FACTORS INFLUENCING ADOPTION OF ENTERPRISE RESOURCE PLANNING (ERP) SYSTEM IN AUTOMOBILE SECTOR WITH SPECIAL REFERENCE TO PUNE REGION

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BY

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December 2020

CERTIFICATE

This is to certify that the thesis entitled **"Factors influencing adoption of Enterprise Resource Planning (ERP) system in automobile sector with special reference to Pune region"**, which is being submitted herewith for the award of the Degree of Philosophy (Ph.D.) in Computer Science Department of Tilak Maharashtra Vidyapeeth, Pune, is the result of original research work completed by **Ms. Sunita Namdev Nikam** under my supervision and guidance. To the best of my knowledge and belief the work incorporated in this thesis has not formed the basis for the award of any degree or similar title of this or any other University or examining body upon her.

Place-Pune **Dr. Vikas Prasad**

Date- **Research Guide**

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I hereby declare that the thesis entitled **"Factors influencing adoption of Enterprise Resource Planning (ERP) system in automobile sector with special reference to Pune region"**, completed and written by me has not previously formed the basis for the award of any degree or other similar title upon me of this or any other Vidyapeeth or examining body.

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"The function of education is to teach one to think intensively and to think critically. Intelligence plus character - that is the goal of true education" is said by Martin Luther King Jr.

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List of Abbreviations

ABBR	Explanation
ACAM	Automotive Component Manufacturers Association
AMP	Automotive Mission Plan
ANN	Artificial Neural Network
ANOVA	Analysis of Variance
APAC	Asia-Pacific
APEC	Asia-Pacific Economic Cooperation
APICS	American Production and Inventory Control Society
ARAI	Automotive Research Association Of India
ARSA	Aeronautical Repair Station Association
AT	Attitude
Avg.	Average
BIDSA	Business Intelligence and Decision Support Applications
BOM	Bill of Material
BPCL	Bharat Petroleum Corporation Limited
AD	Computer Aided Design
CAE	Computer Aided Engineering
CAGR	Compound Annual Growth Rate
CAM	Computer Aided Manufacturing
CEO	Chief Executive Officer
CFA	Confirmatory Factor Analysis
CII	Confederation of Indian Industry
CRM	Customer Relationship Management
CRP	Capacity Requirements Planning
CSF	Critical Success Factors
DV	Dependent Variable
EAM	ERP Acceptance Model
EC	European Commission

E-Commerce	Electronic Commerce
EDI	Electronic Data Interchange
EERP	Extended Enterprise Resource Planning
EFT	Electronic Fund Transfer
EPM	Enterprise Performance Management
ERP	Enterprise Resource Planning
FMCG	Fast-Moving Consumer Goods
GDP	Gross Domestic Product
GM	General Motors
HCM	Human Capital Management
HR	Human Resources
HRM	Human Resource Management
ICAT	International Center For Automotive Technology
ICT	Information and Communication Technology
IDC	International Data Corporation
IDT	Innovation Diffusion Theory
IEEE	Institute of Electrical And Electronics Engineers
IS	Information System
IT	Information Technology
ITTI	Innovation Technology Transfer India
IV	Independent Variable
LCV	Light Commercial Vehicle
M & HVC	Medium and Heavy Commercial Vehicle
M&E/MRO	Maintenance & Engineering Software
M&M	Mahindra and Mahindra
MCCIA	Mahratta Chamber Of Commerce, Industries And Agriculture
MIDC	Maharashtra Industrial Development Corporation
MNCs	Multinational Companies
MPS	Master Production Schedule
MPV,	Multi-Purpose Buses
MRP	Material Requirement Planning

MRP-II	Manufacturing Resource Planning-Ii
NATRiP	National Automotive Research and R&D Infrastructure Project.
NAV	Navision
OEM	Original Equipment Manufacturing
OLTP	On-Line Transaction Processing
PB	Perceived Benefits
PCM	Pulse-Code Modulation
PEOU	Perceived Ease of Use
PIIT	Personal IT Innovation
PTC	Parametric Technology Corporation
PU	Perceived Usefulness
R&D	Research And Development
SAP	Systems Applications And Products
SCM	Supply Chain Management
SD	Standard Deviation
SEM	Structural Equation Modeling
SEZ	Special Economic Zone
SIAM	Society of Indian Automobile Manufacturers
SME	Small and Medium Enterprises
SPSS	Statistical Package For The Social Sciences
TAM	Technology Acceptance Model
TOE	Technology-Organization - Environment
TPB	Theory of Planned Actions
TRA	Theory of Reasoned Action
TTF	Task-Technology Fit
UGS	Unsolicited Grant Service
UK	United Kingdom
UNIDO	United Nations Industrial Development Organization
USA	United States Of America
USD	United States Dollar
UTAUT	Unified Theory of Acceptance And Use of Technology

UV	Utility Vehicles
WAN	Wide Area Network
Y2K	Year 2000 /Or Y2 K.

