which are more effective for customers also. BPR is a an organisational technique for changing and restructuring business operations in order to achieve overall improvements. However, BPR the technique it seems to be new, but has deep-rooted and was widely developed and used by consultancy companies and industrialists in the 1990s.

O'Neill & Sohal (1999) TQM can also be used for the improvement of business operations

Kumar & Hillegersberg (2000) observed that. ERP is a term used to conjure the images of technology in to action in a clear way.

Markus & Tanis (2000) observed that such as technology and business performance. Drivers for Adopting ERP systems recognized are: Operational, Technical, Strategic , Need for a common platform, Y2K compliance , Process improvement , form, Replacement of legacy systems, Globalisation of business terms, Systems incompatibility, Growth of an enterprise, Operating cost reduction, Standardisation of business processes, integration among the units and processes, improve customer service and responsiveness enhance organizational performance and decision making capability.

Ang (2000) claimed that Enterprise Resource Planning permits firms to integrate varied division information's. It's evolved from the HR application to Information Technology management. For several users, Enterprise Resource Planning performs everything from sales order entry to customer service.

Esteves & Pastor (2001) found that the implementation phase of the ERP lifecycle is currently the most widely researched in the IS discipline. They associate this focus on the difficulties of ERP implementations. They subdivided the ERP implementation literature into four topics relating to implementation: case studies, success cases, approaches, and other issues. The ERP literature then reclassified in terms of implementation strategies; implementation models; ERP system upgrade, implementation challenges, the future trend and CSFs.

Holland & Light (2001) established that Enterprise Resource Planning implementations require re-engineering to adapt the business processes in order to match the usefulness and capabilities of the ERP software system. This necessitates going through the ancient empirical project management principles

Themistocleous et al. (2001) having the view that almost all employees react negatively to the changes elicited by Enterprise Resource Planning implementation within the organisation as a general phenomenon of employees resistance to change. Users are usually not willing to use Enterprise Resource Planning systems, and this could inhibit or restrict the realization of advantages offered by the Enterprise Resource Planning implementation

Oliver & Romm (2002) discussed the various factors of adoption of ERP. The researcher insists the important factor for the adoption of ERP is the high proportion of failure in data systems that caused a shift from individual development to standardized, pre-packaged software system solutions called ERP

Sarker & Lee (2003) assumed that the view neglects the role of human agents and the existing organisational and social contexts in the introduction of new technologies. Organisations can be fully redesigned through new technology. There are two possible problems with this view. First, the redesigned process may be less

than optimal process efficiency.

Davenport & Brooks (2004) observed that Enterprise Resource Planning provides twin advantages that not exist in non-integrated division systems: 1) a complete picture of a business that comprises of all departments functions; and 2) an enterprise-wide information which consists of all transactions of business.

Lee & Myers (2004) reported that ERP decisions are strategic decisions because they: are normally adopted in organisations to support the strategic objectives of organisations; spending a large number of organisational funds and resources; involving a long-term process for shaping the ERP system and organisation processes are complex since it affects the organisation and different stakeholders.

O'Leary (2004) grouped the ERP drivers into four categories: technology, business practices, strategy, and competitiveness.

Shehab et. al (2004) stated that organisations implementing ERP system must decide whether to purchase all the ERP modules from a single vendor or to select ERP modules from different vendors based on their particular needs. These two strategies are referred to as enterprise suite and best of breed respectively.

Boersma & Kingma (2005) explained that ERP systems may be the most complicated software solutions and are not easy to define and there is no universally accepted definition of ERP.

Boersma & Kingma (2005) in another article purported that best practices embedded in ERP, contain 'script' for users, instructing the users about the future actions are needed. ERP is not merely a software package to be tailored to an organisation but an organisation business blueprint that affects people how to work. The best practice idea has been supported by software consultants and leading ERP vendors. The technology is considered as a driver of organisational change. The 'best practices' embedded in these software packages and standards of operations but pays no attention to how local context affects the process of implementation, the actual operation and use of the systems, and whether a package is compatible with the

organizations' values and is regarded as the better way of doing things. The ERP vendor's structure has the systems for the best practices; it is the vendor and not the client, who is defining what 'best' means. It has an objective function against which the 'best' can be evaluated.

Keizer et al. (2005) stated that ERP implementation is one of the major challenges of the present times. It comes with a very high failure rate for the implementation putting into a high rate of the technical and social component of risk.

Koch (2005) observed that ERP is a "semi-finished product that needs to be configured and tailored to organisational needs by consultants". The implementation cost is even higher when an organisation decides to undertake major customisation. Therefore, arguably, ERP systems are generally expensive to purchase and implement in organisations. ERP projects have a reputation for draining corporate resources and funds given the massive resources required.

Light (2005) concluded that ERP implementation to an extent consists of BPR and the customisation as per needs and requirements.

Arif et al. (2005) asserted that if an organisation does not already move as per the manner of ERP Systems Software Package they acquired, then, they must re-engineer its entire business processes and practices. Therefore, BPR is considered as a key practice in ERP implementation.

Wagner & Monk (2006) analysed the case of Unisources Worldwide Inc., a paper distributor company, wrote off as loss $168 million due to failure of SAP R/3 ERP Implementation related cost and FoxMeyer, the largest Drug distributor, bankrupted in 1996 and also filled a lawsuit against SAP for $500 million for a case related with ERP implementation. FoxMeyer also contended against the ERP giant SAP, that its package was "a significant factor" which led the firm went into financial catastrophe. The IT giant, Dell Computer Corp, abandoned the SAP R/3 ERP project due to delay and cost overruns. The study revealed that the cost of technology and the price of prewritten software packages are cheap when compared

with in-house software development. The in-house implementation cost will be three to five times more than that of the purchase cost of built-in or prewritten software packages.

Walsham (2006) stated that the period 1990s, was a decade moving from decentralized computing systems to enterprise-wide (ERP) for organisational change. The international management consultancies need to provide awareness and support. The company need to transform into a global context and develop a sense of global business solutions.

Eardley et al. (2008) observed that problems with BPR arises when the radical or "clean sheet" approach is adopted during ERP implementation and should not permit to change their entire present infrastructure and to implement completely to a new one, nor permit to interrupt their existing business while re-engineering processes are done. They suggested that the ERP systems adoption require an organisation to design and re-think their entire organisational processes in order to fit with the new system. In this case, BPR is driven by IT and seeks to radical changes to the existing business practices.

Chung et al. (2009) proposed a method for developing an ERP implementation model for identifying factors for its successful implementation. They analysed both success and failure factors related to ERP Implementation. They also developed a successful model to study the relationships between these factors. The model adopts the TAM, DeLone and McLean's model with the integration of project management. The ultimate goal of this model is to plan and implement ERP and facilitate senior managers to build higher choices in their firms.

Wenrich & Ahmad (2009) found that the acquisitions, mergers and amalgamations between the units are forcing companies to change and function as a single system. However, for each company the drivers for implementing ERP are different as well as their priority order depends on the organisation's context, both internal and external.

Ram **(2010)** selected 3 organizations for the study about Enterprise Resource Planning implementation which includes BPCL, TI Infotech, and ITTI. The results have shown that the primary factor associated with the success of ERP is standard quality dimensions.

Pasaoglu **(2011)** constructed a research model namely, Technology Acceptance Model. The model is measured by multivariate analysis. The factors employed in the model are data concerning Enterprise Resource Planning, demographics, firm's culture, perceived use and actual use Enterprise Resource Planning system. The study indicated that Enterprise Resource Planning isn't solely a technical system however additionally a scheme requiring cluster work. The findings were unconcealed that a majority of the enterprises, not victimization ERP is aware of ERP and needs to use it.

Govindaraju (2012) analysed that several corporations have spent massive investments on ERP implementations, but only a restricted range of them are successful with the implementation. The high rate of failure found in reality, the study here aims at developing a framework that may facilitate to produce a much better understanding of how the process can be managed to bring the advantages for the implementing organizations.

Khurana & Garg (2012) claimed that retailers are making an attempt to reap the advantages of the ERP through Point of Sale (POS). Now ERP replaced non-integrated systems with integrated and rectifiable POPS software system with integration of supply and demand effectively to assist the entire business. it was a tough task with a lot of failures than successes, only a few implementation failures are recorded in the literature. This study looks into important success factors of Enterprise Resource Planning for retail trade.

Sadrzadehrafiei et al. (2013) Observed that the organisational competitive setting is being liberalized and globalized, so the organizations, particularly dry food packaging business, want bigger interaction between their stakeholders. segregation of the business functions is a big issue faced by an organisation at any time. Thus, the business practised implementing Enterprise Resource Planning systems for

finding this drawback. In distinction, the Enterprise Resource Planning systems haven't been effective enough and therefore are unable to realize all the results envisaged. This study classifies certain advantages of ERP implementation in food packaging industries.

Erasmus et al. (2015) studied about the Technology Acceptance Model used cross-sectional style. The results confirmed vital methods from the perceived utility of the data system to attitudes towards and behavioural intentions to use it. ERP Practitioners ought to build user confidence by guaranteeing the convenience of use of a brand new system, coaching, providing relevant education and steerage.

2.3. Enterprise Resource Planning Implementation

Markus et al. (2000) observed that stakeholders of ERP have different views of and experiences. Therefore, individuals or group behaves differently according to their awareness level.

Al-Mashari (2002) represented a large collection of R / 3, the implementation of SAP in the context of the framework was adopted to study the highlight of various PCM construction of institutional experience in various cases, as evidenced by how unified the structure. This study provides the basis and recommendations of many concepts for analysis and examination in the future.

Voordijk et al. (2003) had discussed the factors resulted in the success or failure of Enterprise Resource Planning in massive construction corporations. They are having the opinion that abundant work has been carried out in ERP implementation even though, lacking the theory-linked study of unsuccessful Enterprise Resource Planning.

Yen & Sheu (2004) explained that corporations worldwide have invested a substantial amount in installing ERP systems. But implementing Enterprise Resource Planning system is difficult and also the final benefits are unsure. Researchers suggest that the failures are the results of business issues rather than technical difficulties. The results make sure that Enterprise Resource Planning implementation ought to be aligned with competitive strategy.

Yusuf et al. (2004) suggested that organisations must make a decision on personnel training strategy. Go-live and support phase deals with the maintenance and improvement issues to keep the implemented ERP system running and up to date. The Go Live phase includes also the monitoring of the implemented system in order to make sure to make the necessary changes and modifications if problems are to occur and that could affect the performance of the ERP. During this phase, organisations make the decision on: go-live strategy, maintenance strategy, and bolt-on applications.

Jones (2005) explored that ERP is meant to enable corporations to manage their data by the integration of processes in business and to own better management of information in the organization. To implement ERP which aimed towards the sharing of information and knowledge within the corporations should have the potential of effective data sharing.

Abdolvand et al. (2008) inferred that "ERP System assure best results when it is used as a BPR-enabled proactive tool for Business Process Re-engineering". For the purpose BPR, the business strategy and organisational IT strategy needs to be aligned so that there is no "technology gap". The IT support IT infrastructure of ERP then forms the entire future business strategy. ERP is the best proactive tool used in BPR, the organisation IT strategy and business strategies need to be aligned and need interdependent themselves. In the enabling role, the IT strategy supports the organisational business strategy. In the proactive role, the IT strategy becomes a part of the business strategy.

Carton et al. (2008) observed that the success rate of implementation of ERP isn't high in spite of the sums endowed by organizations in these applications. This study is an application of ERP an MNC in the UK, to analyze the validity of project management frameworks and literature. This study will help ERP implementation Managers in all stages of implementation and helps to anticipate the areas where the problem arises and understand the areas in which special attention requires

Sammon & Adam (2010) noted that prime rates of failure existing in Enterprise Resource Planning project implementation are because of the integrated result of slow beginning of the project and overcoming the implementation complexities.

Candra (2012) emphasized the successful implementation of ERP In today's business, Corporate Resource Planning is one of the key tools for business competitiveness. Enterprise Resource Planning is one way to business management to promote the ability and impact of the front office and back office.

Sanyal & Bhadra (2012) established that ERP systems are the accepted methods for Indian companies for rising their supply chain and business performance to face the sturdy international challenges. Enterprise Resource Planning provides benefits in business and strengthens the various wings of a company with fast response and low dealing price. However, the implementations of Enterprise Resource Planning involve intercalary complexness and someday it ends with total failure and loss of big investment. A sampling methodology has been used for collecting primary information from Indian firms. The findings show that improper system implementation ill-defined procedures, improper designing and large customization designated for implementation etc, had vital influences.

Sadat Safavi et al. (2013) focussed on the implementation of ERP in medium size enterprises. They argued that it's essential for businesses to take care of their risks. Implementation of ERP for SME is costly as well as a risky affair. They analysed the relationship between two risk factors, business processes re-engineering and adequate system. The study additionally investigates the link between cost involved in Enterprise Resource Planning implementation and success of Enterprise Resource Planning project so as to improve Enterprise Resource Planning project with reference to SMEs and have positive effects on performance and competitive benefits.

Ali & Cullinane (2014) argued that the Enterprise Resource Planning system implementation may be a difficult method in SMEs and they face hefty challenges in implementing Enterprise Resource Planning system because of their

restricted Information Technology resources and infrastructure. The findings show that Key participants supported the thought of incorporating simulation model throughout the implementation method since a simulation model build a lot of sense since it'll enable the implementation players to look at the implementation method and therefore the role contest by factors that are important for the success of the implementation. Simulation model also helpful in developing and analyzing totally different implementation ways and predict the resources required for Enterprise Resource Planning implementation.

Bano (2014) dispensed to know key problems for successful complete implementation of ERP in Indian firms. Few organizations have enforced Enterprise Resource Planning and plenty of a lot of are trying to adopt with a watch and see methodology owing to worry of the delay in the success of sophisticated and advanced comprehensive and expensive projects.

Fares & Mandour (2014) There are six motives in line with six teams they are managerial and strategic, clinical and strategic, managerial and operational, technological and clinical and operational and money motives. Five impacts of ERP also; namely, the process, technology, patient, people and money.

Almahamid & Hourani (2015) having the opinion that ERP's first function is the integration of inter-departmental operating procedures, MIS modules, and the allocation of organizational resources. This case study reviews the key success factors mentioned in the literature, the research cites seven issues: coding, re-engineering methods of operations, prioritizing the practical implementation of Corporate Resource Planning, adjustments, the role of participants, advisory roles and contractor performance levels that also influence implementation. This analysis shows that additional case studies are needed for successful implementation of the Enterprise Resource Planning system to complete their work.

Krishnadan (2017) Definitely, there are advantages on successful implementation of Enterprise Resource Planning system, but there are failure cases also.

2.4. Critical Success Factors of ERP Implementation

Holland et al. (1999) recognized three main dimensions of ERP: technical, operational and strategic.

Nielsen (2002) having the opinion that companies should investigate between their desires and requirements with the Enterprise Resource Planning System. Stay in the limelight of adoption and use of information technology in enterprise resource planning. Despite substantial progress in enterprise resource planning capabilities and operations, there exists problems in the underlined system remain constant. The lower use of enterprise resource planning systems is the main challenge faced by the companies. Therefore, the combination of enterprises, the transition of enterprise resource planning, the reorientation of employees resource management system is changing around the core process. Enforcement of Enterprise Resource Planning is a tough process and required at most care and even the entire project success is not guaranteed.

Al-Mashari et al. (2003) marked their view that the blueprint phase comprises a detailed analysis that will allow the production of documentation on the business process requirements. In addition, blueprint phase consists of analysing the current business processes and investigating the chances for BPR or customisation. During the blueprint phase, organisations need to decide on whether to customize the ERP system or re-engineer the existing business activities processes. Realization phase deals with the technical aspect and involves building up a system on the processes and procedures investigated in the former stage.

Mabert et al. (2003) observed that a single vendor solution may not have all the functionality required but will be easier to implement. Similarly, organisations implementing ERP system must decide to either adopt business processes embedded in ERP or to customize the ERP system to make it suitable to existing business activities and processes. All strategies are complex according to their scope, scale and the requirements of the ERP and BPR.

Umble et al. (2003) stated that the project preparation phase of the implementation process consists of getting ready by planning and organizing people and tasks. It is a very important and critical stage of the ERP project since it constitutes the basis for the project. Among the decisions, organisations have to make our decision on the ERP product, the decision on functionalities or modules, the decision on the implementation consultant etc.

Loh & Koh (2004) expressed that the final preparation phase is critical to the success of the implementation project and involves conducting a set of tuning and testing activities related to the configuration, integration, quality, interfaces and reports of the system. Moreover, this phase is concerned with the education and training of the users on the system processes, data discipline and modules.

Olson &Zhao (2007) summarized two studies, which examined the motivational aspects of ERP adoption. One study was carried out in the U.S manufacturing organisation and the other in a Swedish firm. Other reasons that received high ranking were the improvement of interactions with suppliers and customers, the gaining of strategic advantage and the creation of supply-chain for linking into global activities.

Yaseen (2009) Enterprise Resource Planning system adopted companies can sustain the competition from the trade nationally and internationally.

Mohapatra et al. (2015) argued that TAM will be suitable for the Indian public sector. It is employed for determining the requirements for Information System.

Garg & Khurana (2017) Indian retail market for FMCG need to analyse Critical Success Factors from the user angle. Findings indicate that variations in Critical Success Factors play an important role and have an impact on ERP implementation. It depends on the ERP Software selection, analysis, testing and implementation.

2.5. Conclusion

From the review of literature, it was observed that a lot of studies were carried out in Enterprise Resource Planning and the related area of ERP Implementation such as Critical Success Factors (CSFs),   Summary of literature shows the impacts of ERP systems. These literature reviews pave the way to highlight the issues for further consideration with respect to the its context of ERP adoption, selection, development, use, and implementation.

The present study is relevant and important because only limited numbers of studies have been conducted in India to address problems and prospects of ERP implementation. No studies in the knowledge of the researcher, so far done on the topic Problems and Prospects of ERP Systems Implementation in Small and Mid Sized Public Sector Enterprises in Kerala.

The previous studies were focused only on one aspect of the impacts of ERP. Most of the studies as pointed out adopted a perspective of technological determinism offering little help in terms of understanding and interpreting the effect context has on ERP systems adoption, implementation and usage. No such attempts have seen on ERP Implementation in Public Sector Undertakings of Kerala.

In light of the above gaps identified in the literature, this research aims at filling the gap by studying problems and prospects of ERP implementation in small and mid-sized public sector enterprises in Kerala state.

References

Abdolvand, N., Albadvi, A., & Ferdowsi, Z. (2008). Assessing readiness for business process re-engineering. *Business Process Management Journal*, *14*(4), 497-511.

Ali, M., & Cullinane, J. (2014). A study to evaluate the effectiveness of simulation-based decision support system in ERP implementation in SMEs. *Procedia Technology*, *16*, 542-552.

Almahamid, S., & Hourani, A. (2015). An empirical study on the impacts of ERP system, e-business technologies and organisational collaboration on supply chain agility: PLS perspective. *International Journal of Advanced Operations Management*, *7*(3), 229-254.

Al-Mashari, M. A. (2002). Implementing ERP through SAP R/3: A process change management (PCM) perspective. *Journal of King Saud University-Computer and Information Sciences*, *14*, 25-38.

Al-Mashari, M., Al-Mudimigh, A., & Zairi, M. (2003). Enterprise resource planning: A taxonomy of critical factors. *European journal of operational research*, *146*(2), 352-364.

Ang, C. L. (2000). *The use of IT to support TQM in the Malaysian public sector* (Doctoral dissertation, © Chooi-Leng Ang).

Arif, M., Kulonda, D., Jones, J., & Proctor, M. (2005). Enterprise information systems: technology first or process first?. *Business Process Management Journal*, *11*(1), 5-21.

Bano, F. (2014). Quality of ERP Implementation: Case Study of Select Indian Organizations. *International Proceedings of Economics Development and Research*, *75*, 36.

Boersma, K., & Kingma, S. (2005). Developing a cultural perspective on ERP. *Business Process Management Journal*, *11*(2), 123-136.

Boersma, K., & Kingma, S. (2005). From means to ends: The transformation of ERP in a manufacturing company. *The Journal of Strategic Information Systems*, *14*(2), 197-219.

Candra, S. (2012). ERP implementation success and knowledge capability. *Procedia-Social and Behavioral Sciences*, *65*, 141-149.

Carton, F., Adam, F., & Sammon, D. (2008). Project management: a case study of a successful ERP implementation. *International Journal of Managing Projects in Business*, *1*(1), 106-124.

Chung, B., Skibniewski, M. J., & Kwak, Y. H. (2009). Developing ERP systems success model for the construction industry. *Journal of Construction Engineering and Management*, *135*(3), 207-216.

Davenport, T. H. (1998). Putting the enterprise into the enterprise system. *Harvard business review*, *76*(4).

Davenport, T. H., & Brooks, J. D. (2004). Enterprise systems and the supply chain. *Journal of Enterprise Information Management*, *17*(1), 8-19.

Deloitte, C. (1998). ERP's Second Wave-Maximizing the Value of ERP-Enabled Processes. *Atlanta*.

Eardley, A., Shah, H., & Radman, A. (2008). A model for improving the role of IT in BPR. *Business Process Management Journal*, *14*(5), 629-653.

Erasmus, E., Rothmann, S., & Van Eeden, C. (2015). A structural model of technology acceptance. *SA Journal of Industrial Psychology*, *41*(1), 01-12.

Esteves, J., & Pastor, J. (2001). Enterprise resource planning systems research: an annotated bibliography. *Communications of the association for information systems*, *7*(1), 8.

Fares, A. A., & Mandour (2014). M. M. Enterprise Resource Planning (ERP) Implementation in an Egyptian Healthcare Entity: motives and expected impacts.

Garg, P., & Khurana, R. (2017). Applying structural equation model to study the critical risks in ERP implementation in Indian retail. *Benchmarking: An International Journal*, *24*(1), 143-162.

Govindaraju, R. (2012). Enterprise systems implementation framework: An organisational perspective. *Procedia-Social and Behavioral Sciences*, *65*, 473-478.

Holland, C. P., & Light, B. (2001). A stage maturity model for enterprise resource planning systems use. *ACM SIGMIS Database: the DATABASE for Advances in Information Systems*, *32*(2), 34-45.

Holland, C. P., Light, B., & Gibson, N. (1999). A critical success factors model for enterprise resource planning implementation. In *Proceedings of the 7th European conference on information systems* (Vol. 1, pp. 273-287).

Jones, M. C. (2005). Tacit knowledge sharing during ERP implementation: a multi-site case study. *Information Resources Management Journal*, *18*(2), 1.

Keizer, J. A., Vos, J. P., & Halman, J. I. (2005). Risks in new product development: devising a reference tool. *R&D Management*, *35*(3), 297-309.

Keller, G., & Teufel, T. (1998). *SAP R/3 process-oriented implementation*. Addison-Wesley Longman Publishing Co., Inc.

Khurana, R., & Garg, P. (2012). Retail sales in India–the need to go beyond enterprise-wide integration. *International Journal of Electronic Marketing and Retailing*, *5*(2), 147-155.

Koch, C. (2005). Users? What users?-Shaping global corporations and generic users with ERP. *HCI-15 TITA-CSC-MDI 2006: 1 ISSN 1653-5685 ISRN-KTH/CSC/MDI—06/01--SE May 2005*, 51.

Krishnadan, R. S. (2017). *A study of ERP implementation in select industries* (Doctoral dissertation, Gujarat technological university Ahmadabad).

Kumar, K., & van Hillegersberg, J. (2000). Enterprise resource planning: introduction. *Communications of the ACM*, *43*(4), 22-26.

Lee, J. C., & Myers, M. (2004). The challenges of enterprise integration: cycles of integration and disintegration over time. *ICIS 2004 Proceedings*, 75.

Light, B. (2005). Going beyond 'misfit'as a reason for ERP package customisation. *Computers in industry*, *56*(6), 606-619.

Loh, T. C., & Koh*, S. C. L. (2004). Critical elements for a successful enterprise resource planning implementation in small-and medium-sized enterprises. *International journal of production research*, *42*(17), 3433-3455.

Mabert, V. A., Soni, A., & Venkataramanan, M. A. (2003). The impact of organization size on enterprise resource planning (ERP) implementations in the US manufacturing sector. *Omega*, *31*(3), 235-246.

Markus, M. L., & Tanis, C. (2000). The enterprise systems experience-from adoption to success. *Framing the domains of IT research: Glimpsing the future through the past*, *173*, 207-173.

Markus, M. L., Tanis, C., & Van Fenema, P. C. (2000). Enterprise resource planning: multisite ERP implementations. *Communications of the ACM*, *43*(4), 42-46.

Mohapatra, S., Padhi, R., & Mohanty, S. (2015). Study of motivational factors post-implementing ERP (SAP) solutions in National Aluminium Company Limited extending the technology acceptance model at organisation level (TAMO). *International Journal of Management and Enterprise Development*, *14*(3), 250-271.

Nielsen, J. L. (2002). Critical success factors for implementing an ERP system in a university environment: A case study from the Australian HES. *Bachelor Project, Griffith University*.

O'Leary, D. E. (2004). Enterprise resource planning (ERP) systems: an empirical analysis of benefits. *Journal of emerging Technologies in Accounting*, *1*(1), 63-72.

Oliver, D., & Romm, C. (2002). Justifying enterprise resource planning adoption. *Journal of Information Technology*, *17*(4), 199-213.

Olson, D. L., & Zhao, F. (2007). CIOs' perspectives of critical success factors in ERP upgrade projects. *Enterprise Information Systems*, *1*(1), 129-138.

O'Neill, P., & Sohal, A. S. (1999). Business Process Reengineering A review of recent literature. *Technovation*, *19*(9), 571-581.

Pasaoglu, D. (2011). Analysis of ERP usage with technology acceptance model. *Global Business and Management Research*, *3*(2), 157-165.

Ram, C. S. (2010). Success of ERP system in Indian industries: A comparative study among selected industries. *Indian Journal of Science and Technology*, *3*(10), 1089-1093.

Sadat Safavi, N., Amini, M., Abdollahzadegan, A., & Zakaria, N. H. (2013). An Effective Model for Evaluating Organizational Risk and Cost in ERP Implementation by SME.

Sadrzadehrafiei, S., Chofreh, A. G., Hosseini, N. K., & Sulaiman, R. (2013). The benefits of enterprise resource planning (ERP) system implementation in dry food packaging industry. *Procedia Technology*, *11*, 220-226.

Sammon, D., & Adam, F. (2010). Project preparedness and the emergence of implementation problems in ERP projects. *Information & Management*, *47*(1), 1-8.

Sanyal, D. M. K., & Bhadra, S. K. (2012). Sudhangsu Das,". *ERP implementation issues and challenges: A FISHBONE analysis in context to Indian industries", IRACST-International Journal of Research in Management & Technology*.

Sarker, S., & Lee, A. S. (2003). Using a case study to test the role of three key social enablers in ERP implementation. *Information & Management*, *40*(8), 813-829.

Shehab, E. M., Sharp, M. W., Supramaniam, L., & Spedding, T. A. (2004). Enterprise resource planning: An integrative review. *Business process management journal*, *10*(4), 359-386.

Themistocleous, M., Irani, Z., O'Keefe, R. M., & Paul, R. (2001). ERP problems and application integration issues: An empirical survey. In *System Sciences, 2001. Proceedings of the 34th Annual Hawaii International Conference on* (pp. 10-pp). IEEE.

Umble, E. J., Haft, R. R., & Umble, M. M. (2003). Enterprise resource planning: Implementation procedures and critical success factors. *European journal of operational research*, *146*(2), 241-257.

Voordijk, H., Van Leuven, A., & Laan, A. (2003). Enterprise resource planning in a large construction firm: implementation analysis. *Construction management and economics*, *21*(5), 511-521.

Wagner, B., & Monk, E. (2008). *Enterprise resource planning*. Cengage Learning.(BOOK)

Walsham, G. (2006). Doing interpretive research. *European journal of information systems*, *15*(3), 320-330.

Wenrich, K., & Ahmad, N. (2009). Lessons learned during a decade of ERP experience: A case study. *International Journal of Enterprise Information Systems (IJEIS)*, *5*(1), 55-73.

Yaseen, S. G. (2009). Critical factors affecting enterprise resource planning implementation: an explanatory case study. *International Journal of Computer Science and Network Security*, *9*(4), 359-363.

Yen, H. R., & Sheu, C. (2004). Aligning ERP implementation with competitive priorities of manufacturing firms: An exploratory study. *International Journal of production economics*, *92*(3), 207-220.

Yusuf, Y., Gunasekaran, A., & Abthorpe, M. S. (2004). Enterprise information systems project implementation:: A case study of ERP in Rolls-Royce. *International journal of production economics*, *87*(3), 251-266.

MUSTAFA K. "PROBLEMS AND PROSPECTS OF ERP SYSTEMS IMPLEMENTATION IN SMALL AND MID SIZED PUBLIC SECTOR ENTERPRISES IN KERALA." THESIS. PG DEPARTMENT OF COMMERCE, P.S.M.O COLLEGE TIRURANGADI, UNIVERSITY OF CALICUT, 2019.

Chapter III
Conceptual Framework of the Study

3.1. Introduction

This chapter provides the conceptual clarity about the literature on Enterprise Resource Planning Systems relevant to the focus of this research. It is very essential for a researcher to know and understand the concept and topic. The target point of this study is the influence of context on ERP implementation, spanning all the ERP life-cycle phases and helps in providing a conceptual base.

3.1.1. What is ERP?

Enterprise Resource Planning (**ERP**) or ERP system or ERP software is a solution to manage all the information requirements and functionalities of a business firm from a centrally stored and shared database or data bank. ERP represents an integrated software solution for data processing and generation of information and reports for the entire organisation through data entered once and processed centrally, then shared subsequently throughout the organization.

The modules designed in ERP system provides certain services communicating through a local area network. It allows a business firm to add new modules edit or reconfigure existing modules, even from different ERP vendors in order to preserve data integrity over the centrally stored and network distributed database.

ERP is a combined system with software, hardware and methodology components by integrating all critical back-office functions within a company. It is created with a set of applications in "modules" that are linked together without limits through a common database. ERP system coordinates the activities of various departments and functional units like Accounting and Finance, payroll and Human Resources, Production or manufacturing, and Marketing and Sale order processing,

Logistics and Warehousing facilities with Distribution networks, coordinate and collaborate all activities and share information between management and shareholders.

Boersma & Kingma, (2005) stats that best practices of ERP, contain 'script' for users, directing the users about the future actions are needed. ERP is not merely a software package to be tailored to an organisation but an organisation business blue-print that affects people how to work. The best practice idea has been supported by software consultants and leading ERP vendors. The technology is considered as a driver to organisational change. The 'best practices' provided in these packages and standards of operations does not provide attention to how local context affects the process of implementation, the actual operation and use of the systems, and whether a package is compatible with the organizations' values and is regarded as the better way of doing things. Every ERP vendor's structure includes a system of best practices. The vendor has an objective function and defines what are 'best' means to be evaluated against it.

Kosalge, P., & Tole, O. (2010). It is proved that "there has one best way of doing business". On the premise of the views expressed above, it is argued that 'best' is relative and what is best in one organisation, industry, region or country may not apply to others.

Otieno, J. O. (2010). The use of the term ERP is purposeful and is meant to conjure and combine images of technology that is informed by a traditionally hierarchical system.

Davenport, T. H., Harris, J. G., & Cantrell, S. (2004). Replaced all terms relating to ERP with a classification of ERP as 'business systems'

Davenport, T. H. (1998). "ERP represents an integrated software solution for data processing and generation of information and reports for the entire organisation through data entered once and processed centrally, then shared subsequently throughout the organization".

The diagram depicts the Standard ERP system:

Diagram No: 3.1
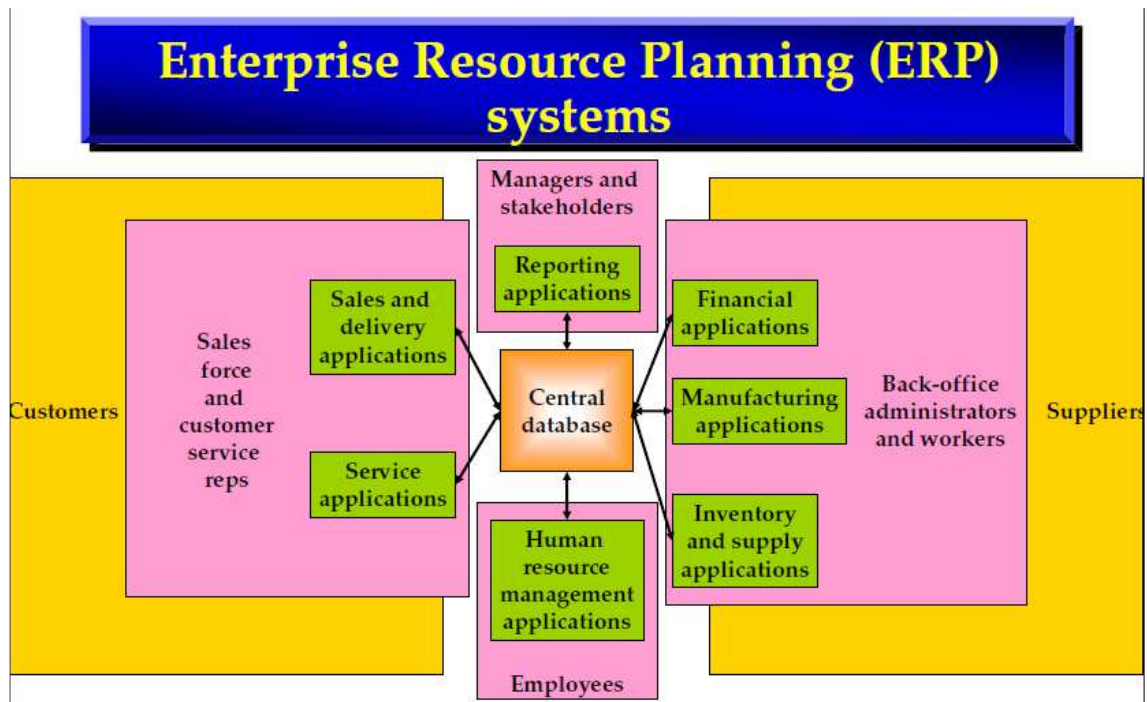
Source: T.Davenport, Putting the Enterprise into the Enterprise System

The above diagram depicts the ERP shares a Central Database in four segments:

1. Managers and Stakeholders who need consolidated Reports, for them ERP is a Reporting Application.

2. Employees of the organisation needs their remuneration and their benefits, for them ERP is a Human Resource Management Application for recruitment, selection, training and payroll.

3. Customer based software for sales-force team and customer service representatives ensuring fast and timely service through ERP sales and delivery applications and customer service applications

4. Supplier based ERP back office employees, administrators and workers in the procuring section etc use ERP applications for Inventory and supply applications, Manufacturing applications and Financial applications.

3.1.2. Drivers for ERP

Walsham, G. (1995). States that, the period 1990s, was a decade moving from decentralized computing systems to enterprise-wide (ERP) initiatives for organisational transformation. He argues that company managers began situating their organisations within a global context and in turn they developed a sense of worldwide business solutions. This awareness was supported by international management consultancies whose revenues increase as approaches become more widespread and standardized.

Wagner, E. L. (2003). Viewed that the consultancies are the "driving force" and play a vital role in the ERP and its predecessor, Business Process Reengineering (BPR) Systems was an integral part of beginning most of the ERP System implementations. During late 1990s, the problem of Y2K compliance was a major concern for many companies and they wish to replace existing and poor quality systems. Many Management consultants supporting the ERP system solutions found a panacea for the Y2K nightmare. ERP vendors and management consultants recommended to replace outdated, custom based in-house grown systems with a single integrated software solution. Other major facts reported in the drivers for ERP literature for the adoption are: Improving organisational performance and efficiency through effective decision making, reduction of labour costs, eliminating bureaucracy and errors. The requirements of the business partner for fast service, pressure from the side of competitors', functional integration between units, standardization of organisational processes across different locations and globalisation of businesses are other notable reasons.

Wenrich, K., & Ahmad, N. (2009). "Acquisitions, mergers and amalgamations among the units are main forces companies to change and function as a single system". However, for each company the drivers for implementing ERP are different as well as their priority order depends on the organisation's context, both internal and external.

O'Leary (2004) grouped the "ERP drivers into four sections: technology, business practices, strategy, and competitiveness".

Holland et al. (1999) recognized three main dimensions: technical, operational and strategic.

Markus & Tanis (1999) narrow down the reasons even to broader groups such as, technological and business performance. Drivers for Adopting ERP systems recognized are: Technical, Operational, Strategic , Need for a common platform, Process improvement , Y2K compliance , form, Replacement of legacy systems, Data visibility, Globalisation of business terms, Systems incompatibility, Operating cost reduction, growth of an enterprise, Standardisation of business processes, better customer service and better responsiveness, integration between the units and processes, enhance organizational performance and decision making capability.

Olson (2004) summarizes two studies, which examined the motivational aspects for ERP adoption. One study carried out in two firms, one in the U.S and another in a Swedish firm. Other reasons that received high ranking were the improvement of interactions with suppliers and customers.

3.1.3. Evolution of ERP

The ERP present form evolved from many stages of management information systems over the past 35 years. It begins from calculating materials requirements for manufacturing and end with complete automation of the entire organisation. MRP (Material Requirement Planning) developed during the 1980's, which, later developed as Manufacturing Resource Planning (MRPII) and finally in the 1990's the birth of ERP. It came as an extension of MRP and gradually transformed to MRPII and then gradually to CIM. ERP systems now cover all functionalities both products and services of an organisation, regardless of the character or size. ERP systems at present used in every manufacturing, production, non-manufacturing, profit seeking and non-profit organizations both products and invisible service sector and in governmental organisations. ERP began from MRP through routings of software architecture capacity planning as a standard software activity. ERP can now handle all the core and key departments and functionalities such as, accounting, invoicing, marketing, manufacturing, shipping and logistics, distribution, inventory, and customer relationship and satisfaction. ERP now

controls and supports many business activities, such as manufacturing and production activity, sales and marketing, inventory and stores management, delivery and distribution, billing and collection, quality control and inspection, and human resource and payroll accounting management. Many companies found ERP systems implementation as a panacea for the Y2K problem they faced (whether real or illusion) in their legacy systems. Organisations utilise this golden opportunity to replace and enhance their existing processes, software and information systems with new ERP systems. The ERP vendors also took this opportunity (Y2K) for boosting their sales remarked as Y2K compliant solution. ERP systems may be disregarded or often incorrectly noted as a back office systems blaming that customers are not directly involved. ERP systems are integrated in cross-functional and intra-enterprise systems. All functionaries and departments involved in manufacturing or production operations or providing services are integrated in one system. There exist special modules in all ERPs for accounting, marketing, manufacturing, warehousing, logistics, human resources, information technology and strategic management in addition to CRM and SRM. Most of the research studies view the ERP systems evolution from a manufacturing angle. In 1950s and early 1960s, the purpose was for scheduling production planning, ordering and reordering materials, shipping and forwarding products and automated reorder point (ROP) systems were used. In late - 1960s, materials requirements planning (MRP) computerised systems began to replace ROP systems.

These systems are regarded as the first business application (ERP) systems available in the market. MRP system consists of BOM processors and forecasting algorithms along with computerised production reporting tools (Orlicky, J. A., Plossl, G.W.,& Wight, O. W. (2003).

During the 1970s, manufacturing resources planning (MRP II) systems developed as a replacement for MRP systems. MRP II systems could integrate materials as well as production capacity requirements. In addition, advanced reporting capabilities enabled the efficient scheduling and monitoring the execution of production plans.

Both MRP and MRP II through the use of ICT, focused on digitalizing and automating the transactions and data for enhancing the firm's operational efficiency.

The MRP systems typically run on mainframe computers, reflected centralised computing, involved limited interactions between users and the system, and less functional integration. On the other hand, the MRP II systems runs mainly on multi-user multi-tasking networks and run on most of IT operating systems and platforms.

The late 1980s witnessed a rapid advancement in Information technology (IT) and MRP II systems and were further integrated with other systems like (CIM), computer integrated manufacturing System EDI (electronic data interchange), JIT (just-in-time), and MES (Manufacturing Execution Systems. ERP systems were replaced by MRP II systems.

ERP systems are an extended form of MRP II system functionalities to include functions such as human resources (HR), sales and distribution (Marketing), and quality to create integrated information in the entire organisation. ERP systems are a packaged or a suite of many integrated software products using a common IT architecture and became integrated or de-linked with existing legacy systems. These integrated systems run on all multi-user, multi-tasking environments and networks and permit a high level of simultaneous aggregation and de-aggregation and the manipulation of real-time data among various departments and functions (Jacobs, F. R. (2007)

ERP systems form the IT support and backbone of organisations and their functionalities. Now it has extended and enhanced to include intra and inter-firm integration facilitated by business applications such as electronic-commerce (E-Commerce), SCM, and CRM

During 2000's, the next-generation software, ERP II, evolved. This new generation software is web-based and known as 'Cloud ERP' which allows employees and all concerned suppliers and customers can interact in real-time basis to access a common database.

ERP Systems are synonymous as EAS (Enterprise Application Suite). When the ERP modules are using through the internet with browsing software and business data are stored on internet or 'cloud'. An ERP system, need to provide at least two functions in modules to integrate. For example, software which has to provide both accounting and payroll functions could be technically considered as an ERP package.

Diagram No: 3.2

Evolution of ERP

1970s	• Material Requirement Planning (MRP)
1980s	• Manufacturing Resource Planning (MRPII)
1990s	• Enterprise Resource Planning (ERP)
2000	• Extended ERP (E-ERP)
	• Enterprise Resource Planning II (ERP II)
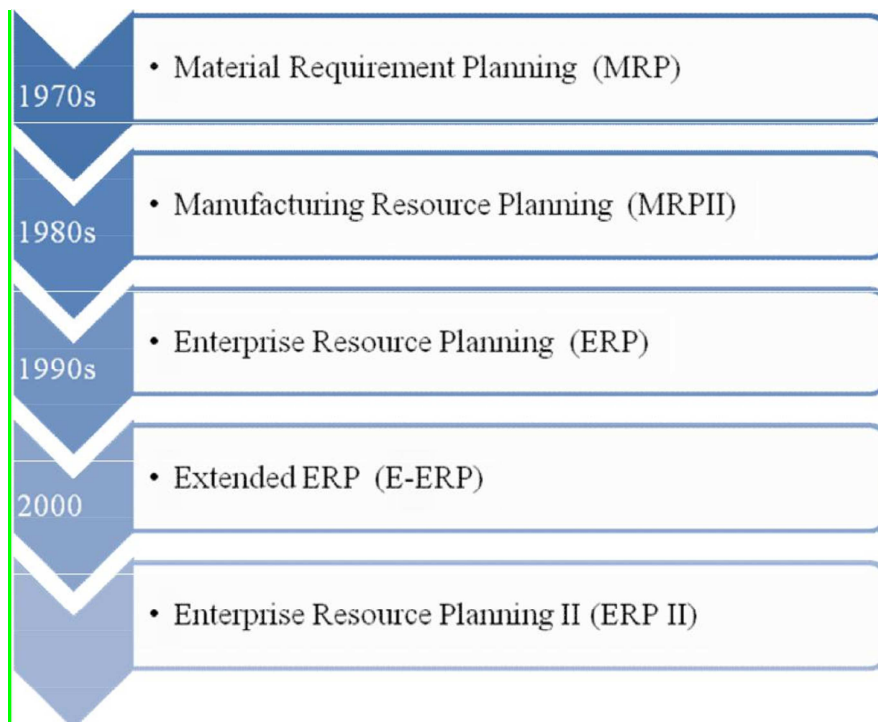
Evolution of ERP - Table No: 3.1

Basic ERP(1990-99)	Extended ERP(2000-05)	**ERP II**(2005 onwards)
• Materials planning • Order entry • Distribution • General ledger • Accounting • Shop floor control	• Forecasting • Scheduling • Capacity planning • Warehousing • Logistics • E-commerce	• Knowledge management • Project management • Workflow • HRM • CRM • Integrated financials • Portal capability • Internet & WWW integration • Cloud computing

3.1.4. Ideal ERP

An ideal ERP System include the stand-alone applications like Official mail handling modules, Product lifecycle management and Supply chain management (Procurement, Manufacturing and Distribution), logistics and Warehouse or store control and Management, Customer Relationship Management (CRM), supplier relationship management (SRM) Quotation and Sales Order Processing, sales and Online Sales, accounting and Financial, Human Resources and payroll, Operational Command Systems and Decision Support System. An ideal ERP provides centrally stored multiple database systems contain all the required data for the various functional modules covering areas like:

a) **Command & System Configuration**

Defining and working based on a pre-defined chain of command and system configuration concepts.

b) **Access control**

Management of various user privileges and processes

c)   Financials

Contains general ledger, cash and cash flow management, expenses and cost control management, debtors and receivables management, creditors and accounts payable management, nominal and personal accounts management, fixed assets management, etc.

d)   Project management

Cost control, Investment, billing, time management and expense management, performance evaluation, activity management.

e)   Human resources

It begins from employee selection, recruitment, training, attendance and time management, and covers employee benefits and payroll management.

f)   Customer relationship management

Marketing and Sales, customer ageing reports and fast collection of debtors, commissions, and customer service, customer contact and call centre support.

Manufacturing Engineering, manufacturing process, manufacturing projects, manufacturing flow control, bills of material, scheduling, capacity, quality control and cost management, workflow control and management, etc.

g)   Supply chain management

The typical functionaries are; Quotation and order to cash, inventory handling, order entry and processing, supply chain planning and supplier scheduling, procuring and purchasing, supply chain planning and supplier scheduling, product specification and quantity fixation, inspection and delivery of goods, claim order and processing, quantity and commission calculation.

h)   Data services

It provides many self-service interfaces for suppliers, customers, and employees like balance enquiry and accounts balance, and data transfer to the management and decision makers through the internet or other fast media.

3.1.5. THE SCOPE OF AN ENTERPRISE SYSTEM

The basic functions of AG's SAP's R/3 ERP package contain the following basic five modules with the integration of the concerned functions available.

Table No: 3.2

Typical ERP Modules

Modules	Financials	Human Resources	Logistics	Operations	Sales and Marketing
Functions	General ledger	Human-resources time keeping	Purchasing	Production planning	Order Processing & management
	Cash management & forecasting	Time booking &accounting	Shipping	Project management	Invoicing & Pricing
	Asset accounting	Personnel planning	Inventory management	Plant maintenance	Sales management
	Accounts receivable & payable	Payroll accounting	Materials management	Quality management	Sales planning
	Financial consolidation	Travel expenses	Material handling	Routing management	
	Product cost accounting		Material requirements planning		
	Profit Center accounting		Vendor evaluation		
	Cost element				
	Cost Center accounting				
	Profitability analysis				
	Executive information system				
	Standard and period-related costing				

Table No: 3.3

ERP Functional Modules Coverage Areas

Command & System Configuration	Pre-defined chain of command and system configuration concepts.
Access control	Management of various user privileges and processes
Financials	Contains general ledger, cash and cash flow management, expenses and cost control management, debtors and receivables management, creditors and accounts payable management, nominal and personal accounts management, fixed assets management, etc
Project management	Investment and cost control, billing, time and expense management, performance evaluation of units, activity management.
Human resources	Employee selection, recruitment, training, attendance and time management, employee benefits and payroll management.
Customer relationship management	Sales and marketing, customer aging reports and collection enhancement, commissions, customer service, customer contact and call centres support.
Manufacturing/ Production/ Service	Manufacturing process, manufacturing projects, manufacturing flow control, bills of material, scheduling, capacity, quality control and cost management, Engineering, workflow control and management, etc.
Supply chain management	Quotation and Sale order to cash, inventory handling, order entry and processing, supply chain planning and supplier scheduling, procuring and purchasing, supply chain planning and supplier scheduling, product specification and quantity fixation, inspection and delivery of goods, claim order and processing, quantity and commission calculation.
Data services	Provides many self-service interfaces for suppliers, customers, and employees like accounts balance and transfer of data to the management and decision makers through internet or other fast media or through customer login services.

3.1.6. Right ERP System considerations

➢ Inter departmental communication needs to be enhanced especially when located far or remote places through virtualization.

➢ The efficiency of the system must ensure better information access to employees wherever in the world they are located.

➢ Streamline Global Risk & Compliance among various departments like Finance and Accounts, Human Resources and Human Capital Management, Marketing & sales, Logistics and Supply Chain Management, Information System Management and Project Management.

➢ The vision of '360 degree' across every functional department and day-today operations.

➢ Saving in time and costs among the departments

➢ Better manage of organisational resources, such as finance, assets, human recourses, etc,.

➢ Information technology helps to solve more complex and complicated business problems.

➢ After implementation, the system must be suitable for custom development, a well dedicated and committed implementation and support team and sufficient training to the potential users.

➢ A provision to ensure the continuous finding of solutions to meet the needs upon business changes and growth.

3.1.7. Characteristics of ERP

An ERP system collects data through a single centrally stored comprehensive database and makes it available to modular or module applications that support the entire organisation's value chain activities. It is available across all functions or departments, business units or branches, and geographical areas.

These systems urged to open a "de facto operating standards" for organisations and develop generic and multi-level solutions, which can be customizable to incorporate good practices, which reflect a set of assumptions regarding the firm's operation in general.

ERP systems share the same data definition across all modules through the support and use of a data dictionary. They facilitate the maintenance of a single set of data across all business processes and hence provide common centralized data access to all users. The client-server technology use, middleware use and the extensive use of Internet enables ERP systems customised according to the dynamic business needs of the firms.

The network architecture under open system allows any ERP module to link or de-link from the central system without trouble to other modules. These discussions highlight the underlying philosophy of ERP systems as the leveraging of IT to achieve capabilities for harnessing inter and intra-firm resources. It is facilitates through the collective use of certain tools, technologies, systems and devices integration mechanisms, and organisation fit strategies (Davenport, 1998; Beretta, 2002). Integration helps in the coordination of business activities.

ERP systems embed integration enabling technologies and adopt a process view of the firm. The management makes it happen interdependencies and enable cross-functional information flows and cognitive integration among the functional units (Harrold, 2001; Beretta, 2002).

3.1.8. Definitions of ERP

Boersma & Kingma (2005) ERP systems may be most complicated software solutions and are not easy to define and there is no universally accepted definition of ERP.

Markus & Tanis, 2000, Different stakeholders of ERP will, according to their position in the organisation, have quite different views of and experiences with ERP. Therefore, individuals or group definitions differ according to their "awareness context".

Deloitte (1998), the ERP system is a business software package that allows an organisation to automate and integrate major business processes. It shares a centrally stored common database in the server. It practices in all departments across and between the entire organisations. It access information from the system on an online and real-time basis and provide to the entire business activities.