Abstract

Organizations perceive Enterprise Resource Planning (ERP) as a useful tool for organizational efficiency, as it incorporates and distributes organizational systems and enables seamless transactions and development. Organizations of all kinds have become deeply conscious of the importance of ERP systems.

Understanding the impact factors of ERP adoption in organizations is important for improving the quality and effectiveness of the use of ERP solutions. Davis (1989) suggested the Technology Acceptance Model (TAM) became the most commonly used paradigm for studying consumer acceptance and use of Information Technology (IT) and Information System (IS). This research aims to use the original TAM as a mediating factor with groups of external factors impacting the actual use of the ERP system and its perceived benefits. Firstly, we concentrate on the use of ERP system in the post-implementation process of companies. Second, four groups of external factors which influence the use of ERP are identified and examined. The model was empirically checked using data from an automotive organizations study.

The implementation of the Enterprise Resource Planning (ERP) issues has received considerable attention because of its high failure rate. Researchers focused on the effect on attitude of perceived usage (PU) and perceived ease of use (PEOU) and symbolized adoption based on the Technology Acceptance Model Theory (TAM). Others examined the factors of success from the organizational or personal aspects. However, few scholars brought them together to explore the impact of different factors on PU and PEU, which are main user acceptance factors for ERP program. This research establishes an integrative structure that integrates organizational, technological, personal and environmental factors with TAM's mediating factors such as Perceived Usefulness (PU), Perceived Ease of Use (PEOU), Attitude and Use Intention.

For a long period, the contributing factors have been established from research, but how those factors affect the implementation of the ERP system in the automotive sector is still uncertain. This research examined the effect of these influencing factors on the perceived benefits with TAM variables identified by the ERP user. The findings suggested that all

four variables with TAM would gain perceived advantages that will eventually be ERP success in an automotive organization.

This study considers the adoption of ERP from automotive hub like Pune region by the automotive industry. This discusses not only the level of ERP adoption by the automotive sector in Pune region and the driving factors of ERP adoption but also the advantages of ERP in post adoption. Four major factors were listed as driving factors for the adoption of ERP and ten perceived benefits in post-adoption. The data collection employed a mixture of questionnaires and semi-structured interviews. Four hundred and thirty-four questionnaires provided quantitative data, evaluated using regression and ANOVA analysis. Structural equation modeling was used to test the causal model. This study found that four factors, namely organizational, technological, individual and environmental with TAM variables mediating, have a positive and significant correlation with the adoption of ERP. ERP adoption provides new business opportunities for an organization ,accomplish specific task more quickly, it enhance the productivity of an organization, it allows purchase product and services for the business, it provides integrated, timely ,accurate and reliable information for decision making, it increase organizations profitability, it helps in controlling and monitoring several projects simultaneously in an organization, it makes data analysis easier and ERP helps in proper inventory management these benefits were found as the top ERP adoption benefits perceived by the automobile companies situated in Pune region.

Besides this, the adoption of ERP also has a positive impact on TAM variables and significance. The findings have implications for the Pune region automobile sector. The results of this study could help owners, managers, etc. of the automotive sector to increase their profits, achieve better targets and implement effective management decisions. They can concentrate on the driving factors of implementing ERP to increase their performance. Many automobile company owners are in the process of raising their adoption levels so that they can excel in competition, this research study contributes to theory and practice by providing a solution in terms of influencing factors to automotive companies.

Chapter 1

Introduction

This chapter contains a general introduction about the research subject. This chapter begins with explanation about the introduction as mentioned in clause in 1.1 and background of this research study is as mentioned in clause 1.2, followed by introduction of ERP adoption and implementation in automobile sector in India. Clauses 1.3, 1.4 and 1.5 give details about motivation of research. Research questions and research problem is explained in clause 1.6 and 1.7 .Research gap is explain in clause 1.8.Small introduction about research methodology used in the research is explained in clause 1.9. The research objective and research hypothesis are outlined in clauses 1.10 and 1.11 respectively Followed by scope of the study in clause 1.12. A brief overview about research contribution is explained in clause 1.13 and significance of study is explained in clause 1.14. And at the last, the structure of the entire research work is described in clause 1.15.

1.1 Introduction

The aim of this study was to "find factors influencing ERP adoption in the automobiles sector with special reference to the Pune region."

The present study aims at

a) Analyzing most influencing factors for adoption of ERP in automobile sector.

b) Based on the analysis give suggestions to organizations to focus on influencing factors for better decision making.

c) Analyzing perceived benefits of ERP adoption in automobile sector.

d) Analyzing impact of TAM variable on ERP adoption.

Digital transformation is a fast-accepting or adopting culture and a global trend that affects maximum industries and society, reshaping revenue centers for the global business with digitally or digitally enhanced products and services. Organizations are

increasingly searching for more digital ways to link individuals, processes, and items, even in the business's vital center, such as their Enterprise Resource Planning (ERP) systems. The modern center of the market, in which automation, analytics, real-time analysis and reporting are incorporated into systems and processes. It needs creativity that involves realization about what is possible and to make it happen. (Whitehead 2017; Ehrenhalt, Briggs, Gish, Mussomeli, Haddad, Katyal ,Sher, and Perinkolam 2017).

The concept "Enterprise Resource Planning" was derived from Manufacturing Resource Planning (MRP II) from the Material Requirements Planning (MRP). Cross-functional and organizational ERP software, it usually manages a company's production, storage, and delivery, procurement, and shipping, invoicing, and accounting functions. Enterprise Resource Planning (ERP) software combines all company's functional areas, including distribution, logistics, accounting, manufacturing, inventory control, quality management, and human resource management, into a single, hierarchical structure. Enterprise Resource Planning programs are some of the most important innovations in the business world when it comes to using information technology. Enterprise Resource Planning software serves as the backbone of information for an organization's core business processes (Campbell, 2000). Forger and Gary (2000) states that companies have understood the importance of Enterprise Resource Planning software, and thus more and more companies are adopting and implementing the software, making it one of the application software market's fastest growing segments. Now a day's every aspect of modern organization relies heavily on information to take decision and survive; in fact, the information system serves the organizations as a life-line, nothing moves without information, and the organizations use ERP to gain competitive advantage in all functional areas. ERP is a single software application that meets a firm's needs in all functional areas of an organization. Typically, within an organization each department has its own computer system optimized to meet the department's specific requirements and ERP combines them all together into a single, integrated software program running on a single database, so that, all the departments together can easily share information and communicate effectively with each other. ERP software is one of the largest expenditure on enterprise Information Technology (IT) budgets (Cissna, 1998; Somers and Nelson, 2001). The central concept of introducing an ERP solution is to gain

measurable business benefits that will boost the organization's efficiency and accomplish certain business goals. This includes reduced inventory, less time for product market, reduced cycle times for the manufacturing and order processing, etc. It is noticeable that, there has not been a single implementation of ERP system in India attaining the stability. Most of them still seem to be in a half-completed stage where the organizations were unable to respond to the demands and discipline required by the ERP packages. The fact that implementing the world-class packages needs to take considerable efforts to execute change management coupled with respective firms' failure to respond to the challenges further compounded with their internal problems.

Enterprise Resource Planning (ERP) systems are implemented by organizations because they want to extract benefit from such technologies. ERP system is a complex software package which provides organizations with the ability to manage flow of information into business processes and integrate all departmental functions into a united system (Markus and Tanis, 2000). Because of the output of ERP systems , organizations expect to gain business benefits from the system, such as more efficient business processes, reduced inventory, improved decision making, improved customer services , and business growth (Panorama, 2015; Shang and Seddon, 2002). As a result of these advantages, companies expect to achieve a competitive advantage.

Most companies have implemented Enterprise Resource Planning (ERP) program in recent years, using software packages such as SAP, Oracle, and BAAN etc. The market for Enterprise Resource Planning software is one of the fastest growing software sector markets (Mary Sumner, 2006).

Companies are continually looking for ways to cut costs and function more effectively and efficiently to stay competitive in the markets, and IT will help them to achieve these goals (Gurbaxani and Whang, 1991). Enterprise resource planning systems (ERPs) constitute the basic software for information systems in the modern business environment, as well as the typical organizational computing model (Bradford, 2010). These systems provide a way to plan and manage an entire company's resources efficiently and effectively by integrating its information and information-based processes across functional areas as well as beyond organizational boundaries (Buonanno , 2005; Laukkanen , 2007). The advantages of implementing an ERP include: cost savings,

improved customer service, increased efficiency, improved quality, enhanced resource management, better planning and fast decision making, and empowerment of organizations (Laukkanen et al., 2007).

Organizations need to study the factors that affect customer satisfaction in order to improve the quality and increase the productivity and effectiveness of using ERP program. Throughout this area, the Technology Acceptance Model (TAM) is one of the most commonly used models to explain behavioral purpose and actual use and can enhance our understanding of how it impacts on actual use which can help to improve the efficiency and effectiveness of the use of ERP system (Shih, 2009). A review of the literature shows that in recent years, only a few studies have been conducted that investigate the acceptance of ERP systems by users through TAM (Lee,2008- Shih, 2009). All of them, however, examine a few contextual factors that influence the intention to use the stabilization stage using an ERP system or ERP. Furthermore, very few studies have been carried out on the adoption of ERP systems by technology (Sun, 2009). Through their scientific research, researchers have recognized that the generality of TAM and their studies on small numbers of additional factors influencing TAM failed to provide more quantitative information on user perceptions about a specific system particularly an ERP system, which is considered as a strategic IS in organizations. Therefore, additional factors need to be incorporated or integrated with other IT accepting models to improve its specialty and exploratory utility.