Davenport (1998) "ERP is a packaged 'off-the-shelf' software product for an organisation to integrate and share its information and related business processes within and across functional areas". This definition stressing the integration of entire processes or activities and functionalities, between various organisational networks, in particular functional areas or divisions within an organisation like finance and accounts, marketing, sales and distribution material & stores procurement, inventory control, human resources development and payroll. Davenport over emphasizes the integration aspect and establishing that ERP is something more than software package. This opinion is very popular among scholars and researchers who generally consider and define ERP based on its capacity to integrate formerly segregated IT systems. The second perspective is bundled with ERP systems, which are fundamental for conceptualizing best practices. He argues that acquiring an ERP software package means much more than purchasing software, it means buying of the software vendor's view of best practices.

ERP has been defined by researchers and practitioners in different ways; some describe ERP as the collection of applications that can be used to manage all of an enterprise's business activities. Other experts define ERP as an integrated but complex business software system that integrates together and automates the main basic processes of a business.

ERP is an optimal enterprise-wide software solution based on technology infrastructure. Researchers also referred to ERP systems as enterprise resource management (ERM) or enterprise systems (ES) or as business systems (BS). ERP systems further described as applications that integrate functional areas and allow functions to share a common database and business analysis tools. In present literature, the ERP definition has undergone serious changes, such that ERP

definition extends to include intra and inter-firm activities through integration of both front and back office entire business applications like Supply Chain Management (SCM) and Customer Relationship Management (CRM) Aronson, J. E., Liang, T. P., & Turban, E. (2005).

In the early 2000s, the Gartner Group introduced the term enterprise resource planning II (ERP II) for business strategies and created a group of industry needed-specific applications creating customer and shareholder value with optimising the inter-enterprise group collaborative marketing, financial operational processes (Beatty, R. C., & Williams, C. D. (2006).

Gould (2002) states that ERP is the integration enhancements of cross-enterprise extension processes and functionalities with IT architecture ERP Gould, L. S. (2002).

The entire studies highlight that the scope and definition of ERP had changed over time, the abbreviated term ERP and the phrase enterprise resources planning has become most common terminology used by researchers, practitioners and implementers to describe integrated business system application packages.

This research study also refers the same enterprise resource planning phrase and its abbreviation 'ERP' to express all value chain business applications with broad, global and universal "umbrella" system, along with ERP-based information infrastructure.

3.1.9. Working Definition of ERP

The working definition of ERP system used in this study is considering the following characteristics associated with ERP systems:

1. ERP System is a full-fledged application software packaged set provided in modules, within an integrated software architecture structure which may be used by the enterprise as the for integrating its database, processes, information technology, in online and real-time, across internal and external value chains;

2.   ERP System provides deep knowledge about the business activities and functionalities gained by the software vendors from the implementation strategies of the client organisation. It has sufficient influence on the designing of processes within an organization;

3.   ERP is a 'semi-finished' product having tables and values that organisations and their implementing partners plan, configure, customize, and integrate with other related information systems based on computer to meet their business requirements.

3.1.10. ERP System Modules

Initial implementers used and deployed certain basic ERP system modules giving attention to certain key intra-firm activities relating to the finance, marketing, logistics, and human resources functions (Olson, D. L. (2003).

Typically firms deployed modules such as financial accounting, controlling, personnel administration, personnel development, general logistics, materials management, procurement, production planning, inventory control, and sales and distribution (Hernandez, 1998; Appelrath & Ritter, 2000). All these modules include numerous sub-modules accessing a common centrally stored database. Generally, firms select to deploy ERP modules in three ways. Madapusi, A., & D'Souza, D. (2012).

Initially, firms implement basic modules with its sub-modules on a stand-alone basis in order to cater the specific business needs for activities. Subsequently, more modules like HRM, Logistics, CRM etc, with or without sub-modules from a partially integrated system to a complete enterprise-wide solution to address a group of business activities. Finally, firms chose to augment the fullest integration potential available in the ERP system by implementing all the available modules and sub-modules in a customized manner to turn a complete full-fledged ERP system (Poston, R., & Grabski, S. (2001).

After establishing the intra-firm integration, then extending their deployments by adding modules for inter-firm business activities among the entire

organisation and supply chain. Typically, most of the firms deploying common modules like SCM, CRM, E-Commerce, product data management (PDM), and EDI (White, R. E. (2008). All these modules, in turn, comprises of numerous sub-modules accessing the firm's common database.

3.2.1. Traditional ERP Modules

Madapusi (2009)[1] introduced some field-tests for ERP system implementation modules in the Indian ERP market. His findings suggest that the implementation of twelve ERP modules make significant contributions to one or more of the ten performance measures. The ERP adopting organizations has to follow a detailed ERP system or intra and inter-firm modules many with sub-modules in order to obtain best performance and benefits. All Critical Success Factors (CSF) have significant interactional effects with individual modules to impact one or more of the ten performance measures.

A firm may implement all ERP modules at a time in all locations which is referred to as The Big bang approach (Gargeya, V. B., & Brady, C. (2005). This approach is adopted by small scale companies going in for ERP software in one or two locations. It reduces implementation time and cost with the inherent disaster of high risk of failure. All ERP software consists of many modules. SAP consists of 27 modules. The number and features vary with ERP package.

If a firm first go for ERP implementation in one plant for all the modules it is referred to as Rollout approach. This location is a representative one and this is the place which is used by the firm to build the global template that covers most of the company process. The most common modules of ERP software are:

1) Finance and Accounting
2) Production Management
3) Sales and Distribution
4) Materials Management
5) Human Resources Management
6) Quality Management

3.2.1.1. Finance and Accounting:

This module deals with accounting aspects. All accounting transactions are recorded. This is useful for Accounts and Finance Managers. Some ERP packages also provide Cost control functions which are helpful in cost control and decision making in which case it is called FI/CO module. Usually this module comprises following sub modules. These sub modules provide an overview of financial solutions and they are described below.

Financial Accounting tracks and share centrally stored financial data within the organisation with an international framework of multiple locations, branches, companies, languages, currencies and chart of accounts. It comprises General ledger, Accounts receivables, Accounts payable, Fixed Assets Accounting.

Investment Management: It provides extensive support for investment processes right from planning through settlement. It facilitates investment planning and financial budgeting with high degree of accuracy with higher order levels than needs and requirements for specific orders or projects. The investment program allows the firm to distribute budgets, which are used during the capital spending process. The system helps to monitor the financial activities and thereby avoids budget overruns.

Controlling: This system gathers the functions required for effective internal cost accounting. It offers a versatile information system, with standard reports and analysis paths for the most common questions. In the treasury component the system provides the firm with a basis for effective liquidity, portfolio and risk management. The Treasury component comprises Cash management, Treasury management, Funds management, Market risk management.

Enterprise Controlling: Consists of functions to optimize share value, along with the internal objectives of growth and investment. This module contains the Executive information system with Business planning & budgeting and Profit centre accounting.

3.2.1.2. Production Management:

This traditional module originated from MRP I generally referred as PM module. In manufacturing the activities include machining by machine tools, pressing, forging, rolling, extrusion, welding, casting etc. apart from other activities depending on nature of business. In chemical industries it involves mixing of chemicals and heating, cooling etc. In oil industry it involves processing, filtering of crude, extraction etc. All of these activities are carried out with an aim of reducing the cost, improving output level and quality. The production can be carried out in job, batch or continuous basis. All of these are supported by Production module of ERP packages.

A robust system of manufacturing planning business process and execution must satisfy a variety of business practices and production methods. Manufacturers must accomplish the task quickly, efficiently and cost effectively to remain profitable and competitive. The PM module aims at planning production activities with reference to customer order, assignment of jobs to machines, scheduling, determining the methods to be employed and optimum resources required like labour, capital etc.

This module involves the following sub modules:

- Material and Capacity Planning

- Shop floor Control

- Quality Control

- Just In time

- Cost Management

- Engineering Change Control

- Engineering Data Management

- Lot control and tooling

- Configuration Management

3.2.1.3. Sales and Distribution Management

Usually this module is referred to as SD module. As technological barriers have come down the thrust is on marketing and sales. The response to customers should be quick, the lead time has to be reduced, service level has to be increased and cost of shipping has to be reduced. These issues were solved through Sales and distribution management module.

Increased efficiency in sales and distribution is a key criterion to ensure that firms retain a competitive edge and improve profitability and customer service. According to the system configuration, all functions are automated and which require some manual processing is identified. The relevant data from these basic functions are centrally stored in the system. The reports can be displayed and updated manually wherever required while subsequent processing.

- The SD module very actively interacts with the other module for delivery and billing and include the following are sub modules:

  - Master Data Management
  - Order Management
  - Shipment
  - Warehouse Management
  - Billing
  - Pricing
  - Sales support
  - Foreign Trade

3.2.1.4. Material Management

It is referred to as MM module. In manufacturing firms materials account for 30% to 70% of the total cost of production. Materials have to be procured from right vendors at right time. The materials required for production have to be identified and ordered from reliable vendors. It involves reducing the inventory cost and also maintaining sufficient buffer stock so as stock out does not happen, otherwise stock out cost will be heavy. The MM module cares and optimizes all purchasing

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functions and work flow processing functions, facilitates supplier evaluation, bringing procurement and warehousing costs to minimum with high degree of accuracy inventory & warehouse management and integrates invoice verification.

It addresses following issues: Economic order quantity, Economic batch run, Fixed period ordering, Vendor rating. This module involves the following sub modules:

- Pre purchasing activities
- Vendor Evaluation
- Purchasing
- Invoice verification and Material Inspection
- Inventory management

3.2.1.5. Human Resource Management (HRM)

HR module addresses human resource management covering all the functions associated with payroll issues adaptable in specific requirements and grow with increasing HR requirements of an organisation.

The system should be flexible to allow the firm to optimize business processes by adopting, customizing and tailoring the ERP solution to suit the organization's needs. The system should support the organization's international needs with country specific versions of HR components. Apart from languages, currencies and legal requirements, accounting systems often vary from country to country as well making this a vital feature. A flexible structure enables quick and easy customization of the system to the requirements.

Some of the subsystems offered in this module are

- Personnel management,
- Payroll accounting & Management
- Organizational management,
- Travel management
- Time management,

3.2.1.6. Plant Maintenance Management:

Apart from normal production functions, other functions like plant maintenance are also important. It involves breakdown maintenance and preventive maintenance. Though Production module (PM) addresses the production, sequencing and cost control, there are other issues like regular maintenance, reduction in set up time etc., which have to be addressed. The plant maintenance module covers all aspects of plant/equipment and becomes integral to the achievement of process improvement. Some of the sub-modules are preventive maintenance, equipment tracking, component tracking and plant maintenance calibration tracking.

Preventive maintenance: This module cares planning, scheduling and control of facilities, equipment and resources. It especially caring the maintenance like equipment lubrication and overhauling, replacement of components in time and regular safety inspections. The famous slogan 'prevention is better than cure' is applicable in the maintenance of organisational resources which lowers the total maintenance costs. It avoids the setup-time, down-time, machine breakage and process variability.

Equipment tracking: In any organization equipment is most important in production process. It should be monitored and protected. Each piece of equipment is defined by a model and serial number. The data sheets can be provided which allow storing the data and grouping the user data. This is in providing useful information for maintenance and transportation control.

Component tracking: Components of machine and equipment are very sensitive. Proper monitoring and replacement of components should be undertaken at regular intervals otherwise their failure costs heavily for the entire equipment. Component tracking includes repair/exchange history and component service life.

Plant maintenance calibration tracking: This module cares the firm to augment and leverage their investment in plant maintenance by calibration and supporting to ISO requirements.

3.2.1.7. Quality Management

The firms should satisfy the customers with the products of the highest quality. Quality is to be assured not only in the final product but also in processes, raw material and service also. This module cares in quality with respect to planning, inspection and controls. It uses statistical quality control tools and quantitative methods of statistical analysis in manufacturing organizations. There are X bar chart, p chart, np chart etc which help the quality inspector to take corrective actions so that quality does not go out of control. Other tools like acceptance sampling, work sampling, six sigma tools are very useful when the production is in large scale. These tools are supported by the Quality module.

3.2.1.8. Other Modules

The ERP Software also covers the innumerable number of other modules also in addition to its own basic modules. Other modules usually included are, the service modules like Transportation, Education etc. There are modules which are suited for service sector like hospitals, retail stores, healthcare, banking etc. The service sector is the area with huge potential for ERP software.

3.3. Overview of the ERP software market

The ERP market is growing rapidly. According to Advanced Market Research Company Inc. Germany, (AMR) (2012), ERP software market grows with the annual compounded growth rate of 40%.

The global ERP market shares, SAP 25%, Oracle account 13%, Sage and Infor 6% each, Microsoft 5%, Kronos, Totus and Concor @ 2% each and Yonyou and Unit4 with 1% of the total ERP market as per the report of Forbes [10].

Diagram No: 3.3

Software market share

2017 ERP Market Share

22.50% — SAP
12.20% — Oracle
6.10% — Sage
5.80% — Workday
5.10% — Infor
52.00% — Others
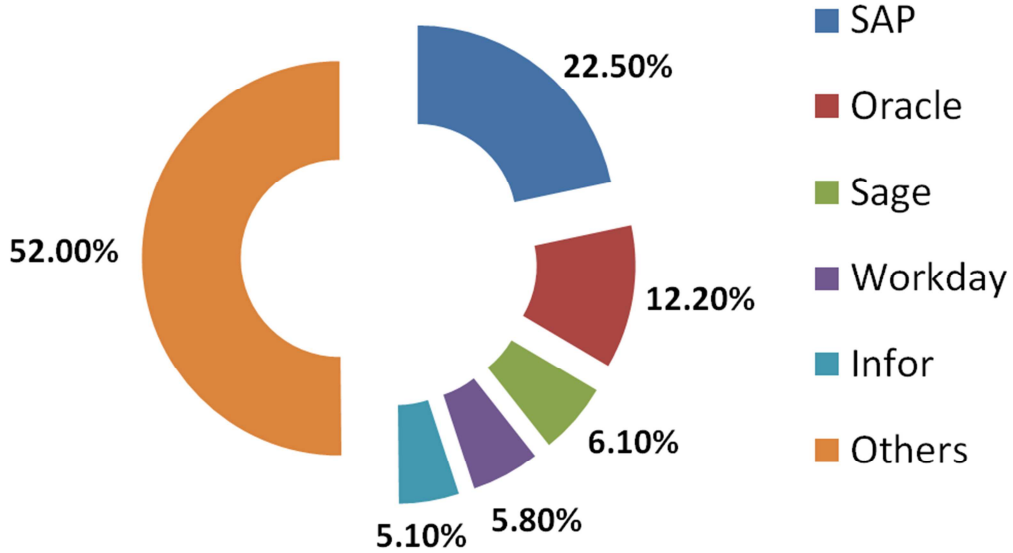
Diagram No: 3.4

Implementation costs of ERP

On budget, 35% — On budget
Over budget by 25% or less, 31% — Over budget by 25% or less
26 % to 50% over budget, 16% — 26 % to 50% over budget
Under Budget, 12% — Under Budget
51% to 75% over budget, 45% — 51% to 75% over budget
Over budget by more than 76%, 2% — Over budget by more than 76%
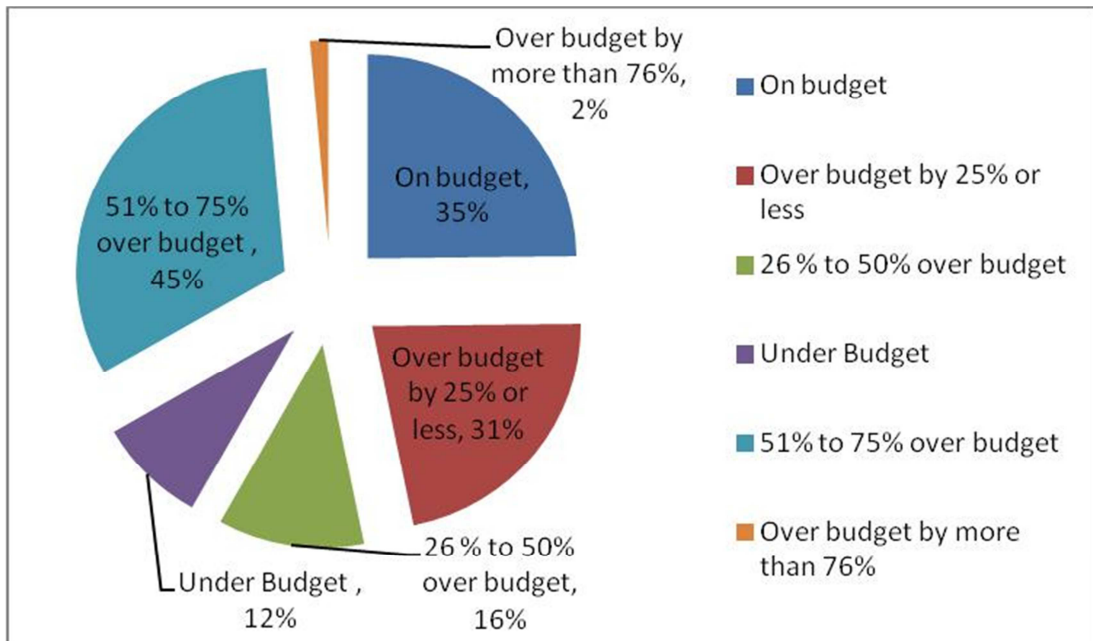
The organisations seek to use the budgeted amount for meeting the expenses of ERP implementation. 35% of ERP implementations take place as per the budgeted expenses. 12% of ERP implementations take place with under budget expenses. 45% of ERP implementations take place with a budget overrun and this over-run lies in the range of 51 % to 75%. 2% of ERP implementations take place with the budget over-run and it is above 76%.

3.3.1 SAP

SAP was established in 1972 in Waldorf, Germany. SAP stands for Systems, Applications and Products in Database Processing. It is the leading global provider of client/server business application solutions. Today it has installations in over107 countries. It is accepted as a standard in key industries such as oil, chemicals, automobiles, engineering and electronic industries.

SAP is the most successful vendor of standard business application software and is the fourth largest independent software supplier. SAP R/3 is one of the latest versions introduced to the market. MySAP is another version launched in 2002 and is designed for small and medium enterprises. SAP spends much more on research and development than any other competitor and is likely to introduce new functionality as a result (Davenport 2000).

The important features of SAP software are real-time integration, linking a company's business processes and applications and supporting immediate responses to change throughout through a template on a departmental, divisional or global scale. SAP products feature a sophistication and robustness unmatched by other business software solutions. The complete suite of R/3 applications is available in 24 languages including Kanji and other double-byte character languages.

Latest technologies such as object orientation are incorporated into the development work and translated into practical customer benefits. SAP R/3 does more than just opening up completely new IT solutions within a company. Its applications also link the business process with those of customers and suppliers to

create complete logistic chains covering the entire route from supply to delivery. R/3 lets one to completely integrate nationally and internationally.

Finance and Control module includes Financial Accounting and Controlling. Financial Accounting component complies with international accounting standards such as Generally Accepted Accounting Practices (GAAP).

It fulfils local legal requirements of many countries and reflects fully the legal and accounting changes resulting from the European market and currency unification. Although transactions are processed individually, they are integrated with other relevant financial areas. Finance and control module includes General ledger, Accounts receivable, Accounts payable, Fixed Asst Accounting and Legal consolidation.

Along with Financial Accounting another important tool widely used is Controlling which includes overhead cost control, cost centre accounting, overhead orders, activity-based costing, cost object controlling, and profitability analysis. Cost and profitability accounting (COPA) tool of SAP plays a major role in analysing the cost centre profitability.

3.3.2 Oracle

Oracle was established in 1977. It is headquartered in Redwood Shores, California. It is the world's second-largest software company and the leading supplier of software for enterprise information management. With annual revenues exceeding $12 billion, the company offers database, tools and applications products along with consulting, education and support services. The total workforce at the global level is over 50,000. It has operations in over 140 countries. Over 6,000 customers in 76 countries use Oracle Applications. It is the world's leading supplier of software for information management and decision support tools (Davenport 2000).

Oracle has entered into healthcare segment which is fast growing. Oracle Applications let companies operate in multiple currencies and languages, support

local business practices and legal requirements and business-critical operations across borders.

Oracle software runs on network computers, personal digital assistants, set top-devices, PCs, workstations, minicomputers, mainframes and massively parallel computers. The product Oracle 11i is most sought after in the industry across the globe. Oracle has developed a range of products.

Oracle Applications is the leading provider of the packaged and integrated front office and ERP solutions for enterprise and a division of Oracle Corporation. Oracle applications are the only suite of enterprise business applications from an ERP vendor that follows the internet computing model. Each module is web-enabled, allowing it to be deployed on corporate internets with no software, other than a browser, required on user's desktops.

The architecture allows the companies to shift the complexity of application management, maintenance and upgrading from users' desktops onto centralized systems, thereby dramatically reducing the cost of deploying and administering the software. By minimizing network traffic, this approach also makes it economical to deploy the applications over Wide Area networks (WAN) to a number of users, making it possible to distribute critical business information much more broadly than in the client/server model. Oracle Applications comprises of 45 plus software modules, which are divided the number of categories:

3.3.3 Baan

Baan was established in the Netherlands in 1978 by brothers Jan and Paul Baan. It has dual headquarters in Barneveld, Netherlands and Reston USA. Baan is one of the leading providers of enterprise business software. Baan offers a component based applications for the front-office, corporate office and back-office automation. Baan company products reduce complexity and costs involved in processes and contribute into improving core business processes.

Baan products which are faster to implement and use are flexible in adapting to changing business scenario and in optimising the management of information

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throughout the entire value chain. Since 1995 the company has significantly expanded its activities in North America, Latin America, Europe.

Baan's product line features multi tiered architecture for maximum scalability and flexible configuration. Applications are isolated from the systems environment, enabling support of new hardware, operating systems, databases, networks and user interfaces without any modification to the application code. Baan products support popular Unix and Microsoft platforms. Baan products include Baan(front office), Baan(supply chain) among others.

Applications: Baan applications provide fully integrated, hybrid manufacturing environment, offering applications that address the spectrum of manufacturing scenarios, like make to stock etc make to order etc. Baan comprises many of standard features as in other ERP software.

Some of BAAN products include:

1.   Baan Distribution and manufacturing
2.   Baan Finance
3.   Baan Service
4.   Baan Project

Baan ERP tools consist of a number of components. Baan tools are like a platform that provides an independent flexible, open and distributed computing and development environment. The open architecture tools make it possible to react to new trends in the marketplace that require software. It is developed Baan applications in such a way that they are independent of third party products such as hardware and databases. It is helpful in easily integrating with third-party products and creating customer-specific solutions.

3.3.4 MFG/ PRO from QAD

QAD was founded in 1979 and has a presence in over 21 countries. The company's products include MFG/PRO, Service/Support management, Decision

Support and Qwizard. MFG/PRO's windows-based graphical user interface is an intuitive navigational tool that simplifies the learning process.

MFG/PRO software is a major client/server application as it increases internal efficiency of distributed operations within months of purchase. It is open, comprehensive and available in 26 languages. It can be implemented at multiple sites. Its user interface is Java Browser.

3.3.5 PC Soft

PC Soft was started in India by Sateesh Jain in 1988. Its solution costs around Rs 30-35 lakh against the MNCs' Rs 1-2 crore. The company is aiming at the SME segment. It has a client list of over 700 organisations. It also offers a module by module solutions to customers. It has introduced a new extension for advance planning and production scheduling in collaboration with Canada's Taylor group, which integrates ERP with the plant shop floor. Its customers include Mumbai based ATC tyres and Rs 1000 crore Ahmadabad based Siddhi Gluco Biols.

3.3.6. Ramco Marshal

Ramco Systems, part of the USD 800 million Ramco Group, is a leading IT company focused on consulting, products and managed services business. It was established in 1989 and is headquartered in Chennai with 14 offices spread across India, U.S., Europe, Middle East, and APAC. The company specializes in providing innovative business solutions that can be delivered quickly and cost-effectively in complex environments.

Ramco Systems has amassed over 100,000 users from over 800 customer organisations. The company has over 1,300 employees. It provides solutions to multiple verticals including manufacturing, real estate and construction, energy and utilities, logistics, service, BFSI, aviation, government and defence. Ramco's collaborative solution-innovation platform – Ramco Virtual Works ensures the customers that when business changes system also changes with it. Ramco Systems has been certified for ISO 9001:2008 quality standards, and ISO 27001:2005 security standards.

Its customers include both small scale as well as medium scale industries. Some of its clients include Mountain hydraulics, Pearl polymers, SEZ and energy firms. Ramco had developed full-fledged ERP solution "On Demand ERP". It provides fully integrated solutions to customers. Ramco on Demand ERP helps businesses streamline processes from start to finish and enables the firm to execute processes with increased efficiency. Because the solution integrates various processes, the firms can gain critical information across each section and make smart decisions. It has the following features:

1. No capital expenditure: It is available on the internet on a subscription model and requires no additional license. It ensures there is no capital expenditure required to purchase.

2. No additional investment: It does not require additional investment and hence is useful in cost reduction.

3. Scale as you grow: It ensures that customers can subscribe to those functionalities that businessmen require.

4. Automatic upgrade: Whenever there is up-gradation required the team from Ramco will carry out up-gradation which will help customers to keep pace with industry requirements.

3.3.7. Other Software

There are number of other software available in the market. Some of them are suited for a particular industry vertical and some of them can be used for a particular industry. The implementation of these ERP software depends on the requirement of the firms, the budget and the objectives of the firms. Many of the software firms have come out with ERP software which are suited with small and medium scale industries. As more and more ERP software are released to the market the users will be benefited and they can be local language to understand the processes. Some of them are mentioned below: Epicor, Sage, Concur, YonYou, Source Pro, Godrej and IFS solution.

3.4. Research Models for ERP

As ERP implementation is followed by some procedures and a framework the firms put in the effort to see that implementation is successful. Before the development of ERP software legacy systems were in use as well as structured systems. There has been the development of information system to suit the needs of business organisations. For successful implementation, many models are proposed. These models are information system models which have been developed along with the development of computer software and technology. The notable models among them are the Technology Acceptance model and DeLone and Mc Lean information system success model.

3.4.1 Technology Acceptance Model (TAM)

Technology Acceptance Model (TAM) was adopted by Davis (1986) after adopting the Theory of Reasoned Action (TRA), specifically modified for modelling user acceptance of information systems. The aim of TAM is to analyse the determinants of computer acceptance related to user behaviour across a broad range of beliefs, attitudes and intentions. TAM was formulated in an attempt to achieve these goals by identifying a small number of primary variables suggested by previous research dealing with the cognitive and affective determinants of information system acceptance and using TRA as a theoretical background for modelling the theoretical relationships among these variables. In this model perceived usefulness and perceived ease of use are of primary relevance for acceptance behaviour as shown in figure no 4.5. Perceived usefulness is defined as the prospective user's subjective probability of an increase in his or her job performance using a specific information system within an organization.

Diagram No: 3.5

Technology Acceptance Model
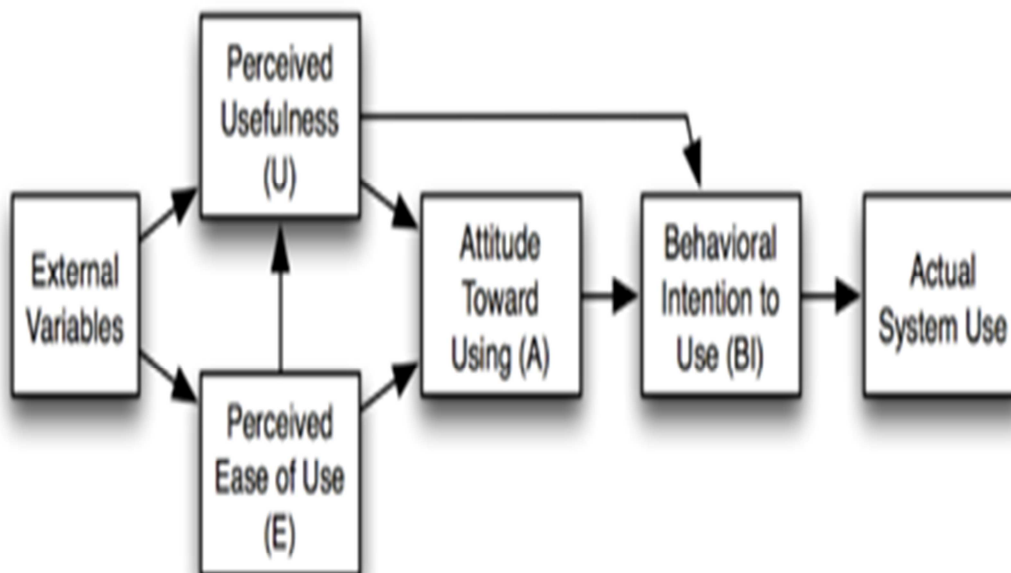
Users of information system usually perceive some benefits from the implementation of an information system. If using of the information system becomes difficult or if the users don't know how to use the information system the very purpose of an information system cannot be fulfilled.

Perceived ease of use indicates the extent to which the prospective user expects the variables indirectly affect attitude toward using, which finally leads to actual system use by influencing perceived usefulness and perceived ease of use. Legris et al. (2003) indicated all the relations among the elements of TAM had been validated through many empirical studies. The tools used with TAM have proven to be of quality and yield statistically reliable results (Legris et al. 2003). There is another theory called the Theory of Reasoned Action (TRA). The main difference between TRA and TAM is the absence of subjective norm in TAM. Subjective norm is defined as "the person's perception that most people who are important to him think he should or should not perform the behaviour in question" (Fishbein and Ajzen 1975). Davis (1986) did not include the variable subjective norms in TAM

because of its uncertain theoretical and psychometric status and negligible effect on perceived usefulness and ease of use.

However, Hartwick and Barki (1994) identified a mixed finding of subjective norm: After separating their respondents into voluntary and mandatory use contexts, they found that subjective norm had a significant impact on intention in mandatory system use but not in voluntary settings (Hartwick and Barki 2001).

For this reason, the updated TAM, also called TAM2, extended the original TAM by including subjective norm as an additional predictor of intention in the case of mandatory system use. Furthermore, TAM2 incorporated additional theoretical constructs including social influence processes and cognitive instrumental processes. The causal relationships and elements of TAM2 are described.

Diagram No: 3.6

Updated Technology Acceptance Model
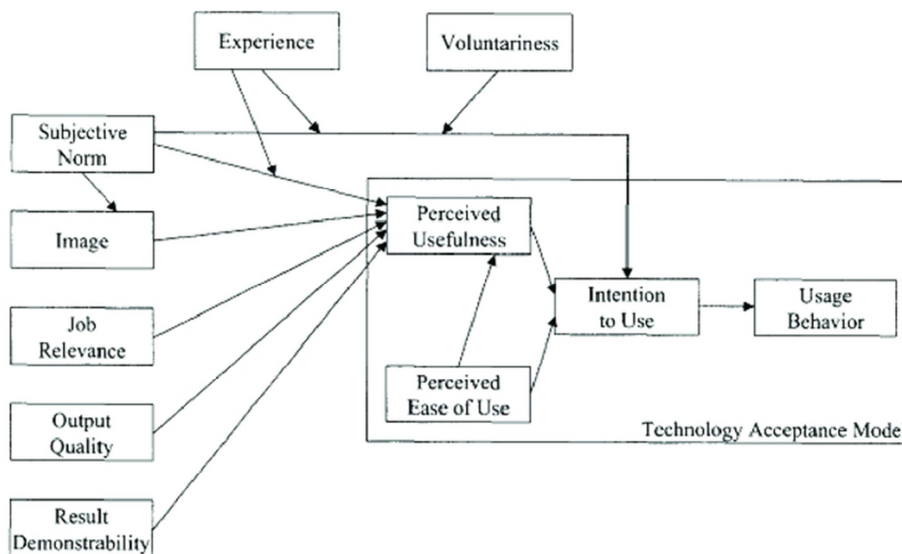
Updated Technology Acceptance Model (Venkatesh, 2000)

3.4.2 DeLone and Mc Lean IS success Model (DM Model)

In recognition of the importance of defining the IS dependent variables and IS success measures, DeLone and McLean proposed a taxonomy and an interactive model as a framework for organizing the concept of IS success. They defined six major dimensions of IS success – System Quality, Information Quality, Use, User Satisfaction, Individual Impact and Organizational Impact. DeLone & McLean's IS Success Model (D&M IS Success Model), as shown in

Figure no: 3.7 deals with both process and causal consideration. These six dimensions in the model are proposed to be interrelated rather than independent.

Diagram No: 3.7

DeLone and Mc Lean IS success Model
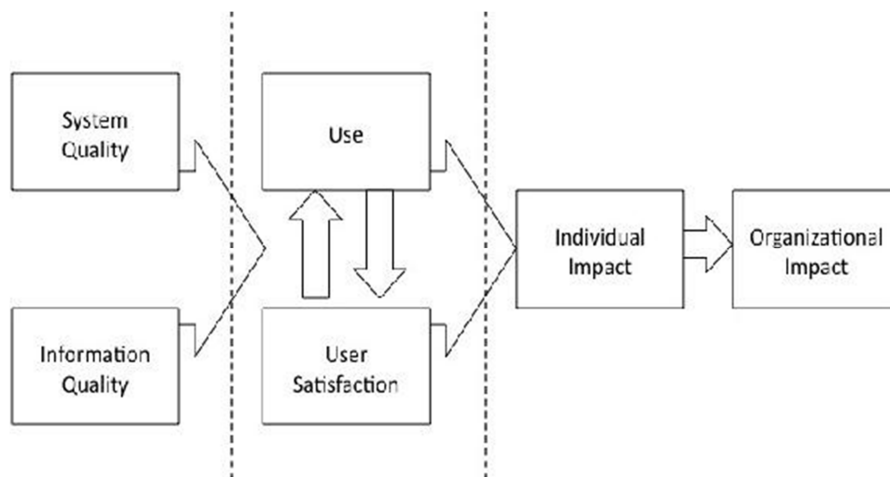
Information Systems Success Model (DeLone & McLean, 1993)

These dimensions are defined as follows (DeLone and McLean 1993):

1)   System Quality - the measure of the information processing system,

2)   Information Quality - the measure of information system output,

3)   Use - the recipient consumption in the output of an information system,

4)   User Satisfaction - the recipient responds to the use of the output of an information system,

5)   Individual Impact - the measure of the effect of information on the behaviour of the recipient, and

6)   Organizational Impact - the measure of the effect of information on organizational performance.

Until 2003, the association among the measures in D&M IS Success Model had been tested by 16 different empirical studies. The results of these studies validated the causal structure of the D&M IS Success Model. Considering the reviews of their original model from the empirical studies, DeLone and McLean established the Updated D&M IS Success Model as shown in Figure 3.8 (DeLone and McLean 2003).

Diagram No: 3.8

Updated DeLone and Mc Lean IS success Model
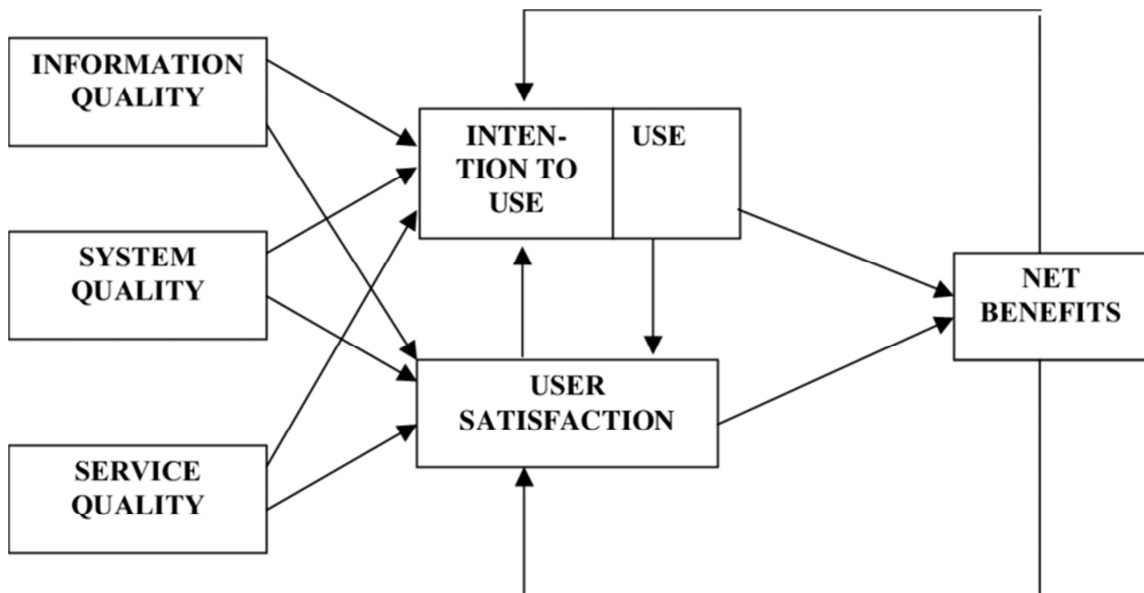
3.4 ERP for manufacturing industries

Some of the large scale industries which have implemented ERP in India include Oil and Natural Gas Corporation (ONGC), Indian Oil (IOC), Ranbaxy, Bajaj Auto Ltd, Hero Honda, ICI India Ltd, Toyota Kirloskar Motors Pvt Ltd. etc.

These firms have achieved economy of scale, significant market share, well established market and growth potential. As their sales turnover exceeds Rs 500 crore and assets size in hundreds or thousands of crores of rupees, heavy investment in ERP software is justified. Many of ERP software vendors have implemented their ERP software in the above mentioned companies. Apart from manufacturing firms those in the service sector are also going in for ERP software.

They include hospitals, retail chains, transport organisations, educational institutions. Financial intuitions are also implementing ERP software.

3.4.1   ERP for Small and Medium Businesses

The large scale industries are able to afford ERP software in order to have the growth, profitability and market share. Equally important are small and medium industries in the growth of the economy. In India top most 500 companies have already implemented ERP. It makes the SMBs the next logical adapters. It is seen that the spending by SMBs on information technology (IT) is expected to exceed IT spending by large enterprises within few years. Especially in an emerging economy like India small and medium industries are having huge potential for growth and profit.

As the players in small and medium businesses are having fewer sales turnover and less market share they have to concentrate on the minimization of cost while adopting ERP software. Also, they have to look into other factors to achieve their objectives.

The main factors that are considered by small and medium industries while implementing ERP software are briefly summarized as follows:

1.   Cost of ERP software, hardware and architecture

2.   Suitability of ERP software with the nature of business processes

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3.   Increasing the market share of the firm

4.   Cost of training workforce to work on ERP

5.   The sales growth potential of the firm

6.   Upgradation to higher versions post implementation

7.   Shortened period of the implementation cycle

In view of the above-mentioned factors many ERP software are being introduced by the ERP vendors. Some of the products are launched by the ERP vendors for SMBs.

SAP has launched a product called "my SAP all-in-one" in 2003. It has the advantage of taking only 6-8 weeks for implementation. SAP has released a product "SAP Business One" in January 2006. It is a software tool that was developed exclusively for small businesses in India.

After Oracle acquired PeopleSoft in 2004 it has strengthened its product portfolio and configuration of the products for different industry segments. Oracle has its suites like Oracle financials 11i, manufacturing etc. First Logic in India has come out with its own ERP suite tailor-made to customer's requirement. It is targeting small enterprises to make inroads into the ERP market.

Likewise, the potential exists for banking and financial services sectors to integrate their branch and overseas offices. Infosys has developed a Financial core banking solution for banking industries. I-Flex has developed Flex cube for the banking industry.

3.4.2 Open source ERP in SMEs

Open source refers to directly reproducing ERP software using any available ERP at a very lower cost or without paying license fees. Many features of ERP software available in any other ERP software can be incorporated into the Open source ERP software. The open source ERP software is helpful to many SMEs to implement ERP software without the need to invest much in IT. The SMEs are

being benefited in their growth. "Compare" is one such ERP, which has been popular in open source ERPs.

Few Open Sources ERP is available now.

1.   Apache OFBiz's suite
2.   BlueSeer .
3.   Dolibarr
4.   ERPNext
5.   EasyERP
6.   inoERP
7.   iDempiere Business Suite, (OSGi + ADempiere)
8.   LedgerSMB
9.   Metasfresh
10. MixERP
11. Odoo
12. OpenPro
13. Opentaps
14. WebERP
15. xTuple PostBooks

3.4.3 Tiers in SMEs

SMEs are divided into four categories called tiers depending upon investment and resources as well as their inclination for IT implementation strategy. Tier1 SMEs give greater emphasis on IT strategy and implementation. They consider IT solutions as part of company's the strategies and seek faster growth. Tier 1 SMBs are few and formless percentage of total SMB space.

Tier 2 SMBs use lesser amount of resources and are likely to enter into the deal with resellers of ERP software. Tier 3 SMBs are those which strive hard to control unnecessary expenditure and purchase directly from internet/mail order resellers. They have a smaller budget. Tier 4 SMBs includes those firms which find

it much necessary to implement ERP because of pressure from customers and suppliers. They prefer regional and national-level vendors.

3.4.4 Approaches to ERP implementation

Different firms follow different approaches for ERP implementation, each of which has its own advantages and disadvantages. There are two approaches namely Big bang and Rollout. In theBig Bang approach, a firm goes for implementing all ERP modules at a time in all locations. This is a common approach for SSIs for implementing ERP in one or two locations.

However, this is not very common in case of large ERP implementations running across several plants and having several modules. Advantage of this approach is that it reduces total implementation time and related cost.

There is also a disadvantage of high-risk failure. Besides, it demands time and effort from a lot of senior personnel in the organization at the same time and therefore for most firms, it becomes difficult to run the business after deploying so many senior people for ERP project. It is not a recommended approach for large scale implementations.

In Rollout approach, a firm first goes for ERP implementation in one plant for all the modules. This location is a representative one, having a good representation of the company's all business process and this is the place where the company builds the global template that covers most of the company process. Later this template is replicated to several locations. An example of this can be a multinational company which goes for its first implementation in a country ABC and XYZ, while most process parts are common. ABC specific sales tax, accounting and duties would be added to the template i.e. the template needs to be localized. Rollout can also be based on different businesses or divisions of a company. The advantage of rollout approach is low risk and it does not put a lot of pressure on the company in terms of time. However, the only disadvantage is that the project may go on for a long time.

Other approach like Big bang and Modular is also used by firms to implement ERP software. In the Big bang and Modular approach, a firm wants to go live for all plants but for selected modules.

The firm may decide that in the first stage a basic transaction system is to be deployed and therefore it would implement financial, material management and sales modules. Later on it will go for other modules like plant maintenance, production management, human resource etc. for all plants.

In Rollout and Modular approach, a firm takes a template rollout approach as described earlier, but first, the basic requirements are implemented in one plant and then rolled out to other plants. Next, the company upgrades the template with more functionality and then again starts rolling out the template in all other locations.

This approach gives lots of scope for learning from earlier implementation and is better in terms of change management. The only drawback here is that more time is needed to complete the implementation.

Different types of ERP projects are

1. **ERP implementation projects**: These are classic ERP projects implementing an ERP solution for the first time in a company.

2. **ERP up gradation projects**: Existing ERP customers need to upgrade to the next version of ERP for better function and/or when the application vendor denies supporting older version of ERP or agrees to support a much higher annual charge.

3. **ERP global rollout projects**: A multinational company having operations in different countries or a company having different businesses may adopt this approach. In this case, based on common requirements of different countries /businesses a global template is created which is then rolled out in different countries after adding country-specific enhancements. This ensures commonality of the process which are central and still providing local flavour as and where needed.

His also reduces project risk (as most of the countries the solution is tested and working in some other country.) and overall project cost.

4. **ERP migration projects:** These are the cases where a customer who is on a particular ERP wants to migrate to another. In the past, many companies which were on JD Edwards or PeopleSoft had migrated to other software as those companies were taken over and no new functionality enhancements were available in their existing ERPs. Some customers of these ERP even had problem in gettingproper support. For a pure migration project from a client's perspective, there is no business benefit expected as the exactly similar process needs to migrate to a different environment.

5. **ERP harmonization/consolidation project:** These are the cases when a company has different ERP instances for different countries/businesses and wants to consolidate these into one to reduce total cost of operations.

As there are different types of ERP projects, the same methodology may not suit every type. So, package vendors and consulting companies came out with several versions of methodology to suit a specific type of project requirement. For example, SAP came up with a separate ASAP methodology version for upgrade and global projects. SAP also has a methodology for application support known as Run SAP.

Implementation of ERP is a strategic decision. It involves the commitment of top management and consultants. ERP provides up to date information and enables decision-makers to take the right decisions in reducing the cost and improving the quality. The implementation involves some difficulties. The implementation should be justified. It involves heavy expenditure to the tune of millions of dollars. The implementation cost includes the cost of software, hardware and training the necessary workforce required to work on the system.

The implementation takes some months to few years depending upon the nature of the business, branches (sites) to be integrated, national or international sites to be covered, etc. The heavy industries in the manufacturing sector find it

affordable to integrate at the national or global level because of the economy of scale it offers. Broadly the steps involved in a total ERP implementation are as follows:

1.   Identification of the needs for implementing ERP package

2.   Evaluating "as is" situation for business

3.   Deciding about the would-be situation for the business

4.   Reengineering of business processes to achieve the desired results

5.   Evaluation of the various ERP packages

6.   Finalisation of the ERP packages

7.   Finalising the implementation consultants

8.   Implementation of the ERP package

Some of the large scale industries which have implemented ERP in India have achieved economy of scale, significant market share. As their sales turnover and assets size are in billions of rupees, heavy investment in ERP software is justified. Successful implementation of ERP is the obvious goal of any organisation that chooses to go in for implementation. Given the kind of complexity coupled with time constraints that are inherent in almost all such projects the risks involved are considerable.

3.4.5 Business Process Reengineering

Business Process Reengineering (BPRE) is a radical transition that companies must make to keep pace with ever-changing global markets. BPRE makes companies more customer-oriented and responsive to the changes taking place in market conditions. BPRE is a rethinking process that helps to improve process speed, quality and output of materials and services.

Over the years competition and the increased customer focus have undermined the importance of economy of scale. The relation between customer and company is no longer is restricted to selling and buying. It encompasses business

activities, consulting and pricing. Earlier information technology was used in the automation process reducing manual work and time.

Now information technology is being used not only for automation, but to redefine the processes, changes and development. Today IT and BPRE are being used simultaneously. BPRE team tries to maximize and streamline processes and assess whether they should be changed or perhaps thrown out.

3.5.1. Common Modules of the ERP Systems

Basically, firms deployed modules such as financial accounting, controlling, personnel administration, personnel development, general logistics, materials management, procurement, inventory control, production planning, and sales and distribution (Hernandez, 1998; Appelrath & Ritter, 2000). Each of these modules in turn comprised of numerous sub-modules that accessed a common database. Firms chose to deploy modules in three ways. Firms implemented each of these modules and/or sub-modules on a stand-alone basis to address specific business activities. They deployed one or more modules and/or sub-modules as a partially integrated solution that addressed a group of business activities. Firms also chose to leverage the full integration potential of the ERP system by implementing all the modules and sub-modules to form a complete ERP system (Hernandez, 1998; Koch 2001; Poston & Grabski, 2001).

Most of the firms deployed certain basic modules such as CRM, SCM, E-Commerce, product data management (PDM), and EDI with sub-modules.

Table No: 3.4

Example Common ERP Modules

Accounting & Financials	Sales & Customers	E-Commerce & Web Store	Purchasing & Operations	Inventory & Distribution	Reporting & Administration	Human Resources
General ledger & journal entries	Opportunities and pipeline management	Online product catalogs	Purchase orders and deliveries	Items management, item queries,	Excel-based reporting, Drag & Relate	Employee directory & administration
Cost accounting	Customer & prospect contact & activity	integrated web store with inventory	Goods receipts and returns	Receipt to stock, release of stock, and stock transaction	Data migration workbench, user defined fields, APIs	Human resource reports
Budget and project management	Sales quotations & orders	Online shopping cart	A/P invoice and Credit notes	Warehouse transfer and serial numbers	SAP Business One Software Development Kit	Training
Banking and statements	Sales & pipeline forecast	E-mail and promotional campaigns	Bill of materials	Inventory (stock) revaluation		
Payment processing and reconciliation	Web-based customer relationship management	Payment, tax and shipping handling	Production orders	Replenishment of Inventory		
Financial statements and Reporting	Service contract management		Forecasting	Customer / vendor catalogue Price lists and special pricing		
Sales tax, VAT and GST	Service call management entry & tracking		Material requirements planning (MRP)	Batch management and pick and pack		
Multi-currency Support						

Source: https://www.sap.com/india/products/business-one.html

Diagram No: 3.9

SAP Business One Common Modules
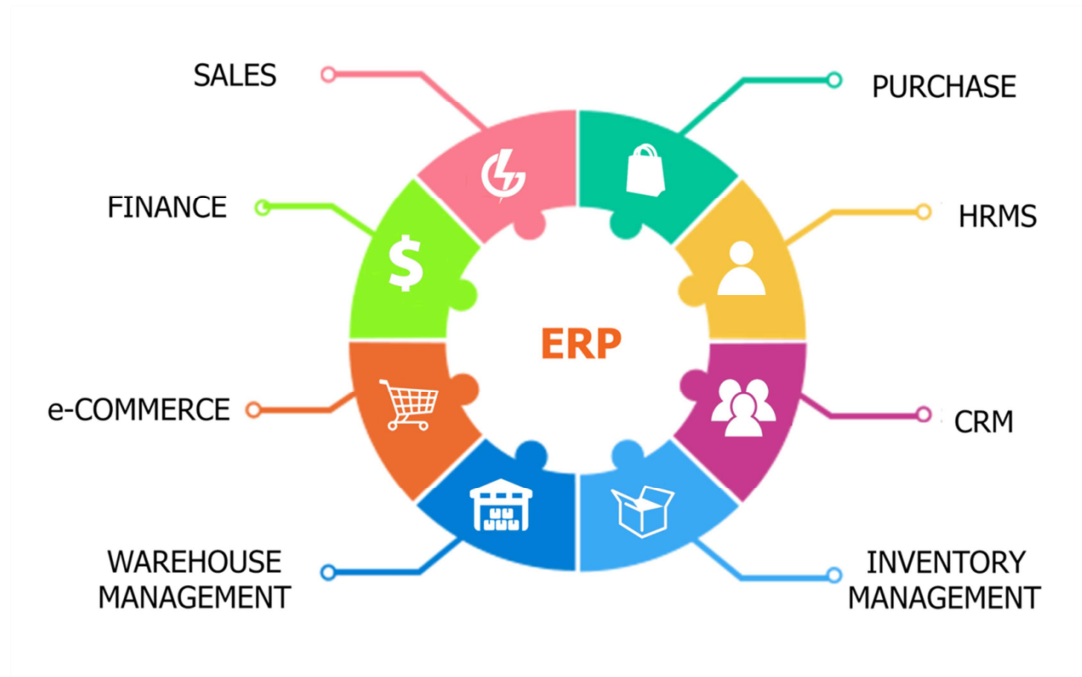
3.5.2. Systems Approach to ERP

Studies show that single module with or without sub-module deployments ensuring increased efficiency and benefits (Klaus, H., Rosemann, M., & Gable, G. G. (2000). Most ERP studies also indicate that firms bags increased benefits through implementing and deploying all the available modules of the given ERP system (Moon, Y. B. (2007). These studies confirm that the effective integration of modules over the years enhanced business performance. Firms facilitate the implementation process by incorporating continuous organisational changes in parallel along with their technical implementations. The management focuses on managing the ERP system implementation and the larger environment for maximizing the benefits from their ERP systems.