This research aims to extend the original TAM with groups of external factors that impacts the actual use of the ERP system. Survey data were collected from ERP users and having ERP exposure.

The objective of this study is to ascertain which factors influence the adoption of ERP systems and thereby enhance the success of an organization and ultimately the ERP. This study aims to explore driving factors by first recognizing them from the previous literature and then focusing on the Pune region's automobile sector through well designed questionnaire and interviewing end-users of ERP within an organization. The findings of this study seek to generate awareness of the important factors for the adoption of ERP systems and their perceived advantages. This study specifically improves work on the adoption of ERP and offers insights into identifying its driving factors.

1.2 Research Background

Most end-users widely underuse ERP systems, while leading companies make significant investments in the systems. It is not likely to achieve the advantages of ERP systems or efficiency enhancements if the users do not use them to the fullest degree (Murphy, Chang, and Unsworth, 2012). End-users also struggle to use ERP systems effectively (Zhang, Gao, and Ge, 2013), which poses significant challenges for many organizations (Hsieh and Wang, 2007). Enterprise resource planning users who do not properly accept and use the systems is one reason organizational leaders fail to realize the system's promised benefits (Sternad and Bobek, 2013). In the overall performance of ERP systems, consumer acceptance is the most evident facet (Hurbean and Negovan, 2013). Organizational leaders only derive benefits from ERP systems to the extent that users frequently and extensively embrace and use the systems, especially in the routine stage (Sternad et al., 2011). Even if the implementation of an ERP system is successful, the system is not desirable when users perceive it as useless to perform their jobs or when users have to make too much effort to understand how to use it (Kwak, Park, Chung and Ghosh, 2012). The failure or success of ERP systems depends on the users, so understanding the determinants of ERP system user acceptance is imperative (Pasaoglu, 2011). Most of the literature on accepting and using ERP systems focuses on the selection and implementation phases (Ha and Ahn, 2014; Teittinen, 2013), for which researchers conducted most of the studies in countries or cities such as Pune. Further research was required particularly to evaluate user acceptance of ERP systems during the Pune routine stage. This study attempted to close the gap by seeking to identify methods for evaluating and enhancing user acceptance of ERP systems during the Pune routine stage, which will result in its success and influencing factors being fine-tuned.

The enterprise resource planning (ERP) systems were introduced to enterprise primarily for first-time improvement of information sharing and communication. Some researchers have tried to find out what influences IS approval like ERP. They treat ERP as a new technology for information. The Technology Accepting Model (TAM) was implemented as the base model. A number of variables were measured to check their effect on perceived usefulness (PU) and perceived ease of use s (PEOU). Many work focused on

the essential factors of success. They are trying to find out some other success factors for forecasting the usefulness of ERP systems for adoption and implementation. More than 70 factors are recognized. But it is still unclear whether such variables affect the success of adoption and implementation. They may affect adoption directly, or they may influence adoption through other variables such as PU or PEU. This study attempted to determine the impacts of some external factors with the help of PU, PEOU, TAM use intension, and attitude (Cheng, 2007).

Davis (1989) has given the technology acceptance model (TAM) as the most widely used model for researching user acceptance and IT / IS use. The main aim of this analysis is to extend the TAM with groups of external factors that impact on the actual use and acceptance of the ERP method. There has been an ever-increasing focus in the Enterprise Resource Planning System (ERP) field over the past few decades, as this ERP system typically aims to include all basic business activities, irrespective of business organizations. The ERP program is not only used by corporations, Non-Government Organizations, NGOs but by governments and other large institutions (Barki, 2005). Because of its high failure rate, much focus has been given to the question of implementation of Enterprise Resource Planning (ERP). So many researchers focused on the effect of perceived use (PU) and perceived ease of use (PEU) on attitude and adoption based on Technology Acceptance Model (TAM) assumptions. Many researchers investigated the essential factors of performance from an organizational or personal viewpoint. While few scholars put them together to observe the influence of some success factors on PU, PEOU and other factors that are key factors in ERP system user approval. This study develops an integrative skeleton that connects factors such as Organizational, Technological, Environmental and Personal with PU, PEOU, Intension to Use ERP, ERP attitude and Perceived Benefits (PB) major factor.

1.3 Introduction of ERP

1.3.1 Background of ERP

An (ERP) Enterprise Resource Planning System is a fully integrated business management system that covers all the business areas such as Logistics, Production, Finance, Accounting, Marketing, Assembly, CRM and HRM etc. It organizes and integrates process activity and information flow to enable the best use of resources such as people, content, money and machines. Nah (2004) describes ERP as 'An Enterprise Resource Planning (ERP) system is generally characterized as a packaged business software system that allows a company to control the efficient and effective use of resources (human resources, materials, finance, etc.) by offering a comprehensive integrated solution to the organization's information processing demands through a process-oriented conversion. Al-Mashari and Zairi (2001) note that ERP represents an ideal infrastructure for enterprise-wide technology. The basic architecture of an ERP system is based on one database, one program and an one enterprise-wide interface.
Enterprise resource planning is therefore nothing but,

- One database,
- One application,
- One user interface

ERP as an enterprise-wide management mechanism that manages demand and supply and provides the ability to connect suppliers and customers to complete supply chain, which helps to establish business decision-making processes and provides a high degree of communication and collaboration between marketing , advertising, procurement , manufacturing, purchasing, retail and distribution (Wallace and Kennerley , 2001).