It suggests that an organisation which adopts a systemic view on ERP system deployments and implementations derives optimal performance benefits. The management focuses on managing the ERP system implementation and the larger environment for maximizing the benefits from their ERP systems. It suggests that an

organisation which adopts a systemic view of their ERP system implementations derives optimal performance benefits.

Diagram No: 3.10

3.5.3. Need for Research

Descriptive and case studies focus on a short-term basis stressing the effectiveness of the process of ERP implementation. Now the researchers shifted their attention to the long-term analysis of specific operational and usage issues. An empirical work on ERP systems is limited. Selected modules that form part of the ERP system have been identified, specific CSFs associated with effective implementations have been examined, and the existing benefits from the ERP systems. Most of the research studies scrutinized the issues separately but absence systematic studies with scientific rigour.

Table No: 3.5

Technological, operational & business reasons for the acquisition of ERP

Technological	Operational	Business
Desire to replace existing IT infrastructure	Data visibility & integration	To cope with and facilitate Globalization
Desire to outsource software maintenance & development	Improvement in managerial accounting & reporting	To facilitate merger / acquisition
Standardisation in technology used	To implement cost control & work flow automation	To adapt best practices built in with ERP
Resolution of Year 2000 problem	Improve customer service & new product development	To facilitate the implementation of BPR
Long term IT cost reduction	Unified reporting & increase reliability of information	To increase flexibility & agility in doing business
Need for adapting clean state approach for improved software system	Improve managerial decision making & operational efficiency	Pressure from value chain & need for electronic networking & collaboration.

3.5.4. ERP systems upgrade

One of the least addressed issues related to ERP software is the decision to upgrade from one version to another.

There comes a point in time when the existing system is deemed to have served its purpose and is viewed as more hindrance to progress than an enabler. With the passage of time, a decision about what to do may be continually put off. The opportunity to seek the benefit of a new or upgraded system is offset by the distraction of the potential cost and effort. There are three options: upgrade, refurbish or replace. Upgrade has the advantage that the people are familiar with both the software and the vendor. Also, an upgrade may be more quickly implemented than a replacement.

3.5.5. Steps in the ERP Implementation Process & Approach:

The following are the project implementation keys to be focused while implementing ERP.

1 .   Selection of ERP software

This is the task of going to understand ERP software selection procedure. First, aware about existing ERP software business solutions available in the market.

Need to thoroughly go through existing major ERP software, ERP software selection criteria, merits, demerits etc.

The following are the points to be kept in mind:-

a)   User-friendly

b)   Easy Customisation & maintenance

c)   System's capability in terms of business analytics

d)   Meet the current and future business requirements

e)   High level of Security

f)   The quality of data, reports and information.

g)   Concepts standardisation and simplification

2.   Selection of ERP system implementation partner

Properly select authorised ERP system implementation partner, those who have more expertise (functional as well as technical) in implementation & supporting service.

You can identify the best ERP system implementation partner in the market based on services, support, & quality of functional & technical expert, etc.

a)   Also, you can take help from ERP software supplier & ask for best implementation solution provider

b)   Also, you can take help from ERP system customers for effective implementation because they have real time implementation experience & they know better how to implement it effectively.

Note: – Good ERP system implementation vendor partner selection, which has excellent command in ERP implementation, supporting & up gradation task.

3.   Dedicated Project Team required

Internally project execution team identification (Project team finalisation)

a)   The dedicated project team should require driving implementation task efficiently

b)   The project team should mixture of the cross-functional expert

Note: – Dedicated implementation team to be required during ERP system designing & configuration & company project team fully involvement required for proper ERP system implementation to meet Project goal & targets).

4.   Cross Application functional expert's involvement

It is a very important phase in ERP system implementation because of without involvement of cross business application experts we can't suppose ERP implementation successful.

It will help & assist to the team during business process mapping & business blueprint designing & it will always help during system designing & configuration.

So ensure before ERP implementation team declaration whether project team mixture of cross business application expert or not

You can clearly understand of functional expert's importance via this example Let's suppose your top management wants to implement material & inventory management system in entire organisation so during implementation you should ensure that your project team (those who have excellent knowledge & sound

knowledge about material management & inventory management) strong & expertise in material management solution.

So there are a couple of examples available to understand the importance of functional experts.

5.   Business key user's participation

Ensure enthusiastically participation of key users as well as end-users during project implementation, focus on user suggestions, and provide awareness classes on the project.

Let's understand business key users importance so a business key user means those who have the authority to take the business discussion in the organisation such as a purchasing head freely can take the discussion in purchasing business process.

So during purchasing business process mapping you should discuss & involve purchasing related person so that they can better assist for effective implementation of ERP system.

So encourage the user's participation during ERP system implementation

6.   Implementation strategy selection (phase wise/full approach)

After the selection of ERP software, an organisation should aware about implementation strategy and means regarding its achievement and business deliverables.

For example, an organisation has set of business application in the entire organisation such as maintenance execution, purchasing activity, sales activity, finance & accounting activity, capital project execution, quality system, material management, etc.

So mapping of the business process via ERP system totally depends on senior management whether they want all business process maps in one shot (all existing business process mapping) or they want phase wise approach (all business process implement phase wise).

So based on your business needs it will always better to understand the ERP system implementation approach before implementing any ERP system.

7. **Project Charter preparation & implementation roadmap define**

Define project charter along with cross business application task, project timeline with individual task completion timeline; define project task responsibility, etc & Finalise & freeze Project Scope with senior management approval.

Note: – Realistic project timeline should require avoiding any project delay business impacts

8. **Enterprise business Gap identification**

Discuss & interact with cross application functional users end & understand existing business practices such as maintenance execution strategy, inventory management system, accounting system, quality system, sales system, purchasing system, capital project execution system etc.

Understand the existing business related problem, company existing systems, understand the organisation information management system.

So based on all inputs & detailed discussion you can easily identify enterprise business Gap.

9. **Enterprise business blueprint design & prepare**

After identification of business gaps & business requirements, you can prepare business blueprint document along with implementation partner, where you should mention propose business solution against existing business practices

So you should clear about your business requirements before handing over the ERP system implementation task to the external implementation team

All enterprise business process should standardisation at the company level during blueprint designing.

After design the blueprint document you need to discuss with the management team & business key user for approval & blueprint document finalisation.

Note: -Scalable ERP blueprint document designed for organisation business & all project tasks should execute based on blueprint document & if anything deviates than same communicates & discusses with senior management.

10. **System design & configure**

In this session, we are going to discuss on ERP system design & configuration topic so based on blueprint document & system feasibility we can design & configure the system to achieve the desired business solution.

So during blueprint designing all business requirements clearly mentioned & maps to avoid any uncertainty among team during system configuration & we know that business process blueprint step plays a vital role in ERP project & it will always guide & assist to system architecture during system designing.

And we can't achieve a desired business solution without proper system design & configuration.

Note: – Make sure ERP system design & configure based on Blueprint document & deviation should be tracked.

11. **Project progress status review & discussion meeting**

Effective implementation of any ERP system task always depends on senior management seriousness as well as involvement and interest. Some of them are:

a)   Project review mechanism to define
b)   Project progress tracking & discuss on project progress
c)   Discuss on project related issues such as delay reasons, resources issues, approval issues, supporting issue, management related issues,
d)   Adhere project meeting schedule

12.   System testing

It is very important & critical phase of ERP system implementation project because of many ERP project are failure due to improper testing of system by functional team & management team so before Go-Live of any ERP system in your organization make sure system proper tested along with functional experts,& Users with the help of blueprint document & proper testing checklist.

So you can't skip system testing step before Go-live any ERP system because it will directly lead your ERP system failure& we all are aware of ERP system failure impacts (in next blog I will discuss on ERP system failure impacts)

All business process should test with proper checklist & if any observations find the same communicate to system architecture & rectify it.

13.   Go Live the ERP system

After proper testing of ERP system & approval, you can go for Go Live the ERP system in the entire organisation. So before Go Live any ERP system ensures that proper system testing task has been completed & all approvals documented for future reference.

14.   Conduct ERP system related-training

Ensure 100% utilisation of ERP system in your organisation & provide the exposure to the team for using ERP system effectively for that we need to conduct ERP system related training session internally as well as externally such as End users training, Super Users training, system administrator training & measure training effectiveness.

Also need to be focused on refresher training for the team about new ERP business applications, system enhancements, system up-gradations, monitoring and review etc.

So it is a very important step to make ERP system implementation successful because during training or awareness session they can share ERP system-related

problems, complexity & improvements with you so based on feedbacks you can serve business solution effectively.

15.   ERP Implementation documentation & approvals

All ERP system implementation related documents & approvals should be documented because of all documents will help in future.

So be careful during documentation of implementation. The document categories are:

a)   Project bid related document & approval

b)   Project Charter & scope document & approval

c)   Blueprint document & approval

d)   System design & configuration related documents

e)   Project review & meeting related MOM

f)   System testing checklists & approvals

g)   Go live related approvals of the System administrator and all end users and super users with user guides and training manuals.

Now it is a universal fact that an organisation cannot achieve desired organisational business objectives, goals and targets, which have expected from ERP system without effectively ERP system implementation. It suggests that very careful & effective drive of ERP system implementation task with the help of experienced functional experts, business key users and senior management.

3.5.6. General ERP implementation problems

Most of the ERP case studies literature does not report reasons for failures and thus the reasons for implementations practitioners or researchers do not know failure. Some of the challenges documented are from the US and Western Europe.

1. Integration and Interconnections problems

All the processes are integrated, inter-related, all works need to be redefined and all procedures need to well-defined and create a new one if required. There may be a complication due to earlier function-based integration of the processes. Thus, the process-orientation resulting from process integration is against the functional differentiation which is common in traditional organisations.

2. Technological complexity problems

According to Lowe & Locke (2008), ERP systems are perhaps the most complex and comprehensive business information systems. Most large organisations still require use of large scale, mainframe legacy systems. Managers find it very challenging to manage the technological complexity of different platforms and to harness the technological power of new enterprise technology. Rogers (1983) assumes ERP become a complex business solution, diffuse slowly and in a limited capacity and finish without realizing its full benefit.

3. Lack of proper ERP management

Laudon & Laudon (2006), argue that most managers are trained to manage a product line, a division, or an office. Their argument is supported by Rishi & Goyal (2008). They are rarely trained to optimise the performance of the organisation as a whole. However, Bingi et al. (2002) report that enterprise systems require managers to take a much larger view of their own behaviour, to include other products, divisions, departments and even outside business firms. Therefore, ERP systems must be developed and implemented over time guided by a shared vision of objectives. According to Laudon & Laudon (2000), many organisations find it very difficult to develop a shared, enterprise-wide vision to guide systems implementation.

4. Cost of technology

This is because ERP is a fast developing and semi-finished product which needs to be configured and tailored to organisational needs by consultants. The

customisation cost may be more than implementation cost in certain circumstances. Therefore, arguably, ERP systems are generally expensive to purchase and implement in organisations. Koch et al. (1999) state that ERP projects have a reputation for draining corporate resources and funds given the massive resources required.

5.   Staff turnover problems

Once the selected employees are trained and after investing a huge sum of money, it is a challenge to retain them, especially when they are skilled. Their pay needs to at least doubled due to their technical skill, but the companies try to manage by providing other intangible strategies such as flexible work hours, and providing other.

6.   Organisational change problems

As stated by Umble et al. (2003), Adoption of ERP is not merely a software installation but it an entire organisational change project. The projects call for co-operation, teamwork, and planning for organisational change are difficult to do when senior management is too busy to give the project adequate attention. The projects bring about massive organisational changes as they consist of many functional modules that can span the whole organisation and yet share a database.

The introduction of any new technology may result in massive staff layoffs and morale prob-lems. The integration of departments leads to reduced need for many staff to man operation hence leading to staff layoffs. The company may lack resources to compensate employees over their job losses.

7.   Product quality and vendor unreliability problems

All ERPs have similar modules and functionalities distinguishing their service quality, implementation styles, customisation and vendor support. System developers are changing hardware platforms, sometimes operating systems and database platforms, and other times overall system architecture. All the vendors are more versions of the same ERP due to continuous developing new version and

organisations need to buy only brand new, 'bug's proof, leading edge, and stable one.

3.5.7 General ERP implementation challenges

The main challenges of an ERP implementation grouped in the responsibility of Management, ERP Vendor and Employees listed in the following table:

Table No: 3.6

General ERP implementation challenges

Sl No.	Management Related	ERP & Vendor Related	Employee Related
1	Inadequate definition of requirements	Selection of wrong /Poor ERP Package	Resistance to change
2	Lack of top management support	Technical complexity	Staff turnover
3	Lack of organisational Readiness	Software & business process incompatibility	Lack of Employee Support/Motivation
4	Inadequate Resources/Money/People/Hardware/Software	Unnecessary Customization	
5	Inability to achieve organisational understandings of functions/processes/Employees	Inadequate training and education	
6	Poor communication	Integration issues	
7	Dynamic nature of the business	Poor project design and management	
8	Inadequate Employee Training/ Retraining		
9	Unrealistic expectation of Cost/benefits/Time & ROI		
10	Poor project design and management		
11	Miscalculation of time and effort		

These challenges need to be addressed for the success of an ERP project. Following are the some of the reports from earlier studies on this topic.

Business processes must be tightly integrated, jobs redefined and new procedures created throughout the company. The process of change is challenging and employees may resist and often not ready to accept new roles and challenges.

Berente (2009) argues that the integration of existing stand-alone information systems with ERP systems is a major problem for many organisations. This is further complicated by the fact that ERP systems also seek to integrate business processes in organisations, which were previously function-based. Thus, the process-orientation resulting from process integration is against the functional differentiation, which is common in traditional organisations.

According to Lowe & Locke (2008), ERP systems are perhaps the most complex and comprehensive of business information systems. ERP systems are built on new powerful technologies that require very different skill sets than legacy systems. Most large organisations still require use of large scale, mainframe legacy systems. Managers find it very challenging to manage the technological complexity of different platforms and to harness the technological power of new enterprise technology.

According to Skok (2001), intangible strategies such as flexible work hours, telecommunication options, and opportunities are also being used.

As stated by Umble et al.[27] (2003), ERP implementation is not just a software project but an organisational change project. The projects call for co-operation, teamwork, and planning for organisational change are difficult to do when senior management is too busy to give the project adequate attention. The introduction of any new technology may result in massive staff layoffs and morale problems. The integration of departments leads to reduced need for many staff to man operation hence leading to staff layoffs. The company may lack resources to compensate employees over their job losses.

Bingi (2002) reports that enterprise systems require managers to take a much

larger view of their own behaviour, to include other products, divisions, departments and even outside business firms. Therefore, ERP systems must be developed and implemented over time guided by a shared vision of objectives. Business processes are not static in a growing environment. The changes emerged from opportunities, technological advantages and innovation in production processes leads to the changes in the organisations business processes. This change is continuous. Hence it demands ERP software processes to be dynamic. In the emergences of business over the internet and virtual office environment we require software which handles all processes over the internet.

Rishi & Goyal, 2008; Laudon & Laudon,(2006, 2000). The previous studies about ERP implementation issues were case studies on individual organisations. The main problem with ERP case studies is that less implementation challenges resulting in these failures have been reported in the literature, and thus the reasons implementations failure is not known to practitioners or researchers.

Lowe & Locke (2008), Information that previously maintained by different departments must be integrated and available to the company as a whole. Business processes must tightly be integrated, jobs redefined and new procedures created throughout the company. The whole process of change is challenging and employees are often unprepared for new procedures and roles. The ERP integration problem as old as the beginning of ERP itself. ERP systems has its own inherent technological complexity, perhaps it is the most complex information systems.

Report by the Institute for Data Research report (Aiken, 2002) ERPs are built on the latest powerful sophisticated technologies require specialised skills. Most large organisations still require use of large scale, mainframe legacy systems. Managers find it very challenging to manage the technological complexity of different platforms and to harness the technological power of new enterprise technology.

Sawah et al. (2008) "ERP adoption is so complex and proven to be very difficult to adopt for many organisations".

Laudon & Laudon (2006), "Lack of proper ERP management they argue that most managers are trained to manage a product line, a division, or an office".

Bingi et al. (2002), reports that "enterprise systems require managers to take a much larger view of their own behaviour, to include other products, divisions, departments and even outside business firms". Therefore, ERP systems must be developed and implemented over time guided by a shared vision of objectives.

Laudon & Laudon (2000), many organisations find it very difficult to develop a shared, enterprise-wide vision to guide systems implementation.

Monk & Wagner (2006), "Cost of technology and the price of prewritten software packages are cheap when compared with in-house software development". The cost of in-house ERP development will be many times more than the purchase of software packages available in the markets.

Koch et al (1999), "ERP product is a semi-finished solution needs to be configured, tailored and customised for organisational needs". Major customisation and maintenance cost may cost even higher than that of basic ERP product cost. Therefore, arguably, ERP systems are generally expensive to purchase and implement in organisations. ERP projects have a reputation for draining corporate resources and funds given the massive resources required.

Skok, (2001), it is a tough task and challenge for the organisations to retain the selected employees who are trained after spending a lot of resources and money when there is a scarcity for skilled SAP persons. Employees can increase their salaries by accepting other positions as well. Organisations struggling for framing strategies to hold employees like bonus programs, fringe benefits and company perks, hike in salary, training and education, and honouring to company loyalty etc. Other intangible and fringe strategies like flexible work hours, telecommunication options, and opportunities also used.

3.5.8. ERP as a change process of Business Process Re-engineering (BPR)

ERP implementation to an extent consists of BPR and the customisation as per needs and requirements. **Arif (2005)**, asserts that if an organisation does not already move as per the manner of ERP Systems Software Package they acquired, then, they must re-engineer its entire business processes and practices. Therefore, BPR is considered as a key practice in ERP implementation. **Keller & Teufel (1998)** describe BPR as a pre-planning phase of ERP, which can be done by either ERP software vendors or consultants, or organizations' own in-house team. The system analyst need to carefully examine the existing structure of the business, procedures and practices in order to propose IS solutions that aimed at introducing radical changes to the business structure, procedures and practices. Replacement of the existing business structure and processes are the primary goal of BPR, which are much more effective for both the customers and the organisation itself. Therefore, BPR can be conceived as an organisational technique for changing and restructuring business operations in order to achieve overall improvements. However, BPR the technique is seems to be new, but has deep-rooted and was widely developed and used by consultancy companies and industrialists in the 1990s. **O'Neill, P., & Sohal, A. S. (1999),** Improvement of business operations can also be achieved through TQM or process improvement, but with BPR, the targeted improvements will be more significant. **Abdolvand et al. (2008)** cautioned that inclusion of BPR in the ERP implementation stage increases considerable risk of implementation failure and also hike in expense of implementation. **Eardley (2008).** Problems with BPR arises when the radical or "clean sheet" approach is adopted during ERP implementation and should not permit to change their entire present infrastructure and to implement completely to a new one, nor permit to interrupt their existing business while re-engineering processes are done. **Eardley et al. (2008)** "The ERP systems adoption require an organisations to design and re-think their entire organisational processes in order to fit with the new system". In this case, BPR is driven by IT and seeks to radical changes to the existing business practices.

Sarker & Lee, (2002), assumes that the view neglects the role of human agents and the existing organisational and social contexts in the introduction of new technologies. Organisations can be fully redesigned through new technology. There are two possible problems with this view. First, the redesigned process may be less than optimal process efficiency. **Reijers & Mansar (2005)** Second, strategic misalignment may be possible because the new process may not contribute to the attainment of strategic business objectives. They argue that, this is in turn, can lead to a full or partial "failure" of the BPR effort. **Abdolvand et al. (2008),** better results can be achieved when ERP System is used as a BPR-enabled as well as a proactive tool for BPR. For the purpose BPR, the business strategy and organisational IT strategy needs to be aligned so that there is no "technology gap". The IT-supported IT infrastructure of ERP then forms the entire future business strategy. In the enabling role, the IT strategy supports the organisational business strategy. In the proactive role, the IT strategy becomes a part of the business strategy.

3.5.9. ERP Implementation

Implementation of ERP is thus, regarded as a complex and dynamic process; Firstly, it involves a mixture of organisational and technological interactions. Most of the ERP failure cases are less documented and the results are unknown. It is aimed that the findings of this research will light in improving ERP implementation success rate in PSUs in Kerala.

Al-Mashari & Al-Mudimigh (2003), implementing ERP systems in many instances causes dramatic changes that need to be carefully administered to tap the advantages of an ERP software solution. The deduction is that this trend has not changed significantly.

Esteves & Pastor (2001), the implementation phase of the ERP lifecycle is currently the most widely researched in the IS discipline. They associate this focus with the difficulties of ERP implementations.

Esteves & Pastor (2001) subdivide the ERP implementation literature into four topics relating to implementation: case studies, success cases, approaches, and

other issues. The ERP literature can be put in terms of ERP implementation strategies, ERP system upgrade, ERP implementation challenges, ERP implementation models; the future ERP trendS and CSFs.

3.5.10. ERP Implementation Strategies

The decisions taken during ERP implementation system are strategic in nature. These decisions relate to: the ERP system to be adopted, the scope of implementation, the implementation strategy, the 'go-live' strategy, the training strategy and upgrade.

Lee & Myers, (2004) ERP decisions are strategic decisions because they: are normally adopted in organisations to support strategic objectives of organisations; spending a large amount of organisational funds and resources; involving a long term process for shaping the ERP system and organisation processes are complex and it affects organisational stakeholders.

Umble, M M. (2003). The project preparation phase of the implementation process consists of getting ready by planning and organizing people and tasks. It is a very important and critical stage of the ERP project since it constitutes the basis for the project. Among the decisions, organisations have to make our decision on the ERP product, decision on functionalities or modules, decision on the implementation consultant etc.

Al-Mashari (2003), The blueprint phase comprises a detailed analysis that will allow the production of documentation on the business process requirements. In addition, blueprint phase consists of analysing the current business processes and investigating the chances for BPR or customisation. During the blueprint phase, organisations need to decide on whether to customize the ERP system or reengineer the existing business activities processes. Realization phase deals with the technical aspect and involves building up a system on the processes and procedures investigated in the former stage.

Loh, T. C., & Koh*, S. C. L. (2004). The final preparation phase is critical to the success of the implementation project and involves conducting a set of tuning

and testing activities related to the configuration, integration, quality, interfaces and reports of the system. Moreover, this phase is concerned with the education and training of the users on the system processes, data discipline and modules.

Yusuf, Y., Gunasekaran, A., & Abthorpe, M. S. (2004), organisations must make a decision on personnel training strategy. Lastly, go-live and support phase deals with the maintenance and improvement issues to keep the implemented ERP system running and up to date. The Go-Live phase includes also the monitoring of the implemented system in order to make sure to make the necessary changes and modifications if problems are to occur and that could affect the performance of the ERP. During this phase, organisations make decision on: go-live strategy, maintenance strategy, and bolt-on applications.

The following are the implementation decisions organisations are required to make based on the researcher's conception and organisational choices (Strategic decisions)

1.   Decision relating to the evaluation team and its members

2.   Decision relating to the evaluation partner(s)

3   Decision relating to the vendor(s)

4.   Decision relating to key business processes

5.   Decision relating to functionalities or modules

6.   Decision relating to bolt-on applications

7.   Decision relating to IT infrastructure

8.   Decision relating to the implementation team

9.   Decision relating to the implementation partner(s)

10.   Decision relating to implementation strategy (BPR and software customisation)

11.   Decision relating to go-live strategy (phased, plunge, or parallel)

12.   Decision relating to ES variation strategy (similar or different versions of the same ES)

13. Decision relating to personnel training strategy

14. Decision relating to reporting needs

15. Decision relating to maintenance strategy

The fundamental decisions regarding scope like; physical, BPR, technical, resource allocation and implementation strategy to be used to implement ERP system based on such aspects like organisation size, complexity and structure, available resources, attitude of the people towards change.

Each implementation is unique because different organisations will make different decisions based on their contextual factors. The decisions taken by implementation project teams significantly influence ERP implementation outcome. Therefore, organisations intending to implement ERP systems need to be aware of the trade-offs involved in making these important decisions in order to minimize the risk of failure and to optimize their ERP implementation.

Shehab, E. M., Sharp, M. W., Supramaniam, L., & Spedding, T. A. (2004), Organisations implementing ERP system must decide whether to purchase all the ERP modules from a single vendor or to select ERP modules from different vendors based on their particular needs. These two strategies are referred to as enterprise suite and best of breed respectively.

Light (2005) and Mabert et al. (2003). A single vendor solution may not have all the functionality required, but will be easier to implement. Similarly, organisations implementing ERP system must decide to either adopt business processes embedded in ERP or to customize the ERP system to make it suitable to existing business activities and processes. All strategies are complex according to their scope, scale and the requirements of the ERP and BPR. **Krumbholz & Maiden (2000),**'misfits' resulting from differences between system requirements and business requirements normally occurs during ERP implementation due to contextual differences between the package and the implementing organisation, requiring it to either configure or customize their system in order to resolve the 'misfits'**.**

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Grabski & Leech (2007) and Shehab et al. (2004) state that configuration known as 'Vanilla approach' can take the form of conscious redesigning of organisational processes and structures to accommodate the functionalities of the ERP system. Vendors promote the 'Vanilla approach' (best business practice) embedded in ERP leading difficulties for future upgrades. The customisation cost is also a concern for the management.

Light (2005) Support the ERP adoption with minimal customisation withholding the organisational evolved over time. However, the researcher's own experience and support indicate that a completely 'Vanilla' implementation is often not feasible.

Nicolaou (2004) describes customisation as the changing the software to fit the already existing business processes in order to cater for organisational specific requirements. Customization of ERP implementation includes modification of the package ranging from package code customization to development of custom module interfaces and comparison. **Arif (2005).** It also implies less organisational changes, as it does not require a sudden change in the organisation's best practices and helps to retain a competitive advantage as well as the way the employees work.

2000; Soh & Sia, 2004a; Huang & Palvia, (2001); Hong & Kim, (2002) argues that ERP customisation is not rational. The successful implementation does not necessarily mean to adopt standard processes, but requires focusing on the improvements, which give a competitive advantage to the company.

Soh & Sia (2004) found out that the reasons for customisation might concern the absence of a required functionality in the standard system and lacking consistency in standard processes and organisational decision-making. It requires an ERP implementation would be a mixture of software customization with organisational setup. Therefore, the decision an organisation may take in response to each 'misfit' is the result of a process of interaction and negotiation among various parties including management, system users and consultants. The organisation would adopt the package, or the organisation structures would be more likely to prevail. **O'Leary (2000),** It may be due to the package would be customized via

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addition of supplementary modules or modification of package code. Once ready to install, organisations are required to follow on big-bang or phased-in (modular strategy) as a 'go-live' strategy. The big-bang implementation approach refers to a scenario where the old systems discarded and all modules of the new ERP system introduced into each business unit over a weekend. The big-bang approach having the great inherent advantage of not requires any parallel running of the existing legacy system and it requires entire resources are utilised within a short span with available resources addressing all problems in particular modules, reducing the risk of total system failure.

Poston & Grabski, 2001; Robey & Ross, 2002), The modular implementation approach, on the other hand, refers to a scenario where one module is implemented, and then it is run in parallel with the legacy system until the output results are satisfactory (i.e. reports and data). Although this approach presents a minimal risk of failure, it leads to increased costs of ERP. Companies planning to implement ERP system need to aware about the inherent facilities of competing strategies to make informed decisions and boost their implementation outcome.

3.5.11. Oracle supported Application Implementation Methodology (AIM)

This System framework includes a set of related and connected elements containing some tasks, phases, processes, and dependencies:

A **task is** a unit of work results in a single output. the forms of tasks are schedules, reports, codes, and their test results. It had only one process, the implementation project team members are entrusted to a process for their needs and requirements, their specialization and background

A **process: It is a** related set of objectives; it is very closely related to a set of dependent tasks for fulfilling a major objective. It is a resource skill requirement. A common discipline will be followed in any process. An inputs process and a deliverable outputs.

A **phase: C**hronological grouping of tasks is called a phase. It is a way of organising tasks in a flexible manner, it prepares schedules for major deliverables, and it delivers projects.

A dependency may be; Data dependence, Control dependence, resource dependence. Dependencies in software dictate the ordering requirements in and between instructions.

Terms and definitions:

Business Requirements Definition: Defines the business requirements and needs that must be carried out by the project. The business processes documentation is done by identifying business events and defining and describing the steps that relate to these events.

Business Requirements Mapping: The requirements of an organisation need to be compared and contrast with certain standard application software projects and its functionality and identifies the inner gaps and requirements that must be honoured to fully meet the needs. When gaps arise between requirements its functionality emerges. When such situations arise, it will be resolved by documenting mapping workarounds, creating alternative solutions, adding application extensions, or by changing the process.

Application and Technical Architecture: This is the designing of information systems architecture according to the business requirements, it reflects the business vision. According to the business and information systems requirements, this technical process helps the development of a plan for setting and configuring the hardware requirements for better ERP implementation.

Module Design and Building: It produces and design custom software solutions according to the needs to fill the gaps in different functional units identified during the business requirements mapping stage. A detailed custom software solution as a module or certain modules will be designed. It must be tested before implementation.

Data Conversion: It is crucial for implementing a new system in an existing organisation where already running certain ERP or other solutions. It defines the tasks of converting existing legacy system data to the new database applications tables like 'Oracle'. It also needs to define the objects for conversion and the source of database these objects are being stored. The converted data may be used for system testing, training and acceptance testing. It also needed for production.

Documentation: It begins with materials created firstly in the project. The technical material and user manuals required for the implementations are prepared by the programme to wring personnel using these documents.

Business System Testing: The resources required for project testing is secured at this stage. Testing aims at linking and converting test requirements into business requirements.

Performance Testing: It defines, builds and execute a performance appraisal test. It helps to take decision based on the results regarding whether or not the performance is acceptable for the business. It also helps to propose tactical and strategic changes to adhere the performance quality standard shortcomings. Testing of performance is inter-dependent and inter-related to the architecture of the technical application.

User Training: any new system application and running requires training both for its administrators and its users. It includes the development of materials, methods and administration. It helps the Instructors and courseware and material developers orient and refresh their material toward roles, jobs and responsibilities.

Production Migration: It is the migration or moving of the entire company, system, people to the new enterprise resource planning system and refines the production systems and the future plans. This process involves the complete transition to production readiness, production changeover or cutover, and a post-production detailed and complete support.

3.5.12. ERP System Implementation Models.

Ross (1999), A typical ERP implementation taking between one and five

years and is a big challenge. They proposed a five stage model for ERP:

1)   implementation, 2) stabilization, 3) continuous improvement,

4)   transformation and 5) Go-live stage.

Five stage model for ERP

Five stage model for ERP
Implementation,
Stabilization,
Continuous improvement
Transformation
Go-live stage.

Markus & Tanis (1999) having the view that an enterprise system experience cycle model has four phases, namely: 1) charter, 2) project, 3) onward and upward and 4) shakedown.

Parr and Shanks (2000), developed a Process Phase Model (PPM) for ERP implementation, which is an extension of Ross (1999) and Markus & Tanis (1999) models, but need to integrate. **Shanks, (2000)** CSFs in each stage. In the PPM, an ERP project is divided into three continuous phases: 1) planning, 2) project and 3) enhancement. In the project phase, it includes activities of set up, re-engineering, design, configuration and testing, and installation. The ERP implementation models mentioned above contain implicit assumptions with regard to the content, context, and nature of the change process.

Weick & Quinn, (1999). Argued that Parr and Shank's model (PPM) was a move towards what can be called an implementation model because it attempted to identify the pertinent factors which should be controlled in each phase of implementation for achieving a successful implementation. However, the main weakness of the PPM is that it over emphasis the project management aspect of an ERP implementation project at the expense of other pertinent factors such as organisation itself - its characteristics - and external factors such the environment in

which an organisation operates. Whereas it is argued that ERP implementation models can help to improve our understanding of enterprise systems, and also can be a good guide for successful ERP implementation, what has been reported as ERP implementation models are more of 'possible' ERP implementation cycles. A 'cycle' is synonymous to a 'model'.

It is argued that a model should go a step further to give guidelines while considering context with the aim of improving the implementation outcomes. To do so, a good model should provide a rich picture of an implementation scenario and the possible sources of influences on implementation and how these actors interact and interrelate to come up with a working acceptable relation beneficial to both the organisation and the individuals.

DeLone & McLean (1992) ERP models discussed above do not include or consider other relevant contextual or environmental influences. In their famous work, caution researchers not only to focus on the dimensions of IT systems success, but to also consider other contingency factors.

Duncan (1972) distinguishes between contexts, he says, "the internal environments are those physical and social factors prevailing within the boundaries of the organisation". Some models consider the influence of contextual factors on ERP implementation.

Saunders and Jones (1992) Model Saunders & Jones (1992) include contextual variables in their study of the performance of the IS function. They investigate both the organisational factors like top management support, size, mission, industry, and so forth as well as the peculiar dimensions to enhance the effectiveness. They proposed an evaluation model which they term "IS Function Performance Evaluation Model".

Saunders & Jones (1992), this study rests on the extent to which it provides support to the view that a model can include both the impact of contingency factors and the dimensions of usage or success.

Willcocks & Sykes (2000) discussed the role of the IT function in ERP

acquisitions.

Sedera et al. (2002) have also used a combination of the Saunders & Jones (1992), Myers et al. (1997) framework Essentially, the framework extends the Saunders & Jones (1992) framework in the context of the assessment of quality and productivity of the IS function. **Saunders & Jones (1992)** recognizes contingency factors and external environmental variables from the organisational factors. They separated the contextual levels into two main areas and provide further insights useful for the development of an ERP implementation model. **Somers et al (2000)**, consider the factors like the type of industry, size and structure of which these researchers imply are critical in achieving positive outcomes from ERP acquisitions. The authors suggested that the value obtained from ERP adoption depends on the extent of matching the process, contexts, and contingency factors framework is rooted in the contingency approach, which will inform the development of this study's model. In conclusion, the studies on the above models are based in developed countries which are significantly different from developing countries. There is extensive research literature on the reasons why organisations adopt ERP systems. The research that is most closely related to ERP system upgrade is software maintenance.

Kidd (2001) defined the software maintenance as "the activities performed on software after the program has been installed". Just as user demand for enhancement and extensions is the most important problem of maintenance.

Lientz & Swanson, (1978), users may also demand upgrades to obtain functionality that an existing version of an ERP system lacks. The most obvious relevant environmental influence is ERP vendors, who stand to profit by selling or licensing ERP software. Vendors actively market new versions well before their ability, promising features and functions that have not yet been built or properly tested. Such pre-announcements can affect the timing of customer's decisions to purchase or upgrade. When ERP supports critical processes and the current version of the system is no longer being supported by the vendor, an organisation is forced to upgrade to the next version. ERP vendors may put a 'sunset dates', for their

support after this date they discontinue support for their earlier versions. The organisation can choose to work with an unsupported version of the software; but the product may become incompatible with other requirements. Unless organisations develop their own software or find another source, their only option is to upgrade the existing version.

Shehab, E. M., Sharp, M. W., Supramaniam, L., & Spedding, T. A. (2004). ERP implemented organisations need not upgrade to every new version since, as per contract, the ERP vendors support multiple versions during the contract time. Proper studies required before taking the decision for migrating to the newer version of ERP and the methodology of upgradation. ERP implementation is a nightmare for certain organisations, as it is not functioning as promised. It has to improve certain key performance areas like efficiency, proficiency, profitability and customer satisfaction.

Table No: 3.7

ERP implementation models in existing ERP literature

Bancroft el al., (1998)	Callaway (1999)	Parr and Shanks (2000)	Markus and Tanis (2000)	Marnewick and Labuschagne (2005)	**Ross (1999)**
a. Focus	a. Project preparation	a. Planning	a. Chartering	a. Pre-implementation	Implementation,
b. As is phase	b. Planning of business processes	b. Project	b. Project	b. Analysis	Stabilization
c. To the phase	c. Configuration of system	c. Enhancement	c. Shakedown	c. Design phase	Continuous improvement
d. Construction and testing	d. Final preparation		d. Onward and upward	d. Construction phase	Transformation
e. Implementation	e. Going live with system			e. Implementation phase	Go-live stage

Source: Compiled by the researcher

Diagram No: 3.11

Single Phase SAP Implementation Cycle

Diagram No: 3.12

Source: Panorama Consulting, 2011 Guide To ERP Systems And Vendors

2004 ERP systems also highly tough and complex information systems and the implementation is very difficult and a costly affair. It requires huge demands for organisational time and resources asserts that organisations spend millions of amount on ERP software packages and implementation and 126customization processes, there is every chance of experiencing considerable problems during the actual stage of implementation. Previous studies reveal that there are several failed ERP attempts. Many enterprises lost investment for ERP packages and to ERP consultants.

Monk & Wagner, (2006) Unisources Worldwide Inc., a largest distributor of paper products, wrote off $168 million in SAP R/3 ERP Implementation related cost and FoxMeyer, a largest Drug distributor, bankrupted in 1996 and also filled a lawsuit against SAP for $500 million for a case related with ERP implementation. FoxMeyer also contended against the ERP giant SAP, that its package was "a significant factor" which led the firm went in to financial catastrophe. The IT giant, Dell Computer Corp, abandoned the SAP R/3 ERP project due to delay and cost overruns.

Diagram No: 3.13

Vendor ERP penetrations 2015

Vendor	Penetration
SAP	22,7%
MICROSOFT	12,3%
EXACT	9,4%
ORACLE	6,6%
CUSTOM BUILD	5,2%
INFOR	3,3%
AFAS	2,6%
UNIT4	1,5%
VAN MEIJEL	1,1%
ISAH	1,0%
QAD	0,6%
IMTECH ICT/AXIANS	0,6%
ACTO	0,5%
SG AUTOMATISERING	0,4%
SYNTESS	0,4%
CENTRIC	0,4%
BOUWINFOSYS	0,3%
IFS	0,3%
MICROS	0,3%
RIDDER	0,3%

All sites with 50 or more employees / The Netherlands
Computer Profile / March 2015

COMPUTER PROFILE
TURNING DATA INTO BUSINESS

Wagner et al. (2006) ERP not just software alone but an organisational change project. The projects intend for co-operation, teamwork, and planning for organisational change and are difficult to implement when senior management is too busy to give the project adequate care. Adoption and successful installation of ERP systems is not an easy task as it requires major changes to entire business processes. The projects bring about massive organisational changes as they consist of many functional modules that can span the whole organisation and yet share a database. Because departments are part of a larger organisation, they are forced to share systems and act not as independent units but as a larger organisation, require good understanding of their individual work.

O'Brien, (1997). The introduction of any new technology may result in massive staff layoffs and morale problems. The integration of departments leads to reduced need for many staff to man operation hence leading to staff layoffs.

Laudon & Laudon, (2006) having the opinion that, when combined to BPR managers can expect resistance to ERP systems from employees, Product quality and vendor unreliability. **Fourney (2007)**, opined that even though most of the ERP systems are similar in nature and functionality, they differ in their output and quality, implementation easiness and vendor support. The stability of the new version or release of an ERP system may not be guaranteed by most of the vendors. System developers are changing hardware platforms, sometimes operating systems and database platforms, and other times overall system architecture. Given that vendors are continually developing new version of their ERP products, one vendor may have several versions of the same system.

3.6. Critical Success Factors for ERP System Implementation

Generally, ERP Implementations have reported success, but there are many failures in instances also. Most of the organisations face many difficulties in deploying and completing ERP implementations and getting effective integration due to numerous, managerial, technical and organisational issues and challenges. In order to overcome these difficulties, many firms adopt an approach of CSF-based ERP System implementation. (Bingi, P., Sharma, M. K., & Godla, J. K. (1999)[22].

Researchers identified certain individual CSFs that the firms focus on these factors will achieve success of implementation easily. (Davenport, 1998; Bingi, Maneesh, & Jayanth, 1999; Padmanabhan, 1999). CSFs are inter-dependent and support the ERP implementation process. Realising the different CSFs, they are very important in different phases of the ERP project. According to the latest ERP life cycle implementation process, recent literature giving priority to CSFs and classifies it (Finney, S., & Corbett, M. (2007)[23].

The competitive capacity can be enhanced through identifying the Critical Success Factor (CSF). Somers and Nelson (2001) created Unified CSF model which contains 20 CSFs, that unifies the set studies made earlier by other authors and the CSFs are categorized in different perspective like Strategic & Tactical as well as organization based & Technology based. Later twelve commonly identified CSFs are consolidated by Bhatt (2005) for the success of ERP implementation project combining all the earlier studies which are listed below:

1.   Project management (PM)

2.   Business process re-engineering (BPR)

3.   User training & education (UTE)

4.   Technology infrastructure (TI)

5.   Change management (CM)

6.   Management of risk (MoR)

7.   Top management support (TMS)

8.   Effective communication (EC)

9.   Team work & composition (TWC)

10.   User involvement (UI)

11.   Use of consultants (UC)

12.   Goals and Objectives (GO)

Studies in ERP when compared to other research in the field of IS, shows that theories on ERP systems implementation have been given less attention. Most

of the studies carried on critical success factors areas lack theoretical basis that successfully link the critical success factors to implementation outcomes of any kind. Besides, there is no consensus on critical success factors owing to difference in context between implementing organisations.

Sarker & Lee, (2000); Leopoldo & Otieno, (2005) It is not a new phenomenon for IS researchers to determine a list of critical success factors' for IT-enabled project initiatives have carried out research in this area to identify similar factors specific to ERP implementations.

Pawlowski et al., (1999), Most recently, authors have employed positivist research approaches to test the validity of these factors as truly necessary conditions for implementation success and then predict the effect of installed ERP technology on organisation performance.

Holland et al.,(1999); Beard & Summer, (2004), The outcome of this is a number of non-industry specific CSFs that were introduced as aids to assist ERP projects has categorized the key factors under ten main points namely: clear understanding of strategic goals, commitment by top management, excellent implementation project management, successful coping with technical issues, great implementation team, multi-site issues, organisational commitment to change, extensive education, training performance measures, accuracy of data, focused, while these findings are useful in predicting the successful outcome of ERP projects, they offer few insights above the existing wisdom because they do not adequately explain why the investigated business outcome occurred.

Leopoldo & Otieno, (2005) In light with their observation, it is argued that these studies are not without benefit because they illuminate important issues for consideration and complexities of projects. Most of the studies carried on critical success factors areas lack theoretical basis that successfully link the critical success factors to implementation outcomes of any kind. They argues that there is no universal consensus on critical success factors owing to difference in context between implementing organisations.

The ERP vendors are now trying to fight for the new generation of ERP systems in clouds and extend their market to companies in developing countries. Davenport's perspective is quite powerful especially with the advent of cloud and web technology makes an ERP to a 'must have' application if an organisation enjoys the economies of e-commerce and large scale operations.

Beard & Summer (2004) support this argument by commenting that "today, enterprise resource planning (ERP) systems are one of the most significant business software investment made in new era". Web-based technology has brought in a new notion. In the last two years or so, the Gartner Group has coined the current ERP systems as ERP II -the next generation of ERP systems, which are based on the principles of collaboration. The front-office functions, like marketing and sales automation, Customer Relationship Management and Supply chain Management Systems gave a new outlook to ERP. With the advent of e-commerce, there were fears that ERP would rest in peace. Today, the drivers behind ERP implementation are most likely to focus on maximizing strategic flexibility and improving business operations by operational cost reduction, enabling integration of business, customer support and responsiveness, improving data and database management and providing better decision making

ERP is not only software, but it is a concept to denote the ultimate integration of all the activities and departments of an enterprise together. And people develop their own Business application on this generalized concept. Each industry is having their business activities which involve Man, material, money of that organization. Common business activities for manufacturing and trading units are Procurement, Material Management, Production, Planning, Sales & Distribution, HR, and Marketing. If it counts the departments of organization then Purchase, Sales, Inventory/Store, Finance, HR are the core departments of each organization. ERP has to plan, manage and integrate all these Man, Material, Machine, and Money resources of any organization. It manages all functionality of any department or business activity.

For finance it helps in financial accounting like receivable, payable, ledger, cash management, consolidation, fixed asset management. For Purchase & inventory, it helps with supply chain management concept, order to receive, warehousing, supplier management, rating, budgeting etc. For HR you can do recruitment, employee management, payroll, salary, leave management, training, assessment etc. It equally helps in project & production planning, pre-sales, after sales activities too.

Diagram No: 3.14
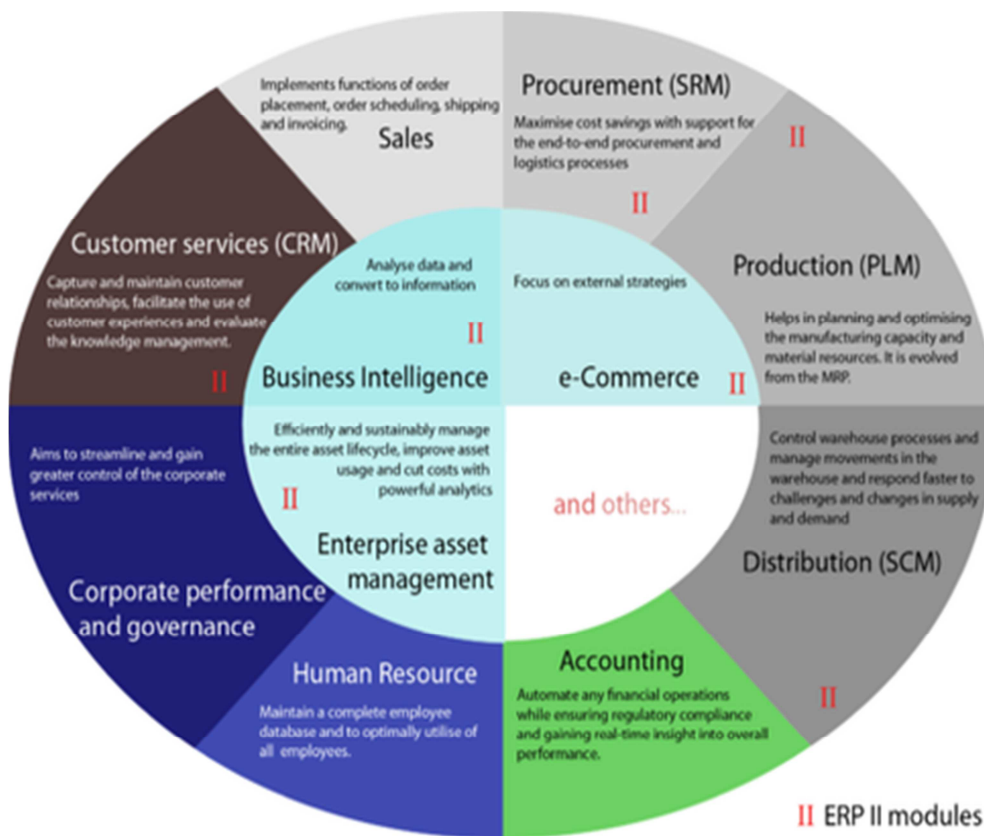
3.7. Advantages of ERP

Gupta (2000), provides the merits of ERP system in to direct and indirect. The direct merits include integration of business functionalities and improved decision-making with reduced inventory, better sales and customer service, etc. The other indirect merits include improved corporate image, customer goodwill and customer satisfaction.

➢ **Integration of Business Functionalities:** ERP packages are integrated information systems supporting optimization of independent business functionalities of a business unit.

➢ **Flexibility:** Possible multi-functional environments like language, currency, accounting standards etc are covered in ERP system with the management of multiple locations.

➢ **Better analysis and planning capabilities:** It is possible to utilize fully all the decision support and stimulation systems.

➢ **Use of latest technology:** Latest ERPs use the latest technology to tap the advantages of ICT for sustained growth.

➢ **Reduced inventory and inventory carrying cost:** Improved planning and scheduling practices allows to reduce inventory. Both cost of the material stocked and savings of the inventory carrying costs. It reduces the interest, costs of warehousing, cost of handling, obsolescence, taxes and insurance, damage, pilferage and shrinkage.

➢ **Reduced manpower cost:** Improved manufacturing processes lead to less manpower and reduction of rework and overtime.

➢ **Reduced material costs:** Improves procurement practices support lower material costs.

➢ **Improves sales and customer service:** Improved coordination of sales leads to better customer service and thereby increased sales.

➢ **Efficient financial management:** Improving collection procedures will reduce the outstanding receivables leading to sufficient cash flow.

3.7.1 The other listed Benefits include:

Better planning and forecasting

Better resource utilization

Improve efficiency and quality of all departments and the entire organization

Instant get status of whole organization, project, department or division.

High data security

Better analysis through business Intelligence.

Better customer service

Increase productivity.

Facilitate integration of all units of the business globally.

Company-wide up gradation.

Real-time information

Reducer of redundancy, Mistakes and errors

Efficient work environment

Past knowledge with experience of vendors, leading to best build and implement a system

Customized user interface facilitates the operational structure of the product

ERP also facilitates in managing the firm's entire accounting jobs, local and overseas purchase order, control of inventory and stores, contact management, supplier and purchases, customer and sales with CRM. Enterprise Resource Planning is business software, dedicated to driving collaboration across departments and efficiency in business processes. It's ideal for all sizes of business that need a view of all processes, results and spending across the business.

Basically, the ERP software is one integrated software package that manages every aspect of a business and keeps everything in one place, allowing for far better

control. It keeps everyone in the business up to date on what is happening at all times, and in real-time.

Enterprise resource planning is business information and management software that can be used to interpret data after collecting, storing, and managing. It uses the tools like back to back sales, the real-time inventory tracking mechanism and tracking of business leads, business opportunities and post or after-sales services. It includes many business activities:

Costing and Product planning,

Manufacturing or production and service delivery

Marketing and include sales

Stores and Inventory management

Transportation, Shipping and payment

In addition to this, ERP facilitates how to manage the resources available for the business. But once business grows and the business and customer base expands, those simple functions began to complicate. ERP is the last word for software needs as "one-stop-shop" for an organization. ERP Software is Enterprise Resource Planning Software that is an advanced platform to make use of cloud in computing and services which provides amenable business transformation. It is a tool that forms a connection between the software and processes. It also helps to control your costs and increase your productivity levels. ERP facilitates the data-driven information flow for taking smooth business decisions. ERP business software suites organize data from all departments and functional areas to provide in real-time the key performance indicators.

3.8. Disadvantages of ERP

ERP also not free from limitations, the main arguments are:

➢ **Huge cost:** The ERP implementation cost in investing Hardware, Software, License, planning and designing, customization and up-gradation, setting configuration, testing, etc. are too high.

➢ High initial implementation cost leads to less **Return on Investment**

➢ **Highly time-consuming**: Projects may require **1-3 years** (or more) for completion and fully operational.

➢ **Customization problem:** may not possible to integrate the ERP system with the entire business process and functions may leads to slow down the system and project.

➢ The **Savings of cost / payback return: M**ay took time and not to be materialized in the immediate future after ERP implementation and difficult to measure also.

➢ The User support and active **participation: It is essential** for the successful implementation of ERP system projects. The user training and user simple user interface are so critical.

➢ Most ERP systems are difficult to learn and much training required for its proper use.

➢ **Indirect costs:** the indirect costs for infrastructural upgrade also essentials.

➢ **Data Migration:** The data from the legacy system to the new ERP systems is also difficult. Existing stand-alone systems data recovery also difficult. These are time, money and resources consuming.

➢ Maybe **inflexible** and difficult to achieve for decentralized organizations.

➢ The contract between the company and the vendor needs to hold up to its

expiry. After the contract with vendor and ERP system implemented, the customer is locked as '**single vendor lock-in' and very difficult** for further customizations, upgrades, etc. Once contract entered with one vendor, it may not be possible and profitable to switch between vendors.

➢ **Evaluation of** ERP system prior to implementation is critical.

➢ **Employees** Relationship is locked and managed by the vendor.

3.9. Top 5 ERP Software Applications

SAP

Oracle

Microsoft Dynamics

Epicor

Infor

SAP ERP is famous, but it's not the only one. An alternative is Microsoft dynamics which is prized because of its transparency and user-friendly features.

Most of the ERP systems mainly focus on processes places in "back office" departments but may not have the public interface.

ERP systems consist many functions, such as:

Manufacturing or Production Module

Financial accounting or Accounting module

Management accounting or Finance and Cost Accounting Module.

Human resources or HR Module

Supply chain management (SCM) or Logistics

Project management

Customer relationship management (CRM)

Data services like (SaaS)

Access control (IT administration)

ERP systems ensure compliance of standards like IAS, IFRS, Sarbanes-Oxley, and more. It also ensure to adhere to standard business industry practices

The best ERP may have the ability to directly integrate with another information systems. Usually, there exist gaps between an ERP system and an organization's other systems.

Implementation of ERP is particularly very much painful for any organization having highly distributed business clusters like branches, franchisees or where regional offices need a high degree of managerial independence. ERP may often force these offices to make irritating and confusing procedural changes on staff or management among these branches. Most of the ERP requires third party software like Oracle license connect. It requires analytical support to perform data analysis for generating reports. ERP software supports resource management on a real-time basis. Anyway, ERP systems are becoming essential parts of any business or office environment and more or less an indicator of industry standard to gage small, medium and large sized businesses. It is also regarded as a failure of ERP deployment is an unforgivable mistake.

ERP Software is the centralizing system that manages all function of a company. It might be sales, production, HR and payroll, finance and accounts, logistics and warehouse, etc. It provides a dashboard where a firm can see the latest reports of all departments.

Enterprise Resource Planning which further means a software to enable all the resources of an enterprise (man, materials etc) to work planned & in synchronizes with one another on a common platform.

3.10. THE NEED FOR AUTOMATION

The information collected by a firm in the business process is compiled and rearranged as per the requirements. Some data may be deformed or lost in this process unintentionally.

Sometimes the information processed may be irrelevant, unreliable or incorrect. The information is stored in a digital format by capturing the information on each activity within the department in a storage device in a system. The accurate and reliable information has to be tested, analyzed, processed and placed in a

presentable format. After this, information is distributed and evaluated subsequently on its effectiveness and finally used for the business analysis. Each process carries a set of information from one individual to another within the department and between individuals outside the department in the organization and to an outsider or another organization. Most of the information gathered within the department is common information and the same has to be shared by various departments within the organization, for example, the Purchase department is required to obtain clearance from the Finance department before placing an order to ensure that payment is made in time for the goods to be delivered. Similarly, the Finance department depends on Sales department to find out the fund flow inside the organization. The dependency level is more in an organization in terms of managing its day to day activities. In a manual scenario, the process of the organization is independently carried-out by the departments. Also information is independently created, collected and processed within the department. Similarly, every department works in an independent and isolated manner which results in the creation of counterproductive and duplicate information. Sometimes it leads to conflict within the organization, when the information processed by one department does not match with the information provided by another department. Material requirement planning is a classic example for integrating the activities of various departments. The manufacturing department plans for the scheduled production on month based on the orders received. The manufacturing department has to ascertain the availability of production line and labour. Firms may suffer huge accumulated dead stock due to poor information sharing between the departments and absence of Material Requirement Planning (MRP). Over employment leads to production and maintenance costs up. Many public sector undertakings were closed or being sick due to over employment of workforce. In order to ensure smooth flow of information within the organization, the process across the departments has to be properly integrated. This integration ensures seamless flow of quality information within the organization and will certainly enhance the efficiency and productivity of the organization.

3.11. ENTERPRISE RESOURCE PLANNING SYSTEMS

ERP Solutions bridges the information gap throughout the organization and offers in addition, the business gathers a variety of resources, such as, material management, inventory management, productivity, customer relationship management and services, effective solutions to get problems related to cash flow, financial management, quality control and distribution. It facilitates the easy flow of information in the management hierarchy from top-down and/ or bottom-top of the organization structure. ERP system works in all management Systems like MIS, DSS, EIS, DMS, and allows installing such other service systems like data mining. It also provides important alerts, notifications and procedural guidelines. Modern business models are all information-driven.

All ERP software ensures inter-departmental integration and co-ordination with an uninterrupted flow of information.. Ready to use ERP software are available in the industry; it suits for the various requirements of the industries.

This application has been developed on a comprehensive business framework that mapped business models. Each organization has its own procedures, processes, and functions, which typically come into broad industrial design.

Enterprise Resource Planning software is available in different scales in order to meet the requirements of the organizations. Most of the ready-made software is customizable and suits to the organisational needs

A. MNCs and **Large businesses use ERPs like SAP, IBM, MS, Oracle etc,** operates from any locations and runs on multiple operating systems (OS), platforms and spheres. Since it is called large scale, ERP implementation requires huge investment, massive infrastructure and the team of experts to successfully implement the project.

B. **Medium ERP satisfies** the needs of SMEs and moderate in size. Their performance is limited in one or two countries having moderates business. Global mid size ERPs vendors like SAP Business 1, SAP AFS, Microsoft Dynamics, World Fashion Exchange, TCS, IFS, EPICOR and Data Tex

supports their services globally. These medium ERP software requires moderate investment, infrastructure and a team of experts for successfully implementing the project.

C. **Small ERP meets and** fulfils the requirements and needs of small-scale business with moderate functionaries and scale of operations. Software like Sage, Pastel, REACH ERP, Eduberry, Peachtree and Tally ERP9 are some of the major players in this category and small size in volume business and limits its business in a small region. As the name suggests Small scale ERP implementation requires minimum investment, infrastructure and team of experts to successfully implement the project. Some industry specific software also available like Education, production and Manufacturing, Automobile and Spare parts, Aeronautical and space research etc. Specific applications are available in different modules for specific processes and needs of any organization. Exclusive software is also available for production planning and control in various manufacturing facilities throughout the country. Supply Chain Management software is extensively used in logistics based business such as Retail and Fast Moving Consumer Goods Industries (FMCG). Product lifecycle management products (Gabor Technology) are used primarily in the clothing and fashion production industries. Enterprise Resource Planning software is available in the market runs in various modules such as Marketing, Production Planning, Manufacturing, Material Management, Maintenance, Supply Chain, Finance, Human Resources and Product Lifecycle. Generally an organization takes a call on whether it wants to completely integrate all the processes of the organization or core processes or selective processes. There are specialized common software applications catering the special needs of any type of industry like, Sun Guard, Eduberry, TallyERP9, Fast React, Gerber etc., while SAP, Microsoft, Oracle and EPICOR are the common Enterprise applications for any type of industry.

3.12. CHANGING TREND IN ERP

Traditional ERP systems are in-house standalone network systems run in a single premise. Present multi-user multi-tasking operating system enables to connect all functional departments and processes within an organization through Local Area Network (LAN). The current ERP enables the firm to connect remote offices or branches and franchisees through the internet or Virtual Private Networks (VPN). The Wide Area Network (WAN) environment provides a firm to operations and delivery locations can be placed under one roof through the design. Latest, the web-enabled cloud solutions facilitate the organization for supporting the all kinds of global operations brings under one roof from multiple locations the information available to the hub from globally at any given time by using the internet. Technology enabled ERP changed the business like: online and mobile technology enables the ERP vendors to reach the users and stakeholders personally in accessing the information. Handheld devices, fingerprint scanners, bar code scanners and other smart cards and devices are used to capture and record the real-time data in remote locations. Radio Frequency Identifiers are widely used in manufacturing plants to examine the movement of the components, spares and end products. Cloud Computing is an emerging trend in the Integrated Enterprise Solution which is available on the web, allowing the organization to pay for the number of actual users, reduction of IT investments in hardware, software and its maintenance globally accessible at an affordable cost. Software as Service (SaaS) model is an effort in the industry to provide a rapid, cost-effective solution to its customers who are looking for an enterprise solution and greater value realization (ROI). The ERP configure the system, simulate and test certain models, and implementation of changes in business technology with least developmental intervention. ERP dynamic reporting capability facilitates logical thinking; predictive analysis and can manage big structured and unstructured data. Present Hybrid model ERP could provide opportunities for better innovation, rapid deployment which will provide additional flexibility to the customers and supports the business process. Big Data Analytics facilitate to dig additional market segments and augment cross selling and up-selling in order to better customer loyalty, retention and have a stronger product positioning

with improved brand value. Data mining and warehousing techniques, facilitate the firms to predict the future eventualities supporting complex forecasting techniques along with Business Intelligence (BI) models.

3.13. General Model of ERP System Implementation

General Model of ERP covers multiple functionality, processes and features. This research study attempts to fill the literature gaps identified in the literature review by evaluating the various performance benefits coming from various ERP system implementations and studying the impact of Critical Success Factors on the ERP system Implementation process. This review indicates that the ERP systems contain a number of modules. The systemic concepts that underlie ERP systems suggest that increasing changes in performance needed to the enterprise when they implement more modules of the ERP system. Enterprise can increase their performance benefits by updating fine-tuning their ERP systems through the effective integration of modules consecutively. The studies show the CSFs has a crucial role in ERP implementation.

3.13.1. Galbraith's Model of ERP System Implementation

This model shows the relationship with performance and CSFs

Diagram No: 3.15

General Model of ERP System Performance
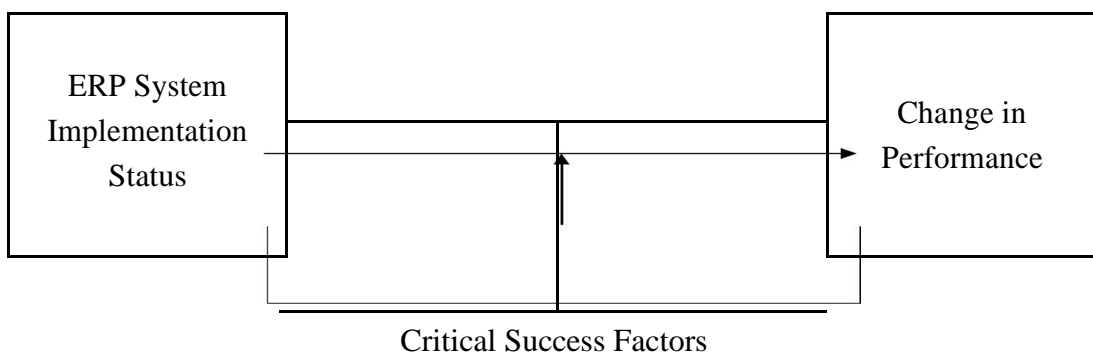
Source: *Post-Implementation Evaluation of Enterprise Resource Planning (ERP) Systems (2008)*

The stable level of the ERP market in developed countries and rising competitive and global pressures have resulted in high ERP growth rates in the developing markets like India. The literature review indicates that most ERP system research is carried on developed countries and there is limited coverage of ERP issues in developing markets. It also shows that the ERP markets in both the developed and the developing countries face similar implementation problems. The scarcity of theoretical models on ERP system research and the huge implementation delays suggest that field testing the ERP system implementation model in a developing country like India would be beneficial for researchers and practitioners in the ERP markets. The Indian ERP market represents a good market to test the ERP system implementation model. This research study is very important as it builds and tests a literature and theoretical driven ERP system implementation model to enhance our understanding of ERP system concepts and associated implementation prospects and problems. This understanding may lead enterprises to uplift their ERP systems and to meet the increasing demands of globalization successfully.

3.14. AN OVERVIEW OF THE PSUs IN KERALA.

Kerala has 130 Public Sector Undertakings. 115 (111 Government Companies and 4 Statutory Corporations) undertaking are functional and 29 are defunct. The working PSUs in Kerala registered a combined turnover of 198.7 billion (which is equivalent to 3.4 per cent of State's GSDP). The accumulated loss of functional units account Rs. 3,136.8 crore with total investment Rs. 19,786.9 crore as on 31 March 2016. The aggregate profits of 50 PSUs during 2015-16 was Rs. 395.5 crore whereas the total loss of 56 PSUs was 10,19.3 crore. Three working PSUs had near to no profit or loss.

Table No: 3.8

Sector Classification of Kerala State Public Sector Enterprises

Sector No.	Sector	No. of PSEs	% of Total
1	Development & Infrastructural Agencies	20	20.83
2	Ceramics and Refractories	2	2.08
3	Chemical Industries	10	10.42
4	Electrical Industries	4	4.17
5	Electronics	3	3.13
6	Engineering & Manufacturing	9	9.38
7	Plantation/Agro & Livestock Based Units	12	12.50
8	Textiles	2	2.08
9	Traditional Industries	7	7.29
10	Trading Units	3	3.13
11	Welfare Agencies	11	11.46
12	Public Utilities	6	6.25
13	Others	7	7.29
	Total	**96**	**100.00**

Ownership

Among the 96 working enterprises, eight (8.33%) are statutory bodies, while 62 (64.58%) are fully owned by the Government of Kerala. Eight enterprises (8.33%) jointly owned by the State and Central Governments.

A summary of the same are shown in Table 3.9 below.

Table No: 3.9

Status of Ownership of Kerala State Public Sector Enterprises

Sl. No.	Status of Ownership	No. of PSEs	% of Total
1	Wholly owned by the Government of Kerala	62	64.58
2	Joint ownership of Government of Kerala & Public	10	10.42
3	Statutory Bodies	8	8.33
4	Joint ownership of State & Central Governments	8	8.33
5	Joint ownership of Government of Kerala, Financial Institutions & Public	4	4.17
6	Joint ownership with Government of Kerala, Financial Institutions, Public & Foreign Firms	2	2.08
7	Joint ownership with Government of Kerala & NRIs	1	1.04
8	Joint ownership with Government of Kerala and Urban Local Bodies	1	1.04
	Total	**96**	**100.00**

3.14.1. STATUS OF ERP IMPLEMENTATION IN THE SMALL AND MID-SIZED PSUs OF KERALA

PSUs OF KERALA is scattered around the state. 130 PSUs are registered and 99 units are working at present. Yet many of the established undertakings adhere to the best production practices. Companies which believe in transparency use software to monitor the manufacturing processes. Most of the organisations now turned to use automation processes for their selected operations like Sales, Marketing, Delivery and Merchandising, Production Planning, Pattern Making, Financial Planning, Supply Chain Management, Human Resources etc. Present MNCs use Enterprise Resource Planning software for their integrated enterprise solution. Some of the Free software movements and initiatives from the part of Kerala state include; "ORUMA" ERP billing software by Kerala State Electricity Board, IT@School Project movement of Education Department, Kerala Khadi &

Village Industries Board, Public Works Department (PWD) and Kerala Legislative Assembly also moved to Free software.

Some of the Enterprise Resource Planning software used by PSUs in Kerala is:-

ERP/SOFTWARE

a. REACH ERP
b. Microsoft Dynamics
c. SAP – AFS
d. Fast React
e. Stage
f. World Fashion Exchange
g. Now (Data tex)
h. Gems lite
i. Tally ERP9
j. Oruma
k. Core Financial Solution& Integrated Administrative System

Some of the enterprises have developed in-house software to cater to the requirements of its automation process.

3.15. ERP DEPLOYMENTS

An ERP system is intended to integrate all functional departments in an organisation into a single computer network system that serves the requirements of all departments.

Regardless of the industry or size of an organisation for any business, there's an ERP system for a particular organisation. Building a single software program that serves the needs of human resources, warehouse and finance departments. These organisations having separate software for each department for their specific work. ERP combines this software into one single and integrated software program and organisation uses one single database for their entire use, various departments can use it very easily and the uniform information arrives for the organisation from a

different department, which runs on a single database. This integrated Project method has remarkable merits and payback when organisations install and implement it correctly.

Here are some ways an ERP solution can help an organisation

- Avoid silos by increasing communication between growing departments

- Increase efficiencies by ensuring employees can work from anywhere throughout Canada, the United States or anywhere you do business

- Streamline business processes across HR, Sales & Marketing, Finance and Accounting, Operations, Procurement and Sourcing, Supply Chain Management, Project Management, Human Capital Management, Global Risk & Compliance, etc.

- Obtain full visibility into your day-to-day Operations

- Significant cost savings across your organisation

- Better financial management

Enterprise Resource Planning can benefit the following industries:

- Manufacturing
- Distribution and Wholesale
- Oil and Gas
- Retail
- Financial Services
- Professional Services
- Utilities
- Health Care
- Construction and Transportation
- Sports and Entertainment
- Food and Beverage Distributors
- Not for Profit (Non-profit Organisations)
- Educational Institutions

Diagram No: 3.16
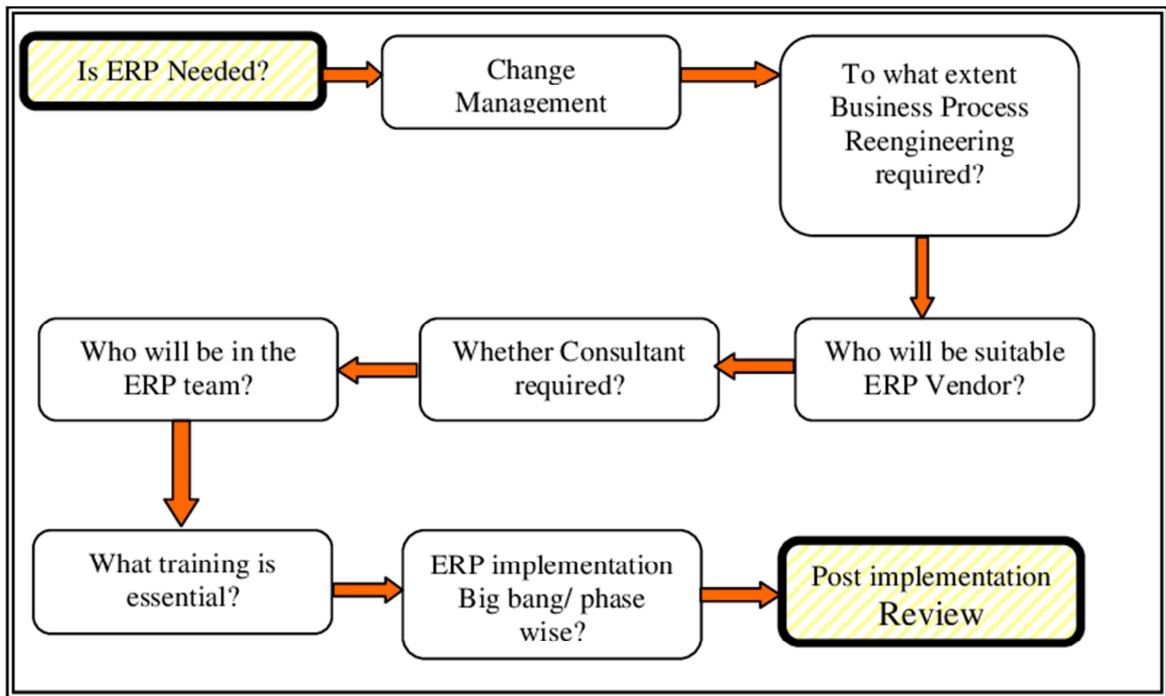
Diagram No: 3.17

ERP Deployment Models

On-Premise
- Own the software & hardware
- Largest Investment
- Greatest control

Hosted
- Own the software
- Rent the hardware & related infrastructure services

Public Cloud
- Owned and remotely hosted by vendor (subscription)
- Shared resources across customers

Private Cloud
- Owned and remotely hosted by vendor (subscription)
- Ability to have dedicated resources
- More security options than Public Cloud

Davenport Model: Diagram No: 3.19
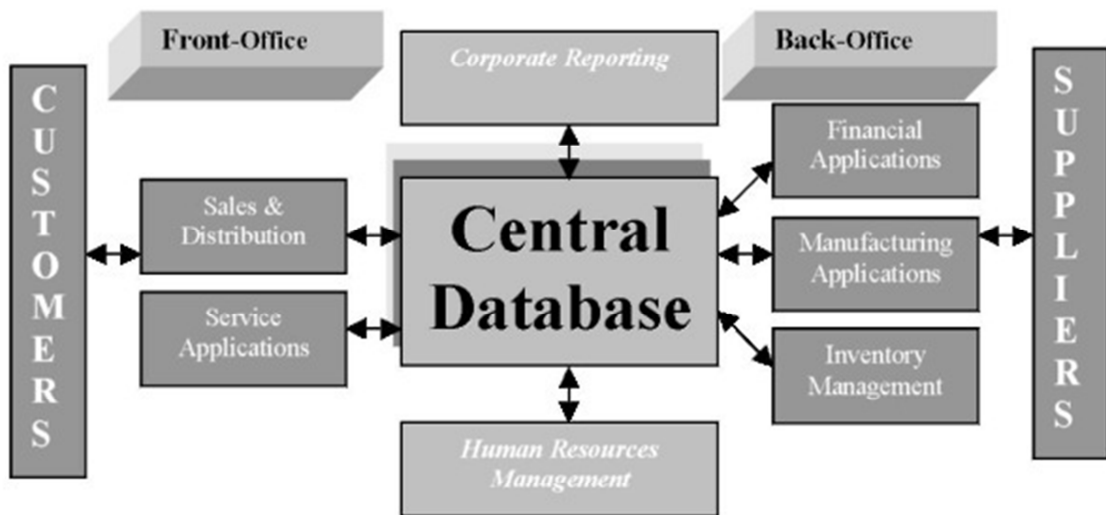
Diagram No: 3.20
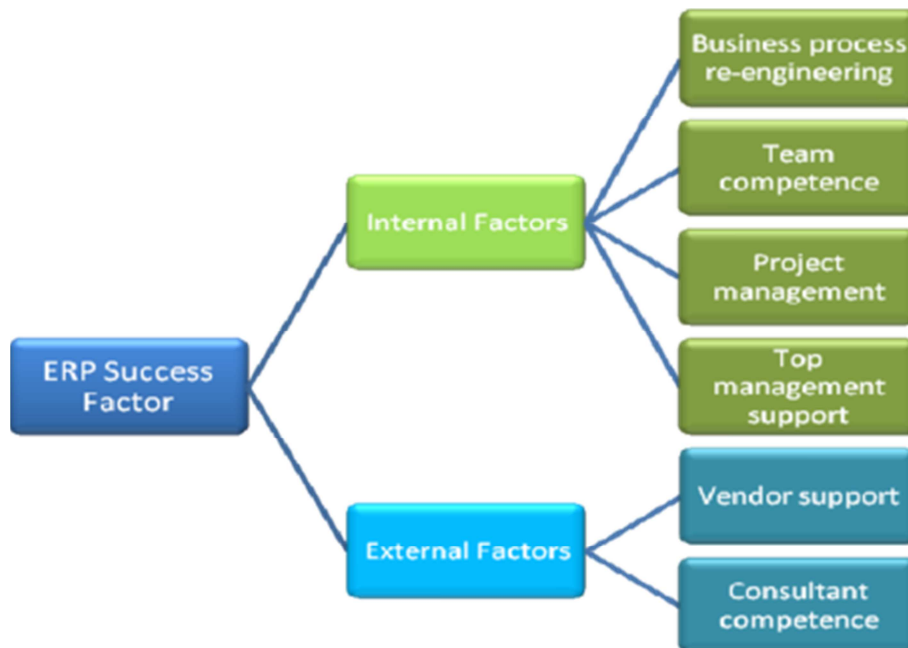
Diagram No: 3.21

Critical Success Factors of ERP

1. Top Management Support
2. Project Champion
3. User Training and Education
4. Management of Expectation
5. Vendor and Customer Partnerships
6. Use of Vendor Development Tools
7. Selection of the appropriate package
8. Project Management
9. Steering Committee
10. Use of Consultants
11. Minimal Customization
12. Data analysis and Conversion

3.15.1. The changing ERP market

ERP market research report by Panorama consulting solutions, (2012) shows a continuing tragedy in some areas, with new trends emerging in others. As the technologies of e-business & ERP converge, effective ERP systems will be a critical component for enterprise success. Now the things are beyond the corporate walls maintaining and holding transactions integrity and security to enable intelligent collaboration between companies and their customers and suppliers.

The market is expected to see following changes:

- Mobility will redefine the manufacturing workplace: The concept of constantly being connected from anywhere has changed our personal lives and started making the way into the production environment. Now, through tablets, smart phones and other real-time devices, manufacturers are completely connected and can see what is occurring in their businesses from anywhere costly integration and customization requirements. The future does lie in a single system - a single *extended* and comprehensive solution.

- Share of ERP in Cloud market continues to increase, but SMEs prefer on-premise ERP systems which is still dominate. Majority of ERP implementations in SME's still prefer traditional on-premise ERP solutions, organisations are migrating to cloud ERP systems.

3.15.2. Indian scenario

There exists huge competition among ERP Software vendors in India also. SAP, Oracle, Microsoft dynamics have the dominant shares in the market than local players like Ramco,3i InfoTech, Sage ERP, Godrej Info tech, Eastern Software systems, Base information etc . Usage of ERP Software in India shows a rapid growth. Trends shows that ERP market in India is expected to grow @ 13% to 15%.

The following are the salient features of Indian ERP market:

- ERP Customers, especially SMEs are moving from the best of breed to the best for business approach,

- Competitive price points & higher returns on investments dictate the choice. Indian players have a product that are cheap, can be implemented quickly, are flexible & need lower IT dependence and support.

- Indian ERP vendors having better understanding of the local requirements like VAT are in better hand to provide ERP solutions with the right functionality, technology and reduced pricing.

- The computing hardware proposed by Indian players is much less compared to MNC products, which gives advantage to local players.

- Virtualization is the current trend. Most of the ERP vendors are providing their software solutions enabling virtualization aspects.

- IDC, a market research firm in India, recently stated that it has "slightly downgraded" its expectations for the ERP market in India due to a "continued mindset of caution and tactical investments" among organizations in India.

- As customization is inevitable in the implementation of MNC ERP, it created large business opportunity in India for developing resources for ERP projects and later the resources are outsourced for other country implementations.

3.15.3. Current Trend

"ERP is a watchdog look beyond the four walls and corners of the organisation with inter and intra-organisational integration", Huang et al (2004). The ERP vendors are now trying to fight for the new generation of ERP systems and extend their market to companies in developing countries, Small and Medium Sized enterprises.

Web-based technology has brought in a new notionThe current ERP systems as ERP II -the next generation of ERP systems, which are based on collaborative principles. ERP has acquired a new look by including more "front-office" functions, such as sales force and marketing automation, Customer Relationship Management (CRM) and Supply chain Management Systems (SCM).

With the advent of e-commerce, there were fears that ERP would rest in peace. ERP is a prerequisite for sound e-commerce infrastructure also. ERP and e-commerce technologies supercharge each other , the drivers behind ERP implementation are most likely to focus on maximizing strategic flexibility and improving processes and operations through cost reduction, facilitating total integration, enhancing customer responsiveness and relationships, improved data visibility and better decision making. The ERP market growth reflects a focus on innovation & regulatory compliance as listed below:

- **Service Oriented Architecture (SOA):** The SOA architecture is moving into the mainstream and will continue to be pervasive in all new ERP systems in these years. It provides better support for business processes.

- **Cloud ERP:** It provides more flexibility and ease of use with less cost of setup. The companies need not purchase a license for every user that uses the system. Instead, a company can simply pay a fixed amount for the Cloud ERP license and then everyone can use the system. Cloud ERP is very much cost effective solution for SMEs. The top most advantage towards Cloud ERP is that the organisations need not to update their hardware and software systems every time to get new features and upgrades. With the whole data in the cloud, it is very easy for any company to move it anywhere at any time without losing it.

- **Focus on small business:** AMR research too finds SMB to be the linchpin of the ERP market. Globally the mid-range ($50 m- $1bn in annual revenue) and SMB (less than $50 million in annual revenue) market continue to be major focuses are for ERP vendors.

- **Shift in revenue sources:** The revenue sources for ERP vendors are from License, Maintenance & professional services. The ERP vendors realize that maintenance revenue has been the growth engine of the mature ERP market while professional services revenue has declined because of multiples service providers. The ERP vendors focus on minimum level of attrition with lot of new strategies to retain their existing customers

- **Operating systems & Databases:** Microsoft SQL server database and Oracle database are the most preferred databases. A recent survey reveals that most of the organizations looking for new ERP to be deployed in Windows environment. The second choice in Linux followed by a cloud or hosted environment. The cloud options appear to be tempting due to its lower initial cost & avoidance of hardware issues.

Diagram No: 3.22

ERP systems deployment models

	On-premises	Hosted	Cloud-based
Implementation size	Large	Medium	Small to medium
Solution complexity	High	Medium	Low
Capital costs	High	Medium	Low
Operating costs	Low to medium	Medium	Medium
Implementation time	12–36 months	9–18 months	4–8 months
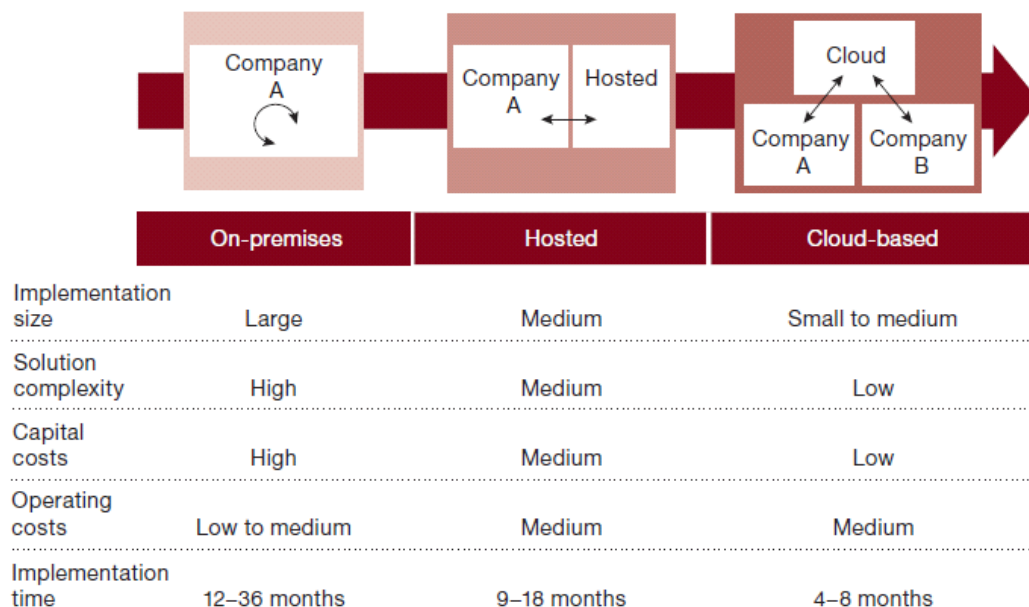
- **ERP & e-business integration:** Beyond the core business functions that ERP has traditionally focused on, e-business pushes the ERP from the inside core of the companies to the network fashion. Now a new extended system emerged as integration with e-business shows more focused, agile and more competitive than traditional structured business and tight B2B and B2C connections. These technologies include, CRM, SCM, DW, DM, OLAP, EDI, EFT, BI etc. More & more companies construct their system architecture by integrating ERP systems with e-Business. By using web portal interface with outside entities like suppliers and customers with additional add-on modules like SCM, CRM, etc. in

to the complete integration. It makes the entire value chin system more powerful than ever. Examples of successful cases include SUN, IBM, Dell, Intel & CISCO in the high tech industries; Amazon.com, flipcart, etc, in the retail industry and in the financial service sector, many banks.

3.16. Observed Obstacles in Success of ERP Implementation

The degrees of failure of ERP implementation vary the with ERP projects. The biggest failure is that a firm after deciding for ERP implementation, and could not implement the ERP itself. A Project will fail when the new system has not been utilized completely. No single reason can be attributable for unsuccessful ERP implementations. Some of the causes that have been identified as the causes for the failure of ERP projects include:

a) The Inherent complication of the implementation of EPP

b) Unrealistic expectations

c) Outside Consultants' Issues

d) Software Over-Customization

e) Inadequate Training

f) problem of handling IT issues

g) Handle risk and process disruption

h) Timeline flexibility

i) Infrastructure issues

For any ERP implementation there are certain universal factors which have been identified here are:

a) Planning and foresight.

b) Business Process Re-engineering.

c) Change management.

d) User training on IT solutions.

e) Top management support

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f)   Management of risk.

g)   Effective communication.

h)   User involvement.

i)   Team work and composition.

j)   Use of private consultants.

The order of importance for the above factors differs for each organisation depending on its functional applicability. Based on these important inputs the researcher has chalked a systematic plan which includes surveys by means of interviews, case studies, questionnaires etc to validate the critical success factors and impediments which the Corps of EME is likely to encounter on its ERP implementation path.

3.17. ERP Related Technologies and Their Applications

The ERP vendors realised the limitations of the old legacy information systems used the 1980s and 1990s. The conventional systems were in-house developed systems utilizing several different data and database management systems, different languages and software packages, may not suitable for efficient and smooth flow of data and information between functionalities. There exist difficulties to enhance the capacity through up gradation with the organizational changes and basic strategic goals cope with sophisticated information technologies. It was realised that an ideal system should have the following characteristics: This module is designed by combining all distinct business functionalities and use a common centralized database (DBMS).

These integrated modules are capable of providing seamless and smooth data flow with increased operational transparency using standard interfaces and through batch and online processing capabilities, working in real time environment with Internet-enabled capabilities providing best business practices.

All ERP software provide certain degree of specialty, most of them are complex systems costing more and high time-consuming with tailored configuration.

The core modules with basic features are same provided by all ERP vendors. Some of the core modules common in the ERP systems are:

1.   Project management and Risk management (PMR)

2.   Financial management (FM)

3.   Inventory Management (IM)

4.   Production management (PM)

5.   Supply chain Management (SCM)

6.   Customer relationship management (CRM)

7.   Human resources management (HRM)

The ERP modules work as separate stand-alone units or combined with several modules and processes together with the integrated system.

Project Management and Risk Management

In all cases, the ERP packages do not provide the entire business solution processes. Customization is the solution for this problem. It is the art of altering and shaping of the core ERP in to the requirements of the user, coordinate and manage the existing information, integrate the enterprise business processes.

The ERP deployment management involves the processes such as; gathering of ERP Product, vendor selection and contract, product purchase or acquisition, integration of existing system and software implementation and development, and system deployment and operation. It involves risk management, stakeholder politics, financial support, and other intangible roles and activities that impact project success. Need to consider the principles and values of project management and risk management, and also need to define critical success factors, design architecture, and people management.

Financial Management

In the present turbulent financial environment, it is required the ERP systems cope with financial systems to adapt internal and external financial reconstructions

like mergers, amalgamations and acquisitions and other changes in business or organizational models. Executives overseeing these systems must be able to understand available options for ERP and financial management systems and how they can best support their organization's strategies and business objectives.

Streamline financial management processes and align it with organisation.

Capture operating efficiencies through improved and standardized organization- wide business policies and processes.

Enhance financial management controls.

Obtain better information to manage business

Enhance system capabilities for-changing business needs and changing technologies

Inventory Management

The inventory management module provides the whole inventory functions, inventory movement in production/ manufacturing, receipt and issue of inventory in order to better supply chain management capabilities. The efficient inventory management module:

Gives complete real-time visibility into demand, supply and inventory costs profitability.

Eliminating manual inventory control processes and better vendor satisfaction through integrating all functions provide self service and up-to-date real-time visibility.

Reduces inventory costs, increases operational efficiencies and eliminates inefficiencies throughout an organization. It facilitates to track and control costs and reduces or eliminates errors through the creation of a complete process.

Leads to optimized manufacturing processes wherein it streamlines the assembly process.

Production management

In a manufacturing company, typically, it is the 'operations' or 'production' that is the biggest cost centre.

ERP answers to the following questions:

a.   What to make?'
b.   How much? and
c.   When to make?.

Human Resource Management

The ultimate objective of HR module is to streamline the Human Resource processes in order to increase the efficiency of the procedures. The other objectives of the Human Resource Module are faster HR processes with real time information for quick decision making and ensure a competence based approach by placing all positions with right people. The HR module is to manage Workforce, Recruitment, Induction, Training & skills, Personnel Administration, Travel, Time & Attendance, Performance, HR Reports. In addition, professional development programs need to be in place and project managers must develop their skills and competences throughout their career.

Supply Chain Management

The ERP Systems streamline and integrate all operations, production and other service processes and smooth information flows to synergize the resources of an organization namely men, material, money and machine. SCM is all about getting the right things to the right places at the right time.

The SCM module used for Production Process, Planning, Execution, Inventory, Forecasting, Demand Planning, Asset Management, Reporting, Logistics, Delivery, Raw Material Management and Returns Processing.

Customer Relationship Management

The CRM module of the ERP offers readily available consistent customer data managing all operations from pre-sales activities such as enquiry or quotation to actual payment for the sales. It is achieved through automated sales processes, consistent customer service, evaluation of constant sales and after-sale service, and identifies the market trends, existing problems and future opportunities.

The benefits of this module are :-

a.   An all round view about the customer

b.   Retaining existing high value customers,

c.   Maximizing opportunities and increase revenues and profits.

d.   To provide customer services.

e.   Faster product development and quick service and delivery processes

f.   Understanding the customer's needs and requirements.

g.   Enables fast solutions for the customer problems to augment customer trust.

h.   Successful customer interaction

As we have seen that the various modules of ERP packages offer different solutions. The modules required for any organisation depends on its own typical needs and it has to be custom made for that organisation. It is very important to understand that the needs of any organisation have to be clearly defined and the areas which need the ERP solutions have to be earmarked before deciding on the module to address the concerns of these areas.

An organisation as large and as complex as Army has its own typical needs which need to be understood well before embarking on a ERP project. Before proceeding we shall discuss its various aspects to get an in-depth understanding of the various functions of Army logistics.

3.18. Use of various survey techniques for identifying key implementation factors

Various survey techniques were used in this study with the primary aim of identifying the critical factors. The design of various survey techniques like questionnaires, case studies and interviews was planned very carefully to ensure that both, cross-sectional data analysis. The main criteria while designing various questions and responses was to extract realistic and accurate data so that it can be converted into useful information for analysing it such that it clearly indicates the key factors that are going to impact the implementation of ERP.

3.19. The major possible risks associated with specific project phases are:

During the ERP system design phase:

- Too aggressive schedule.
- The underestimation of the complexity by the supplier
- high employee turnover rate among the implementation team
- implementing personnel inefficiently manages suppliers
- variability in the procedures and requirements
- future law changes can affect the existing design and development of the system
- Insufficient testing or testing performed another team
- system configuration may not adequately controlled by the implementing personnel
- insufficient details in the system documentation
- Inadequate output level documentation
- current load and nature of the transactions may not be consistant with the internal architecture of the existing system
- the insufficient system compatibility

During the phase of ERP system implementation:

- Delays due to conflicting priorities.
- Degree of data conversion complexity may be underestimated.
- Complexities of interfaces have been underestimated.

- Insufficient user supported training mechanism on the new ERP system.
- Too many changes made in the procedures and requirements.
- All users may not actively engage in the development phase.
- System capacity and performance are insufficient for current operations.

During the phase of ERP system operation & maintenance:

- lack of adequate funding to restore operations and technology up gradation
- inadequate financing to support legislative changes and user needs and requests
- Less financing for the project than required
- Insufficient involvement of management executives
- strategic plan missing
- inaccurate procedures and inadequate documentation
- Less transfer of technology and knowledge from ERP vender to maintenance staffs.
- discontinuing of cop with project procedures and controls
- difficulties at the time of changing from the development phase/stage to operation phase/ stage

3.20. The ERP Implementation Methodologies

AIM Structure Framework (Source www.oracle.com)

AIM (Application Implementation Methodology) is a System framework consists of related and connected elements. It has certain processes, tasks, phases and dependencies:

A **process: It is a** related set of objectives; it is very closely related to a set of dependent tasks for fulfilling a major objective. It is a resource skill requirement. A common discipline will be followed in any process. An input process and a deliverable outputs.

A **task: Is** a unit of work with single outcome. It may take many different forms like schedules, reports, codes, and their test results. It has one process, one

implementation team and their needs and requirements, their specialization and requirements

A **phase: C**hronological grouping of tasks is called a phase. It is a way of organizing tasks in a flexible manner, it prepares schedules for major deliverables, and it delivers projects.

A dependency may be; Data dependence, Control dependence, resource dependence. Dependencies in software dictate the ordering requirements in and between instructions.

Certain Terms and definitions:

Business Requirements Definition: Business Requirements Definition defines the business requirements and needs that must be met by the implementation of the ERP project. The business processes documentation is done by identifying business events and defining and describing the steps that relates to these events.

Business Requirements Mapping: The requirements of an organisation need to be compared and contrast with certain standard application software projects and its functionality and identifies the inner gaps and requirements that must be honored to fully meet the needs. When gaps arise between requirements its functionality emerges. When such situations arises, it will be resolved by documenting mapping workarounds, creating alternative solutions, adding application extensions, or by changing the entire underlying business process.

Application and Technical Architecture: This is the designing of information systems architecture according to the business requirements, it reflects the business vision. The technical process supports the plan for configuration setups for the ERP hardware requirements for better implementation.

Module Design and Building: It produces and design custom software solutions according to the needs to fill the gaps in different functional units identified during business requirements mapping stage. A detailed custom software solution as a

module or certain modules will be designed. It must be tested before implementation.

Data Conversion: It is crucial for implementing a new system in an existing organization where already running certain ERP or other solutions. It defines the tasks of converting existing legacy system data to the new database applications tables like 'Oracle'. It also needs to define the objects for conversion and the source of database these objects are being stored. The converted data may be used for system testing, training and acceptance testing. It also needed for production.

Documentation: It begins with materials created firstly in the project. The technical material and user manuals required for the implementations are prepared by the programme wring personnel using these documents.

Business System Testing: The resources required for project testing is secured at this stage. Testing aims at linking and converting test requirements in to business requirements. Business System Testing supports utilization of common test information.

Performance Testing: It defines, build and execute a performance appraisal test. It helps to take decision based on the results regarding whether or not the performance is acceptable for the business. It also helps to propose tactical and strategic changes to adhere the performance quality standard shortcomings. Testing of performance is inter-dependent and inter-related to the architecture of technical application.

User Training: any new system application and running requires training both for its administrators and its users. It also contains the progress of methods, materials and administration. It helps the Instructors and courseware and material developers orient and refresh their material toward roles, jobs and responsibilities.

Production Migration: It is the migration or moving of the entire company, system, and people to the new enterprise resource planning system. This process involves the complete transition to production readiness, production changeover or cutover, and a post-production detailed and complete support.

3.21. THE ERP SYSTEM IMPLEMENTATION MECHANICS

1. Modern businesses have different applications and processes among their functional units leading ERP software systems more complex and impose on employees significant changes on their work practices. Since the implementation of ERP software too complex and requires more skill, it is better or desirable to entrust outside consultants for its implementation who are professionally skilled and trained in this area rather than depending on in-house employees.

2. ERP implementation is more difficult in such organizations where it is structured into independent business units having its own organisational hierarchies and decision centres. Independent business units with different processes, rules, responsibility centres and data semantics.

3. The following are the four ERP implementation process phases suggested by Markus and Tanis:

    a. **Phase- I - Chartering Phase** it is the initial phase of decisions for providing the funds for an ERP system. It gives a kick start to the project; decide the Vendors, Executives, Consultants, IT specialists and implementation team. Vendor and software package selection, identify the project manager and an implementing team, approve funds and fix time schedule. The following are the set of activities to be completed in this phase:

        (1) Executive decision to implement the ERP.
        (2) Determine the sufficient changes required and start the change process one-by-one.
        (3) Need to form an excellent implementation team and assure them required resources.
        (4) Select proper implementation methodology and software vendor. The approach can be centralized or de- centralized.
        (5) Determine the level of services required from the selected software vendor.

(6) Sign a contract with software vendor regarding the entire implementation, pre-implementation as well as post-implementation and AMC and ASC etc.

b. **Phase- II - Project Phase** Contains the activities to be performed to start and get up the ERP system and test run in one or more functional units. Project team members, Project Manager, Internal IT specialists, Software Vendors and Consultants etc are the key players. The Key activities in this phase are Software configuration and installation, system integrity checking, testing and data conversion. The following are the activities listed in this phase:

(1) Identification of required data and area.

(2) Scale Down Model Demo

(3) Hardware and infrastructure installation.

(4) Software module development and its deployment.

(5) Series of dry tests

(6) Application checking and counter checking.

c. **Phase- III - Shakedown Phase** this is the stage in which the organization coming under the grips of the ERP System. The key players in this phase are Project Manager, Operational Managers, Project team members, and all level users of ERP System. The main activities are during this phase are; Fixation of Bugs and rework, system performance analysis and tuning, retraining the users, staffing up to rectify temporary shortcomings and inefficiencies. This is the phase in which the errors of prior phases are rectified, even though; there exists the chances for new errors after achieving normal operations the phase ends. The following are the activities to be undergone during this phase:

(1) Training of different types of Users

(2) Development and fixation of Master Trainers and Individual Users

(3)   Trial running on selected departments or functionalities.

(4)   Running up of all connected Functionalities parallel to ERP sys.

(5)   Handling of bugs and programme errors.

(6)   Overall System fine tuning processes are to be done.

(7)   Redefinition of Systems Applications wherever required.

(8)   Start-up as "Here we go" stage.

d.   **Phase- IV - Onward and Upward Phase:** This phase is like any software installation begins with normal day to day routine operations til the entire legacy process system is replaced with an upgraded new system. The Key players in this phase are Operational Managers, IT support personnel, End-users and Vendors and consultants. The Key activities in this phase are business improvement, development and building of additional user skills and analysis and assessment of post implementation benefits. The following are the set of key activities to be completed during this phase:

(1)   Obtaining and marking User's feed back

(2)   Parallel Non-ERP System which was running need to be discontinued.

(3)   Dedicated Customization according to the users' requirements.

(4)   Setting and activation of "After Sales Protocols"

(5)   Finding solutions for the User's problems.

(6)   Benefit analysis and assessment.

The ERP Implementation life cycle is follows:

Diagram No: 3.23

ERP implementation Life Cycle
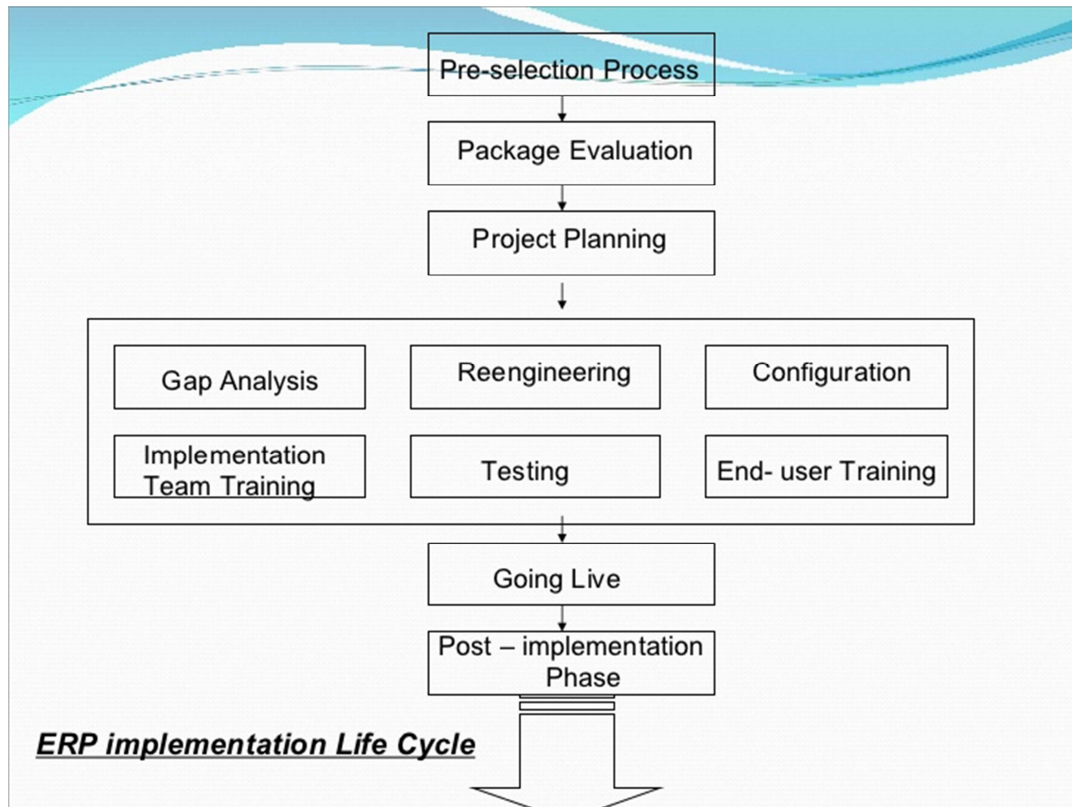
4.   **Elaboration of Implementation Mechanics** The following are some of the high lights of implementation mechanics involved in ERP:

a.   **Identification and Establishment of Need**

(1)   An organisation need to decide upon the following decisions:

(a)   Whether the organisation needs or warrants an ERP?

(b)   If the answer is "YES", then what are its requirements and the level of the need?

(c)   The availability or acquisition of the software, whether off the shelf open sourced, customized ERP or proprietary software system?

(d)   Funds available and Budget estimates.

(e)   Extend of integration, whether across the board programme or through a limited special programmes only?

(2)   Once decided and funds are allocated, Competent Implementation Teams need to be formed.

(3)   Tentative Time schedule are to be framed.

b.   **ERP Vendors & Vendor Services**

(1)   Vendor selection and choice of vendor services.