Figure 1.1 shows different modules under one roof in an organization.



Figure 1.1- Diagram showing some typical ERP modules Source-

https://www.123rf.com/photo_154791814_stock-vector-enterprise-resource-planning-erp-modules-with-circle-diagram-and-icon-9-modules-sign-vector-design.html

Enterprise Resource Planning (ERP) is an enterprise management system that integrates broad software sets that can be used when implemented effectively to manage and integrate all business functions within an organization (Boykin, 2009). According to Gardiner (2010) numerous scholars pointed out several variables as determinants of the acceptance and application of the ERP method. The ERP system has been seen to be either a failure in the design or implementation phase, where the success or failure of the ERP system is subject to many different reasons. Implementation of the ERP system in an organization, unless care is taken, can be a difficult process. It can be considered a high-risk project because it can impact the organization's entire operation and efficiency, therefore it should be carefully handled and prepared. Implementation of the ERP system is expensive and difficult due to the high time required and resources required.

The ERP program is an integrated management strategy that helps companies in achieving their strategic goals as it assists companies in controlling their resources around the corporation and enables the incorporation of several different business functions (Davenports 1998). ERP systems allow organizational functions to be incorporated into

centralized and automated business processes. Several companies invested more than $20 billion on their ERP implementation with ERP vendors and consulting firms (Willcocks, 2000). In this research, the ERP implementation process is defined as the process that starts with the management decision to install and use an ERP program, and is complete when the system is used and operated as an integral part of the IS of the organization (Govindaraju, 2002). Given major investments by organizations, there were many shortcomings in execution and less than adequate increases in productivity (Govindaraju, 2002). One of the commonly cited reasons for these ERP failures is the hesitancy or unwillingness of end-users to adopt or use the newly implemented ERP system (Nah, 2004). Lack of user acceptance will result in minimal use of the software and a lot of social organizational problems. A strong understanding of the end-users' acceptance of the ERP system is essential to effective adoption of ERP. A literature analysis of past ERP studies reveals that few studies have already been conducted on the acceptance by end-users of ERP systems (Brown, 2002; Chau, 2002; Venkatesh , 2000; Kwasi, 2004; Nah, 2004; Kwasi, 2005). This study aims to improve the previously published ERP acceptance model (Hoon, 2004) by incorporating together the few factors that are related to individual, environmental, technological, and organizational contexts may also influence the acceptance of ERP systems. This study thus attempts to contribute to the development of new knowledge about the success of ERP, or acceptance of ERP in the automobile sector.

(Simona, 2013) The perception of key success factors in organizational assimilation of ERP solutions is essential to enhancing the quality and efficacy of the usage of ERP solutions. The Technology Acceptance Model (TAM) was proposed by Davis (1989) as the most widely used framework for researching customer acceptance and IT / IS use. The primary source such as data collection and the secondary information sources such as websites, book chapters, and published reports were carefully studied to understand the research context dimensions. Such sources were used to collect knowledge and observations about ERP's past and context, its implementation in different sectors.

One of the main reasons given is that users of ERP are not using those solutions properly. After a study of literature in this research, author analyzed the influence of 29 external factors that influence ERP adoption by its users. Author has also extended existing

research studies to include different groups of external factors. The goal of any business that has implemented ERP solution should be for ERP users to make full use of their ERP solution. Through the researched model, author suggest that companies concentrate more on defined external factors that influence ERP adoption and usage. The work was based on a model of the TAM. Organizations should focus on their organizational, technical, environmental and individual factors by verifying external factors, which will enhance the implementation of the ERP program, its practical use and achieve its Perceived benefits.

1.3.2 Features of ERP

Some of the main features of ERP and its advantages for the business system are:

- Multi-platform, multi-facility, multi-mode, multi-currency, multi-lingual installations are available from ERP.
- Facilitates strategic and business planning activities, organizational planning, implementation, control on materials and services.
- The ERP covers all production and nonproductive areas such as production, sales and distribution, payables, receivables, inventories, payroll, human resources, acquisitions, etc.
- ERP conducts crucial operations and enhances customer loyalty, thus contribute for building business image or of the brand.
- ERP offers full alignment of systems under the control of same management, not only by departments, but also by organizations.
- ERP is the key to effective program management.
- ERP enables the integrated introduction of emerging technology such as Electronic Fund Transfer (EFT), Electronic Data Interchange (EDI), Telephone, Intranet, Video Conferencing and E-Commerce and so on.
- ERP eliminates most industry challenges such as shortages of production, improved productivity, customer service, cash management, inventory problems, quality issues, timely delivery, etc.
- ERP brings the information gap within the organizations to a close.