(2)   The services provided by the vendors are consulting, customization and support. The time required for implementing ERP system depends on many aspects like; the size of the business organisation, the number of functionaries and modules, the extent of customization required the scope of the change and change process, the customers' permission to take up the project. The ERP systems are modular based and cannot be implemented in one stretch. The total work may be divided into various stages, or phase according to functionaries. An ideal ERP project implementation may require a time of 12 to 15 months and more than 150 consultants. A small (company having less than 100 staff) ERP project Implementation can be completed within 3 to 9 months. A large MNC company having its operation scattered over multi-site or multi-country, the implementation process may be extended to some years. The length of period[1] of implementations depends on the desired amount of customization.

c.   The three professional services provided by consulting firms include consultation, customization as per the requirements and support. The ERP implementing organization can also have its own independent program management or implementation team, business analysis executives, change management team, and IT specialists to ensure their business requirements during implementation process.

d.   **Concept of Best practices**

(1)   Instead of beginning from Zero-Based techniques and complete system change, method of best practices can be followed. The existing system can be scrutinized and customized according to the needs based on the best practices concept.

(2)   Most of the ERP software packages contain a provision holding best practices. The implementing organizations can choose either customizing or modifying the existing business processes to the "best practice".

(3)   Because of the complexities of most of the ERP systems and the consequences of ERP implementation failure, most of the ERP vendors provide a clause of "Best Practices" in their ERP software. The "Best Practices" are regarded as the most efficient way of implementing ERP in a business. These best practices may reduce implementation risk by 70% compared with new installations.

e.   **Data Deployment**

(1)   Data migration is regarded as an important activity which requires much planning for the successful implementation of an ERP. Many ERP Vendors taking data migration is the last activity which makes a lot of problems during the ERP implementation. The following are the data migration steps and strategy that must be followed:

    (a)   Identification of the data to be migrated
    (b)   data migration timing need to be determined
    (c)   formation of the data migration template
    (d)   Determine the data migration tools
    (e)   Decide upon the migration setups
    (f)   Data archiving and begin migration process.

f.   **Process Preparation**

(1)   Process Preparation is an exercise of customization of the ERP by the vendor in order to full fills the specific needs of the customer.

(a)   Most of the ERP vendors designed their ERP systems according to standard business processes and best business practices having standard modular nature. It is crucial for an organization to perform a business process analysis in order to map all present operational processes. Studies shows that:

(b)   Proper connection and synchronization of organizational process with strategy.

(c)   Analysis of the effectiveness of the processes with its business capability.

(d)   Complete understanding of the new ERP solution.

g.   **Configuration.** Configuring an ERP system begins with the installation decision of first module and adjusts it by using configuration setup to achieve the best results.

5.   **Modules.** Most of the systems are provided in modules simply for selecting some functions from the available modules according to the needs of the implementing organisation. There are certain common similar modules adopted by all organisations, like finance and accounts, there are some other modules like human resource management adopted by others. A service organisation may not require the manufacturing module.

6.   **Consulting services.** The employee's internal skills and ERP talent of small and mid-sized organizations are may not be satisfactory. They may gp for seeking the support of ERP Implementing consulting services available on payment basis. The responsibilities cared by them includes:

a.   Selecting

b.   Planning

c.   Training

d.   Testing

e.   Implementation

f.   Delivery

7.   The cost of ERP implementation includes the ERP Software cost, Database user licenses fees and user customization and annual service charges (ASC). Large and multi-national organisations having multiple sites scattered over different countries requires more on the customization of the software than the user licenses fees. It may be three to five times more than that of the cost of implementation.

8.   **Customization VS Configuration**:

a.   The optional configuration added to the software before the software put to work like setting up of new cost centre and profit centre structures, adding organisational trees, and responsibilities etc, include customization.

b.   Customization is individual customer oriented whereas; Configuration is needed to all customers.

c.   Customization requires an element of programming and need structural changes to the tables. But configuration changes are made only to entries in vendor supplied data tables.

d.   The customization effect is unpredictable and it is a time-consuming and stress making. It is the testing phase by the implementation team. The configuration is predictable and affects the performance of the system and it is the ERP vendor's sole responsibility to configure the entire software.

e.   Customizations overwrite all upgrades and need to be re-tested and re-implemented manually. Configurations are changed while upgrading existing system to a new version.

9.   Customization of ERP System is a complicated and expensive effort and leads to delay the delivery and finishing of the entire system. It also provides scope to implement excellence in certain specific areas.

3.22. Changes in Performance due to ERP System Implementation

ERP implementation may pave reason for generating, collecting and storing huge quantities of data pertaining to several years across different divisions, functionalities, geographical regions, and different databases. Though invaluable, this fragmented data represents one of the main drags on business productivity and performance **(Gable, G. G., Scott, J. E., & Davenport, T. D. (1998).** After deploying their early intra-firm ERP system and stabilised, firms turn to fine-tune their existing systems and extend additional modules to their ERP systems. It increases the efficiencies to attain strategic objectives and benefits like better profitability, higher return on investment and growth in share value with improved customer satisfaction.

3.23. Summary

This chapter highlights the theoretical concepts and clarity on ERP selection, development, adoption, use, and implementation. The ERPs are developed with standard business practices and ethical considerations. It is a fact that there is no consensus on the business practice and customs among the countries, areas or regions of a particular country, different organisations like profit seeking or non-profit seeking and among different firms in the industries. In light of the gaps identified in literature, this research aims at filling the gap by studying problems and prospects of ERP implementation in small and mid-sized public sector enterprises of Kerala.

3.24. Conclusion

The important objective of the study was to enhance the effectiveness of the ERP systems implementation in small and medium sized public sector enterprises of Kerala and to reduce the problems and risks associated and related with the ERP system implementation failure. The study tries to create a workable solution for the methodology of ERP systems implementation in small and mid- sized public sector enterprises of Kerala. The deficiencies identified based on the practical research and theoretical analysis through questionnaire and survey. The important risks

formulated based on the collected data and analysed through questionnaire and survey conducted in selected small and mid-sized public sector enterprises of Kerala. The inherent risks around the implementation of ERP has been studied and analysed with different phases of the project. The uncertainties and problems during these stages are address with a risk management, which affects significantly the success of the project.

Works Cited

World Bank, http://www.worldbank.org/en/topic/ict/brief/e-government

Books

Alexis Leon, Enterprise Resource Planning, New Delhi: Tata McGraw-Hill Publishing Company Limited, 2006.Vinod Kumar Garg & N.K, Venkiftakrishnan, Enterprise Resource Planning Concepts and Practice, 2nd ed. New Delhi: Prentice-Hall of India Private Limited, 2004. Kenneth R. baker & Stephen G. Powell, Management Science the Art of Modeling with Spreadsheets 2nd ed. New Delhi :John Wiley & Sons, Inc

Dave Chaffey, E-Business and E-Commerce Management, New Delhi: Pearson Education Ltd, 2007.

Boersma, K., & Kingma, S. (2005). Developing a cultural perspective on ERP. *Business Process Management Journal*, *11*(2), 123-136.

Kosalge, P., & Tole, O. (2010). Web 2.0 and business: Early results on perceptions of Web 2.0 and factors influencing its adoption. In *AMCIS* (p. 208). Otieno, J. O. (2010). *Enterprise resource planning systems implementation and upgrade (a Kenyan study)* (Doctoral dissertation, Middlesex University).

Davenport, T. H., Harris, J. G., & Cantrell, S. (2004). Enterprise systems and ongoing process change. *Business Process Management Journal*, *10*(1), 16-26.

Davenport, T. H. (1998). Putting the enterprise into the enterprise system. *Harvard business review*, *76*(4).

Walsham, G. (1995). The emergence of interpretivism in IS research. *Information systems research*, *6*(4), 376-394.

Wagner, E. L. (2003). *Narrating an organisational matter of fact: Negotiating with enterprise resource planning technology to achieve order within a traditional academic administration* (Doctoral dissertation, London School of Economics and Political Science (United Kingdom)).

Wenrich, K., & Ahmad, N. (2009). Lessons learned during a decade of ERP experience: A case study. *International Journal of Enterprise Information Systems (IJEIS)*, *5*(1), 55-73.

Rajesh Ray "Enterprise Resource Planning" Tata Mc Graw Hill Education Pvt Ltd. New Delhi (2012)

Madapusi (2009) in his study used a theory driven approach to field-test an ERP system implementation model in the Indian ERP market

Gargeya, V. B., & Brady, C. (2005). Success and failure factors of adopting SAP in ERP system implementation. *Business process management journal*, *11*(5), 501-516.

MUSTAFA K. "PROBLEMS AND PROSPECTS OF ERP SYSTEMS IMPLEMENTATION IN SMALL AND MID SIZED PUBLIC SECTOR ENTERPRISES IN KERALA." THESIS. PG DEPARTMENT OF COMMERCE, P.S.M.O COLLEGE TIRURANGADI, UNIVERSITY OF CALICUT, 2019.

Chapter 4

Implementation of ERP from Administrators, Users and Beneficiaries Perspective

4.1 Introduction

Majority of the small and medium PSUs in Kerala have not implemented full-fledged ERP and have limited access to it. This study tries to pin point the reasons that why these enterprises have not adopted or limited access to adoption of ERP products and services. This study consider the peculiar details of enterprises like nature, size, number of employees, annual turnover, functional areas and locations, infrastructure availability like of number of computers, laptops and other network devices, data servers, internet facility and IT wing or separate department. The required data collected from all ERP adopted, non-adopted small, and medium public sector enterprises in Kerala. The data from the ERP Implemented enterprises collected on the following factors.

a. The influencing factors of ERP adoption

b. Present stage of the existing ERP application.

c. The reason for choosing or not choosing a particular ERP application

d. Present Status, stage and period for the new ERP implementation.

e. The details of training on implementation and thereafter

f. The involvement of adopting team during Implementation

g. The general problems of respondents on ERP implementation and running and maintenance in areas like implementing team, Project cost, implementation Schedule, Implementation vendor, technical issues and general problems

h. The benefits as regard to efficiency, technical, cost and time saving in manpower, machines and other general terms

i.   Overall satisfaction level as regard to ERP Implementation and use

j.   Opinions, suggestions and recommendations as regard to the ERP products to other enterprises to concentrate and improve for successful implementation

The information such as, the reasons for non-adoption of the ERP and their plan of adoption with the scheme & schedule was sought from the ERP non-adopted enterprises.

General Profile of the PSUs and its Respondents:

The general data gathered here were:

a.   Nature and Sector of the Public Enterprise

b.   Company type and Status of Ownership

c.   Annual Turnover in Rs crores (2016-17)

d.   Employee Strength

e.   No. of Offices or Branches/No. of Offices

f.   Executive contacted for this research

g.   ERP Infrastructure and Computerization

h.   IT Infrastructure

i.   Personal Computers/Laptops/Servers

j.   Availability of Internet

k.   Availability of a separate IT Department

l.   Software used

m.   Details about the Present Software application

n.   The maintenance of present ERP

o.   The Easiness and Comfort on use

p.   Measure taken for Improvement of the ERP

Table No: 4.1

Overall Performance of Public Sector Enterprises in Kerala :			
2013-14 to 2015-16 (Amount in Rs lakh)			
Particulars	**2013-14**	**2014-15**	**2015-16**
Paid up Share Capital	13391.75	13820.04	15544.49
Capital Invested	35971.72	40357.29	44323.12
Net Worth	10908.55	9382.81	9762.80
Capital Employed	42129.85	44488.96	48032.11
Net Assets	33196.01	34208.87	35537.02
No of Employees	142394	142894	142988
Turnover (Net Sales)	30347.52	31634.21	36050.93
Net Profit	-970.69	-1952.92	-1452.85
Source: Bureau of Public Enterprises, Government of Kerala, a Review of Public Enterprises in Kerala 2015-16			

The above table shows the general data on Share Capital Investment, Net worth, Capital Employed, Net Assets, turnover, number of employees, and Net Profit classified using the frequency distribution.

Table No: 4.2

Performance of working of Public Sector Enterprises in Kerala turnover *vis-a-vis* GDP

(Rs in Core)

Sl. No.	Particulars	2012-13	2013-14	2014-15	2015-16	2016-17
1	Turnover **10**	18,486.21	17,586.85	19,194.06	19,878.35	26,463.28
2	GSDP	4,12,313	4,65,041	5,26,002	5,88,337	6,55,205
3	*Percentage* of Turnover to GDP	4.48	3.78	3.65	3.38	4.04

(Source: Audit Report of Comptroller & Audit General 2016-17)

The above table shows the general data on Performance of working of Public Sector Enterprises in Kerala turnover *vis-a-vis* GDP shows that the turnover is increasing but the GDP is declining except for the year 2016-17. The companies with fewer turnovers were not serious in adopting the ERP and majority of the companies in the higher turnover bracket have moved for adopting the ERP Systems.

4.2.1 Nature, Ownership and Sector of the Public Sector Enterprise

Table No: 4.3

Nature of the Public Sector Enterprise (Status of Ownership)

Dependent Variables (Status of Ownership)	Independent Variables	Total
1	Wholly owned by the Government of Kerala	80
2	Joint ownership of Government of Kerala & Public	10
3	Statutory Bodies	8
4	Joint ownership of State & Central Governments	8
5	Joint ownership of Government of Kerala, Financial Institutions & Public	4
6	Joint ownership of Government of Kerala, Financial Institutions, Public & Foreign Firms	2
7	Joint ownership of Government of Kerala & NRIs	1
8	Joint ownership of Government of Kerala and Urban Local Bodies	1
9	Defunct/Non-Functioning	16
	Total	**130**

Source: Report of the comptroller and auditor general of India on public sector undertakings for the year ended 31 March 2017

The above Table 4.3 Classified based on Nature of Public Sector Enterprise such as State Sector, Central Sector, Public Utilities and Govt. Companies where ERP adopted and ERP non-adopted. The State Sector enterprises have taken for the purpose of this study.

Table No: 4.4

Sector wise Classification of the Public Sector Enterprise

Dependent Variables (Sector)	Independent Variables	Total	% of Total
1	Development & Infrastructural Agencies	22	17.0
2	Ceramics and Refractories	2	1.5
3	Chemical Industries	10	7.7
4	Electrical Industries	4	3.1
5	Electronics	3	2.3
6	Engineering & Manufacturing	9	6.9
7	Plantation/Agro & Livestock Based Units	13	10.0
8	Textiles	2	1.5
9	Traditional Industries	7	5.4
10	Trading Units	3	2.3
11	Welfare Agencies	13	10.0
12	Public Utilities	6	4.60
13	Others	20	15.4
14	Defunct/Non-Functioning	16	12.3
	Total	**130**	**100.00**

Source: Report of the comptroller and auditor general of India on public sector undertakings for the year ended 31 March 2017

The above Table 4.4 Classified based on ERP adopted and ERP non-adopted organizations. It describes Nature of Public Sector Enterprise such as State Sector, Central Sector, Public Utilities and Govt. Companies where ERP adopted *(43.)*and ERP non-adopted. *(38.)*

From the above data, it is clear that the State Sector have taken the first place in adopting ERP than the other categories.

4.2.1 No. of Employees of the Selected Public Sector Enterprise under study

Table No: 4.5

**Classification of No. of Employees of the
Selected Public Sector Enterprise under study**

Classes	Dependent Variables (No. of Employees)	Total
1	<50,	7
2	51 – 100	3
3	101 – 200	3
4	201 – 500	2
5	> 500	0
	Total	**15**

Source: Primary Data

The Table 4.5 describes the number of employees working in the Public Sector Companies. Under ERP adopted segment 6 and one from non-adopted totaling 7 from companies have less than 50 employees, from 51 to 100 employees were working ERP adopted segment 2 and one from non-adopted totaling 3, companies with 101 to 200 employees category, 2 and no companies have more than 200 employees at all levels.

The non-adoption of the ERP is high among the small-scale units with small base of employees.

Gender data of the respondents

Table No: 4.6

Gender data of the respondents

Valid Questionnaire	Frequency	Percent	Valid Percent	Cumulative Percent
Male	303	72.2	72.2	72.2
Female	117	27.8	27.8	100.0
Total	420	100.0	100.0	

Out of 420 respondents, 303 with 72.2% were male and 117 were female with 27.8%

4.2.1 No. of Offices or Branches of the Public Sector Enterprise

Table No: 4.7

No. of Offices or Branches of the Selected Public Sector Enterprise

Dependent Variables (No. of Offices or Branches)	Independent Variables	Total
1	1 – 10 Offices or Branches	10
2	11 – 25 Offices or Branches	2
3	26 – 50 Offices or Branches	2
4	>50 Offices or Branches	1
	Total	**15**

Source: Primary Data

The above table 4.7 states the No. of Offices or Branches under the ERP adopted segment, 10 Public Sector Companies have only one to 10 Offices or Branches, 2 Public Sector Companies have 11 to 25 operating Offices or Branches and 2 Public Sector Companies have 26 to 50 Offices or Branches and one with more than 50 locations. In ERP not adopted segment, 1 Public Sector Companies

have only one Offices or Branches, 1 Public Sector Companies have 2 to 10 Offices or Branches, and the rest are all nil.

The analysis found that there is no correlation between the number of operating Offices or Branches and the ERP adoption/non-adoption.

4.2.1   Details on the Executives' Designation of the Respondents of the Public Sector Enterprise

Table No: 4.8

Details on the Executives' Designation of the Respondents

Dependent Variables (Executives' Designation)	Independent Variables	Total
1	MD/Director/Chairman/Chief Executive Officer	15
2	IT Head or System Administrator/Analyst	30
3	Head/Manager Finance/ Accounts	15
4	Head /Manager Operations/Manufacturing/ Service	15
5	Head /Manager Sales/ Marketing	15
6	Other Managerial /Administrative Heads	72
	Total	**162**

Source: Primary Data

The Table 4.8 shows the executives' designation wise respondents classifications. ERP adopted companies - In 14 companies, the data were collected from the Managing Director/Chief Executive Officer/Director, in 28 companies the IT heads were the respondents, finance/accounts heads in 14 companies, Operation/Manufacturing heads from 14 companies, 14 from heads of Sales/marketing departments and 58 in the non-classified (others) category. In ERP non-adopted companies - in one company's data were collected from Managing Director/Chief Executive Officer/Director, in 2 companies from IT heads, in 1 company from finance heads, in 1 company from operation and manufacturing

heads, in 1 company from sales & marketing heads and 14 cases are in the non-classified (others) category.

Though most of the data were collected from the Directors & Heads of the departments, the highest number of respondents were the IT heads or system maintenance team members. Since most of the respondents were in the senior level, the data collected could be accurate, relevant & appropriate for this study.

4.2.6 ERP Infrastructure and Computerization

Table No: 4.9

Details of Number of Personal Computers/Laptops

Dependent Variables (Personal Computers/Laptops)	Independent Variables (No of Personal Computers/Laptops)	No of Companies
Personal Computers/Laptops	1 to 10	1
	11 to 25	6
	26 to 50	8
	Above 50	0
	Total	**15**

Source: Primary Data

All ERP adopted public sector enterprises selected were having sufficient number of computers to work with ERP Systems.

4.2.7　ERP Infrastructure and Computerization

Table No: 4.10

Details of Number of Servers of the Public Sector Enterprise

Dependent Variables (Number of Servers)	Independent Variables (No of Number of Servers)	No of Companies
Number of Servers	1 to 10	15
	11 to 25	0
	26 to 50	0
	Above 50	0
	Total	**15**

All the 15 selected companies having ERP were with sufficient Servers or infrastructures.

4.2.8　ERP Infrastructure and Computerization

Table No: 4.11

Details of Internet Availability of the Public Sector Enterprise

Dependent Variables (Internet Availability)	Independent Variables	Adopted Small & Medium Public Sector	Adopted Small & Medium Public Sector	Total
Internet Availability	Yes	13	2	15
	No	0	0	
	Total			**15**

The above Table reveals that all Public Sector Enterprise under the study had Internet availability

Table No: 4.12

Details of IT Department Available in the Public Sector Enterprise

Dependent Variables (IT Department Availability)	Independent Variables	Adopted Small & Medium Public Sector	Adopted Small & Medium Public Sector	Total
IT Department Availability	Yes	2	0	2
	No	13	0	13
	Total			**15**

Only Two companies having separate IT department and the rest 13 companies selected does not have separate IT Departments.

Table No: 4.13

Software Installed in the Public Sector Enterprise

Dependent Variables (Software Installed)	Independent Variables	Total
	A full-fledged ERP Like SAP/ORACLE Etc	2
	Software Developed Internally & specifically	1
Software Installed	Accounting Software Like Tally ERP9/Peach Tree/ Sage Etc	2
	Mix-up of systems with MS-Office software/ Office 365	4
	Other application software for Inventory, sales, Manufacturing etc from the Market	6
	Total	**15**

Classification of above the Table 4.13 based on the software implementation. In ERP adopted companies, majority of the companies have MS-Office software, 4 companies have Tally for accounting purpose, 2 companies have implemented the full-fledged ERP and 6 companies have installed other software applications. Out of 15 companies, 12 companies also use Tally software for ad-hoc accounting & other requirements and its usage is high in the ERP non-adopted companies.

4.2. **Present Software Maintained by**

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Table No: 4.14

Present Software Maintained in the Public Sector Enterprise

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Dependent Variables (Software Maintained)	Independent Variables	Total	% of Total
Software Installed	Own team-Internal	12	80
	External Vendor/	1	7
	Support Teams other than Vendor	2	13
	Combination of Internal & External	0	0
	No support	0	0
	Total	**15**	**100**

The above table shows the Classification of the present software maintenance, majority of the companies maintain their software by themselves.

4.2. Easiness/ Comfort of the Present Software

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Table No: 4.15

Easiness/ Comfort of the Present Software in the Public Sector Enterprise

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Dependent Variables (Easiness/ Comfort)	Independent Variables	Respondents	% of Total
Easiness/ Comfort	Fully comfortable	334	80
	Comfortable	76	18
	Not comfortable but manageable (OK)	6	1
	Not comfortable and needs changes	4	1
	Not at all comfortable and needs a total change	0	0
	Total	**420**	**100**

The above the table shows that 80% of the respondents are fully comfortable with existing software, 18% is in comfortable zone and rest 2% are not comfortable zone.

4.2. Measure taken for Improvement of the Present Software

Table No: 4.16

**Measure taken for Improvement of the
Present Software in the Public Sector Enterprise**

Dependent Variables (Measure taken for Improvement)	Independent Variables	Total	% of Total
Measure taken for Improvement	Restructure the entire system for better performance	68	16
	Upgrading to a new version of existing Software	132	31
	Training the users for better performance and usage	128	30
	Improve the existing technical setup	54	13
	Adding more modules with customization	20	5
	Others (Please specify)	18	5
Total		**420**	**100**

The above the table shows that 16% of the respondents are recommending Restructure the entire system for better performance, 62% suggesting Upgrading to a new version of existing Software and needs Training the users for better performance and usage 13% respondents suggesting Improve the existing technical setup and rest 10% having the opinion of improving with adding additional modules.

4.2.11   General awareness about ERP

Table No: 4.17

General awareness about ERP

Dependent Variables (Awareness about ERP)	Independent Variables	Respondents	% of Total
Awareness about ERP	Already aware about ERP	359	85.5
	From other companies using ERP now	43	10.3
	From Trade Associations/ Conferences/ Exhibitions	6	1.3
	From Media : Magazines & Periodicals/ TV Ads	8	1.9
	Direct From ERP Vendors	4	1.0
	Not know about ERP	0	0
	Total	**420**	**420**

The above Table gives the awareness about the ERP product from the organizations, who have not adopted ERP. Awareness level is good and no one responded as 'Don't know'.

Therefore, from this Table, the greater level of awareness on ERP is clear even among the ERP non-adopted companies.

4.2.11 Plans for implementing ERP in the immediate future

Table No: 4.18

Plans for ERP

Dependent Variables (Future plans for ERP)	Independent Variables	Respondents	% of Total
Future plans for ERP	Yes, immediate future	226	53.8
	Yes, But not now	120	28.6
	No, the existing software is OK	74	17.6
	Not Decided	0	0
	Not at all required	0	0
	Total	**392**	**100**

The above Table gives the plans for the ERP implementation 54% respondent says for immediate implementation, 28% having the plan but not immediately, but in future, 17% respondents are OK with the existing software.

4.3.1. Influence of Organisational, People and Technical Factors while implementing ERP.

The following factors were analysed with Independent sample t test for testing the Influence of Organisational, People and Technical Factors while implementing ERP and Kaiser-Meyer-Olkin Measure of Sampling Adequacy (KMO) and Bartlett's Test of Sphericity were used to test whether there exists any significant difference in factors considered while implementing ERP related to nature of the enterprises and it is found that the tests rejected the hypothesis confirming that these factors significantly influencing while implementing ERP systems in these organisations.

Organisational, People and Technical Factors faced while implementing ERP -

Table No: 4.19

Sl No	Organization factors
1	Before implementing ERP, the enterprises must already reengineered the business process
2	After implementing ERP, the enterprises need to reengineer business process.
3	Enterprises must be computerised or to have computers in all departments
4	Enterprises must have high speed internet connectivity
5	Enterprises must have LAN/WAN or network connectivity.
6	ERP systems are designed as per the organizational structure
	People Factors
1	User participation need to be assured in all areas of implementation and design
2	Enterprises should have proper user documentation
3	Proper training is to provide to all staffs
4	Proper user ID and security is to provide to all users
	Technical Factors
1	ERP systems are designed based on the software applications available.
2	ERP systems are designed based on the business processes of enterprises.
3	The implemented ERP projects is done in the scheduled time.
4	The implemented ERP projects is completed after the expected time.

Descriptive Analysis

Organisational Factors

Table No: 4.20

Descriptive Statistics

Organisational Factors	Mean	Std. Deviation	Analysis N
Before implementing ERP, the enterprises must already reengineered the business process	4.00	.633	420
After implementing ERP, the enterprises need to reengineer business process.	4.20	.749	420
Enterprises must be computerised with high speed internet connectivity, LAN/WAN or network connectivity.	3.90	.832	420
Enterprises must have high speed internet connectivity	3.96	.662	420

Table No: 4.21

Correlation Matrix

Organisational Factors		Before implementing ERP, the enterprises must already reengineered the business process	After implementing ERP, the enterprises need to reengineer business process.	Enterprises must be computerised with high speed internet connectivity, LAN/WAN or network connectivity.	Enterprises must have high speed internet connectivity
Correlation	Before implementing ERP, the enterprises must already reengineered the business process	1.000	.000	-.190	.501
	After implementing ERP, the enterprises need to reengineer business process.	.000	1.000	.354	.015

Organisational Factors		Before implementing ERP, the enterprises must already reengineered the business process	After implementing ERP, the enterprises need to reengineer business process.	Enterprises must be computerised with high speed internet connectivity, LAN/WAN or network connectivity.	Enterprises must have high speed internet connectivity
	Enterprises must be computerised with high speed internet connectivity, LAN/WAN or network connectivity.	-.190	.354	1.000	-.154
	Enterprises must have high speed internet connectivity	.501	.015	-.154	1.000
Sig. (1-tailed)	Before implementing ERP, the enterprises must already reengineered the business process		.500	.000	.000
	After implementing ERP, the enterprises need to reengineer business process.	.500		.000	.376
	Enterprises must be computerised with high speed internet connectivity, LAN/WAN or network connectivity.	.000	.000		.001
	Enterprises must have high speed internet connectivity	.000	.376	.001	
a. Determinant = .623					

Table No: 4.22

KMO and Bartlett's Test		
Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		.525
Bartlett's Test of Sphericity	Approx. Chi-Square	196.983
	df	6
	Sig.	.000

Table No: 4.23

Communalities

Organisational Factors	Initial	Extraction
Before implementing ERP, the enterprises must already reengineered the business process	1.000	.740
After implementing ERP, the enterprises need to reengineer business process.	1.000	.735
Enterprises must be computerised with high speed internet connectivity, LAN/WAN or network connectivity.	1.000	.682
Enterprises must have high speed internet connectivity	1.000	.737

Extraction Method: Principal Component Analysis.

Table No: 4.24

Total Variance Explained

Component	Initial Eigen values			Extraction Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	1.632	40.800	40.800	1.632	40.800	40.800
2	1.262	31.546	72.347	1.262	31.546	72.347
3	.609	15.234	87.580			
4	.497	12.420	100.000			

Extraction Method: Principal Component Analysis.

Table No: 4.25

Component Matrix

Organisational Factors	Component	
	1	**2**
Before implementing ERP, the enterprises must already reengineered the business process	.779	.365
After implementing ERP, the enterprises need to reengineer business process.	-.315	.797
Enterprises must be computerised with high speed internet connectivity, LAN/WAN or network connectivity.	-.596	.572
Enterprises must have high speed internet connectivity	.756	.408
Extraction Method: Principal Component Analysis.		

People Factors

Table No: 4.26
Descriptive Statistics

People Factors	Mean	Std. Deviation	Analysis N
User participation need to be assured in all areas of implementation and design	3.94	.656	420
Enterprises should have proper user documentation	3.96	.662	420
Proper training is to provide to all staffs	3.96	.662	420
Proper user ID and security is to provide to all users	3.93	.753	420

Table No: 4.27

Correlation Matrix

People Factors	User participation need to be assured in all areas of implementation and design	Enterprises should have proper user documentation	Proper training is to provide to all staffs
User participation need to be assured in all areas of implementation and design	1.000	-.148	-.148
Enterprises should have proper user documentation	-.148	1.000	1.000
Proper training is to provide to all staffs	-.148	1.000	1.000
Proper user ID and security is to provide to all users	-.202	.085	.085

Table No: 4.28

Correlation Matrix

People Factors Correlation	Proper user ID and security is to provide to all users
User participation need to be assured in all areas of implementation and design	-.202
Enterprises should have proper user documentation	.085
Proper training is to provide to all staffs	.085
Proper user ID and security is to provide to all users	1.000
a. Determinant = .000	
b. This matrix is not positive definite.	

Table No: 4.29

Communalities

People Factors	Initial	Extraction
User participation need to be assured in all areas of implementation and design	1.000	.578
Enterprises should have proper user documentation	1.000	.999
Proper training is to provide to all staffs	1.000	.999
Proper user ID and security is to provide to all users	1.000	.631

Extraction Method: Principal Component Analysis.

Table No: 4.30

Total Variance Explained

Component	Initial Eigen values			Extraction Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	2.066	51.660	51.660	2.066	51.660	51.660
2	1.139	28.484	80.144	1.139	28.484	80.144
3	.794	19.856	100.000			
4	1.002E-013	1.050E-013	100.000			

Extraction Method: Principal Component Analysis.

Table No: 4.31

Component Matrix

People Factors	Component	
	1	2
User participation need to be assured in all areas of implementation and design	-.314	.692
Enterprises should have proper user documentation	.980	.195
Proper training is to provide to all staffs	.980	.195
Proper user ID and security is to provide to all users	.217	-.764

Extraction Method: Principal Component Analysis.[a]

a. 2 components extracted.

Technical Factors

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Table No: 4.32

Descriptive Statistics

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Technical Factors	Mean	Std. Deviation	Analysis N
ERP systems are designed based on the software applications available.	3.90	.832	420
ERP systems are designed based on the business processes of enterprises.	3.96	.662	420
The implemented ERP projects is done in the scheduled time.	3.94	.656	420
The implemented ERP projects is completed after the expected time.	3.91	.820	420

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Table No: 4.33

Correlation Matrix

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	Technical Factors	ERP systems are designed based on the software applications available.	ERP systems are designed based on the business processes of enterprises.	The implemented ERP projects is done in the scheduled time.
Correlation	ERP systems are designed based on the software applications available.	1.000	-.154	.435
	ERP systems are designed based on the business processes of enterprises.	-.154	1.000	-.148
	The implemented ERP projects is done in the scheduled time.	.435	-.148	1.000
	The implemented ERP projects is completed after the expected time.	.012	.016	.070

Technical Factors		ERP systems are designed based on the software applications available.	ERP systems are designed based on the business processes of enterprises.	The implemented ERP projects is done in the scheduled time.
Sig. (1-tailed)	ERP systems are designed based on the software applications available.		.001	.000
	ERP systems are designed based on the business processes of enterprises.	.001		.001
	The implemented ERP projects is done in the scheduled time.	.000	.001	
	The implemented ERP projects is completed after the expected time.	.407	.373	.077

Table No: 4.34

Correlation Matrix

Technical Factors		The implemented ERP projects is completed after the expected time.
Correlation	ERP systems are designed based on the software applications available.	.012
	ERP systems are designed based on the business processes of enterprises.	.016
	The implemented ERP projects is done in the scheduled time.	.070
	The implemented ERP projects is completed after the expected time.	1.000
Sig. (1-tailed)	ERP systems are designed based on the software applications available.	.407
	ERP systems are designed based on the business processes of enterprises.	.373
	The implemented ERP projects is done in the scheduled time.	.077
	The implemented ERP projects is completed after the expected time.	
a. Determinant = .780		

Table No: 4.35

KMO and Bartlett's Test

Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		.542
Bartlett's Test of Sphericity	Approx. Chi-Square	103.334
	Df	6
	Sig.	.000

Table No: 4.36

Communalities

Technical Factors	Initial	Extraction
ERP systems are designed based on the software applications available.	1.000	.649
ERP systems are designed based on the business processes of enterprises.	1.000	.335
The implemented ERP projects is done in the scheduled time.	1.000	.664
The implemented ERP projects is completed after the expected time.	1.000	.892

Extraction Method: Principal Component Analysis.

Table No: 4.37

Total Variance Explained

Component	Initial Eigen values			Extraction Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	1.527	38.168	38.168	1.527	38.168	38.168
2	1.013	25.322	63.490	1.013	25.322	63.490
3	.899	22.476	85.966			
4	.561	14.034	100.000			

Extraction Method: Principal Component Analysis.

Table No: 4.38

Component Matrix

Technical Factors	Component	
	1	2
ERP systems are designed based on the software applications available.	.805	-.028
ERP systems are designed based on the business processes of enterprises.	-.461	.350
The implemented ERP projects is done in the scheduled time.	.809	.099
The implemented ERP projects is completed after the expected time.	.111	.938

Extraction Method: Principal Component Analysis

a. 2 components extracted.

Confirmatory Factor Analysis (CFA): CFA is used to represent all the constructs in the scale along with their variables in the measurement model for analysing the validity of the construct of the scale. It is mainly used when the structure of the scale is already developed.

Network Analysis Techniques: Programme Evaluation Review Technique (PERT) and Critical Path Method (CPM) were used to determine the time required to complete the ERP implementation and analysed the implementation programmes and schedules.

Structural Equation Modeling (SEM): SEM is a statistical tool for analyzing the dependence relationships among cause and effects in a set of constructs represented by multiple measurable variables in a single model. SEM uses the concept of both regression analysis and exploratory factor analysis. This research tries to examine the path significance and magnitude of the hypothesis and its effects on the proposed model with SEM.

SEM is a most widely used multivariate statistical tool and a method in the area of social science research. It is a popular term that represents a family of

concepts and methods such as construct analysis, confirmatory factor analysis, path analysis and partial least square. The extreme strength of SEM is its ability to use latent variables, called constructs in dependence models. SEM popularly used to test the theoretical relationships between the sets of constructs. The basic objective of research is to draw concrete conclusion, which has to be reliable and validated. SEM helps a researcher in providing justice to his/her research with proper care given to constructs. There are many fields where SEM is proving its credentials, e.g. sociology, psychology and marketing. It is a logical instrument used specifically for evaluating the relations among latent variables and testing theoretical models.

The analysis with CFA and SEM confirmed by rejecting the hypothesis that some factors like Organisational, People, Technical other Critical Success Factors negatively influence and a have a positive significant relationship with ERP usefulness with respect to implementation. The ERP Usefulness and the satisfaction of the users have a positive significant relationship with training given to the users. The factors related to Cost, Time, Technical, Efficiency, Manpower are highly influenced while implementing ERP in these companies. The test also rejected the hypothesis that "there is no association between the satisfaction levels of users and training given to them.

Diagram 4.1

CFA of Organisational factors
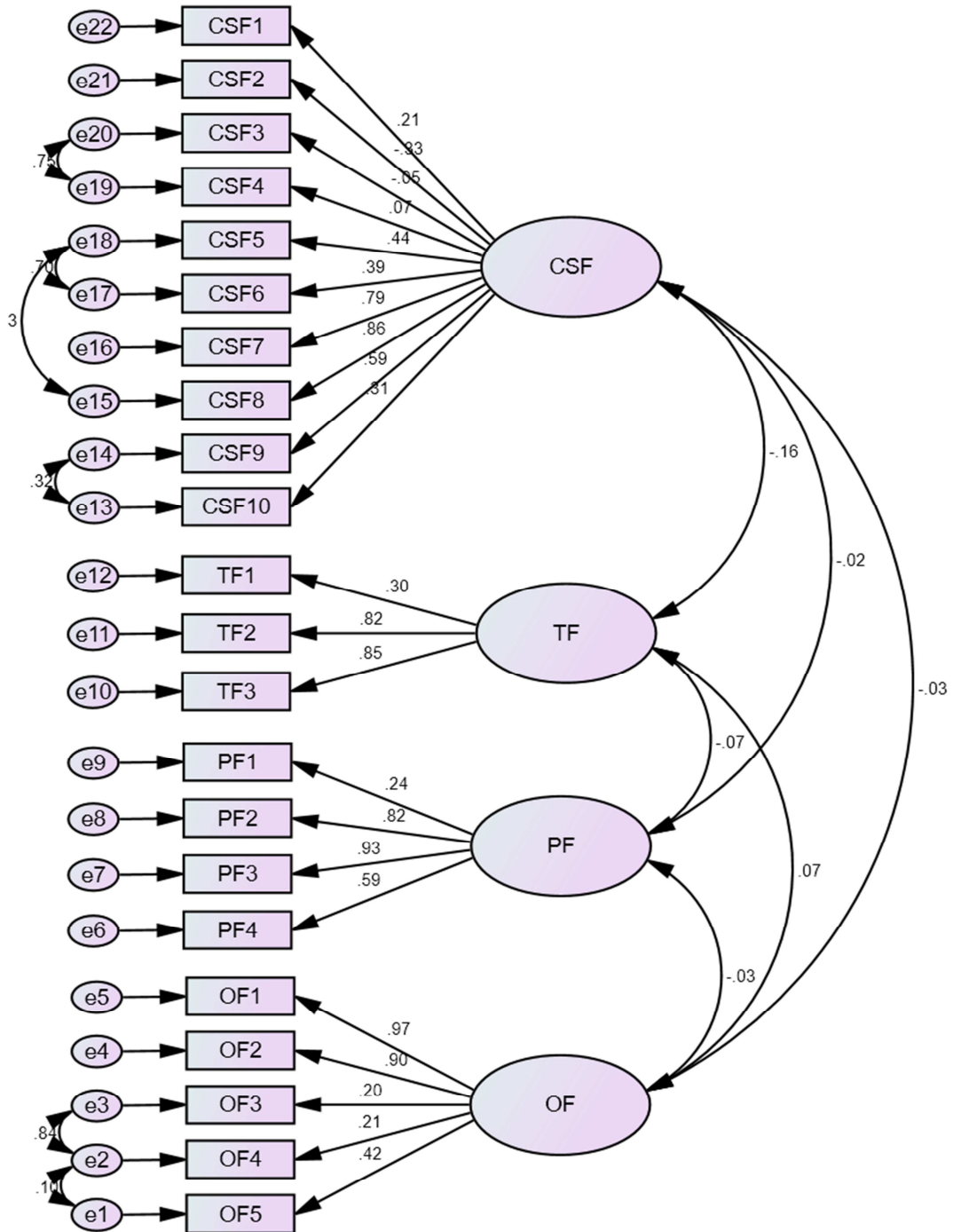
Diagram 4.2

Causal relationship between organisational factors critical success factors
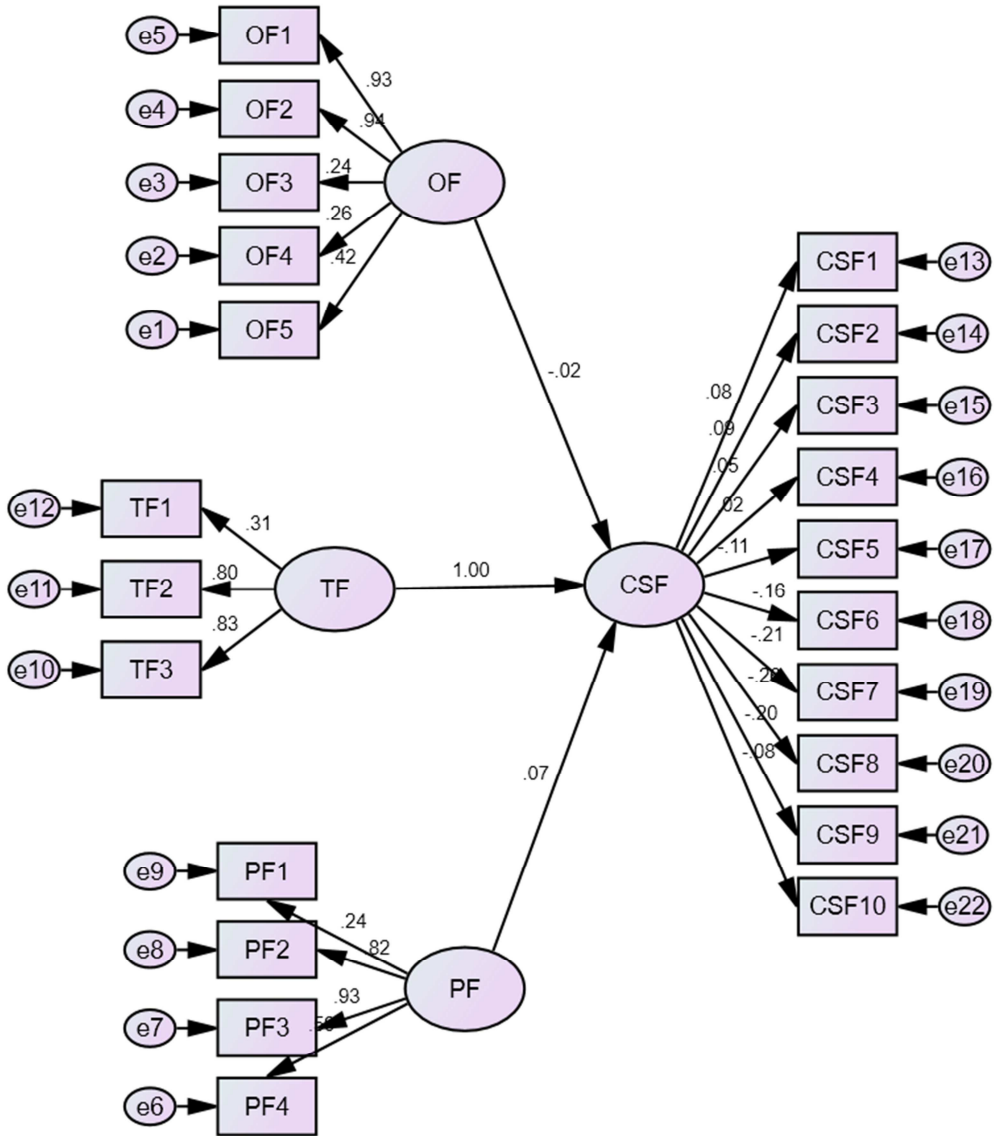
Diagram 4.3

CFA organisational factors and use and satisfaction
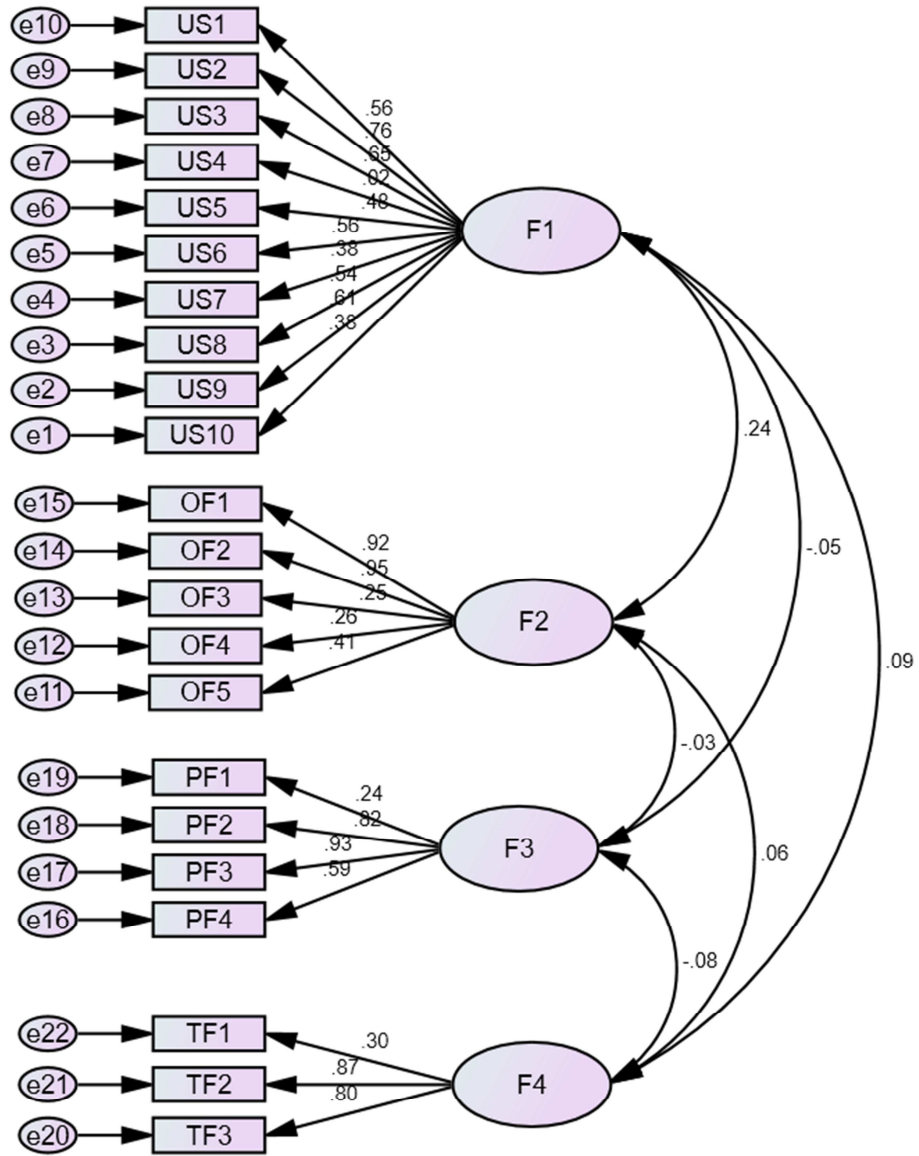
Diagram 4.4

Causal relationship between organisational factors and US
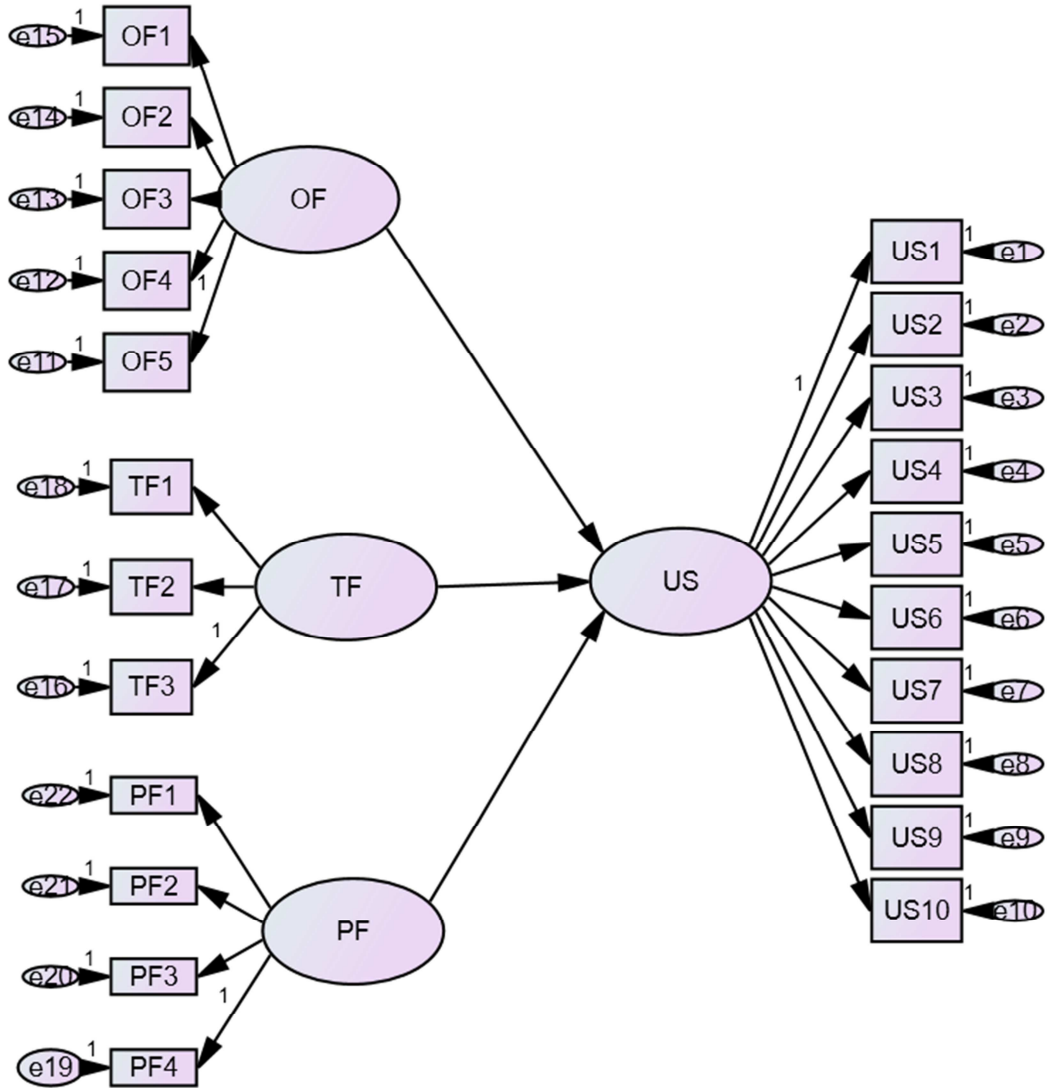
4.3.2. ERP Implementation Team

The perception and influence of ERP Implementation Team also analysed with respect to their training and satisfaction with Independent Samples Test and ANOVA. The test rejected the hypothesis "there is no association between the satisfaction level and training given to employees" confirming that the satisfaction and training are associated with highest mean square. Levene's Test for Equality of Variances and t-test for Equality of Means were used to test the variances and mean scores.