- ERP provides smart business tools to enable effective decision-making, such as decision support, executive information system, data mining, and easy-to-use systems.

1.3.3 ERP in India

(Ram 2010) Enterprise solutions provide a centralized framework for all organization's data and processes. This covers all facets of a company from planning to manufacturing, inventory management, distribution, marketing, accounting, customer support and human resources. To a large extent, the performance of implementing ERP program depends on the quality dimensions. Thus the most important factor in determining the quality of the system is technological novelty. An enterprise resource planning (ERP) system is a highly integrated enterprise information system for the management of all aspects of the business operations of an organization especially transactional data, including growth, procurement, engineering design, production, distribution, marketing, delivery, accounting and customer care, etc.

If ERP systems are implemented effectively, significant benefits can be achieved, such as improved customer support, better production scheduling and lower production costs etc. However, the successful ERP adoption rate can be accounted for as still very low and many businesses that have gained some advantages from ERP systems have yet to recognize the full potential benefits to their organizations.

In India, the need for ERP was felt in the early 1990s, soon after economic liberalization. Indian businesses realized the importance of customer focus to compete with MNCs, improving delivery speed and cost competitiveness. Companies needed to work proactively to build their capacities and competencies to stay ahead in the phase of such high competition author had to differentiate them from the rest of the market, competitively. They turned to ERP to help them adapt quickly to the competitive market conditions. The Indian ERP market got a boost when industry leader SAP revealed in 2001 their intention to invest $125 million in Indian operations. JD Edward's, another ERP vendor, followed suit and announced plans to establish a 100 per cent Indian subsidiary to enter the Indian market by early 2002. The growth of e-business has

provided the ERP market with a fillip according to industry analysts. Indian companies were looking for an ERP solution incorporating elements of the e-business like CRM and SCM. ERP II solutions provided for this. In addition to a large pool of skilled functional and technical talent available, the total cost of ownership of an ERP dropped significantly, with vendors offering country-specific localization. It was found that understanding of the definition of ERP increased with an organization's employee size-it was the highest in the service sector, especially among large organizations. The highest level of knowledge about ERP in the IT / Software category. In India companies in both the public and private sectors have successfully introduced ERP and are enjoying its advantage. Earliest to adopt ERP systems were manufacturing firms in India, closely followed by FMCG, automobile, steel, oil, textile and pharmaceutical companies. Some of the major companies that decided to implement an ERP system were companies such as TISCO, Nestle, TELCO, Reliance, Larsen and Toubro, Godrej, HLL, Maruti, BPCL, Coke, lOCL, Pand G Pepsi, ITC, , Shoppers' Stop and Mahindra and Mahindra. BPCL, Godrej, lOCL, and Mahindra and Mahindra were among the highly successful ones.

1.3.4 Reasons for Companies to Undertake ERP

According to Gupta (2000), the introduction of an ERP system has many -direct and indirect-advantages. The direct benefits include business convergence for better decision making, reduced inventory, increased revenue and customer support, and so on. The indirect advantages include improved brand identity, increased customer loyalty, customer satisfaction etc.

- **Business integration:** First and most important benefit comes from fostering integration. The reason ERP packages are called integrated is the automated data upgrade between similar business components, because traditional company information systems were designed to optimize separate business functions in business units, almost all of which were poor in terms of communication and

integration of information that transcended the specific business functions in the case of large business examples.

- **Flexibility:** The second advantage in ERP kits is their versatility. Different multi-functional environments, such as language, currency, accounting standards, etc., are covered in one framework and functions that are bundled and can be automatically applied, managing different locations across a business
- **Better analysis and planning capabilities:** ERP plays a vital role in the planning process as well as brings an improvement. Systems like decision-support and stimulation can be fully utilized by enabling comprehensive and coherent implementation management of the relevant business and its data.
- **Use of latest technology:** The fourth benefit is the use of cutting-edge IT technologies. It is this rapid adaptation to the latest innovations in information technology that allows fast adaptation to future business environments. It is this versatility that allows the integration of the latest technologies during the program's customization, maintenance and expansion phases.
- **Reduced inventory and inventory carrying cost:** The savings that companies can create in their procurement processes are best seen in this cost-management capacity. Customers may undertake a more thorough inventory planning and status review with the ERP program. Those plans and inspections expose potential stock surpluses or shortages. Improved procedures for preparation and scheduling usually result in inventory reductions up to 20 per cent or even more than it.
- **Reduced manpower cost:** Improved methods of production lead to panic shortages and interruptions, and fewer rework and overtime. Typical savings in labor cost from a productive ERP program that raises direct and indirect labor costs by ten per cent. By eliminating rush jobs and parts shortages, less time is required to drive, handle equipment, new installations, delays and track splits tons of odd jobs that have been set aside.
- **Reduced material costs:** ERP systems provide information on the negotiations, such as estimated product group material specifications and vendor performance statistics. Giving manufacturers a better understanding of potential needs allows them to gain efficiencies which can be considered as lower production costs

- **Improves sales and customer service:** Changes in customer relationship management, fulfillment of delivery commitments and reduced delivery lead times contribute to improved customer satisfaction, trust and repeat orders. ERP systems also have the capability to respond to shifts in demand and to diagnose distribution problems. Early corrective steps should be taken, such as setting shipping deadlines, notifying customers of adjustments to guarantee delivery time, or changing production plans to meet customer demand.
- **Efficient financial management:** Improves payment practices by reducing the quantum of days of outstanding receivables and thus provide additional cash balance. Underlying these improvements is the quick, accurate preparation of invoices directly from shipping transactions, timely customer statements and follow-up on customer and vendors accounting. Credit checking and improved customer demand handling during order intake which helps to reduce further accounting problems.

1.4 Automobile sector in India

According to the SIAM annual report (2019-20), the automobile industry and automobile production cycle are one of the most complex and large-scale product manufacturing processes. IT and ERP programs today integrate a significant portion of the manufacturing processes. Without any integrated structures, such as ERP, the proper development and distribution would be shaky. The ERP system, which is the present generation of technological systems, make manufacturing and sales processes easier for industries and that, is the key factor in the" industries development" anyhow. Today most amongst large, medium and small enterprises design and deploy ERP systems. The ERP systems automate many of the operational processes and allow organization to enhance individual as well as organizational performance.

Automobile Mission Plan 2016-26 states that India will becoming a leading automobile exporter, with strong hopes in the near future for the growth of exports. During April-November 2020, automotive exports grew 20.78 per cent. It is projected to increase to a CAGR of 3.05 per cent during 2016-2026. However, Government of India and major car

manufacturers in the Indian market are taking several initiatives to make India a global leader in the two-wheeler and four-wheeler manufacturing industries by the year 2020. Companies have to adapt to the ever-changing and growing circumstances in today's dynamic market for their survival and expansion. Therefore the organization's initiatives are critical in the cycle of adaptation. In this period, the companies should have a clear understanding of its own system dynamics, its current role and status in the market, as well as ever-changing dynamics impacting and affecting the world, the region, the sector and finally the company itself, in terms of taking appropriate decisions. According to SIAM 2019-20 annual report, vehicle wise segmentation of the market share of the automobile industry in India is as shown in figure 1.2 which indicates there is need and demand to invest in ERP.

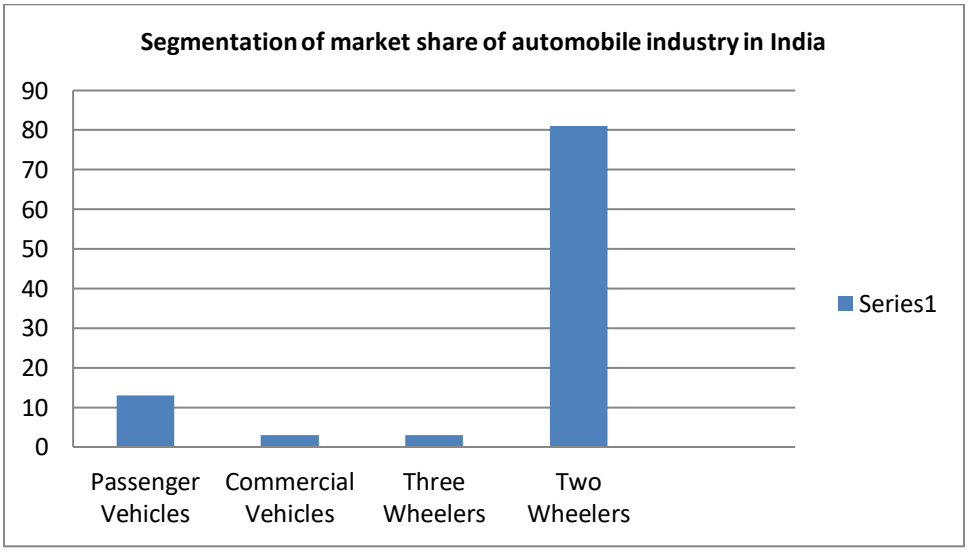


Figure 1.2- Segmentation of market share of automobile industry in India

Source- http://www.siam.in/statistics.aspx?mpgid=8&pgidtrail=12

Passenger Vehicle: 13%

Commercial Vehicle: 3%

Three wheelers: 3%

Two wheelers: 81%

1.4.1 Need for ERP in Automobile Industry:

- Integrating the different processes of the supply chain
- Managing inventories.
- Supervision and continuous control of multiple programs;
- Maximum exposure to enterprise.
- Operational efficiency and mitigation of errors.
- Improved CRM access and Real-time Information access.