Table No: 4.39

Table Group Statistics

	Sector	N	Mean	Std. Deviation	Std. Error Mean
Transform the way the company operates through process improvements	State Sector	336	4.01	.687	.037
	Govt. Companies	78	3.77	.533	.060
Face the ever changing statutory/regulatory compliance	State Sector	336	4.20	.812	.044
	Govt. Companies	78	4.23	.424	.048
Replace aging legacy systems & modernize the IT setup with data integration	State Sector	336	3.93	.715	.039
	Govt. Companies	78	3.97	.321	.036
Increase the operational efficiency	State Sector	336	3.94	.770	.042
	Govt. Companies	78	3.79	1.024	.116
Enhance accountability/regulatory compliance	State Sector	336	4.20	.812	.044
	Govt. Companies	78	4.23	.424	.048
Provide better management tools	State Sector	336	3.93	.715	.039
	Govt. Companies	78	3.97	.321	.036
Face company's fast growth & stay competitive	State Sector	336	3.94	.770	.042
	Govt. Companies	78	3.79	1.024	.116
Improve the services to externals like suppliers & customers	State Sector	336	4.01	.687	.037
	Govt. Companies	78	3.77	.533	.060
Adapt the industrial Best practices available in ERP	State Sector	336	3.99	.695	.038
	Govt. Companies	78	3.69	.916	.104
Complete business segments went for ERP	State Sector	336	4.20	.812	.044
	Govt. Companies	78	4.23	.424	.048
Minimize the personnel dependency	State Sector	336	3.93	.715	.039
	Govt. Companies	78	3.97	.321	.036
Build checks & controls in the business operations	State Sector	336	3.94	.770	.042
	Govt. Companies	78	3.79	1.024	.116

Table No: 4.40

Independent Samples Test

		Levene's Test for Equality of Variances		t-test for Equality of Means		
		F	Sig.	t	df	Sig. (2-tailed)
Transform the way the company operates through process improvements	Equal variances assumed	.451	.502	2.851	412	.005
	Equal variances not assumed			3.334	142.997	.001
Face the ever changing statutory/regulatory compliance	Equal variances assumed	65.778	.000	-.362	412	.718
	Equal variances not assumed			-.526	226.303	.600
Replace aging legacy systems & modernize the IT setup with data integration	Equal variances assumed	17.393	.000	-.516	412	.606
	Equal variances not assumed			-.802	273.066	.423
Increase the operational efficiency	Equal variances assumed	19.353	.000	1.406	412	.160
	Equal variances not assumed			1.181	98.179	.241
Enhance accountability/regulatory compliance	Equal variances assumed	65.778	.000	-.362	412	.718
	Equal variances not assumed			-.526	226.303	.600
Provide better management tools	Equal variances assumed	17.393	.000	-.516	412	.606
	Equal variances not assumed			-.802	273.066	.423
Face company's fast growth & stay competitive	Equal variances assumed	19.353	.000	1.406	412	.160
	Equal variances not assumed			1.181	98.179	.241

		Levene's Test for Equality of Variances		t-test for Equality of Means		
		F	Sig.	t	df	Sig. (2-
Improve the services to externals like suppliers & customers	Equal variances assumed	.451	.502	2.851	412	.005
	Equal variances not assumed			3.334	142.997	.001
Adapt the industrial Best practices available in ERP	Equal variances assumed	25.700	.000	3.237	412	.001
	Equal variances not assumed			2.732	98.572	.007
Complete business segments went for ERP	Equal variances assumed	65.778	.000	-.362	412	.718
	Equal variances not assumed			-.526	226.303	.600
Minimize the personnel dependency	Equal variances assumed	17.393	.000	-.516	412	.606
	Equal variances not assumed			-.802	273.066	.423
Build checks & controls in the business operations	Equal variances assumed	19.353	.000	1.406	412	.160
	Equal variances not assumed			1.181	98.179	.241

Table No: 4.41

Independent Samples Test

		t-test for Equality of Means			
		Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference	
				Lower	Upper
Transform the way the company operates through process improvements	Equal variances assumed	.237	.083	.073	.400
	Equal variances not assumed	.237	.071	.096	.377
Face the ever changing statutory/regulatory compliance	Equal variances assumed	-.034	.095	-.221	.152
	Equal variances not assumed	-.034	.065	-.163	.094
Replace aging legacy systems & modernize the IT setup with data integration	Equal variances assumed	-.043	.083	-.206	.120
	Equal variances not assumed	-.043	.053	-.148	.062
Increase the operational efficiency	Equal variances assumed	.146	.104	-.058	.349
	Equal variances not assumed	.146	.123	-.099	.390
Enhance accountability/regulatory compliance	Equal variances assumed	-.034	.095	-.221	.152
	Equal variances not assumed	-.034	.065	-.163	.094
Provide better management tools	Equal variances assumed	-.043	.083	-.206	.120
	Equal variances not assumed	-.043	.053	-.148	.062
Face company's fast growth & stay competitive	Equal variances assumed	.146	.104	-.058	.349
	Equal variances not assumed	.146	.123	-.099	.390
Improve the services to externals like suppliers & customers	Equal variances assumed	.237	.083	.073	.400
	Equal variances not assumed	.237	.071	.096	.377

		t-test for Equality of Means			
		Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference	
				Lower	Upper
Adapt the industrial Best practices available in ERP	Equal variances assumed	.302	.093	.119	.485
	Equal variances not assumed	.302	.110	.083	.521
Complete business segments went for ERP	Equal variances assumed	-.034	.095	-.221	.152
	Equal variances not assumed	-.034	.065	-.163	.094
Minimize the personnel dependency	Equal variances assumed	-.043	.083	-.206	.120
	Equal variances not assumed	-.043	.053	-.148	.062
Build checks & controls in the business operations	Equal variances assumed	.146	.104	-.058	.349
	Equal variances not assumed	.146	.123	-.099	.390

ERP Implementation Team & Training

Table No: 4.42

ANOVA

		Sum of Squares	df	Mean Square	F	Sig.
Transform the way the company operates through process improvements	Between Groups	183.390	2	91.695	.	.
	Within Groups	.000	417	.000		
	Total	183.390	419			
Face the ever changing statutory/regulatory compliance	Between Groups	44.125	2	22.063	48.149	.000
	Within Groups	191.075	417	.458		
	Total	235.200	419			

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		Sum of Squares	df	Mean Square	F	Sig.
Replace aging legacy systems & modernize the IT setup with data integration	Between Groups	16.608	2	8.304	21.143	.000
	Within Groups	163.782	417	.393		
	Total	180.390	419			
Increase the operational efficiency	Between Groups	.182	2	.091	.135	.874
	Within Groups	281.559	417	.675		
	Total	281.740	419			
Enhance accountability/regulatory compliance	Between Groups	44.125	2	22.063	48.149	.000
	Within Groups	191.075	417	.458		
	Total	235.200	419			
Provide better management tools	Between Groups	16.608	2	8.304	21.143	.000
	Within Groups	163.782	417	.393		
	Total	180.390	419			
Face company's fast growth & stay competitive	Between Groups	.182	2	.091	.135	.874
	Within Groups	281.559	417	.675		
	Total	281.740	419			
Improve the services to externals like suppliers & customers	Between Groups	183.390	2	91.695	.	.
	Within Groups	.000	417	.000		
	Total	183.390	419			
Adapt the industrial Best practices available in ERP	Between Groups	1.983	2	.992	1.753	.174
	Within Groups	235.874	417	.566		
	Total	237.857	419			

		Sum of Squares	df	Mean Square	F	Sig.
Complete business segments went for ERP	Between Groups	44.125	2	22.063	48.149	.000
	Within Groups	191.075	417	.458		
	Total	235.200	419			
Minimize the personnel dependency	Between Groups	16.608	2	8.304	21.143	.000
	Within Groups	163.782	417	.393		
	Total	180.390	419			
Build checks & controls in the business operations	Between Groups	.182	2	.091	.135	.874
	Within Groups	281.559	417	.675		
	Total	281.740	419			

The influence of ERP users analysed with respect to their training and satisfaction with Independent Samples Test and ANOVA. The test rejected the hypothesis "there is no association between the satisfaction level and training given to employees" confirming that the satisfaction and training are associated with highest mean square. Levene's Test for Equality of Variances and t-test for Equality of Means were used to test the variances and mean scores.

ANOVA- About the perception of Implementation Team (executives) on ERP

Table No: 4.43

ANOVA

		Sum of Squares	Df	Mean Square	F	Sig.
transform the way the company operates through process improvements	Between Groups	.482	1	.482	1.102	.294
	Within Groups	182.908	418	.438		
	Total	183.390	419			
face the ever changing statutory/regulatory compliance	Between Groups	.047	1	.047	.083	.773
	Within Groups	235.153	418	.563		
	Total	235.200	419			
replace aging legacy systems & modernize the IT setup with data integration	Between Groups	.077	1	.077	.179	.673
	Within Groups	180.313	418	.431		
	Total	180.390	419			
increase the operational efficiency	Between Groups	.002	1	.002	.003	.955
	Within Groups	281.738	418	.674		
	Total	281.740	419			
enhance accountability/regulatory compliance	Between Groups	.047	1	.047	.083	.773
	Within Groups	235.153	418	.563		
	Total	235.200	419			
provide better management tools	Between Groups	.077	1	.077	.179	.673
	Within Groups	180.313	418	.431		
	Total	180.390	419			
face company's fast growth & stay competitive	Between Groups	.002	1	.002	.003	.955
	Within Groups	281.738	418	.674		
	Total	281.740	419			

		Sum of Squares	Df	Mean Square	F	Sig.
Improve the services to externals like suppliers & customers	Between Groups	.482	1	.482	1.102	.294
	Within Groups	182.908	418	.438		
	Total	183.390	419			
adapt the industrial Best practices available in ERP	Between Groups	.004	1	.004	.007	.935
	Within Groups	237.853	418	.569		
	Total	237.857	419			
complete business segments went for ERP	Between Groups	.047	1	.047	.083	.773
	Within Groups	235.153	418	.563		
	Total	235.200	419			
minimize the personnel dependency	Between Groups	.077	1	.077	.179	.673
	Within Groups	180.313	418	.431		
	Total	180.390	419			
build checks & controls in the business operations	Between Groups	.002	1	.002	.003	.955
	Within Groups	281.738	418	.674		
	Total	281.740	419			

The perception of ERP Implementation Team also analysed with respect to their training with ANOVA. The test rejected the hypothesis "there is no association between the satisfaction level and training given to employees" confirming that the satisfaction and training are associated and significant.

4.4. FACTOR ANALYSIS – PROBLEMS FACED DURING ERP IMPLEMENTATION

The pilot survey conducted in three units in three districts revealed certain problems faced by the ERP adopted companies. The problems mainly based on the resources availability. Based on this, certain variables and statements were set for the study and analysis.

ERP product Problems:

1. Lack of understanding of the product capabilities
2. Gaps between the product features & the expectations
3. Non-availability of good documentation
4. Selected by the Management without forming a team
5. ERP software is not user friendly, and
6. Bug/quality fulfillment issues.

People or User Problems:

1. Lack of Co-ordination between functional groups/teams
2. Employee resistance to change
3. Poor estimation of the manpower needed
4. Unavailability of skilled people
5. lack of involvement during the project, and
6. Turnover of the key people involved in the project.

Problems related to Project cost:

1. Poor project cost estimation
2. Implementation delay
3. Unplanned Customization
4. Unplanned/Extended training
5. Additional investment on technical infra structure etc.
6. Under-estimation of staff requirement/involvement
7. Rise in the consulting fee due to project delay and
8. Compelled to interface with the external systems.

Problems related to Project schedule:

1.   Project scope expansion

2.   Poor schedule estimation [unrealistic/over-ambitious]

3.   Unplanned Customization

4.   Technical issues [both hardware & software oriented]

5.   Conflict with other priorities [closure of accounting year etc.]

6.   Data issues', 'Resource constraints [staff, budget, etc.]

7.   Team – poor involvement/resistance and

8.   Implementation partner [consultant related issues etc.]

General Problems:

1.   Lack of Change Management

2.   Separate team not earmarked for ERP implementation

3.   Expectations out of the ERP were not clear

4.   Lack of commitment & involvement by the Management

5.   Inadequate training [overall]

6.   Poor project Management [no frequent reviews etc.] and

7.   More involvement of IT team instead of functional teams.

Problems related to Implementation partner:

1.   Frequent change of resources

2.   Incompetent consultants

3.   Poor knowledge transfer

4.   Poor alignment with the internal team

5.   Incompetent Project Manager

6.   Poor Post-implementation support and

7.   Consultants did not understand the culture of the organization'.

Technical Issues:

1.   Inadequate hardware resources

2.   Performance [slow/poor]

3.   Data issues [delay in codification, providing data, etc.]

4.   No help desk to support the technical issues

5.   Business entities are not well connected/networked and

6.   Poor technical support team.

The above-cited problems encountered while adopting and implementing the ERP System were analysed with Factor Analysis tool.

Simple Correlation technique also used to analyse the factors and all the dependent and independent variables.

ANALYSIS OF ERP PRODUCT RELATED PROBLEM

Table No: 4.44

Problems faced during ERP implementation - Descriptive Statistics

Product Related		Mean	Std. Deviation	Analysis N
1	Lack of understanding of the product capabilities	4.15	.360	420
2	Gaps between the product features & the expectations	4.80	.404	420
3	Non-availability of good documentation	3.00	.000	420
4	Selected by the Management without forming a team	2.00	.000	420
5	ERP software is not user friendly, and	1.00	.000	420
6	Bug/quality fulfillment issues.	4.36	.480	420

Table No: 4.45

Correlation Matrix

	1	2	3	4	5	6
Lack of understanding of the product capabilities	1.000	.215	.	.	.	.569
Gaps between the product features & the expectations	.215	1.000	.	.	.	-.681
Non-availability of good documentation	.	.	1.000	.	.	.
Selected by the Management without forming a team	.	.	.	1.000	.	.
ERP software is not user friendly, and	.	.	.	.	1.000	.
Bug/quality fulfillment issues.	.569	-.681	.	.	.	1.000

PEOPLE RELATED PROBLEM

Table No: 4.46

**People related Problems faced during
ERP implementation - Descriptive Statistics**

People related	Mean	Std. Deviation	Analysis N
1. Lack of Co-ordination between functional groups/teams	3.90	.557	420
2. Employee resistance to change	3.21	.406	420
3. Poor estimation of the manpower needed	5.09	.550	420
4. Unavailability of skilled people	2.00	.000	420
5. Lack of involvement during the project, and	1.00	.000	420
6. Turnover of the key people involved in the project.	5.80	.399	420

Table No: 4.47

Correlation Matrix

	1	2	3	4	5	6
Lack of Co-ordination between functional groups/teams	1.000	-.831	-.642	.	.	.334
Employee resistance to change	-.831	1.000	.337	.	.	-.322
Poor estimation of the manpower needed	-.642	.337	1.000	.	.	-.825
Unavailability of skilled people	.	.	.	1.000	.	.
lack of involvement during the project, and	.	.	.	.	1.000	.
Turnover of the key people involved in the project.	.334	-.322	-.825	.	.	1.000

PROJECT COST RELATED PROBLEM

Table No: 4.48

**Project related Problems faced during
ERP implementation - Descriptive Statistics**

	Project related	Mean	Std. Deviation	Analysis N
1	Poor project cost estimation	3.21	.406	420
2	Implementation delay	3.79	.406	420
3	Unplanned Customization	1.69	.464	420
4	Unplanned/Extended training	4.31	.464	420
5	Additional investment on technical infra structure etc.	1.31	.464	420
6	Under-estimation of staff requirement/involvement	4.69	.464	420

Table No: 4.49

Correlation Matrix

		1	2	3	4	5	6
1.	Poor project cost estimation	1.000	-1.000	-.201	-.344	.201	.344
2.	Implementation delay	-1.000	1.000	.201	.344	-.201	-.344
3.	Unplanned customization	-.201	.201	1.000	-.523	-1.000	.523
4.	Unplanned/Extended training	-.344	.344	-.523	1.000	.523	-1.000
5.	Additional investment on technical infra structure etc.	.201	-.201	-1.000	.523	1.000	-.523
6.	Under-estimation of staff requirement/involvement	.344	-.344	.523	-1.000	-.523	1.000

Table No: 4.50

Total Variance Explained

Component	Initial Eigenvalues			Extraction Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	3.096	51.598	51.598	3.096	51.598	51.598
2	2.362	39.375	90.973	2.362	39.375	90.973
3	.542	9.027	100.000			
4	1.002E-013	1.034E-013	100.000			
5	1.001E-013	1.013E-013	100.000			
6	-1.000E-013	-1.000E-013	100.000			

Extraction Method: Principal Component Analysis.

PROJECT SCHEDULE RELATED

Table No: 4.51

**Project Schedule related Problems faced
during ERP implementation - Descriptive Statistics**

	Mean	Std. Deviation	Analysis N
1 Project scope expansion	4.90	.830	420
2 Poor schedule estimation [unrealistic/over-ambitious]	1.30	.458	420
3 Unplanned Customization	3.00	.000	420
4 Technical issues [both hardware & software oriented]	1.70	.458	420
5 Conflict with other priorities [closure of accounting year etc.]	4.30	.458	420
6 Data issues', 'Resource constraints [staff, budget, etc.]	4.70	.458	420
7 Team – poor involvement/resistance and	4.30	.460	420
8 Implementation partner [consultant related issues etc.]	4.70	.460	420
9 Project scope expansion	4.70	.460	420

Table No: 4.52

Correlation Matrix

	1	2	3	4	5	6
Project scope expansion	1.000	.099	.	-.099	.068	-.068
Poor schedule estimation [unrealistic/over-ambitious]	.099	1.000	.	-1.000	-.424	.424
Unplanned Customization	.	.	1.000	.	.	.
Technical issues [both hardware & software oriented]	-.099	-1.000	.	1.000	.424	-.424
Conflict with other priorities [closure of accounting year etc.]	.068	-.424	.	.424	1.000	-1.000
Data issues', 'Resource constraints [staff, budget, etc.]	-.068	.424	.	-.424	-1.000	1.000
Team – poor involvement/resistance and	.350	.535	.	-.535	-.429	.429
Implementation partner [consultant related issues etc.]	-.081	-.048	.	.048	-.059	.059
Project scope expansion	-.350	-.535	.	.535	.429	-.429

PARTNER RELATED PROBLEM

Table No: 4.53

**Partner related Problems faced
during ERP implementation - Descriptive Statistics**

		Mean	Std. Deviation	Analysis N
1	Frequent change of resources	4.29	.701	420
2	Incompetent consultants	4.21	.774	420
3	Poor knowledge transfer	4.29	1.580	420
4	Poor alignment with the internal team	4.43	1.593	420
5	Incompetent Project Manager	4.00	2.567	420
6	Poor Post-implementation support and	1.29	.452	420
7	Consultants did not understand the culture of the organization'.	2.50	.825	420

Table No: 4.54

Correlation Matrix

	1	2	3	4	5	6	7
Frequent change of resources	1.000	-.510	-.074	.403	-.637	.645	.619
Incompetent consultants	-.510	1.000	.008	-.772	.721	-.789	-.842
Poor knowledge transfer	-.074	.008	1.000	-.504	-.424	.286	.275
Poor alignment with the internal team	.403	-.772	-.504	1.000	-.490	.625	.600
Incompetent Project Manager	-.637	.721	-.424	-.490	1.000	-.987	-.947
Poor Post-implementation support and	.645	-.789	.286	.625	-.987	1.000	.960
Consultants did not understand the culture of the organization'.	.619	-.842	.275	.600	-.947	.960	1.000

Table No: 4.55

Communalities

	Initial	Extraction
Frequent change of resources	1.000	.518
Incompetent consultants	1.000	.820
Poor knowledge transfer	1.000	.977
Poor alignment with the internal team	1.000	.924
Incompetent Project Manager	1.000	.978
Poor Post-implementation support and	1.000	.974
Consultants did not understand the culture of the organization'.	1.000	.958

Extraction Method: Principal Component Analysis.

Table No: 4.56

Total Variance Explained						
Component	Initial Eigen values			Extraction Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	4.590	65.578	65.578	4.590	65.578	65.578
2	1.558	22.253	87.831	1.558	22.253	87.831
3	.611	8.735	96.566			
4	.189	2.702	99.269			
5	.051	.731	100.000			
6	1.036E-013	1.513E-013	100.000			
7	-1.016E-013	-1.224E-013	100.000			

Extraction Method: Principal Component Analysis.

Table No: 4.57

Component Matrix

	Component	
	1	2
Frequent change of resources	.712	-.105
Incompetent consultants	-.884	.196
Poor knowledge transfer	.147	.977
Poor alignment with the internal team	.710	-.648
Incompetent Project Manager	-.942	-.301
Poor Post-implementation support and	.975	.150
Consultants did not understand the culture of the organization'.	.969	.140

Extraction Method: Principal Component Analysis.[a]
a. 2 components extracted.

TECHNICAL ISSUES

Table No: 4.58

Technical Problems faced during ERP implementation - Descriptive Statistics

	Mean	Std. Deviation	Analysis N
1 Inadequate hardware resources	4.00	.731	420
2 Performance [slow/poor]	1.27	.443	420
3 Data issues [delay in codification, providing data, etc.]	1.73	.443	420
4 No help desk to support the technical issues	4.73	.443	420
5 Business entities are not well connected/networked and	3.27	.443	420
6 Poor technical support team.	4.73	.443	420

Table No: 4.59

Component Matrix

	1	2	3	4	5	6
1. Inadequate hardware resources	1.000	.000	.000	-.826	-.826	.826
2. Performance [slow/poor]	.000	1.000	-1.000	.364	-.364	.364
3. Data issues [delay in codification, providing data, etc.]	.000	-1.000	1.000	-.364	.364	-.364
4. No help desk to support the technical issues	-.826	.364	-.364	1.000	.364	-.364
5. Business entities are not well connected/networked and	-.826	-.364	.364	.364	1.000	-1.000
6. Poor technical support team.	.826	.364	-.364	-.364	-1.000	1.000

Table No: 4.60

Communalities

	Initial	Extraction
Inadequate hardware resources	1.000	.989
Performance [slow/poor]	1.000	.954
Data issues [delay in codification, providing data, etc.]	1.000	.954
No help desk to support the technical issues	1.000	.816
Business entities are not well connected/networked and	1.000	.936
Poor technical support team.	1.000	.936

Extraction Method: Principal Component Analysis.

Total Variance Explained

Component	Initial Eigenvalues			Extraction Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	3.260	54.337	54.337	3.260	54.337	54.337
2	2.325	38.749	93.086	2.325	38.749	93.086
3	.415	6.914	100.000			
4	1.001E-013	1.023E-013	100.000			
5	-1.003E-013	-1.042E-013	100.000			
6	-1.046E-013	-1.773E-013	100.000			

Extraction Method: Principal Component Analysis.

Table No: 4.62

Component Matrix

	Component	
	1	2
Inadequate hardware resources	.891	-.441
Performance [slow/poor]	.413	.885
Data issues [delay in codification, providing data, etc.]	-.413	-.885
No help desk to support the technical issues	-.504	.750
Business entities are not well connected/networked and	-.967	-.021
Poor technical support team.	.967	.021

Extraction Method: Principal Component Analysis.

a. 2 components extracted.

GENERAL PROBLEMS

Table No: 4.63

General Problems faced during ERP implementation - Descriptive Statistics

	Mean	Std. Deviation	Analysis N
1 Lack of Change Management	4.38	.743	420
2 Separate team not earmarked for ERP implementation	4.30	.461	420
3 Expectations out of the ERP were not clear	2.43	.495	420
4 Lack of commitment & involvement by the Management	2.84	.820	420
5 Inadequate training [overall]	1.00	.000	420
6 Poor project Management [no frequent reviews etc.] and	4.04	.758	420
7 More involvement of IT team instead of functional teams.	4.01	.967	420

Table No: 4.64

Correlation Matrix

	1	2	3	4	5	6
Lack of Change Management	1.000	-.340	-.138	.357	.	-.504
Separate team not earmarked for ERP implementation	-.340	1.000	-.571	.127	.	.844
Expectations out of the ERP were not clear	-.138	-.571	1.000	-.887	.	-.041
Lack of commitment & involvement by the Management	.357	.127	-.887	1.000	.	-.425
Inadequate training [overall]	.	.	.	.	1.000	.
Poor project Management [no frequent reviews etc.] and	-.504	.844	-.041	-.425	.	1.000
More involvement of IT team instead of functional teams.	-.444	-.692	.649	-.395	.	-.417

Table No: 4.65

Correlation Matrix

	General Problems/Barriers
Lack of Change Management	-.444
Separate team not earmarked for ERP implementation	-.692
Expectations out of the ERP were not clear	.649
Lack of commitment & involvement by the Management	-.395
Inadequate training [overall]	
Poor project Management [no frequent reviews etc.] and	-.417
More involvement of IT team instead of functional teams.	1.000

The Descriptive Statistics shows the 47 variables' mean, (X) standard deviation (S) and number of respondents (N) who had participated in the survey were analysed. Ten variables were identified most critical with high mean score, such as Lack of understanding of the product capabilities, Bug/quality fulfillment issues, Turnover of the key people involved in the project, Under-estimation of staff requirement/involvement, Unplanned/Extended training, Project scope expansion, Team – poor involvement/resistance, Implementation partner [consultant related issues etc.], Poor technical support team, Separate team not earmarked for ERP implementation. Among these variables, most critical is the Implementation partner [consultant related issues etc.], that had affected most of the respondents during ERP adoption (with highest mean). On the other hand, 'the Data related issues', 'technical issues', 'lack of involvements' is the least affecting variable with lowest means.

4.5   SWOC ANALYSIS ON ERP IMPLEMENTATION

SWOC is the short form of Strengths, Weaknesses, Opportunities and Challenges (Hemavathy et al. 2014) is used to evaluate a project with respect to its strengths, weaknesses, opportunities and challenges. This tool guides successful estimation of the challenges which are built on the project's strengths, identifying its opportunities as well and protecting it against external challenges. Identification of

SWOCs is significant because they can enlighten later steps in planning to accomplish the goals. This tool recognizes the internal and external key factors which are necessary and important to achieve the organizational objectives and goals. If an organization wants to implement ERP then that organization needs to analyze the factors which affect the related processes and to control & manage the problems that would arise during the ERP implementation.

ERP Adoption – SWOC factors

STRENGTHS	WEAKNESSES	OPPORTUNITIES	CHALLENGES
Reasons for Adoption of ERP Product Selection	**Reasons for Non-Adoption of ERP**	**Factors for Adoption of ERP in Future**	**Areas need to improved or need attention for ERP Implementation**

STRENGTHS – Reasons for Adoption of ERP Product Selection
- Suitability of the ERP Software for the business needs
- Price of the ERP software and cost of installation
- ERP software vendor reputation in the market
- Supply and implementation vendors fame
- Advice from the industry analyst/ consultant or peer groups
- Previous experience from the ERP software using companies
- Post implementation support
- The technology platform of the ERP software
- Shorter implementation timeframe
- Availability of the ERP Software for the business needs

WEAKNESSES – Reasons for Non-Adoption of ERP
- Existing Legacy system Sufficient
- Feel too small to go for ERP
- Not required (not seen any value in it)
- Available ERP not fit for our needs
- The existing bad experience of others
- ERP Comes in next priorities
- Non-availability of skilled expertise
- Non-availability of a full-fledged IT/EDP team
- Cost/affordability factors
- Employee/Union résistance

OPPORTUNITIES – Factors for Adoption of ERP in Future
- A serious necessity emerged in the existing software environment
- Significant drop in the Price of the software & ERP Installation and maintenance costs
- Considerable drop in the implementation risks of ERP
- Availability of a ERP software which would meet the organisational requirements
- Industry witnessing more successful ERP implementations
- Once our competing priorities are addressed
- Reaching the organizational maturity [People & Process]
- Improvement in the financial position
- Stage when an agreement with the employees/Unions have reached
- Increase in the desire of the Management towards going for ERP

CHALLENGES – Areas need to improved or need attention for ERP Implementation
- ERP product Selection
- Project Manager
- Implementation vendor Selection/engagement
- Formation of good/focused Internal Team
- Team Involvement
- Project schedule adherence
- Project Scope clarity
- Project Governance
- Project Budget adherence
- Clear Communication
- Training process
- Technology Infrastructure
- Process redesign
- Level of customization
- Management involvement at all the stages
- Change Management
- Duration of the parallel run
- Project roll-out period prior to go-live

SWOC analysis groups key pieces of information into two main categories:

1. **Internal factors** – the *strengths* (reason for ERP adoption) and *weaknesses* (reason for ERP non-adoption) internal to the organization

2. **External factors** – the *opportunities* (ERP adoption in future) and *challenges* (problems need to be rectified related to ERP implementation) presented by the environment external to the organization

4.5.1 Strengths of ERP Adoption

Based on the strengths of the ERP product only the companies tend to choose a particular ERP product for them. In this study, the strengths/traits, which influenced the respondents to choose their ERP application, were analyzed under SWOC analysis. The analysis with **Friedman** Ranking Test and **Garret** Ranking suggests the 'Suitability of the ERP Software for the business needs', 'Shorter implementation timeframe', 'Price of the ERP software and cost of installation' and 'Post implementation support' tops with good Mean Ranks. On the other hand, 'the technology platform of the ERP software', 'ERP software vendor reputation in the market', 'Supply and implementation vendors fame', 'Availability of the ERP Software for the business needs' and 'Advice from the industry analyst/ consultant or peer groups' have less popular.

Descriptive Statistics – Strengths

SWOC – STRENGTHS - Friedman Test

Table No: 4.66

Ranks

SWOC – STRENGTHS	Mean Rank
Suitability of the ERP Software for the business needs	1.28
Shorter implementation timeframe	2.25
Price of the ERP software and cost of installation	2.47
Post implementation support	4.45
Previous experience from the ERP software using companies	4.90
The technology platform of the ERP software	6.12
ERP software vendor reputation in the market	6.66
Supply and implementation vendors fame	8.23
Availability of the ERP Software for the business needs	9.17
Advice from the industry analyst/ consultant or peer groups	9.46

Test Statistics

N	420
Chi-Square	3547.406
df	9
Asymp. Sig.	.000
a. Friedman Test	

The collected data also analysed with Garret Ranking method, the results are shown in the following table.

Table No: 4.67

Reasons for the Selection of current ERP product (SWOC - Strengths)

Variables - Strengths		Rank	Percent position $\frac{100(Rij-0.5)}{Nj}$	Calculated Value	Garret Value corresponding to calculated value
A.	Suitability of the ERP Software for the business needs	1	$\frac{100(1-0.5)}{10}$	5	96
B.	Price of the ERP software and cost of installation	2	$\frac{100(2-0.5)}{10}$	15	70
C.	ERP software vendor reputation in the market	3	$\frac{100(3-0.5)}{5}$	25	63
D.	Supply and implementation vendors fame	4	$\frac{100(4-0.5)}{5}$	35	58
E.	Advice from the industry analyst/ consultant or peer groups	5	$\frac{100(5-0.5)}{5}$	45	52
F.	Previous experience from the ERP software using companies	6	$\frac{100(6-0.5)}{5}$	55	48
G.	Post implementation support	7	$\frac{100(7-0.5)}{5}$	65	42
H.	The technology platform of the ERP software	8	$\frac{100(8-0.5)}{5}$	75	37
I.	Shorter implementation timeframe	9	$\frac{100(9-0.5)}{5}$	85	30
J.	Availability of the ERP Software for the business needs	10	$\frac{100(10-0.5)}{5}$	95	18

Table No: 4.68

Frequency Table-strengths

A	B	C	D	E	F	G	H	I	J
352	40	29	0	0	0	0	0	0	0
69	87	265	0	0	0	0	0	0	0
0	0	1	50	0	51	279	40	0	0
0	0	0	1	0	0	40	285	95	0
0	0	0	0	1	0	40	0	125	255
0	0	0	40	380	1	0	0	0	0
0	0	0	330	40	0	51	0	0	0
0	0	0	0	0	369	51	1	0	0
0	334	86	0	0	0	0	0	1	0
0	0	0	0	0	0	0	95	200	126

Table No: 4.69

Table showing Garett Value (Strengths)

Varia-ble	1	2	3	4	5	6	7	8	9	10	Total Garret Value	Rank
A	33792	2800	1827	0	0	0	0	0	0	0	38419	1
B	6624	6090	16695	0	0	0	0	0	0	0	29409	2
C	0	0	63	2900	0	2448	11718	1480	0	0	18609	7
D	0	0	0	58	0	0	1680	10545	2850	0	15133	8
E	0	0	0	0	52	0	1680	0	3750	4590	10072	10
F	0	0	0	2320	19760	48	0	0	0	0	22128	5
G	0	0	0	19140	2080	0	2142	0	0	0	23362	4
H	0	0	0	0	0	17712	2142	37	0	0	19891	6
I	0	23380	5418	0	0	0	0	0	30	0	28828	3
J	0	0	0	0	0	0	0	3515	6000	2268	11783	9

4.5.2 Weaknesses in ERP Adoption Kendall's W Test

The weaknesses of the ERP adoption were the factors which affect the ERP adoption in the organization. These are the factors considered for non-adoption of ERP in an organisation.

Due to these factors only, the respondents are keeping away in adopting ERP in their organizations and were analyzed under SWOC Analysis. The collected data were analysed with Friedman Ranking Test and Kendall's W Test and also with **Garret** Ranking suggests that the 'Cost/affordability factors' and the attitude of 'Existing Legacy system Sufficient' were the main weaknesses with least ranking scores. 'The existing bad experience of others' and 'Available ERP not fit for our needs' were the least affecting factors in ERP adoption.

SWOC – WEAKNESS - Friedman Test

Table No: 4.70

Ranks

SWOC – WEAKNESS	Mean Rank
Cost/affordability factors	2.16
Existing Legacy system Sufficient	3.75
Feel too small to go for ERP	4.29
ERP Comes in next priorities	4.69
Non-availability of skilled expertise	4.70
Non-availability of a full-fledged IT/EDP team	4.92
Employee/Union résistance	6.41
Not required (not seen any value in it)	7.05
Available ERP not fit for our needs	7.93
The existing bad experience of others	9.10

Table No: 4.71

Test Statistics

N	420
Chi-Square	1805.673
df	9
Asymp. Sig.	.000

a. Friedman Test

Kendall's W Test

Table No: 4.72

Ranks

SWOC - Weakness	Mean Rank
Cost/affordability factors	2.16
Existing Legacy system Sufficient	3.75
Feel too small to go for ERP	4.29
ERP Comes in next priorities	4.69
Non-availability of skilled expertise	4.70
Non-availability of a full-fledged IT/EDP team	4.92
Employee/Union résistance	6.41
Not required (not seen any value in it)	7.05
Available ERP not fit for our needs	7.93
The existing bad experience of others	9.10

Table No: 4.73

Test Statistics

N	420
Kendall's W	.478
Chi-Square	1805.673
df	9
Asymp. Sig.	.000

a. Kendall's Coefficient of Concordance

The collected data also analysed with Garret Ranking method, the results are shown in the Table 4.70 and 4.71.

Reason for not opting ERP (SWOC - Weakness)

Table No: 4.74

Frequency table - Weaknesses

Weaknesses	A	B	C	D	E	F	G	H	I	J
A. Existing Legacy system Sufficient	221	30	23	0	0	20	53	0	74	0
B. Feel too small to go for ERP	53	55	166	0	0	53	0	74	20	0
C. Not required (not seen any value in it)	0	0	1	81	0	28	208	30	0	73
D. Available ERP not fit for our needs	1	0	0	0	0	74	30	253	63	0
E. The existing bad experience of others	0	0	0	0	1	0	104	0	136	180
F. ERP Comes in next priorities	0	0	0	157	263	1	0	0	0	0
G. Non-availability of skilled expertise	0	0	0	236	157	0	28	0	0	0
H. Non-availability of a full-fledged IT/EDP team	20	0	127	0	0	245	28	1	0	0
I. Cost/affordability factors	0	366	54	0	0	0	0	0	1	0
J. Employee/Union résistance	127	0	20	0	0	0	0	63	127	84

Table No: 4.75

Table showing Garrett Value (Weaknesses)

	1	2	3	4	5	6	7	8	9	10	TOTAL	RANK
A	21216	2100	1449	0	0	960	2226	0	2220	0	30171	1
B	5088	3850	10458	0	0	2544	0	2738	600	0	25278	2
C	0	0	63	4698	0	1344	8736	1110	0	1314	17265	7
D	96	0	0	0	0	3552	1260	9361	1890	0	16159	8
E	0	0	0	0	52	0	4368	0	4080	3240	11740	9
F	0	0	0	9106	13676	48	0	0	0	0	22830	5
G	0	0	0	13688	8164	0	1176	0	0	0	23028	3
H	1920	0	8001	0	0	11760	1176	37	0	0	22894	4
I	0	25620	3402	0	0	0	0	0	30	0	22894	4
J	12192	0	1260	0	0	0	0	2331	3810	1512	21105	6

4.5.3 Opportunities in ERP Adoption

The factors which influence the organization for the adoption of ERP in future were considered as the opportunities of ERP under SWOC analysis. The factors under the opportunity are, 'A serious necessity to emerge in our existing software environment', 'Significant drop in the Price of the software & maintenance costs', 'Considerable drop in the risks of implementation', 'Availability of an ERP software which would meet our expectations', 'Witnessing lot of successful implementations in our specific industry', 'Once our competing priorities are addressed', 'Reaching the organizational maturity [People & Process]', 'Improvement in the financial position', 'Stage when an agreement with the employees/Unions have reached', 'Increase in the desire of the Management towards going for ERP'.

The collected data were analysed with **Friedman** Ranking Test and **Kendall's W** Test and also with **Garret** Ranking suggests that From the above mentioned variables, 'Availability of an ERP software which would meet our expectations' is the power variable, followed by other variables such as 'Increase in the desire of the Management towards going for ERP' and the variable in the last

position is 'Stage when an agreement with the employees/Unions have reached', which has less impact on dependent variable .

Descriptive Statistics – Opportunities of ERP Adoption in the Future

SWOC – Opportunities
Table No: 4.76 Friedman Test – Ranks

SWOC – OPPORTUNUTIES	Mean Rank
A serious necessity emerged in the existing software environment	1.75
Considerable drop in the implementation risks of ERP	1.89
Significant drop in the Price of the software & ERP Installation and maintenance costs	2.36
Increase in the desire of the Management towards going for ERP	5.09
Availability of a ERP software which would meet the organisational requirements	5.36
Once our competing priorities are addressed	5.69
Industry witnessing more successful ERP implementations	5.90
Reaching the organizational maturity [People & Process]	8.06
Improvement in the financial position	9.26
Stage when an agreement with the employees/Unions have reached	9.64

a. Friedman Test **Statistics**

N	420
Chi-Square	3444.195
df	9
Asymp. Sig.	.000

Kendall's W Test

Table No: 4.77

Ranks

SWOC – Opportunities	Mean Rank
A serious necessity emerged in the existing software environment	1.75
Considerable drop in the implementation risks of ERP	1.89
Significant drop in the Price of the software & ERP Installation and maintenance costs	2.36
Increase in the desire of the Management towards going for ERP	5.09
Availability of a ERP software which would meet the organisational requirements	5.36
Once our competing priorities are addressed	5.69
Industry witnessing more successful ERP implementations	5.90
Reaching the organizational maturity [People & Process]	8.06
Improvement in the financial position	9.26
Stage when an agreement with the employees/Unions have reached	9.64

Test Statistics	
N	420
Kendall's W[a]	.911
Chi-Square	3444.195
df	9
Asymp. Sig.	.000

a. Kendall's Coefficient of Concordance

Reason for ERP implementation in the immediate future (SWOC - Opportunities)

Table No: 4.78

Frequency Table-Opportunities

Opportunities	1	2	3	4	5	6	7	8	9	10
A. A serious necessity emerged in the existing software environment	264	0	157	0	0	0	0	0	0	0
B. Significant drop in the Price of the software & ERP Installation and maintenance costs	0	268	153	0	0	0	0	0	0	0
C. Considerable drop in the implementation risks of ERP	157	153	111	0	0	0	0	0	0	0
D. Availability of a ERP software which would meet the organisational requirements	0	0	0	1	267	153	0	0	0	0
E. Industry witnessing more successful ERP implementations	0	0	0	0	154	157	110	0	0	0
F. Once our competing priorities are addressed	0	0	0	0	153	111	143	14	0	0
G. Reaching the organizational maturity [People & Process]	0	0	0	0	0	0	21	369	20	11
H. Improvement in the financial position	0	0	0	0	0	0	0	38	243	140
I. Stage when an agreement with the employees/Unions have reached	0	0	0	0	0	0	0	0	158	263
J. Increase in the desire of the Management towards going for ERP	0	0	0	267	0	0	153	0	0	1

Garrett Rank of Opportunities

Table No: 4.79

	1	2	3	4	5	6	7	8	9	10	TOTAL	RANK
A	25344	0	9891	0	0	0	0	0	0	0	35235	1
B	0	18760	9639	0	0	0	0	0	0	0	28399	3
C	15072	10710	6993	0	0	0	0	0	0	0	32775	2
D	0	0	0	58	13884	7344	0	0	0	0	21286	5
E	0	0	0	0	8008	7536	4620	0	0	0	20164	6
F	0	0	0	0	7956	5328	6006	518	0	0	19808	7
G	0	0	0	0	0	0	882	13653	600	198	15333	8
H	0	0	0	0	0	0	0	1406	7290	2520	11216	9
I	0	0	0	0	0	0	0	0	4740	4734	9474	10
J	0	0	0	15486	0	0	6426	0	0	18	21930	4

4.5.4　Challenges in ERP Adoption

Under this factor of SWOC Analysis, the challenges are the variables where the ERP aspirants need to pay attention as per the views of respondents who adopted the ERP. The critical variables under this factor are 'ERP product Selection', 'Project Manager', Implementation vendor Selection/engagement', 'Formation of good/focused Internal Team', 'Team Involvement', 'Project schedule adherence', 'Project Scope clarity', 'Project Governance', 'Project Budget adherence', 'Clear Communication', 'Training process', 'Technology Infrastructure', 'Process redesign', 'Level of customization', 'Management involvement at all the stages', 'Change Management', 'Duration of the parallel run'and 'Black-out period prior to go-live'.

The collected data were analysed with **Friedman** Ranking Test and **Kendall's W** Test and also with **Factor Analysis** suggests that 'ERP product Selection' and 'Level of customization' with the highest mean value plays a major role in 'Challenges' segment and is a critical parameter to be considered while planning to go for ERP adoption.

SWOC – CHALLENGES Friedman Test - Ranks

Table No: 4.80

SWOC – CHALLENGES	Mean Rank
ERP Product Selection - Challenges	13.12
Project Manager	7.14
Implementation vendor Selection/engagement	7.54
Formation of good/focused Internal Team	12.72
Team Involvement	10.08
Project schedule adherence	11.40
Project Scope clarity	11.80
Project Governance	4.60
Project Budget adherence	5.24
Clear Communication	6.32
Training process	12.65
Technology Infrastructure	12.65
Process redesign	11.40
Level of customization	13.12
Management involvement at all the stages	4.60
Change Management	7.14
Duration of the parallel run	8.86
Project roll-out period prior to go-live	4.60

a. Friedman Test

Kendall's W Test

<div align="center">

Table No: 4.81

Ranks

</div>

SWOC – CHALLENGES	Mean Rank
ERP product Selection - Challenges	13.12
Project Manager	7.14
Implementation vendor Selection/engagement	7.54
Formation of good/focused Internal Team	12.72
Team Involvement	10.08
Project schedule adherence	11.40
Project Scope clarity	11.80
Project Governance	4.60
Project Budget adherence	5.24
Clear Communication	6.32
Training process	12.65
Technology Infrastructure	12.65
Process redesign	11.40
Level of customization	13.12
Management involvement at all the stages	4.60
Change Management	7.14
Duration of the parallel run	8.86
Project roll-out period prior to go-live	4.60

<div align="center">

Table No: 4.82

Test Statistics

</div>

N	420
Kendall's W[a]	.593
Chi-Square	4233.248
df	17
Asymp. Sig.	.000

a. Kendall's Coefficient of Concordance

Specific area need to pay attention (SWOC - Challenges) - Factor Analysis

Table No: 4.83

Total Variance Explained

Component	Initial Eigen values			Extraction Sums of Squared Loadings			Rotation Sums of Squared Loadings		
	Total	% of Varian-ce	Cumula-tive %	Total	% of Varian ce	Cumul-ative %	Total	% of Varia-nce	Cumulative %
ERP product Selection	8.453	46.962	46.962	8.453	46.962	46.962	6.714	37.300	37.300
Project Manager	6.142	34.124	81.085	6.142	34.124	81.085	5.662	31.455	68.755
Implementation vendor Selection/engagement	3.405	18.915	100.000	3.405	18.915	100.000	5.624	31.245	100.000
Formation of good/focused Internal Team	6.587E-014	3.660E-013	100.000						
Team Involvement	3.355E-014	1.864E-013	100.000						
Project schedule adherence	1.258E-014	6.986E-014	100.000						
Project Scope clarity	1.110E-014	6.168E-014	100.000						
Project Governance	9.508E-015	5.282E-014	100.000						
Project Budget adherence	6.901E-015	3.834E-014	100.000						
Clear Communicatio n	4.130E-015	2.294E-014	100.000						
Training process	2.360E-015	1.311E-014	100.000						
Technology Infrastructure	-1.734E-015	-9.636E-015	100.000						
Process redesign	-6.200E-015	-3.445E-014	100.000						
Level of customization	-7.728E-015	-4.293E-014	100.000						
Management involvement at all the stages	-9.535E-015	-5.297E-014	100.000						
Change Management	-1.057E-014	-5.874E-014	100.000						
Duration of the parallel run	-2.028E-014	-1.127E-013	100.000						
Project roll-out period prior to go-live	-6.024E-014	-3.347E-013	100.000						

Extraction Method: Principal Component Analysis.

Table No: 4.84

Rotated Component Matrix

	Component		
	1	2	3
ERP product Selection		-.981	
Project Manager		.553	.757
Implementation vendor Selection/engagement			.908
Formation of good/focused Internal Team			-.907
Team Involvement			.993
Project schedule adherence		.978	
Project Scope clarity			.878
Project Governance	.510		.822
Project Budget adherence		.955	
Clear Communication	.735	-.659	
Training process	.965		
Technology Infrastructure	.965		
Process redesign		.889	
Level of customization	.847	-.513	
Management involvement at all the stages	.807		.587
Change Management	.676	.574	
Duration of the parallel run	.965		
Project roll-out period prior to go-live	.862		.508

Extraction Method: Principal Component Analysis.

Rotation Method: Varimax with Kaiser Normalization.

a. Rotation converged in 6 iterations.

4.6. Analysis of Critical success factors (CSFs)

The following table shows the Critical success factors (CSFs) influenced while adopting ERP in an organisation.

Table No: 4.85

Critical success factors (CSFs)	Category
Change Management Process	Process related
BPR and Software Configuration	
Effective Communication Plan	
Risk Management	
Project Champion	
Data Conversion and integrity	
Post Implementation Evolution	Enterprise related
Focused Performance Measure	
Business Plan, Vision	
Implementation Cost	
Top Management Commitment and Support	
Software Developments, Testing, Trouble Shooting and Crises Management	Technology related
Legacy System Consideration	
Client Consolations	
Project Management	Vendor related
Vanilla ERP (Best Business Practice)	
Vendor/Customer Relationship	
Employee Attitude and Morale	Employee/ HR Related
Empowered Decision Makers	
User Education and Training	End-user related
User Involvements	
Organizational /Corporate Cultures	Performance related
System Documentation	
Quality Improvement Measures	Quality related
Project Team	
Personnel/Staff	
Selection of ERP Package	Strategy related
Implementation Strategy and Timeframe	
IT Infrastructures	Project related
Consultant Selections	

ANALYSIS of CRITICAL SUCCESS FACTORS Process Related

Chi-Square Test

Process related-Change Management - Table No: 4.86			
	Observed N	Expected N	Residual
4	163	210.0	-47.0
5	257	210.0	47.0
Total	420		

BPR and Software Configuration- Table No: 4.87			
	Observed N	Expected N	Residual
3	70	140.0	-70.0
4	254	140.0	114.0
5	96	140.0	-44.0
Total	420		

Effective Communication Plan- Table No: 4.88			
	Observed N	Expected N	Residual
3	31	140.0	-109.0
4	121	140.0	-19.0
5	268	140.0	128.0
Total	420		

Risk Management - Table No: 4.89			
	Observed N	Expected N	Residual
3	118	140.0	-22.0
4	205	140.0	65.0
5	97	140.0	-43.0
Total	420		

Project Champion - Table No: 4.90

	Observed N	Expected N	Residual
3	43	140.0	-97.0
4	130	140.0	-10.0
5	247	140.0	107.0
Total	420		

Data Conversion and integrity - Table No: 4.91

	Observed N	Expected N	Residual
3	143	140.0	3.0
4	183	140.0	43.0
5	94	140.0	-46.0
Total	420		

Test Statistics - Table No: 4.92						
	Process related-Change Management	BPR and Software Configuration	Effective Communication Plan	Risk Management	Project Champion	Data Conversion and integrity
Chi-Square	21.038[a]	141.657[b]	204.471[b]	46.843[b]	149.700[b]	28.386[a]
df	1	2	2	2	2	2
Asymp. Sig.	.000	.000	.000	.000	.000	.000

CRITICAL SUCCESS FACTORS Enterprise Related Chi-Square Test

Enterprise related-Post Implementation Evolution - Table No: 4.93

	Observed N	Expected N	Residual
4	163	210.0	-47.0
5	257	210.0	47.0
Total	420		

Focused Performance Measure - Table No: 4.94

	Observed N	Expected N	Residual
3	70	140.0	-70.0
4	254	140.0	114.0
5	96	140.0	-44.0
Total	420		

Business Plan, Vision - Table No: 4.95

	Observed N	Expected N	Residual
3	31	140.0	-109.0
4	121	140.0	-19.0
5	268	140.0	128.0
Total	420		

Implementation Cost - Table No: 4.96

	Observed N	Expected N	Residual
3	118	140.0	-22.0
4	205	140.0	65.0
5	97	140.0	-43.0
Total	420		

Top Management Commitment and Support - Table No: 4.97

	Observed N	Expected N	Residual
3	43	140.0	-97.0
4	130	140.0	-10.0
5	247	140.0	107.0
Total	420		

Test Statistics - Table No: 4.98

	Enterprise related-Post Implementation Evolution	Focused Performance Measure	Business Plan, Vision	Implementation Cost	Top Management Commitment and Support
Chi-Square	21.038[a]	141.657[b]	204.471[b]	46.843[b]	149.700[b]
df	1	2	2	2	2
Asymp. Sig.	.000	.000	.000	.000	.000

CRITICAL SUCCESS FACTORS Technology Related

Chi-Square Test

Technology related- Software Related - Table No: 4.99

	Observed N	Expected N	Residual
3	143	140.0	3.0
4	183	140.0	43.0
5	94	140.0	-46.0
Total	420		

Legacy System Consideration - Table No: 4.100

	Observed N	Expected N	Residual
3	20	140.0	-120.0
4	147	140.0	7.0
5	253	140.0	113.0
Total	420		

Client Consolations - Table No: 4.101

	Observed N	Expected N	Residual
3	96	140.0	-44.0
4	233	140.0	93.0
5	91	140.0	-49.0
Total	420		

Test Statistics - Table No: 4.102

	Technology related-Software Related	Legacy System Consideration	Client Consolations
Chi-Square	28.386[a]	194.414[a]	92.757[a]
df	2	2	2
Asymp. Sig.	.000	.000	.000

CRITICAL SUCCESS FACTORS Vendor Related

Chi-Square Test Vendor related - Project Management - Table No: 4.103

	Observed N	Expected N	Residual
2	2	105.0	-103.0
3	87	105.0	-18.0
4	150	105.0	45.0
5	181	105.0	76.0
Total	420		

Vanilla ERP (Best Business Practice) - Table No: 4.104

	Observed N	Expected N	Residual
3	211	140.0	71.0
4	139	140.0	-1.0
5	70	140.0	-70.0
Total	420		

Vendor/Customer Relationship - Table No: 4.105

	Observed N	Expected N	Residual
4	163	210.0	-47.0
5	257	210.0	47.0
Total	420		

Table No: 4.106

Test Statistics

	Vendor related - Project Management	Empowered Decision Makers	Vendor/Customer Relationship
Chi-Square	178.419[a]	71.014[b]	21.038[c]
df	3	3	1
Asymp. Sig.	.000	.000	.000

CRITICAL SUCCESS FACTORS Employee Related

Chi-Square Test

Employee/ HR Related-Attitude Morale - Table No: 4.107

	Observed N	Expected N	Residual
3	70	140.0	-70.0
4	254	140.0	114.0
5	96	140.0	-44.0
Total	420		

Table No: 4.108

Empowered Decision Makers -

	Observed N	Expected N	Residual
3	31	140.0	-109.0
4	121	140.0	-19.0
5	268	140.0	128.0
Total	420		

Table No: 4.109

Test Statistics

	Employee/ HR Related-Attitude Morale	Empowered Decision Makers
Chi-Square	141.657[a]	204.471[a]
df	2	2
Asymp. Sig.	.000	.000

CRITICAL SUCCESS FACTORS End User Related

Chi-Square Test

Frequencies

Table No: 4.110
End-user related – Training

	Observed N	Expected N	Residual
3	118	140.0	-22.0
4	205	140.0	65.0
5	97	140.0	-43.0
Total	420		

User Involvements - Table No: 4.111

	Observed N	Expected N	Residual
4	163	210.0	-47.0
5	257	210.0	47.0
Total	420		

Table No: 4.112

Test Statistics

	End-user related - Training	User Involvements
Chi-Square	46.843[a]	21.038[b]
df	2	1
Asymp. Sig.	.000	.000

Chi-Square Test

Frequencies

Table No: 4.113

Performance related - Organisational Culture -

	Observed N	Expected N	Residual
3	70	140.0	-70.0
4	254	140.0	114.0
5	96	140.0	-44.0
Total	420		

Table No: 4.114

System Documentation -

	Observed N	Expected N	Residual
3	31	140.0	-109.0
4	121	140.0	-19.0
5	268	140.0	128.0
Total	420		

Table No: 4.115

Test Statistics

	Performance related - Organisational Culture	System Documentation
Chi-Square	141.657[a]	204.471[a]
df	2	2
Asymp. Sig.	.000	.000

CRITICAL SUCCESS FACTORS Performance Related

Chi-Square Test

Table No: 4.116

Performance related - Organisational Culture -

	Observed N	Expected N	Residual
3	70	140.0	-70.0
4	254	140.0	114.0
5	96	140.0	-44.0
Total	420		

Table No: 4.117

System Documentation

	Observed N	Expected N	Residual
3	31	140.0	-109.0
4	121	140.0	-19.0
5	268	140.0	128.0
Total	420		

Table No: 4.118

Test Statistics

	Performance related - Organisational Culture	System Documentation
Chi-Square	141.657[a]	204.471[a]
df	2	2
Asymp. Sig.	.000	.000

CRITICAL SUCCESS FACTORS Quality Related

Chi-Square Test

Frequencies

Table No: 4.119

Quality related - Quality Improvement Measures

	Observed N	Expected N	Residual
3	118	140.0	-22.0
4	205	140.0	65.0
5	97	140.0	-43.0
Total	420		

Table No: 4.120

Project Team -

	Observed N	Expected N	Residual
3	43	140.0	-97.0
4	130	140.0	-10.0
5	247	140.0	107.0
Total	420		

Table No: 4.121

Test Statistics -

	Quality related - Quality Improvement Measures	Project Team
Chi-Square	46.843[a]	149.700[a]
df	2	2
Asymp. Sig.	.000	.000

CRITICAL SUCCESS FACTORS Strategy Related

Chi-Square Test

Frequencies

Table No: 4.122

Strategy Related - Personnel/Staff

	Observed N	Expected N	Residual
3	143	140.0	3.0
4	183	140.0	43.0
5	94	140.0	-46.0
Total	420		

Table No: 4.123

Selection of ERP Package

	Observed N	Expected N	Residual
3	20	140.0	-120.0
4	147	140.0	7.0
5	253	140.0	113.0
Total	420		

Table No: 4.124

Implementation Strategy and Timeframe

	Observed N	Expected N	Residual
3	96	140.0	-44.0
4	233	140.0	93.0
5	91	140.0	-49.0
Total	420		

Table No: 4.125

Test Statistics

	Strategy Related - Personnel/Staff	Selection of ERP Package	Implementation Strategy and Timeframe
Chi-Square	28.386[a]	194.414[a]	92.757[a]
df	2	2	2
Asymp. Sig.	.000	.000	.000

CRITICAL SUCCESS FACTORS Project Related

Chi-Square Test

Frequencies

Table No: 4.126

Project related - IT Infrastructure

	Observed N	Expected N	Residual
2	2	105.0	-103.0
3	87	105.0	-18.0
4	150	105.0	45.0
5	181	105.0	76.0
Total	420		

Table No: 4.127

Consultant Selections

	Observed N	Expected N	Residual
3	211	140.0	71.0
4	139	140.0	-1.0
5	70	140.0	-70.0
Total	420		

Table No: 4.128

Test Statistics

	Project related - IT Infrastructure	Consultant Selections
Chi-Square	178.419[a]	71.014[b]
df	3	2
Asymp. Sig.	.000	.000

4.7. VARIABLES INFLUENCING THE ADOPTION OF ERP

Conceptual Frameworks for Variables Influence on ERP Adoption

The factors influencing ERP adoption recognised are; For Process Improvement, To face statutory Compliance, Replace legacy System, Regulatory Compliance, To Provide Better Management Tools, Fast Growth, Benefit for external Stakeholders, Industry Best Practices, Control Business Operations. Among the variables, 'To provide better management tools' is found to be the most important variable followed by, 'process improvement', 'fast growth', 'replace legacy system', 'benefit for external stakeholders', 'control business operations', 'to adapt industrial best practices' , 'to enhance regulatory compliances', and finally, 'to face statutory compliance'.

4.7.1   Multiple Regression Equation

Among the factors influenced for ERP adoption the factor 'To provide better management tools' was most influenced and toped among the dependent variables. Through ERP adoption, the companies believe to get suitable enablement for managing the business effectively, hence out of all the twelve variables 'To provide better management tools' has more influence on ERP adoption.

The variable 'process improvement' was the next influenced variable that affected ERP adoption. ERP expected to transform the way the company operates through process improvements. The next variable 'fast growth' also supports the company to face the fast growth and stay competitive.

The next influencing variable is 'replacement of legacy system' as companies expect ERP to replace the aging legacy systems and equip the IT setup with data integration. The 'benefit of stake holders' is the next variable that influences for ERP adoption.

The ERP adoption regulates and controls the business operations easily, the factor, 'control business operators' is having next important influencer. ERP

adoption also influences to follow and 'to adapt the Industries best practices' applicable to specific industries.

The factors, 'to enhance regulatory compliances' and 'To face the changing statutory compliance' influence very less in the ERP adoption process.

4.8. Economic and Operational Benefits of ERP

Analysis Using Factor Analysis and Multiple Regressions

Benefits of ERP adoption from the respondents related to Cost, Time, Technical, Efficiency, Manpower and General.

Factor analysis and Multiple Regression has used for analysing the relationship among the dependent variables. The rationale for using Factor analysis and Multiple Regression is its ability to treat many variables simultaneously so that their effect could examined together.

Respondents such as Board of Directors, Managing Director or the top level executives of the business, Head of Finance/Accounts / Functional heads (Departmental Managers), Managers/Supervisors/ Senior functional Executives, End users, IT team (for administration and technical support), External: Customers/Vendors etc., Auditors (Internal and External), External Consultants, were asked to assign the level of agreement on variables under each of the six factors with multiple dependent variables (Cost, Time, Technical, Efficiency, Manpower and General). Responses were ranked and an attempt is made to assess the significance of the factors to support the null hypotheses.

4.8.1 Cost Related Benefits

Descriptive Analysis for Cost related benefits

Table No: 4.129

Table Descriptive Statistics

Benefits of ERP implementation-Cost	Mean	Std. Deviation	Analysis N
1. Increase in business turnover	4.57	.905	420
2. Cost reduction	1.96	.732	420
3. Lowered inventory levels	4.11	.674	420
4. Improved cash management	4.43	.905	420
5. Financial flows control	4.45	.905	420
6. Increased revenue	3.50	1.744	420

Table No: 4.130

Correlation Matrix

Correlation	implementation-Cost					
Increase in business turnover	1.000	-.834	-.101	.400	.400	-.544
Cost reduction	-.834	1.000	.008	-.031	-.031	.042
Lowered inventory levels	-.101	.008	1.000	-.839	-.839	.533
Improved cash management	.400	-.031	-.839	1.000	1.000	-.907
Financial flows control	.400	-.031	-.839	1.000	1.000	-.907
Increased revenue	-.544	.042	.533	-.907	-.907	1.000

Extraction Method: Principal Component Analysis.

Total Variance Explained

Component **Benefits of ERP implementation-Cost**	Initial Eigen values			Extraction Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
Increase in business turnover	3.757	62.618	62.618	3.757	62.618	62.618
Cost reduction	1.714	28.559	91.177	1.714	28.559	91.177
Lowered inventory levels	.529	8.823	100.000			
Improved cash management	1.084E-013	2.393E-013	100.000			
Financial flows control	1.008E-013	1.142E-013	100.000			
Increased revenue	-1.000E-013	-1.007E-013	100.000			

Descriptive analysis for the variables 'cost related benefits' shown above to reveals that Increase in business turnover, Improved cash management and Financial flows control having highest mean values are statistically significant. It is therefore inferred that the model fits well with cost related benefits of ERP adoption.

4.8.2 Time Related Benefits

Table No: 4.132

Time related Descriptive Statistics

Time related Benefits	Mean	Std. Deviation	Analysis N
1. Operational Cycle time reduction	3.60	.490	420
2. Decreased financial close cycle	3.40	.490	420
3. Quickened information response time	1.82	.387	420
4. Improved order management cycle	1.18	.387	420

Table No: 4.133

Total Variance Explained

Component Time related	Initial Eigen values			Extraction Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	2.774	69.343	69.343	2.774	69.343	69.343
2	1.226	30.657	100.000	1.226	30.657	100.000
3	1.002E-013	1.059E-013	100.000			
4	-1.000E-013	-1.006E-013	100.000			

Extraction Method: Principal Component Analysis.

Source: Primary Data

Descriptive analysis for the variables 'time related benefits' shown above to reveals that 'Operational cycle time reduction' with mean value of (3.60), 'decreased financial close cycle' (3.40), are statistically significant having highest mean values and 'Quickened information response time', 'Improved order management cycle' are also statistically significant. It is therefore, the model fits well with time related benefits of ERP adoption.

4.8.3 Technical Benefits

Table No: 4.134

Descriptive Statistics

Technical related	Mean	Std. Deviation	Analysis N
1. Improved & Secured access control	4.60	.490	420
2. Seamless connectivity of business entities	2.23	.763	420
3. Faster & organized processing of transactions	1.44	.496	420
4. Single data source for all	3.70	1.554	420
5. Improved accountability with audit-trails etc.	3.03	.656	420

Table No: 4.135

Correlation Matrix

Correlation	cost	cost	cost	cost	cost
1. Improved & Secured access control	1.000	.055	.670	-.872	.660
2. Seamless connectivity of business entities	.055	1.000	-.182	-.538	.258
3. Faster & organized processing of transactions	.670	-.182	1.000	-.477	-.116
4. Single data source for all	-.872	-.538	-.477	1.000	-.684
5. Improved accountability with audit-trails etc.	.660	.258	-.116	-.684	1.000

Table No: 4.136

Total Variance Explained

Component	Initial Eigen values			Extraction Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
Improved & Secured access control	2.810	56.206	56.206	2.810	56.206	56.206
Seamless connectivity of business entities	1.404	28.089	84.295	1.404	28.089	84.295
Faster & organized processing of transactions	.785	15.705	100.000			
Single data source for all	1.022E-013	1.438E-013	100.000			
Improved accountability with audit-trails etc.	1.010E-013	1.203E-013	100.000			

Extraction Method: Principal Component Analysis.
Source: Primary Data

Descriptive analysis for the variables 'Technical benefits' shown above reveals that 'Improved & Secured access control', 'Seamless connectivity of business entities' , 'Faster & organized processing of transactions', 'single data source for all' and 'Improved Accountability are statistically significant. Therefore, it is concluded that the model fits good with Technical benefits of ERP adoption.

4.8.4 Efficiency Related to Benefits

Table No: 4.137

Descriptive Statistics

Efficiency related	Mean	Std. Deviation	Analysis N
1. Productivity improvement	4.60	.491	420
2. Quality improvement	3.80	.749	420
3. Better resource management	3.20	1.170	420
4. More efficient business processes	2.00	.633	420
5. Overall Performance improvement	1.40	.801	420

Table No: 4.138

Correlation Matrix

Efficiency related Correlation	Efficiency related	Efficiency related	Efficiency related	Efficiency related	Efficiency related
Productivity improvement	1.000	-.213	-.215	.645	-.609
Quality improvement	-.213	1.000	-.871	-.423	.802
Better resource management	-.215	-.871	1.000	.000	-.514
	.645	-.423	.000	1.000	-.791
More efficient business processes Overall Performance improvement	-.609	.802	-.514	-.791	1.000

a. Determinant = .000

b. This matrix is not positive definite.

Table No: 4.139

Total Variance Explained

Component	Initial Eigenvalues			Extraction Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	2.988	59.753	59.753	2.988	59.753	59.753
2	1.631	32.628	92.381	1.631	32.628	92.381
3	.326	6.522	98.904			
4	.055	1.096	100.000			
5	-1.016E-013	-1.313E-013	100.000			

Extraction Method: Principal Component Analysis.
Source: Primary Data

Descriptive analysis for the variables 'efficiency related benefits' shown above reveals that 'Productivity improvement' with highest mean, 'Quality improvement', 'Better Resources management', 'More efficient Business processes', 'Overall Performance Improvement', are statistically significant at. It is therefore inferred that the model fits well with Efficiency related benefits of ERP adoption.

4.8.5   Benefits Related to Man Power

Table No: 4.140

Descriptive Statistics

Manpower related	Mean	Std. Deviation	Analysis N
1. Reduction in manpower	3.82	.3.81	420
2. Empowered users with data/information	1.94	.640	420
3. Right-sizing of manpower	3.00	.594	420
4. Facilitates business learning	1.24	.425	420

Table No: 4.141

Correlation Matrix

Correlation-Manpower related	Manpower related	Manpower related	Manpower related	Manpower related
Reduction in manpower	1.000	-.817	.000	.257
Empowered users with data/information	-.817	1.000	-.464	-.043
Right-sizing of manpower	.000	-.464	1.000	-.779
Facilitates business learning	.257	-.043	-.779	1.000

Table No: 4.142

Total Variance Explained

Component	Initial Eigenvalues			Extraction Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	1.965	49.121	49.121	1.965	49.121	49.121
2	1.787	44.686	93.808	1.787	44.686	93.808
3	.248	6.192	100.000			
4	1.021E-013	1.514E-013	100.000			

Extraction Method: Principal Component Analysis.
Source: Primary Data

Descriptive analysis for the variables 'man power related benefits' shown above reveals that 'Man power reduction' with mean value of 3.82, 'Right Sizing of man power',' Empowered users with data/information'. 'Facilitates Business Learning' are statistically significant. Therefore, the model fits good with man power related benefits of ERP adoption.

4.8.6 General Benefits

Table No: 4.143

Descriptive Mean, Std. Deviation and Variance analysis for General Benefits

	Descriptive Statistics				
Sl No	General benefits	Mean	N	Std. Deviation	Variance
1	Improved decision making	4.2	420	0.397	0.157
2	Supporting business growth, expansion etc.	4.4	420	0.51	0.26
3	Better coordination among the inter-related functional activities	1.41	420	0.492	0.242
4	Better management and controlling functions	1.59	420	0.492	0.242
5	Improved statutory compliance	3.59	420	0.492	0.242
6	Improved interaction with customers	3.2	420	0.404	0.163
7	Improved interaction with suppliers	3.8	420	0.404	0.163

Table No: 4.144

Correlation Matrix

Correlation	General benefits	General benefits	General benefits	General benefits	General benefits	General benefits	General benefits
Improved decision making	1.000	-.068	-.007	.007	.032	.033	-.033
Supporting business growth, expansion etc.	-.068	1.000	.154	-.154	-.982	.598	-.598
Better coordination among the inter-related functional activities	-.007	.154	1.000	-1.000	-.153	.609	-.609
Better management and controlling functions	.007	-.154	-1.000	1.000	.153	-.609	.609
Improved statutory compliance	.032	-.982	-.153	.153	1.000	-.609	.609
Improved interaction with customers	.033	.598	.609	-.609	-.609	1.000	-1.000
Improved interaction with suppliers	-.033	-.598	-.609	.609	.609	-1.000	1.000

a. Determinant = .000

b. This matrix is not positive definite.

Table No: 4.145

Total Variance Explained

Component	Initial Eigenvalues			Extraction Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	3.871	55.303	55.303	3.871	55.303	55.303
2	1.686	24.088	79.391	1.686	24.088	79.391
3	1.007	14.388	93.779	1.007	14.388	93.779
4	.418	5.972	99.751			
5	.017	.249	100.000			
6	1.004E-013	1.054E-013	100.000			
7	1.000E-013	1.001E-013	100.000			

Extraction Method: Principal Component Analysis.

Regression

Table No: 4.146

ANOVA

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	1.175	5	.235	1.435	.211[b]
	Residual	67.804	414	.164		
	Total	68.979	419			

a. Dependent Variable: Project cost related Problems/Barriers
b. Predictors: (Constant), General benefits

Table No: 4.147

Coefficients

Model	Un-standardized Coefficients		Standardized Coefficients	t	Sig.
	B	Std. Error	Beta		
Improved decision making	-.608	2.801		-.217	.828
Supporting business growth, expansion etc.	.049	.051	.048	.964	.335
Better coordination among the inter-related functional activities	.264	.208	.331	1.268	.205
Better management and controlling functions	.029	.054	.036	.542	.588
Improved statutory compliance	.365	.218	.443	1.675	.095
Improved interaction with customers	-.153	.082	-.153	-1.861	.063

a. Dependent Variable: Project cost related Problems/Barriers

Descriptive Mean , Std. Deviation and Variance analysis for the variables 'General benefits' with Correlation and regression analysis done on the data collected from the respondents of different level of stakeholders reveal that these data are statistically significant. The test for individual factors indicates 'Improved Decision

Making', 'Supporting Business Growth and expansion, etc', 'Better Coordination among the inter-related functional activities', 'Better Management and Controlling functions', 'Improved Statutory Compliance', Improved interaction with customers', 'Improved interaction with suppliers', are statistically. It is therefore, inferred that the model fits well with the general benefits of ERP adoption.

4.9. CHI-SQUARE TEST: SATISFACTION Vs. TRAINING

In the ERP adopted small and mid-sized public sector enterprises, the satisfaction level of the administrators, managers, ERP implementing teams and

users connected with overall deployment of ERP were analysed with training given to them through chi-square test.

Satisfaction Level of Respondents Vs. Training given

Frequencies

Table No: 4.148

The Introduction of ERP software increased your efficiency

	Observed N	Expected N	Residual
Highly Satisfied	163	210.0	-47.0
Very Highly Satisfied	257	210.0	47.0
Total	420		

Table No: 4.149

Can ERP help in better decision-making process as a user?

	Observed N	Expected N	Residual
Average Satisfied	70	140.0	-70.0
Highly Satisfied	257	140.0	117.0
Very Highly Satisfied	93	140.0	-47.0
Total	420		

Table No: 4.150

An ERP System caused to hike the productivity standard and efficiency of the employees

	Observed N	Expected N	Residual
Average Satisfied	28	140.0	-112.0
Highly Satisfied	122	140.0	-18.0
Very Highly Satisfied	270	140.0	130.0
Total	420		

Table No: 4.151

Does your ERP helps as a manager to track your subordinate status?

	Observed N	Expected N	Residual
Average Satisfied	112	140.0	-28.0
Highly Satisfied	207	140.0	67.0
Very Highly Satisfied	101	140.0	-39.0
Total	420		

Table No: 4.152

The ERP helps in completing your daily routine tasks much easier

	Observed N	Expected N	Residual
Average Satisfied	42	140.0	-98.0
Highly Satisfied	127	140.0	-13.0
Very Highly Satisfied	251	140.0	111.0
Total	420		

Table No: 4.153

Do you think Report Generation of is much easier and simple now by using this ERP?

	Observed N	Expected N	Residual
Average Satisfied	141	140.0	1.0
Highly Satisfied	185	140.0	45.0
Very Highly Satisfied	94	140.0	-46.0
Total	420		

Table No: 4.154

Is the information provided in the ERP a4.156re structured and accurate

	Observed N	Expected N	Residual
Average Satisfied	15	140.0	-125.0
Highly Satisfied	149	140.0	9.0
Very Highly Satisfied	256	140.0	116.0
Total	420		

Table No: 4.155

Are all the modules of ERP useful for your Department

	Observed N	Expected N	Residual
Average Satisfied	94	140.0	-46.0
Highly Satisfied	232	140.0	92.0
Very Highly Satisfied	94	140.0	-46.0
Total	420		

Table No: 4.156

The ERP Software installed in your organisation is easy to use.

	Observed N	Expected N	Residual
Average Satisfied	85	140.0	-55.0
Highly Satisfied	151	140.0	11.0
Very Highly Satisfied	184	140.0	44.0
Total	420		

Table No: 4.157

Overall, I feel the ERP implementation in my organisation has been successful and beneficial to both me and to my organisation

	Observed N	Expected N	Residual
Average Satisfied	208	140.0	68.0
Highly Satisfied	142	140.0	2.0
Very Highly Satisfied	70	140.0	-70.0
Total	420		

Table No: 4.158

Satisfaction of end users with respect to training

Sl No	Satisfaction of end users with respect to training	Chi-Square	df	Asymp. Sig.
1	The Introduction of ERP software increased your efficiency.	21.038a	2	0.00
2	Can ERP help in better decision-making process as a user?	148.557b	2	0.00
3	An ERP System caused to hike the productivity standard and efficiency of the employees.	212.629b	2	0.00
4	Does your ERP helps as a manager to track your subordinate status?	48.529b	2	0.00
5	The ERP helps in completing your daily routine tasks much easier.	157.814b	2	0.00
6	Do you think Report Generation of is much easier and simple now by using this ERP?	29.586a	2	0.00
7	Is the information provided in the ERP are structured and accurate	208.300b	2	0.00
8	Are all the modules of ERP useful for your Department	90.686b	2	0.00
9	The ERP Software installed in your organisation is easy to use.	36.300b	2	0.00
10	Overall, I feel the ERP implementation in my organisation has been successful and beneficial to both me and to my organisation	68.057b	2	0.00

Source: Primary Data

The above Table shows that the satisfaction level of the administrators, managers, ERP implementing teams and users, being the stakeholders connected with overall deployment of ERP were analysed with training given to them. The classified category of users who provide trainings were; the Managing Director or the top level administrators and executives of the business, Functional heads (Departmental Managers), Managers/Supervisors, End users, IT team (for administration and technical support), Training on report generation by the users or IT team and Auditors (Internal and External).

The results clearly show that the high level of satisfaction is due to the training given to the related respondents, those who did not trained were not satisfied mostly and few of them did not give comments at all. The chi –square value is highly and statistically significant. The test rejected the hypothesis that "there is no association between the satisfaction level and training given to employees". It is therefore, concluded that there is a strong association between the satisfaction level of the respondents and the training given to the users in respect of implementation.

4.10. DESCRIPTIVE ANALYSIS - SATISFACTION and INVOLVEMENT

Descriptive Statistics- Table No: 4.159

Sl No	Overall satisfaction of the end users	Mean	N	Std. Deviation	Variance
1	The Introduction of ERP software increased your efficiency.	4.61	420	0.488	0.238
2	Can ERP help in better decision-making process as a user?	4.05	420	0.621	0.386
3	An ERP System caused to hike the productivity standard and efficiency of the employees.	4.58	420	0.615	0.378
4	Does your ERP helps as a manager to track your subordinate status?	3.97	420	0.713	0.508
5	The ERP helps in completing your daily routine tasks much easier.	4.50	420	0.672	0.451

Sl No	Overall satisfaction of the end users	Mean	N	Std. Deviation	Variance
6	Do you think Report Generation of is much easier and simple now by using this ERP?	3.89	420	0.740	0.548
7	Is the information provided in the ERP are structured and accurate	4.57	420	0.563	0.317
8	Are all the modules of ERP useful for your Department	4.00	420	0.670	0.449
9	The ERP Software installed in your organisation is easy to use.	4.24	420	0.766	0.586
10	Overall, I feel the ERP implementation in my organisation has been successful and beneficial to both me and to my organisation	3.67	420	0.745	0.555

Source: Primary Data

The descriptive analysis shows that the involvement of the end users connected with overall deployment of ERP were analysed. The classified category of users, Managing Director or the top level administrators and executives of the business, Functional heads (Departmental Managers), Managers/Supervisors, End users, IT team. The results clearly show that the high level of involvement by the stakeholders in the ERP implementation process. The chi –square value is highly and statistically significant. The test rejected the hypothesis that "there is no association between the satisfaction level and involvement to employees". It is therefore, concluded that there is a strong association between the satisfaction level of the respondents and the training given to the users in respect of implementation.

The above analysis ensures full involvements of users at all levels such as Managing Director or administrators at the top-level executives who manage the business, Functional heads, Managers/ Supervisors, End users, IT team, Auditors and customers/vendors. Majority of the stakeholders were actively involved in the ERP implementation were highly satisfied, few respondents did not express their views at all.

The results clearly show that high satisfaction is due to high involvement of respondents, those who are not involved were not satisfied mostly and some of them didn't give any comments. The chi–square value is highly and statistically significant. Therefore, it is conclude that there is a strong association between the satisfaction level of the respondents and their involvement during ERP implementation and the hypothesis rejected.

There is no association between the satisfaction level and active involvement of employees in the ERP implementation

4.11   Research Framework and Outcome

The summary framework of this research consisting of the objectives, the hypothesis, the methodology and results are shown in the following Table along with the results.

Table No: 4.160

Highlights of the Objectives, the Hypothesis, the Methodology and the Results

Sl No	Objectives	Hypothesis	Methodology	Result
1	To identify the problems and prospects associated and related with the ERP system implementation in small and medium sized public sector enterprises of Kerala.	Some factors negatively influence on ERP implementation	Factor Analysis, Kaiser-Meyer-Olkin Measure of Sampling Adequacy (KMO) and Bartlett's Test of Sphericity	The tests rejected the hypothesis confirming that these factors significantly influencing while implementing ERP systems in these organisations.
2	To enhance the effectiveness of ERP systems implementation in small and medium sized public sector enterprises of Kerala through SWOC analysis exploring the reasons for opting a particular ERP (Strength), hindrance factors of ERP adoption (Weakness), influencing factors/ variables for future ERP adoption (Opportunities) and special care areas to be taken care while adopting ERP (Challenges).	SWOC Analysis	SWOC Analysis Friedman Ranking Test and Kendall's W Test and **Garret** Ranking s **& Factor Analysis**	S)'Suitability of the ERP Software for the business needs' and 'Shorter implementation timeframe' are the strengths. W)The existing bad experience of others' and 'Available ERP not fit for our needs' were the least affecting factors. O)Availability of an ERP software which would meet our expectations' is the power variable. C)'ERP product Selection' and

Sl No	Objectives	Hypothesis	Methodology	Result
				'Level of customization' with the highest mean value plays a major role in 'Challenges'
3	To reduce the problems and risks associated and related with the ERP system implementation failure through examining the level of satisfaction with involvement and training given to the implementing team, executives and end users.	There is no association between the satisfaction level and training given to employees There is no association between the satisfaction level and active involvement of employees in the ERP implementation	Independent Samples Test and ANOVA. Levene's Test for Equality of Variances and t-test for Equality of Means were used to test the variances and mean scores	The test rejected the hypothesis "there is no association between the satisfaction level and training given to employees" confirming that the satisfaction and training are associated with highest mean square.
4	To examine the current ERP awareness in small and medium sized public sector enterprises of Kerala		Percentage analysis and descriptive analysis	Awareness level is good
5	To identify the Organisational, People and Technical Factors and other Critical Success Factors (CSF) influencing the implementation of ERP and suggest such measures for the smooth and successful implementation of ERP system software in Small and Medium PSUs in Kerala.	There is no influence on Organisational, People, Technical & other Critical Success Factor variables while implementing ERP system in small and medium sized public sector enterprises of	Kaiser-Meyer-Olkin Measure of Sampling Adequacy (KMO) and Bartlett's Test of Sphericity. CFA and SEM analysis	The tests rejected the hypothesis confirming that these factors significantly influencing while implementing ERP systems in these organisations.

Sl No	Objectives	Hypothesis	Methodology	Result
		Kerala.		
6	To develop ERP implementation success model for Small and Mid-Sized PSUs of Kerala		Descriptive Mean , Std. Deviation and Variance analysis	The test for individual factors It is therefore, inferred that the model fits well with the general benefits of ERP adoption.
7	To bring to light the benefits reaped on ERP adoption in Small and Mid-Sized PSUs of Kerala	The variables related to Cost, Time, Technical, Efficiency, Manpower and General benefits are not dependent on ERP adoption in Small and Medium PSUs of Kerala	Descriptive Mean , Std. Deviation and Variance analysis	Descriptive Mean , Std. Deviation and Variance analysis for the variables 'General benefits' with Correlation and regression analysis says that these are statistically significant. The test for individual factors are statistically. It is therefore, inferred that the model fits well with the general benefits of ERP adoption.

Chapter V
Summary, Findings, Suggestions
and Conclusion

5.1. Introduction

This chapter covers a brief summary of the study with major findings drawn from the analysis, suggestions and conclusions based on the study. The present chapter is also devoted to discuss the scope for further research.

5.2. Summary of the Study

Majority of the small and medium PSUs in Kerala have not implemented full-fledged ERP and have limited access to it. This study tries to pin-point the reasons that why these enterprises have not adopted or limited access to adoption of ERP products and services. This study consider the peculiar details of enterprises like nature, size, number of employees, annual turnover, functional areas and locations, infrastructure availability like of number of computers, laptops and other network devices, data servers, internet facility and IT wing or separate department. The required data collected from all ERP adopted, non-adopted small, and medium public sector enterprises in Kerala.

Enterprise Resource Planning (**ERP**) or ERP system or ERP software is a solution to manage all the information requirements and functionalities of a business firm from a centrally stored and shared database or data bank. ERP represents an integrated software solution for data processing and generation of information and reports for the entire organisation through data entered once and processed centrally, then shared subsequently throughout the organization.

The ERP present form evolved from many stages of management information systems over the past 35 years. It begins from calculating materials requirements for manufacturing and end with complete automation of the entire organisation. MRP (Material Requirement Planning) developed during 1980's,

which, later developed as Manufacturing Resource Planning (MRPII) and finally in 1990's the birth of ERP. It was introduced as an extension of MRP and changed to MRPII and then gradually to CIM. ERP systems now cover all functionalities both products and services of an organisation, regardless of the character or size. ERP systems now used in all manufacturing, non-manufacturing, profit and non-profit organizations both products and invisible service sector and in governmental organisations. ERP began from MRP through routings of software architecture capacity planning as a standard software activity. ERP can now handle all the core and key departments and functionalities such as, accounting, invoicing, marketing, manufacturing, shipping and logistics, distribution, inventory, and customer relationship and satisfaction. ERP now controls and supports many business activities, such as manufacturing and production activity, sales and marketing, inventory and stores management, delivery and distribution, billing and collection, quality control and inspection, and human resource and payroll accounting management. Many companies found ERP systems implementation as a panacea for the Y2K problem they faced (whether real or illusion) in their legacy systems. Organisations treat this excellent opportunity to replace their existing software and information systems with new ERP systems. The ERP vendors also took this opportunity (Y2K) for boosting their sales remarked as Y2K compliant solution. There exist special modules in all ERPs for accounting, marketing, manufacturing, warehousing, logistics, human resources, information technology and strategic management in addition to CRM and SRM.

Enterprise Resource Planning developed with standard business practices and ethical considerations. It is a fact that there is no consensus on the business practice and customs among the countries, areas or regions of a particular country, different organisations like profit seeking or non-profit seeking and among different firms in the industries. In light of the gaps identified in literature, this research aims at filling the gap by studying problems and prospects of ERP implementation in small and mid-sized public sector enterprises of Kerala.

The important objective of the study was to enhance the effectiveness of the ERP systems implementation in small and medium sized public sector enterprises of Kerala and to reduce the problems and risks associated and related with the ERP system implementation failure. The study tries to create a workable solution for the methodology of ERP systems implementation in small and mid- sized public sector enterprises of Kerala. The deficiencies identified based on the practical research and theoretical analysis through questionnaire and survey. The important risks formulated based on the collected data and analysed through questionnaire and survey conducted in selected small and mid- sized public sector enterprises of Kerala. The inherent risks around the implementation of ERP has been studied and analysed with different phases of the project. The uncertainties and problems during these stages are address with a risk management, which affects significantly the success of the project.

The focus of this research is on the study on problems and prospects of ERP Systems implementation on small and medium sized public enterprises in the state of Kerala. The reason for the selection is that adoption of ERP systems implementation is a burning topic because of its complexities and failures. Thus by looking at SMEs in the public sector of Kerala, the study will add to the body of knowledge in the area where it is still lacking. Moreover, the operational environments of the public sectors enterprises are entirely different and the findings of the study definitely add knowledge to this area of research.

This study concentrates on ERP Systems' basic functionality and implementation stages comparing the benefits of different ERP systems.

This study covers only ERP implementation on small and medium sized enterprises especially on the Kerala public sector.

This study also tries to bring in to light the ERP implementation life-cycle in this research. Because the ERP technology and the research area are subject to deep and dynamic change frequently. Further to implementation and ERP became live, there may be a dead-lock and delay on actions targeted for achieving the full capabilities and benefits of installed processes.

Earlier studies reveal that 60% to 70% of the deployments are failure after implementing 80% to 90% of the software. But the present literature shows a revival registering 80% to 90% success and ERP vendors and consultants trying to make it 100%. The cost reduction to the extent of 30% to 50% is offered with doubling the functionalities and benefits.

The organisational context is subject to continuous change in order to adapt to the ever-changing environmental context like new competitors, new governmental policies and regulations, wonderful change in Information and Communication Technology (ICT), with other external environmental changes, etc. A 'snapshot' view of these events could not capture the sweeping changes taking place and the influence they had on case study organisations hence the decision to study all the implementation life-cycle phases.

All ERP Implementation researches have been about the adoption of certain factors and processes. This research combines problems and prospects of ERP Systems implementation in Small and Mid Sized Public Sector Enterprises in Kerala in a sophisticated and an innovative manner. The outcome of this research may be useful for Small and Mid Sized Public Sector company's managers/administrators/ decision makers in Kerala looking for ERP Systems applications. Some of the administrators and managers of Public Sector Enterprises may have limited knowledge to understand the complexities of the ERP Implementation. This research identifies the problems and bottlenecks along with the future prospects of ERP adoptions factors with the in different stages of ERP Systems implementation. Generally, the administrators and managers of Public Sector Enterprises have limited knowledge and skills to understand the complexities involved in the ERP Implementation.

Some studies were also focused on ERP solutions for evaluating the suitability of the ERP system with ERP vendors and consultants, or on Critical Success Factors (CSFs) or failure factors regarding ERP selection and implementation. The present study focused on Problems and Prospects of ERP Systems Implementation in Small and Mid Sized Public Sector Enterprises in

Kerala, the area in which no previous studies were held. Moreover, previous literature shows that all those researches were on large enterprises or MNCs in the private sector, no such studies were done on ERP Systems deployments in Small and Medium Sized Public Sector Enterprises of Kerala.

The Technology Acceptance Model (TAM) was used to evaluate the impact of user satisfaction and enhancement of efficiency and effectiveness of ERP deployments.

The study on ERP implementation problems and prospects for all public sector undertakings are equally important. It seems to be little researches carried on for the successful ERP implementation of SMEs in Kerala PSUs .This study looking for achieving this objective by proposing an ERP implementation model to identify and guide for the ERP implementation in these enterprises. **The specific objectives set for filling this gap are**:

1) To identify the problems and prospects associated with the ERP system implementation in small and medium sized public sector enterprises of Kerala.

2) To enhance the effectiveness of ERP systems implementation in small and medium sized public sector enterprises of Kerala through SWOC analysis exploring the reasons for opting a particular ERP (Strength), hindrance factors of ERP adoption (Weakness), influencing factors/ variables for future ERP adoption (Opportunities) and special care areas to be taken care while adopting ERP (Challenges).

3) To reduce the problems and risks associated and related with the ERP system implementation failure through examining the level of satisfaction with involvement and training given to the implementing team, executives and end users.

4) To examine the current ERP awareness in small and medium sized public sector enterprises of Kerala

5) To identify the Organisational, People and Technical Factors and other critical success factors (CSF) influencing the implementation of ERP and suggest such measures for the smooth and successful implementation of ERP system software in PSUs in Kerala.

6) To develop ERP implementation success model for Small and Mid-Sized PSUs of Kerala

7) To bring to light the benefits reaped on ERP adoption in Small and Mid-Sized PSUs of Kerala

The study had designed as exploratory and descriptive based on both primary and secondary data. The primary data was done with field study using survey methodology to obtain data from selected Small and Mid Sized Public Sector Enterprises in Kerala. The survey was implemented using a variety of methods like, postal mail, email, Google forms, direct supply of questionnaires and personal interviews.

Primary data for this study has collected with the help of questionnaires, Google forms, emails and direct contact and interview with ERP implementing team users like members, managers, administrators and employees of the small and medium public enterprises. These respondents represents from the members of the implementing team of the top management, implementing team mangers and ERP users at different levels of the implementing company.

The secondary data gathered for this study was with the help of URLs (web sites) of the small and mid-sized public enterprises of Kerala State and other relevant sources, Report of The Comptroller and Auditor General of India on Public Sector Undertakings and from the previous research thesis works conducted, journals, books, magazines, newspapers, Company reports including annual reports. Various online thesis repositories like "shodhganga", "indcat" "e-ShodhSindhu", "shodhgangotri" and various e-services and e-journals of INFLIBNET, other famous online journals sources like Emerald insight, Ebsco, Springer, Jstor etc, also have been contributed.

The data analysis was done with variety of statistical techniques. The general data on investment, turnover, number of employees, IT setup, rural or urban in ERP adopted, and non-adopted enterprises classified using the frequency distribution. Simple Correlation technique also used to analyse the factors and all the dependent and independent variables. Independent sample 't-test' was used for testing the Influence of Organisational, People and Technical Factors while implementing ERP. The statistical techniques and tests like techniques of univariate analysis (ANOVA) and multivariate techniques like factor and regression analysis were also used. It establishes the research strategy through the philosophical assumptions with the empirical research techniques for achieving the objectives of this study.

5.3. Findings of the Study

The analyses of the data collected through the administrators, managers, ERP implementing teams, users and beneficiaries of small and medium sized Kerala public sector enterprises have revealed certain important findings. The major findings of the study are briefly listed here:

The general data on investment, turnover, number of employees, IT setup, rural or urban in ERP adopted, and non-adopted enterprises classified using the frequency distribution.

Nature, Ownership and Sector of the Public Sector Enterprise

- The Classification based on ERP adopted and ERP non-adopted organizations. It describes Nature of Public Sector Enterprise such as State Sector, Central Sector, Public Utilities and Govt. Companies where ERP adopted and ERP non-adopted.

- The State Sector public sector enterprises are leading in adopting ERP than the centre Sector public sector enterprises.

- The Classification based on ERP adopted and ERP non-adopted organizations. It describes Nature of Public Sector Enterprise such as State Sector, Central

Sector, Public Utilities and Govt. Companies where ERP adopted *(43)* and ERP non-adopted. *(38)Large PSUs (49)*

- The general data on Performance of working of Public Sector Enterprises in Kerala turnover *vis-a-vis* GDP shows that the turnover is increasing but the GDP is declining except for the year 2016-17. The companies with fewer turnovers were not serious in adopting the ERP and majority of the companies in the higher turnover bracket have moved for adopting the ERP Systems.

- Out of 420 respondents, 303 with 72.2% were male and 117 were female with 27.8%

- Regarding the No. of Offices or Branches, the analysis found that there is no correlation between the number of operating Offices or Branches and the ERP adoption/non-adoption.

- All ERP adopted public sector enterprises selected were having sufficient number of computers to work with ERP Systems.

- All the selected companies having ERP were with sufficient number of Servers and infrastructures and Internet connectivity

- Regarding the software implementation, majority of the companies use MS-Office software, Tally ERP9 for accounting purpose, 2 companies has implemented the full-fledged ERP and 6 companies have installed other software applications. Some companies use Tally software for ad-hoc accounting & other requirements and its usage is high in the ERP non-adopted companies.

- Majority of the companies maintain their software by themselves.

- Regarding the Easiness and Comfort of the Present Software, 80% of the respondents are fully comfortable with existing software, 18% is in comfortable zone and rest 2% are not comfortable zone.

- 16% of the respondents are recommending Restructure the entire system for better performance, 62% suggesting Upgrading to a new version of existing Software and needs Training the users for better performance and usage 13% respondents suggesting Improve the existing technical setup and rest 10% having the opinion of improving with adding additional modules**.**

- The General awareness about ERP product was good and no one responded as 'Don't know'. Therefore, it assumes a greater level of awareness on ERP among the ERP adopted companies.

- Regarding the plans for the ERP implementation 54% respondent says for immediate implementation, 28% having the plan but not immediately, but in future, 17% respondents are OK with the existing software.

- Influence of Organisational, People and Technical Factors while implementing ERP were analysed with Independent sample t-test and Kaiser-Meyer-Olkin Measure of Sampling Adequacy (KMO) and Bartlett's Test of Sphericity were used to test whether there exists any significant difference in factors considered while implementing ERP related to nature of the enterprises and it is found that the tests rejected the hypothesis confirming that these factors significantly influencing while implementing ERP systems in these organisations.

- The perception and influence of ERP Implementation team also analysed with respect to their training and satisfaction with Independent Samples Test and ANOVA. The test rejected the hypothesis "there is no association between the satisfaction level and training given to employees" confirming that the satisfaction and training are associated with highest mean square. Levene's Test for Equality of Variances and t-test for Equality of Means were used to test the variances and mean scores.

- The perception of ERP Implementation Team also analysed with respect to their training with ANOVA. The test rejected the hypothesis "there is no association between the satisfaction level and training given to employees" confirming that the satisfaction and training are associated and significant.

Problems faced during ERP implementation.

The pilot survey conducted in three units revealed certain problems faced by the ERP adopted companies. The problems mainly based on the resources availability. Based on this, certain variables and statements were set for the study and analysis. The main category of problems include, ERP product Problems, People or User Problems, Problems related to Project cost, Problems related to Project schedule, General Problems, Problems related to Implementation partner and Technical Issues or problems. These issues were analysed with Factor analysis

The Descriptive Statistics shows the 47 variables' mean, (X) standard deviation (S) and number of respondents (N) who had participated in the survey were analysed. Ten variables were identified most critical with high mean score, such as Lack of understanding of the product capabilities, Bug/quality fulfilment issues, Turnover of the key people involved in the project, Under-estimation of staff requirement/involvement, Unplanned/Extended training, Project scope expansion, Team – poor involvement/resistance, Implementation partner [consultant related issues etc.], Poor technical support team, Separate team not earmarked for ERP implementation. Among these variables, most critical is the Implementation partner [consultant related issues etc.], that had affected most of the respondents during ERP adoption (with highest mean). On the other hand, 'the Data related issues', 'technical issues', 'lack of involvements' is the least affecting variable with lowest means.

SWOC analysis groups key pieces of information into two main categories:

1.   **Internal factors** – the *strengths* (reason for ERP adoption) and *weaknesses* (reason for ERP non-adoption) internal to the organization

2.   **External factors** – the *opportunities* (ERP adoption in future) and *challenges* (problems need to be rectified related to ERP implementation) presented by the environment external to the organization

Analysis of Strengths of ERP Adoption

Based on the strengths of the ERP product only the companies tend to choose a particular ERP product for them. In this study, the strengths/traits, which influenced the respondents to choose their ERP application, were analyzed under SWOC analysis. The analysis with **Friedman** Ranking Test and **Garret** Ranking suggests the 'Suitability of the ERP Software for the business needs', 'Shorter implementation timeframe', 'Price of the ERP software and cost of installation' and 'Post implementation support' tops with good Mean Ranks. On the other hand, 'the technology platform of the ERP software', 'ERP software vendor reputation in the market', 'Supply and implementation vendors fame', 'Availability of the ERP Software for the business needs' and 'Advice from the industry analyst/ consultant or peer groups' have less popular.

Analysis of Weaknesses in ERP Adoption Kendall's W Test

The weaknesses of ERP adoption were the factors which affect the ERP adoption in the organization. These are the factors considered for non-adoption of ERP in an organisation. Due to these factors only, the respondents are keeping away in adopting ERP in their organizations and were analyzed under SWOC Analysis. The collected data were analysed with **Friedman Ranking Test and Kendall's W Test** and also with **Garret Ranking** suggests that the 'Cost/affordability factors' and the attitude of 'Existing Legacy system Sufficient' were the main weaknesses with least ranking scores. 'The existing bad experience of others' and 'Available ERP not fit for our needs' were the least affecting factors in ERP adoption.

Analysis of Opportunities in ERP Adoption

The factors that influence the organization for the adoption of ERP in future were considered as the opportunities of ERP under SWOC analysis. The factors under the opportunity are, 'A serious necessity to emerge in our existing software environment', 'Significant drop in the Price of the software & maintenance costs', 'Considerable drop in the risks of implementation', 'Availability of an ERP software which would meet our expectations', 'Witnessing lot of successful implementations

in our specific industry', 'Once our competing priorities are addressed', 'Reaching the organizational maturity [People & Process]', 'Improvement in the financial position', 'Stage when an agreement with the employees/ Unions have reached', 'Increase in the desire of the Management towards going for ERP'.

The collected data were analysed with **Friedman** Ranking Test and **Kendall's** W Test and also with **Garret** Ranking suggests that From the above mentioned variables, 'Availability of an ERP software which would meet our expectations' is the power variable, followed by other variables such as 'Increase in the desire of the Management towards going for ERP' and the variable in the last position is 'Stage when an agreement with the employees/Unions have reached', which has less impact on dependent variable .

Analysis of Challenges in ERP Adoption

Under this factor of SWOC Analysis, the challenges are the variables where the ERP aspirants need to pay attention as per the views of respondents who adopted the ERP. The critical variables under this factor are 'ERP product Selection', 'Project Manager', Implementation vendor Selection/engagement', 'Formation of good/focused Internal Team', 'Team Involvement', 'Project schedule adherence', 'Project Scope clarity', 'Project Governance', 'Project Budget adherence', 'Clear Communication', 'Training process', 'Technology Infrastructure', 'Process redesign', 'Level of customization', 'Management involvement at all the stages', 'Change Management', 'Duration of the parallel run 'and 'Black-out period prior to go-live'.

The collected data were analysed with **Friedman** Ranking Test and **Kendall's W** Test and also with **Factor Analysis** suggests that 'ERP product Selection' and 'Level of customization' with the highest mean value plays a major role in 'Challenges' segment and is a critical parameter to be considered while planning to go for ERP adoption.

Analysis of Organisational, People, and Technical Factors and other Critical success factors (CSFs)

In addition to six Organisational factors, four people factors and four technical factors, thirty Critical success factors (CSFs) were identified which influence while adopting ERP in an organisation. These thirty factors grouped under ten categories for factor analysis. All these factors were analysed with Confirmatory Factor Analysis (CFA) and Structural Equation Modelling (SEM). These factors also tested with chi-square to test its association with cost and efficiency related variables.

Confirmatory Factor Analysis (CFA): CFA used to represent all the constructs in the scale along with their variables in the measurement model for analysing the validity of the construct of the scale. For the purpose of analysis, the scale variable structure was developed.

Structural Equation Modelling (SEM): SEM is a statistical tool for analyzing the dependence relationships among cause and effects in a set of constructs represented by multiple measurable variables in a single model. SEM uses the concept of both regression analysis and exploratory factor analysis. The analysis examined the path significance and magnitude of the hypothesis and its effects on the proposed model with SEM. Network Analysis Techniques: Programme Evaluation Review Technique (PERT) and Critical Path Method (CPM) were also used to determine the time required to complete the ERP implementation and analysed the implementation programmes and schedules.

The analysis with CFA and SEM confirmed by rejecting the hypothesis that some factors like Organisational, People, Technical other Critical Success Factors negatively influence and a have a positive significant relationship with ERP usefulness with respect to implementation. The ERP Usefulness and the satisfaction of the users have a positive significant relationship with training given to the users. The factors related to Cost, Time, Technical, Efficiency, Manpower are highly influenced while implementing ERP in these companies. The test also rejected the

hypothesis that "there is no association between the satisfaction levels of users and training given to them.

Conceptual Frameworks for Variables Influence on ERP Adoption

The factors influencing ERP adoption recognised are; For Process Improvement, To face statutory Compliance, Replace legacy System, Regulatory Compliance, To Provide Better Management Tools, Fast Growth, Benefit for external Stakeholders, Industry Best Practices, Control Business Operations. Among the variables, 'To provide better management tools' is found to be the most important variable followed by, 'process improvement', 'fast growth', 'replace legacy system', 'benefit for external stakeholders', 'control business operations', 'to adapt industrial best practices', 'to enhance regulatory compliances', and finally, 'to face statutory compliance'.

The Factors influenced for ERP adoption were analysed with Multiple Regression Equation Among the factors influenced for ERP adoption the factor 'To provide better management tools' was most influenced and toped among the dependent variables. Through ERP adoption, the companies believe to get suitable enablement for managing the business effectively, hence out of all the twelve variables 'To provide better management tools' has more influence on ERP adoption. The variable 'process improvement' was the next influenced variable that affected ERP adoption. ERP expected to transform the way the company operates through process improvements. The next variable 'fast growth' also supports the company to face the fast growth and stay competitive. The next influencing variable is 'replacement of legacy system' as companies expect ERP to replace the aging legacy systems and equip the IT setup with data integration. The 'benefit of stake holders' is the next variable that influences for ERP adoption. The ERP adoption regulates and controls the business operations easily, the factor, 'control business operators' is having next important influencer. ERP adoption also influences to follow and 'to adapt the Industries best practices' applicable to specific industries.

The factors, 'to enhance regulatory compliances' and 'To face the changing statutory compliance' influence very less in the ERP adoption process.

Analysis of Economic and Operational Benefits of ERP Using Factor Analysis and Multiple Regressions. Benefits of ERP adoption from the respondents related to Cost, Time, Technical, Efficiency, Manpower and General.

Factor analysis and Multiple Regression has used for analysing the relationship among the dependent variables. The rationale for using Factor analysis and Multiple Regression is its ability to treat many variables simultaneously so that their effect could examined together.

Respondents such as Board of Directors, Managing Director or the top level executives of the business, Head of Finance/Accounts / Functional heads (Departmental Managers), Managers/Supervisors/ Senior functional Executives, End users, IT team (for administration and technical support), External: Customers/ Vendors etc., Auditors (Internal and External), External Consultants, were asked to assign the level of agreement on variables under each of the six factors with multiple dependent variables (Cost, Time, Technical, Efficiency, Manpower and General). Responses were ranked and an attempt is made to assess the significance of the factors to support the eight hypotheses of the study. The variables related to Cost, Time, Technical, Efficiency, Manpower and General benefits are analysed with factor analysis and multiple regression and the tests rejected the hypothesis, found that these variables are dependent, and associated with ERP adoption in Small and Medium PSUs of Kerala.

Descriptive analysis for the variables 'cost related benefits' shown above to reveals that Increase in business turnover, Improved cash management and Financial flows control having highest mean values are statistically significant. It is therefore inferred that the model fits well with cost related benefits of ERP adoption.

Descriptive analysis for the variables 'time related benefits' shown above to reveals that 'Operational cycle time reduction' with mean value of (3.60), 'decreased financial close cycle' (3.40), are statistically significant having highest

mean values and 'Quickened information response time', 'Improved order management cycle' are also statistically significant. It is therefore, the model fits well with time related benefits of ERP adoption.

Descriptive analysis for the variables 'Technical benefits' shown above reveals that 'Improved & Secured access control', 'Seamless connectivity of business entities' , 'Faster & organized processing of transactions', 'single data source for all' and 'Improved Accountability are statistically significant. Therefore, it is concluded that the model fits good with Technical benefits of ERP adoption.

Descriptive analysis for the variables 'efficiency related benefits' shown above reveals that 'Productivity improvement' with highest mean, 'Quality improvement', 'Better Resources management', 'More efficient Business processes', 'Overall Performance Improvement', are statistically significant at. It is therefore inferred that the model fits well with Efficiency related benefits of ERP adoption

Descriptive analysis for the variables 'man power related benefits' shown above reveals that 'Man power reduction' with mean value of 3.82, 'Right Sizing of man power',' Empowered users with data/information'. 'Facilitates Business Learning' are statistically significant. Therefore, the model fits good with man power related benefits of ERP adoption.

Descriptive Mean , Std. Deviation and Variance analysis for the variables 'General benefits' with Correlation and regression analysis done on the data collected from the respondents of different level of stakeholders reveal that these data are statistically significant. The test for individual factors indicates 'Improved Decision Making', 'Supporting Business Growth and expansion, etc', 'Better Coordination among the inter-related functional activities', 'Better Management and Controlling functions', 'Improved Statutory Compliance', Improved interaction with customers', 'Improved interaction with suppliers', are statistically. It is therefore, inferred that the model fits well with the general benefits of ERP adoption.

Analysis of Satisfaction and Training

In the ERP adopted small and mid-sized public sector enterprises, the satisfaction level of the administrators, managers, ERP implementing teams and users connected with overall deployment of ERP were analysed with training given to them through chi-square test

The satisfaction level of the administrators, managers, ERP implementing teams and users, being the stakeholders connected with overall deployment of ERP were analysed with training given to them with chi-square. The classified category of users who provide trainings were; the Managing Director or the top level administrators and executives of the business, Functional heads (Departmental Managers), Managers/Supervisors, End users, IT team (for administration and technical support), Training on report generation by the users or IT team and Auditors (Internal and External).

The results clearly show that the high level of satisfaction is due to the training given to the related respondents, those who did not trained were not satisfied mostly and few of them did not give comments at all. The chi –square value is highly and statistically significant. The test rejected the hypothesis that "there is no association between the satisfaction level and training given to employees". It is therefore, concluded that there is a strong association between the satisfaction level of the respondents and the training given to the users in respect of implementation.

Descriptive Analysis - Satisfaction and Involvement

The above analysis ensures full involvements of users at all levels such as Managing Director or administrators at the top-level executives who manage the business, Functional heads, Managers/ Supervisors, End users, IT team, Auditors and customers/vendors. Majority of the stakeholders were actively involved in the ERP implementation were highly satisfied, few respondents did not express their views at all.

The results clearly show that high satisfaction is due to high involvement of respondents, those who are not involved were not satisfied mostly and some of them

didn't give any comments. The chi –square value is highly and statistically significant. The test rejected the hypothesis that "There is no association between the satisfaction level and active involvement of employees in the ERP implementation". It is therefore, concluded that there is a strong association between the satisfaction level of the respondents and active involvement of employees in the ERP implementation.

5.4. Suggestions

In this highly competitive business world dominated by big business giants and MNCs, small and medium sized organizations especially, the public sector enterprises have to strive to grow and sustain in the market. All sizes of organisations, whether small, medium or large it has to move forward and emerge successful in the era of ever changing market conditions. They need to cope up with the latest trends and technological advancements are the need of hour. Information, Communication and Telecommunication Technologies with advanced Networking, is advancing at an unbelievable super speed. Internet and Networking Technology has made this world a global village with all information at our fingertips. The businesses organisations cannot confine themselves to the domestic market only, but need to expose globally.

They have to adopt changes especially in information technology to cope with the global requirements. The researcher would like to give following suggestions based on the study.

1. Instead of acquiring separate ERP software for each Public Sector SMEs, a common ERP Software can be developed for the entire Public Sector SMEs in the state of Kerala under Linux platform with free and open source ERP to reduce the cost of the software.

2. Now the government of Kerala is using wage/salary payment software called "SPARK" (Service and Payroll Administrative Repository for Kerala) for Payroll administration of all Government employees of Kerala. The same can be extended to all public sector enterprises of Kerala state.

3.   ERP software vendors may conduct more promotion activities for their ERP software for PS SMEs of Kerala.

4.   The PS SMEs should understand that ERP investment is for long-term benefit.

5.   Industry bodies like District industries centre etc. may organize workshop/ seminar to spread awareness about benefit of ERP to PSUs.

6.   PS SMEs should give emphasis on adopting ERP software from known success packages suitable for the industry for which it belongs.

7.   There should be a separate body in the Industries Department in Kerala state and Central Government which can promote ERP software for SME and Large scale sector.

8.   PS SMEs providing specialized services can go for in-house custom ERP Software to cater their special needs.

9.   Those PS SMEs which have implemented ERP on their own should evaluate whether they are able to get the benefits of the software to the maximum extent.

10.   The PS SMEs should encourage Researchers, Commerce and Management students to undertake project in their organizations to conduct study on ERP software.

11.   PS SMEs can first adopt basic or a single module in the beginning to evaluate whether ERP is useful or not, then it found that it is useful, and then go for other modules.

12.   Employees' who got training in ERP have tendency to switch over to other Public Sector Undertakings after gaining experience in using the ERP software. The management of the Public Sector Undertakings should have strategy to retain these employees as they can add a lot of value to the Public Sector Undertaking.

13. As technically educated work force with graduate or diploma degree entering in to the SSI sector, the technology adoption and ERP Implementation by PS SMEs need to increase.

14. Many of the prestigious institutions in India like Universities, management institutes and professional bodies are conducting workshops on ERP, CRM and SCM. These programmes can be conducted for specifically meeting the needs of PS SMEs and SSIs at lower fees with the grant from governments.

15. As internet usage and applications are spreading fast PS SMEs can get connected to their ERP vendors network and get online support for their day to day transactions using ERP.

16. The Government should provide subsidy to implement ERP software to PS SMEs like subsidies set up in units of backward industrial areas.

17. PS SMEs should give emphasis to move on adopting Cloud based ERP software. It is an emerging technology and enterprise application integration has a lot of scope in future.

    With the development of mobile phones/tablets, smart phones and related technology like android, there could be better integration of some or all functions of ERP software using mobile devices and better control over the activities using mobile applications.

5.5. Conclusion

The modern global competitive market, business organisations are moving through severe challenges and cutthroat competition struggling for growth and survival. Latest sophisticated technological developments contributed much for the efficiency of an organisation. ERP dominated by MIS ensures the flow of information across all functional boundaries. ERP under MIS environment facilitates the managers to take proper and timely decisions within short span of time within all constraints. Earlier ERP systems developed for large organisations involving huge cost and highly complicated network sharing and integration. Now the fruits of the ERP systems reached to Small and Medium business enterprises as well. Success

rate of implementation in large organisations has led the ERP vendors to extend the solutions to small and medium enterprises. The study shows that Public Sector SMEs in Kerala have derived financial benefits through the ERP implementation measured in terms of profits and turnover. Kerala PS SMEs are benefited number of intangible factors such as high customer satisfaction, full capacity utilization, good information flow, better picture of public companies and a better picture of quality management. The Small and Mid Sized Public Enterprises of Kerala has to play a major role in implementing ERP software. They can increase their performance if their employees properly understand the use of ERP software. These organisations prefer Linux based free open source or low cost ERP instead of branded proprietary ERP software. Some organisations use the custom-made software for their purposes. All executives, administrative and managers of Kerala PS SMEs have recommended ERP implementation with a solution suitable to their needs and requirements.

The main contribution of ERP systems are the saving in time to complete business activities and processes through information and data sharing. The ICT based ERP systems offer a better and more efficient work environment for Small and Mid-sized Public sector undertakings in Kerala. The success of implementation of ERP in these organisations deeply depends on technical perspective, but real success lays in the willingness and acceptance of ERP users in these organisations. Most of the implementation models are supported by Davis Technology Acceptance Model (TAM) especially in the initial phases as it is empirically tested and widely used model explaining actual use of Information. The important outcome of this research is the identification of the external factors for the improvement of the efficiency and effectiveness of ERP use. The managerial implications of this research are that if the organization wants to improve business performance and increase ERP user satisfaction, it should take into account the external factors confirmed in this research.

5.6. Scope for Further Research

✓ To identify the clusters based on ERP usage.

✓ To carry out the same research between type of industries and external factors

- ✓ To discriminate the industries based on external factors.

- ✓ The influence of language, culture, nation and politics of company management on ERP implementation

- ✓ Explore the role of external factors in ERP lifecycle.

- ✓ To carry the same research in other parts of country

- ✓ To carry the same research in other Sectors

- ✓ To carry the same research in use of cloud technology in ERP implementation

- ✓ To carry the same research in use of "SPARK" (Service and Payroll Administrative Repository for Kerala) for Payroll administration of all Government employees of Kerala.

- ✓ To carry the same research in use of "ORUMA - Free software", Billing and Service software of Kerala State Electricity Board Ltd

MUSTAFA K. "PROBLEMS AND PROSPECTS OF ERP SYSTEMS IMPLEMENTATION IN SMALL AND MID SIZED PUBLIC SECTOR ENTERPRISES IN KERALA." THESIS. PG DEPARTMENT OF COMMERCE, P.S.M.O COLLEGE TIRURANGADI, UNIVERSITY OF CALICUT, 2019.

Bibliography

Ali, M., & Cullinane, J. (2014). A study to evaluate the effectiveness of simulation based decision support system in ERP implementation in SMEs. *Procedia Technology*, *16*, 542-552.

Almahamid, S., & Hourani, A. (2015). An empirical study on the impacts of ERP system, e-business technologies and organisational collaboration on supply chain agility: PLS perspective. *International Journal of Advanced Operations Management*, *7*(3), 229-254.

Al-Mashari, M. A. (2002). Implementing ERP through SAP R/3: A process change management (PCM) perspective. *Journal of King Saud University-Computer and Information Sciences*, *14*, 25-38. Al-Mashari, M. A. (2002). Implementing ERP through SAP R/3: A process change management (PCM) perspective. *Journal of King Saud University-Computer and Information Sciences*, *14*, 25-38.

Ang, C. L. (2000). *The use of IT to support TQM in the Malaysian public sector* (Doctoral dissertation, © Chooi-Leng Ang).

Aronson, J. E., Liang, T. P., & Turban, E. (2005). *Decision support systems and intelligent systems*. Pearson Prentice-Hall.

Bano, F. (2014). Quality of ERP Implementation: Case Study of Select Indian Organizations. *International Proceedings of Economics Development and Research*, *75*, 36.

Beatty, R. C., & Williams, C. D. (2006). ERP II: best practices for successfully implementing an ERP upgrade. *Communications of the ACM*, *49*(3), 105-109.

Beretta, S. (2002). Unleashing the integration potential of ERP systems: the role of process-based performance measurement systems. *Business Process Management Journal*, *8*(3), 254-277.

Bingi, P., Sharma, M. K., & Godla, J. K. (1999). Critical issues affecting an ERP implementation. *IS Management*, *16*(3), 7-14.

Candra, S. (2012). ERP implementation success and knowledge capability. *Procedia-Social and Behavioral Sciences*, *65*, 141-149.

Carton, F., Adam, F., & Sammon, D. (2008). Project management: a case study of a successful ERP implementation. *International Journal of Managing Projects in Business*, *1*(1), 106-124.

Chung, B., Skibniewski, M. J., & Kwak, Y. H. (2009). Developing ERP systems success model for the construction industry. *Journal of Construction Engineering and Management*, *135*(3), 207-216.

Davenport, T. H. (1998). Putting the enterprise into the enterprise system. *Harvard business review*, *76*(4).

Davenport, T. H. (1998). Putting the enterprise into the enterprise system. *Harvard business review*, *76*(4).

Davenport, T. H. (1998). Putting the enterprise into the enterprise system. *Harvard business review*, *76*(4).

Davenport, T. H., & Brooks, J. D. (2004). Enterprise systems and the supply chain. *Journal of Enterprise Information Management*, *17*(1), 8-19.

Davenport, T. H., & Short, J. (2000). In search of ERP paybacks. *Computerworld*, *34*(8), 42.

Erasmus, E., Rothmann, S., & Van Eeden, C. (2015). A structural model of technology acceptance. *SA Journal of Industrial Psychology*, *41*(1), 01-12.

Fares, A. A., & Mandour, M. M. Enterprise Resource Planning (ERP) Implementation in an Egyptian Healthcare Entity: motives and expected impacts.

Gable, G. G., Scott, J. E., & Davenport, T. D. (1998). Cooperative ERP life-cycle knowledge management.

Gable, G. G., Scott, J. E., & Davenport, T. D. (1998). Cooperative ERP life-cycle knowledge management.

Garg, P., & Khurana, R. (2017). Applying structural equation model to study the critical risks in ERP implementation in Indian retail. *Benchmarking: An International Journal*, *24*(1), 143-162.

Gould, L. S. (2002). ERP: Complexities, ironies, and advances. *Automotive Manufacturing and Production*, *114*(7), 44-44.

Govindaraju, R. (2012). Enterprise systems implementation framework: An organisational perspective. *Procedia-Social and Behavioral Sciences*, *65*, 473-478.

Holland, C. P., & Light, B. (2001). A stage maturity model for enterprise resource planning systems use. *ACM SIGMIS Database: the DATABASE for Advances in Information Systems*, *32*(2), 34-45.

Holland, C. R., & Light, B. (1999). A critical success factors model for ERP implementation. *IEEE software*, *16*(3), 30-36.

Hsieh, P. J., & Kleiner, B. H. (1992). New developments in inventory and materials management. *Logistics Information Management*, *5*(2), 32-35.

Huang, Z., & Palvia, P. (2001). ERP implementation issues in advanced and developing countries. *Business process management journal*, *7*(3), 276-284.

Jacobs, F. R. (2007). Enterprise resource planning (ERP)—A brief history. *Journal of Operations Management*, *25*(2), 357-363.

Jones, M. C. (2005). Tacit knowledge sharing during ERP implementation: a multi-site case study. *Information Resources Management Journal*, *18*(2), 1.

Keizer, J. A., Vos, J. P., & Halman, J. I. (2005). Risks in new product development: devising a reference tool. *R&D Management*, *35*(3), 297-309.

Khurana, R., & Garg, P. (2012). Retail sales in India–the need to go beyond enterprise-wide integration. *International Journal of Electronic Marketing and Retailing*, *5*(2), 147-155.

Krishnadan, R. S. (2017). *A STUDY OF ERP IMPLEMENTATION IN SELECT INDUSTRIES* (Doctoral dissertation, GUJARAT TECHNOLOGICAL UNIVERSITY AHMEDABAD).

Kwak, Y. H., Park, J., Chung, B. Y., & Ghosh, S. (2012). Understanding end-users' acceptance of enterprise resource planning (ERP) system in project-based sectors. *IEEE Transactions on Engineering Management*, *59*(2), 266-277.

Mabert, V. A., Soni, A., & Venkataramanan, M. A. (2003). The impact of organization size on enterprise resource planning (ERP) implementations in the US manufacturing sector. *Omega*, *31*(3), 235-246.

Madapusi, A., & D'Souza, D. (2012). The influence of ERP system implementation on the operational performance of an organization. *International Journal of Information Management*, *32*(1), 24-34.

Madapusi, A., & D'Souza, D. (2012). The influence of ERP system implementation on the operational performance of an organization. *International Journal of Information Management*, *32*(1), 24-34.

Mohapatra, S., Padhi, R., & Mohanty, S. (2015). Study of motivational factors post-implementing ERP (SAP) solutions in National Aluminium Company Limited extending the technology acceptance model at organisation level (TAMO). *International Journal of Management and Enterprise Development*, *14*(3), 250-271.

Moon, Y. B. (2007). Enterprise Resource Planning (ERP): a review of the literature. *International journal of management and enterprise development*, *4*(3), 235-264.

Nielsen, J. L. (2002). Critical success factors for implementing an ERP system in a university environment: A case study from the Australian HES. *Bachelor Project, Griffith University*.

Oliver, D., & Romm, C. (2002). Justifying enterprise resource planning adoption. *Journal of Information Technology*, *17*(4), 199-213.

Olson, D. L. (2003). *Managerial issues of enterprise resource planning systems*. McGraw-Hill, Inc..

Orlicky, J. A., Plossl, G. W., & Wight, O. W. (2003). Structuring the Bill of Material for MRP. *Operations management: critical perspectives on business and management*, *58*.

Pasaoglu, D. (2011). Analysis of ERP usage with technology acceptance model. *Global Business and Management Research*, *3*(2), 157-165.

Pitic, L., Popescu, S., & Pitic, D. (2014). Roadmap for ERP evaluation and selection. *Procedia Economics and Finance*, *15*, 1374-1382.

Poston, R., & Grabski, S. (2001). Financial impacts of enterprise resource planning implementations. *International Journal of Accounting Information Systems*, *2*(4), 271-294.

Ram, C. S. (2010). Success of ERP system in Indian industries: A comparative study among selected industries. *Indian Journal of Science and Technology*, *3*(10), 1089-1093.

Ram, J., Wu, M. L., & Tagg, R. (2014). Competitive advantage from ERP projects: Examining the role of key implementation drivers. *International Journal of Project Management*, *32*(4), 663-675.

Ramayah, T., Roy, M. H., Arokiasamy, S., Zbib, I., & Ahmed, Z. U. (2007). Critical success factors for successful implementation of enterprise resource planning systems in manufacturing organisations. *International Journal of Business Information Systems*, *2*(3), 276-297.

Reilly, K. (2005). AMR research releases ERP market report showing overall market growth of 14% in 2004. *AMR Research*, *29*.

Rom, A., & Rohde, C. (2006). Enterprise resource planning systems, strategic enterprise management systems and management accounting: A Danish study. *Journal of Enterprise Information Management*, *19*(1), 50-66.

Sadagopan, S. (1999). The world of ERP. *ERP: A Managerial Perspective*, 1-16.

Sadat Safavi, N., Amini, M., Abdollahzadegan, A., & Zakaria, N. H. (2013). An Effective Model for Evaluating Organizational Risk and Cost in ERP Implementation by SME.

Sadrzadehrafiei, S., Chofreh, A. G., Hosseini, N. K., & Sulaiman, R. (2013). The benefits of enterprise resource planning (ERP) system implementation in dry food packaging industry. *Procedia Technology*, *11*, 220-226.

Sammon, D., & Adam, F. (2010). Project preparedness and the emergence of implementation problems in ERP projects. *Information & Management*, *47*(1), 1-8.

Sanyal, D. M. K., & Bhadra, S. K. (2012). Sudhangsu Das,". *ERP implementation issues and challenges: A FISHBONE analysis in context to Indian industries", IRACST-International Journal of Research in Management & Technology*.

Sarkis, J., Helms, M. M., & Hervani, A. A. (2010). Reverse logistics and social sustainability. *Corporate Social Responsibility and Environmental Management*, *17*(6), 337-354.

Soffer, P., Golany, B., & Dori, D. (2003). ERP modeling: a comprehensive approach. *Information systems*, *28*(6), 673-690.

Themistocleous, M., Irani, Z., O'Keefe, R. M., & Paul, R. (2001). ERP problems and application integration issues: An empirical survey. In *System Sciences, 2001. Proceedings of the 34th Annual Hawaii International Conference on* (pp. 10-pp). IEEE.

Umble, E. J., Haft, R. R., & Umble, M. M. (2003). Enterprise resource planning: Implementation procedures and critical success factors. *European journal of operational research*, *146*(2), 241-257.

Voordijk, H., Van Leuven, A., & Laan, A. (2003). Enterprise resource planning in a large construction firm: implementation analysis. *Construction management and economics*, *21*(5), 511-521.

White, R. E. (2008). Post-implementation evaluation of enterprise resource planning (ERP) systems. *University of North Texas*.

White, R. E. (2008). Post-implementation evaluation of enterprise resource planning (ERP) systems. *University of North Texas*.

White, R. E. (2008). Post-implementation evaluation of enterprise resource planning (ERP) systems. *University of North Texas*.

Yaseen, S. G. (2009). Critical factors affecting enterprise resource planning implementation: an explanatory case study. *International Journal of Computer Science and Network Security*, *9*(4), 359-363.

Yen, H. R., & Sheu, C. (2004). Aligning ERP implementation with competitive priorities of manufacturing firms: An exploratory study. *International Journal of production economics*, *92*(3), 207-220.

Yusuf, Y., Gunasekaran, A., & Wu, C. (2006). Implementation of enterprise resource planning in China. *Technovation*, *26*(12), 1324-1336.

Zhang, L., Lee, M. K., Zhang, Z., & Banerjee, P. (2003, January). Critical success factors of enterprise resource planning systems implementation success in China. In *System Sciences, 2003. Proceedings of the 36th Annual Hawaii International Conference on* (pp. 10-pp). IEEE.

PROBLEMS AND PROSPECTS OF ERP SYSTEMS IMPLEMENTATION IN SMALL AND MID SIZED PUBLIC SECTOR ENTERPRISES IN KERALA

All information collected through this will treated as STRICTLY CONFIDENTIAL and will be used for Academic Research purposes only.

QUESTIONNAIRE

Public Enterprise name _____Division _____

Public Enterprise size: Revenue _____(In Rs. Crores) Staff strength _____

Respondent name (Optional) _____ Designation_____

Name of the ERP/Software Solution using_____ Vendor_____

ERP/Software Solution using since _____ Modules_____

1. What are the main objectives for the ERP project?

    (a) Centralization of data   [ ]

    (b) Cost efficiency in operations   [ ]

    (c) Replacing old IT system   [ ]

    (d) Enforcing organization competitiveness   [ ]

    (e) Process efficiency and cycle time reduction   [ ]

    (f) Centralized control of operations   [ ]

2. Do you feel that the objectives have been achieved in general? (Yes) [ ] (No) [ ]

    If yes, in what amount have they been achieved (%)?

    (a). Up to 25%   [ ]

    (b). Up to 50%   [ ]

    (c). Up to 75%   [ ]

    (d). More than 75%   [ ]

    (e). 100%   [ ]

3. What were the most Critical Factors that enable the success of your ERP Project Implementation?

    (a) Top Management Support   [ ]

    (b) Team Motivation / Planning   [ ]

    (c) Communication Management   [ ]

    (d) Effective Business Process Re-engineering   [ ]

    (e) Effective Change Management   [ ]

    (f) Vendor Selection   [ ]

    (g) Effective Project Management   [ ]

    (h) User Training   [ ]

4. What are the changes observed by you before and after the implementation of the ERP Project in respect of the following:

- Business operations efficiency   (Increased) (Reduced)
- Organisation hierarchy   (Increased) (Reduced)
- Operations Costs   (Increased) (Reduced)
- Other, Please specify _____   (Increased) (Reduced)

5. What are the major challenges you observed while ERP implementation? Please *RANK* in its order of importance:

- Resistance to Change   [   ]
- Unrealistic expectations   [   ]
- Project management   [   ]
- Lack of implementation skills   [   ]
- Successful Changeover to ERP   [   ]
- Other factor 1:   [   ]
- Other factor 2:   [   ]

6. Can you rate the highest benefit of ERP Implementation according to your observation?

Tangible Benefits: Please Tick

- Reduction in Inventory and inventory costs.   [   ]
- Reductions in Manufacturing and Operational Costs.   [   ]
- Improvements in Financial Operations   [   ]
- Reductions in Office Administrative Costs   [   ]
- Efficiency in Production Schedule Improved   [   ]
- Other_____   [   ]

PROBLEMS & PROSPECTS OF ERP SYSTEMS IMPLIMENTATION IN SMALL AND MID SIZED PUBLIC SECTOR ENTERPRISES IN KERALA

All information collected through this will be treated as STRICTLY CONFIDENTIAL

QUESTIONNAIRE - for ERP Implementing Team

Please (✓) in the number of the box, which best represents your satisfaction level:

1 = totally disagree; 2 = disagree; 3 = neutral; 4 = partially agree; 5 = fully agree

5	4	3	2	1
Fully Agree	*Partially Agree*	*Neutral*	*Disagree*	*Totally Disagree*

1.   The ERP Software installed in your organisation is easy to use.

1.	2.	3.	4.	5.

I am in control of the menus toolbars.

1.	2.	3.	4.	5.

2.   I could be able to understand all that was offered in the ERP.

1.	2.	3.	4.	5.

3.   Navigation toolbars and menus are easy to handle.

1.	2.	3.	4.	5.

4.   The frond-end ERP navigation is easy to follow.

1.	2.	3.	4.	5.

5.   The menu contents and style of the toolbars are matching my needs.

1.	2.	3.	4.	5.

6.   Getting started with this ERP version is easy.

1.	2.	3.	4.	5.

7.   I can easily find out the options in the menus and toolbars.

1.	2.	3.	4.	5.

8.   I am mentally satisfied while I am using this ERP.

1.	2.	3.	4.	5.

9.   This ERP System has caused to increase the productivity and efficiency of the users.

1.	2.	3.	4.	5.

10. *This ERP Software helps a manager to study and track employee status*

1.	2.	3.	4.	5.

11. *The ERP helps in faster completion of official your daily routine tasks*

1.	2.	3.	4.	5.

12. *The information in the ERP is detailed, structured and accurate.*

1.	2.	3.	4.	5.

All the modules of ERP useful for the HR Department

1.	2.	3.	4.	5.

Future of ERP

Please (tick) mark an appropriate answer of your choice in YES or No

1. *The Introduction of ERP software increased your efficiency?*

   Yes   No

2. *Can ERP help in better decision-making process as a user?*

   Yes   No

3. *An ERP System caused to hike the productivity standard and efficiency of the employees.*

   Yes   No

4. *Does your ERP helps as a manager to track your subordinate status?*

   Yes   No

5. *The ERP helps in completing your daily routine tasks much easier?*

   Yes   No

6. *Do you think Report Generation of is much easier and simple now by using this ERP?*

   Yes   No

7. *Is the information provided in the ERP are structured and accurate?*

   Yes   No

8. *Are all the modules of ERP useful for your Department?*

   Yes   No

Name: _____

Name of the Organisation: _____

PROBLEMS AND PROSPECTS OF ERP SYSTEMS IMPLEMENTATION IN SMALL AND MID SIZED PUBLIC SECTOR ENTERPRISES IN KERALA

All information collected through this will be STRICTLY CONFIDENTIAL and used for Academic Research purposes only.

QUESTIONNAIRE

1. Name of the Public Enterprise [optional]:

2. Nature and Sector of the Public Sector Enterprise [*Please tick (✓) the appropriate Cell*]

Sl No	(a) Nature of the Public Enterprise	*Please tick (✓)*
1	State Sector	
2	Central Sector	
3	Public Utilities	
4	Govt. Companies	
	(b) Sector of the Public Enterprise	*Please tick (✓)*
1	Development & Infrastructural Agencies	
2	Ceramics and Refractories	
3	Chemical Industries	
4	Electrical Industries	
5	Electronics	
6	Engineering & Manufacturing	
7	Plantation/Agro & Livestock Based Units	
8	Textiles	
9	Traditional Industries	
10	Trading Units	
11	Welfare Agencies	
12	Public Utilities	
13	Others	

3.1 Turnover [in Rs crores] : (2016-17) [*Please tick (✔) the appropriate Cell*]

Sl No	Annual Turnover	Please tick (✔)
1	< 25	
2	25 – 50	
3	51 – 100	
4	101 – 500	
5	501 – 1000	
6	>1000	

3.2 No. Of Employees: [*Please tick (✔) the appropriate Cell*]

Sl No	Employee Strength (No. of Employees)	Please tick (✔)
1	<50,	
2	51 – 100	
3	101 – 200	
4	201 – 500	
5	> 500	

3.3 No. of Offices or Branches: [*Please tick (✔) the appropriate Cell*]

Sl No	No. of Offices or Branches	Please tick (✔)
1	One Office/ Business Place only	
2	2 – 10 **Offices or Branches**	
3	11 – 25 **Offices or Branches**	
4	26 – 50 **Offices or Branches**	
5	**>50 Offices or Branches**	

3.4 Company type: Status of Ownership [*Please tick (✔) the appropriate Cell*]

Sl No	Ownership	Please tick (✔)
1	Wholly owned by the Government of Kerala	
2	Joint ownership of Government of Kerala & Public	
3	Statutory Bodies	
4	Joint ownership of State & Central Governments	

5	Joint ownership of Government of Kerala, Financial Institutions & Public	
6	Joint ownership of Government of Kerala, Financial Institutions, Public & Foreign Firms	
7	Joint ownership of Government of Kerala & NRIs	
8	Joint ownership of Government of Kerala and Urban Local Bodies	

3.5 Executive contacted for this research [*Please tick (✓) the appropriate Cell*]

Sl No	Executive contacted	*Please tick (✓)*
1	MD/Director/Chairman/Chief Executive Officer	
2	IT Head or System Administrator/Analyst	
3	Head/Manager Finance/Accounts	
4	Head /Manager Operations/Manufacturing/Service	
5	Head /Manager Sales/Marketing	
6	Other Managerial /Administrative Heads [Please mention]	

ERP Infrastructure and Computerization

4. Indicate the details about your Computer environment – [*Please tick (✓) the appropriate Cell*]

Sl No	IT Infrastructure	1 to 10	11 to 25	26 to 50	> 50
1	**Personal Computers/Laptops**				
2	**No.of Servers**				
3	**Availability of Internet**	Yes/ No			
4	**Availability of a separate IT Dept**	Yes/ No			

5. Software being used [*Please tick the appropriate Cell*]

Sl No	Software Used	*Please tick (✓)*	Specify If Required
1	A full-fledged ERP Like SAP/ORACLE Etc		
2	**Accounting Software Like** Tally ERP9/Peach Tree/ Sage Etc		
3	MS-Office software/ Office 365		
4	Other application software for Inventory, sales, Manufacturing etc		

6. Application systems

6.1 Details about the Present Software application system [*Please tick the appropriate Cell*]

Sl No	Present Software	*Please tick (✔)*	Specify If Required
1	Software Developed specifically		
2	**Accounting Software Like** Tally ERP9/Peach Tree/ Sage Etc		
3	Mix-up of systems with MS-Office software		
4	Other application software for Inventory, sales, Manufacturing etc from the Market		

6.2 ERP maintained by: [*Please tick (✔) the appropriate Cell*]

Sl No	Present Software Maintained by	*Please tick (✔)*	Specify If Required
1	Own team		
2	External Vendor/ Support Teams		
3	Combination of Internal & External		
4	No support		

6.3 The Easiness and Comfort on use [*Please tick (✔) the appropriate Cell*]

Sl No	Easiness/ Comfort	*Please tick (✔)*	Specify If Required
1	Fully comfortable		
2	Comfortable		
3	Not comfortable but manageable (OK)		
4	Not comfortable and needs changes		
5	Not at all comfortable and needs a total change		

7. Measure taken for the improvement and to extend the benefits of the existing software setup [*Please tick (✓) the appropriate Cell*] (*6th Objective*)

Sl No	Measure taken for Improvement	*Please tick (✓)*	Specify If Required
1	Restructure the entire system for better performance		
2	Upgrading to a new version of existing Software		
3	Training the users for better performance and usage		
4	Improve the existing technical setup		
5	Adding more modules with customization		
6	Others (Please specify)		

8. General awareness about ERP *(4th Objective)*

8.1 How do you came to know about this ERP? [*Please tick (✓) the appropriate Cell*]

Sl No	Awareness about ERP	*Please tick (✓)*	Specify If Required
1	Already aware about ERP		
2	From other companies using ERP now		
3	From Trade Associations/ Conferences/ Exhibitions		
4	From Media : Magazines & Periodicals/ TV Ads		
5	Direct From ERP Vendors		
6	Not know about ERP		

8.2. Do you have plans to go for ERP in the near future? [*Please tick (✓) the appropriate Cell*]

Sl No	Plans for ERP	*Please tick (✓)*
1	Yes, immediate future	
2	Yes, But not now	
3	No, the existing software is OK	
4	Not Decided	
5	Not at all required	

9. About the ERP Implementation [*Please tick (✓) the appropriate Cell*]

State the factors that influenced you to implement ERP in your company. *(5th Objective)*

The bellow factors are relates to the ERP implementation. Please rate each statement on a scale of 1 to 5, where 1 means that you strongly disagree with the statement and 5 means that you strongly agree with the Statement.

9.1. Influence of *Organisational, People and Technical Factors* while implementing ERP.

1	2	3	4	5				
Strongly disagree	Disagree	Neutral	Agree	Strongly agree				

Sl No	Organization factors	*Please tick (✓)*				
1	Before implementing ERP, the enterprises must already reengineered the business process	1	2	3	4	5
2	After implementing ERP, the enterprises need to reengineer business process.	1	2	3	4	5
3	Enterprises must be computerised or to have computers in all departments	1	2	3	4	5
4	Enterprises must have high speed internet connectivity	1	2	3	4	5
5	Enterprises must have LAN/WAN or network connectivity.	1	2	3	4	5
6	ERP systems are designed as per the organizational structure	1	2	3	4	5
	People Factors					
1	User participation need to be assured in all areas of implementation and design	1	2	3	4	5
2	Enterprises should have proper user documentation	1	2	3	4	5
3	Proper training is to provide to all staffs	1	2	3	4	5
4	Proper user ID and security is to provide to all users	1	2	3	4	5
	Technical Factors					
1	ERP systems are designed based on the software applications available.	1	2	3	4	5
2	ERP systems are designed based on the business processes of enterprises.	1	2	3	4	5

3	The implemented ERP projects is done in the scheduled time.	1	2	3	4	5
4	The implemented ERP projects is completed after the expected time.	1	2	3	4	5

10 About the ERP Product and Implementation Team [*Please tick (✔) the appropriate Cell*]

10.1. State the factors that influenced you to implement ERP in your company. *(5th Objective)*

Bellow the written statements relating to the use of ERP. Rate each statement on a scale of 1 to 5, where 1 means that you strongly disagree with the statement and 5 means that you strongly agree with the Statement.

1	2	3	4	5	
Strongly disagree	Disagree	Neutral	Agree	Strongly agree	

Sl No	About the ERP Product and Implementation Team Leads to					
1	transform the way the company operates through process improvements	1	2	3	4	5
2	face the ever changing statutory/regulatory compliance	1	2	3	4	5
3	replace aging legacy systems & modernize the IT setup with data integration	1	2	3	4	5
4	increase the operational efficiency	1	2	3	4	5
5	enhance accountability/regulatory compliance	1	2	3	4	5
6	provide better management tools	1	2	3	4	5
7	face company's fast growth & stay competitive	1	2	3	4	5
8	Improve the services to externals like suppliers & customers	1	2	3	4	5
9	adapt the industrial Best practices available in ERP	1	2	3	4	5
10	complete business segments went for ERP	1	2	3	4	5
11	minimize the personnel dependency	1	2	3	4	5
12	build checks & controls in the business operations	1	2	3	4	5

10.2. Please indicate the factors are you considered Critical while adopting ERP in any organisation? (*Kindly rank (✓) the factors in the ascending number order*) (**5th Objective**)

Sl No	Critical Success Factors (CSFs)	Rank as per *relevance*
1	Business Plan, Vision	
2	Top Management Commitment and Support	
3	Project Champion	
4	Focused Performance Measure	
5	Change Management Process	
6	Effective Communication Plan	
7	Risk Management	
8	Post Implementation Evolution	
9	BPR and Software Configuration	
10	Quality Improvement Measures	
11	Selection of ERP Package	
12	Organizational /Corporate Cultures	
13	IT Infrastructures	
14	System Documentation	
15	Implementation Cost	
16	Data Conversion and integrity	
17	Vanilla ERP (Best Business Practice)	
18	Legacy System Consideration	
19	Software Developments, Testing, Trouble Shooting and Crisis Management	
20	Project Team	
21	Client Consultations	
22	Implementation Strategy and Timeframe	
23	Project Management	
24	Employee Attitude and Morale	
25	Consultant Selections	
26	User Involvements	

27	Personnel/Staff	
28	User Education and Training	
29	Vendor/Customer Relationship	
30	Empowered Decision Makers	

11 About existing ERP software

11.1. Indicate the existing ERP software used [*Please tick (✓) the appropriate Cell*]

Sl No	Existing ERP Software used in the organisation	*Please tick (✓)*
1	SAP	
2	SAP Business One	
3	Oracle Apps	
4	Ramco	
5	3i Infotech	
6	PeopleSoft	
7	JD Edwards	
8	MS Navision	
9	MS Axapta	
10	Sage Accpac	
11	Baan- Infor	
12	Tally ERP9	
13	Other ERP (Please specify)	

11.2.. Whether the *core modules like* Accounting, Inventory, Procurement, Production, Sales etc, fully implemented in the present ERP? [*Please tick (✓) the appropriate Cell*]

Sl No	Whether the *core modules* are successfully Implemented	*Please tick (✓)*
1	Properly implemented & stabilized	
2	Implemented, but need to be stabilized	
3	Implemented, but some of the modules are yet to be used	
4	Some of the modules are still pending for implementation & use	

11.3. ERP Implementation period [*Please tick (✓) the appropriate Cell*]

Sl No	ERP Implementation Timeframe (in months)	Please tick (✓)
1	Initial timeframe for implementation of the core modules	
2	Subsequent timeframe for the completion of modules	
3	Subsequent required for the completion of additional modules	
4	Timeframe for the Data migration and parallel entry	
5	Timeframe for the proper user training	

11.4. Indicate the details of the training given during implementation (*Level of Training*)

1	2	3	4	5
Not trained	*base level*	Average	*Mid level*	*In-depth level*

Sl No	Trainee	[*Please tick (✓) One Cell*]				
1	Managing Director or the top level executives of the business	1	2	3	4	5
2	Functional heads (Departmental Managers)	1	2	3	4	5
3	Managers/Supervisors	1	2	3	4	5
4	End users	1	2	3	4	5
5	IT team (for administration and technical support)	1	2	3	4	5
6	Training on report generation by the users or IT team	1	2	3	4	5
7	Auditors (Internal and External)	1	2	3	4	5

11.5. Who had done the implementation? [*Please tick (✓) the appropriate Cell*]

Sl No	Maintained by	Please tick (✓)	Specify If Required
1	ERP Product vendor		
2	Implementation Vendor		
3	In-house IT team (Own IT Department)		
4	Jointly by the IT team & the Implementation vendor		

11.6. Indicate the involvement of the concerned stakeholders during ERP implementation [*Please tick (✔) the appropriate Cell*]

1	2	3	4	5				
No involvement	*low involvement*	*Average involvement*	*Active involvement*	*Highly Active involvement*				
Sl No	**Stake holders**							
1	Board of Directors							
2	Managing Director or the top level executives of the business	1	2	3	4	5		
3	Head of Finance/Accounts /	1	2	3	4	5		
4	Functional heads (Departmental Managers)	1	2	3	4	5		
5	Managers/Supervisors/ Senior functional Executives	1	2	3	4	5		
6	End users	1	2	3	4	5		
7	IT team (for administration and technical support)	1	2	3	4	5		
8	External: Customers/Vendors etc.	1	2	3	4	5		
9	Auditors (Internal and External)	1	2	3	4	5		
10	External Consultants	1	2	3	4	5		

12. Problems/Barriers encountered (*1ˢᵗ & 3ʳᵈ Objective*)

12.1. Indicate the overall Problem Areas / Barriers faced during Implementation (***Kindly rank the Problems in ascending number order***)

Sl No	Product Related Problems/Barriers encountered	Rank as per *relevance*
1	Lack of understanding of the product capabilities	
2	Gaps between the product features & the expectations	
3	Non-availability of good documentation	
4	Selected by the Management without forming a team	
5	Software not user-friendly	
6	Bug/quality fulfilment issues	
	People related Problems/Barriers	
1	Poor estimation of the manpower requirement	

2	Short/ Unavailability of skilled people	
3	Turnover of key people involved in the project	
4	Lack of involvement	
5	Lack of Co-ordination among functional groups/teams	
6	Employee resistance to change	

Sl No	Project cost related Problems/Barriers	Rank as per *relevance*
1	Poor project cost estimation	
2	Unplanned Customization	
3	Scope creep	
4	Additional investment on technical infra structure etc.	
5	Under-estimation of staff requirement/involvement	
6	Resource constraints [staff, budget etc.]	
7	Rise in the consulting fee due to project delay	
	Project schedule related Problems/Barriers	
	Project scope expansion	
1	Implementation delay	
2	Poor schedule estimation	
3	Unplanned Customization	
4	Technical issues (both hardware & software oriented)	
5	Unplanned/Extended training	
6	Conflict with other priorities	
7	Data issues	
8	Team – poor involvement/resistance	
9	Compelled to interface with the external systems	
10		

Sl No	Implementation partner related Problems/Barriers	Rank as per *relevance*
1	Frequent change of resources	
2	Incompetent consultants	
3	Poor knowledge transfer	
4	Poor alignment with the internal team	
5	Incompetent Project Manager	
6	Poor Post-implementation support	
7	Did not understand the culture of our organization	
	Technical issues	
1	Inadequate hardware resources	
2	Performance [slow/poor]	
3	Data issues [delay in codification, providing data etc.]	
4	No help desk to support the technical issues	
5	Business entities are not well connected/networked	
6	Poor technical support team	
	General Problems/Barriers	
1	Lack of Change Management	
2	Separate team not earmarked for ERP implementation	
3	Expectations out of the ERP were not clear	
4	Lack of commitment & involvement by the Management	
5	Inadequate training [overall]	
6	Poor project Management [no frequent reviews etc.]	
7	More involvement of IT team instead of functional teams	

13. Benefits of ERP implementation *(7th Objective)*

13.1. How the ERP implementation benefitted your organization in terms of each of the following economic and operational results? (***Kindly rank the benefits in the ascending number order***)

Sl No	Economic and Operational Benefits of ERP	Rank as per *relevance*
	Cost related	
1	Increase in business turnover	
2	Cost reduction	
3	Lowered inventory levels	
4	Improved cash management	
5	Financial flows control	
6	Increased revenue	
	Time related	
1	Operational Cycle time reduction	
2	Decreased financial close cycle	
3	Quickened information response time	
4	Improved order management cycle	
	Technical related	
1	Improved & Secured access control	
2	Seamless connectivity of business entities	
3	Faster & organized processing of transactions	
4	Single data source for all	
5	Improved accountability with audit-trails etc.	
	Efficiency related	
1	Productivity improvement	
2	Quality improvement	
3	Better resource management	
4	More efficient business processes	
5	Overall Performance improvement	
	Manpower related	
1	Reduction in manpower	
2	Empowered users with data/information	

3	Right-sizing of manpower	
4	Facilitates business learning	
	General benefits	
1	Improved decision making	
2	Supporting business growth, expansion etc.	
3	Better coordination among the inter-related functional activities	
4	Better management and controlling functions	
5	Improved statutory compliance	
6	Improved interaction with customers	
7	Improved interaction with suppliers	

14. SWOC ANALYSIS *(2nd Objective)*

14.1. How you selected the current ERP product? [*Please tick the appropriate Cell*]

Sl No	Reasons for the Selection of current ERP product (SWOC - Strengths)	*Please tick (✔)*
1	Suitability of the ERP Software for the business needs	
2	Price of the ERP software and cost of installation	
3	ERP software vendor reputation in the market	
4	Supply and implementation vendors fame	
5	Advice from the industry analyst/ consultant or peer groups	
6	Previous experience from the ERP software using companies	
7	Post implementation support	
8	The technology platform of the ERP software	
9	Shorter implementation timeframe	
10	Availability of the ERP Software for the business needs	

14.2. Why ERP Software not being implemented [*Kindly rank the reasons in the order of 1 to 10]*

Sl No	Reason for not opting ERP (SWOC - Weakness)	Rank as per *relevance*
1	Existing Legacy system Sufficient	
2	Feel too small to go for ERP	
3	Not required (not seen any value in it)	
4	Available ERP not fit for our needs	
5	The existing bad experience of others	
6	ERP Comes in next priorities	
7	Non-availability of skilled expertise	
8	Non-availability of a full-fledged IT/EDP team	
9	Cost/affordability factors	
10	Employee/Union résistance	

14.3. Do you looking for ERP implementation in the near immediate future. [*Kindly rank the reasons in the order of 1 to 10*]

Sl No	Reason for ERP implementation in the immediate future (SWOC - Opportunities)	Rank as per *relevance*
1	A serious necessity emerged in the existing software environment	
2	Significant drop in the Price of the software & ERP Installation and maintenance costs	
3	Considerable drop in the implementation risks of ERP	
4	Availability of a ERP software which would meet the organisational requirements	
5	Industry witnessing more successful ERP implementations	
6	Once our competing priorities are addressed	
7	Reaching the organizational maturity [People & Process]	
8	Improvement in the financial position	
9	Stage when an agreement with the employees/Unions have reached	
10	Increase in the desire of the Management towards going for ERP	

14.4. With your experience in this field, which is the area need to pay special attention?

[*Please tick (✔) the appropriate Cell*]

1	2	3	4	5			
Very Low	*Low*	*Medium/ Average*	*High*	*Extremely High*			

Sl No	Specific area need to pay attention (SWOC - Challenges)						
1	ERP product Selection	1	2	3	4	5
2	Project Manager	1	2	3	4	5
3	Implementation vendor Selection/engagement	1	2	3	4	5
4	Formation of good/focused Internal Team	1	2	3	4	5
5	Team Involvement	1	2	3	4	5
6	Project schedule adherence	1	2	3	4	5
7	Project Scope clarity	1	2	3	4	5
8	Project Governance	1	2	3	4	5
9	Project Budget adherence	1	2	3	4	5
10	Clear Communication	1	2	3	4	5
11	Training process	1	2	3	4	5
12	Technology Infrastructure	1	2	3	4	5
13	Process redesign	1	2	3	4	5
14	Level of customization	1	2	3	4	5
15	Management involvement at all the stages	1	2	3	4	5
16	Change Management	1	2	3	4	5
17	Duration of the parallel run	1	2	3	4	5
18	Project roll-out period prior to go-live	1	2	3	4	5

15 . Overall satisfaction of the Management, stakeholders and End Users on ERP

15.1. Indicate the overall satisfaction of the Management and stakeholders of ERP deployment.

[*Please tick (✔) the appropriate Cell*]

1	2	3	4	5				
Not at all Satisfied	*Less Satisfied*	*Average Satisfied*	*Highly Satisfied*	*Very Highly Satisfied*				
Sl No	**Management / Stake holders**							
1	Board of Directors							
2	Managing Director or the top level executives of the business	1	2	3	4	5		
3	Head of Finance/Accounts /	1	2	3	4	5		
4	Functional heads (Departmental Managers)	1	2	3	4	5		
5	Managers/Supervisors/ Senior functional Executives	1	2	3	4	5		
6	End users	1	2	3	4	5		
7	IT team (for administration and technical support)	1	2	3	4	5		
8	External: Customers/Vendors etc.	1	2	3	4	5		
9	Auditors (Internal and External)	1	2	3	4	5		
10	External Consultants	1	2	3	4	5		

15.2. Indicate the overall satisfaction of the end users on ERP deployment. [*Please tick (✔) the appropriate Cell*]

1	2	3	4	5				
Not at all Satisfied	*Less Satisfied*	*Average Satisfied*	*Highly Satisfied*	*Very Highly Satisfied*				
Sl No	**Overall satisfaction of the end users**							
1	The Introduction of ERP software increased your efficiency.							
2	Can ERP help in better decision-making process as a user?	1	2	3	4	5		
3	An ERP System caused to hike the productivity standard and efficiency of the employees.	1	2	3	4	5		
4	Does your ERP helps as a manager to track your subordinate status?	1	2	3	4	5		
5	The ERP helps in completing your daily routine tasks much easier.	1	2	3	4	5		

6	Do you think Report Generation of is much easier and simple now by using this ERP?	1	2	3	4	5
7	Is the information provided in the ERP are structured and accurate	1	2	3	4	5
8	Are all the modules of ERP useful for your Department	1	2	3	4	5
9	The ERP Software installed in your organisation is easy to use.	1	2	3	4	5
10	Overall, I feel the ERP implementation in my organisation has been successful and beneficial to both me and to my organisation	1	2	3	4	5

16. Do you recommend the ERP to others? [*Please tick the appropriate Cell*]

Sl No	Do you recommend Your ERP to others	*Please tick (✔)*	Specify If Required
1	Yes Definitely		
2	No		
3	*Can't Say*		
4	Let's have some time to recommend		

Thank you very much for your valuable Contribution