As per (Rohadia S., 2017), below are lists from reputable internet sources of some of India's best ERP tools used by the auto industries.

- SAP
- ORACLE
- Peoplesoft
- JD Edward
- MS Dynamics
- Quad
- Ramco
- Infor
- Netsuite
- Microsoft
- Epicor
- Focus
- Sage plus more others.

1.4.2 Noticeable Benefits that, ERP can bring to automobile industries:

- Helps to develop a single information flow for working teams
- Helps to reduce manufacturing costs, boost the quality of products, customer satisfaction and raise payouts.
- Keep track on activities and output in terms of quality in all departments.

- Helps in business decisions making on the basis of reliable and analytical data which is much more thoughtful.
- Helps to evaluate financial parameters
- Supports in reducing operating costs, wastage and productive simplification of the sector
- Can provide expected service and maintain loyalty with customers.
- Interactive dashboards provide a straightforward workflow picture.
- Easily managed in less time with multiple operations.
- Prompt decision-making based on daily demands.

1.5 Motivation in Research

As Pune region is India's big IT and Automobile hub. It motivates author to work on it as a matter of contribution.

The objective of this study is to contribute to the automobile industries by convincing them to adopt ERP system by defining a framework and analyzing the influencing factors. More studies focuses on the implementation of ERP in a particular company and it's a case study with respect to either a success or failure. But there are far fewer studies focusing on the automobile sector and its adoption of ERP and attaining its Perceived benefits.

This study will actual depend on following motivational factors

- ERP adoption in automobile Sector.
- Factors influencing ERP adoption and success in automobile sector.
- Perceived benefits of ERP adoption
- Impact of TAM on adoption of ERP and its perceived benefits

1.6 Research Questions

This study is focused to address the following research questions:

- Considering the Automobile sector of Pune Maharashtra, what factors influence the adoption of ERP system?
- Which Organizational factors influence the adoption of ERP in Automobile Sector?
- Which Technological factors influence the adoption of ERP in Automobile Sector?
- Which Individual/Personal factors influence the adoption of ERP in Automobile Sector?
- Which Environmental factors influence the adoption of ERP in Automobile Sector?
- How Technology adoption model plays a significant role in adoption of ERP?
- How end-users' acceptance of the Enterprise Resource Planning system in Automobile sector can be improved?
- What are the perceived benefits from user's point of view in adoption of ERP adoption?
- Is there any difference of opinion in perceived benefits in Original equipment manufacturing and auto ancillaries?

1.7 Research Problem

According to the study by Shang and Seddon (2002), a successfully implemented ERP program has positive effects on the productivity of users and the development of organizations, as well as positive changes in industry. With the rising demand from the ERP program, it is becoming increasingly prevalent in large and middle-sized organizations. Increasing the effectiveness of the IS becoming more crucial for organizations. Nevertheless, lack of user acceptance which has hampered the progress of the implementation of new ERP systems. Implementation of ERP systems can be divided into three phases: including selection, implementation, and service. The phase of

operation can also be divided into stabilization and routine phases. The machine will be undergoing a very critical cycle in the service phase. This stage is where much of the effectiveness of the ERP method remains (Motiwalla and Thompson, 2012). In the stabilization stage, ERP systems experience a post-implementation period. The performance of the system could not have long-term consequences for an organization (Gattiker and Goodhue, 2005). In addition, ERP systems may be successfully implemented for a technological perspective, but factors influencing performance depends on the actions of end-users and the actual usage of the program (Kwahk and Lee, 2008). The extent to which users often and extensively accept and utilize the ERP system plays a crucial role in the adoption of the system. It becomes more important for the organizations to examine those factors that affect the acceptance of users in order to improve the efficiency and effectiveness of ERP systems.

Majority of successfully implemented ERP systems remain in the process of technological implementation. Acceptance by users is essential for the complete success of the adoption of new ERP systems. There are three phases to ERP framework in the lifecycle of implementation of ERP program. The most crucial phase is post implementing. The authors found that few of them had investigated the acceptance of the end-users in the selection and implementation phase of prior two stages.

End-user resistance as one of the main contributing factors to the failure of the ERP adoption. ERP implementation may have been successful, but end-users often only use a subset of functionalities available (Yin, 2003; Ross and Weill, 2002; Boudreau, 2003; Jasperson, 2005).Wang and Liu (2005) describe the attitude of end-users towards an information system, their acceptance of the system and the extent of expected use of the system as factors directly influencing their successful adoption. Hence, it is important to analyze these factors so that organizations can work effectively (Yin, 2003).

Acceptance of users can be defined as the demonstrable willingness within a user group to use information technology for the tasks that it is intended to support. Kwahk and lee (2008) stated that ERP systems could be effectively implemented from a technical perspective but factors affecting success also depend on the behavior of the end-user and the actual use of the system. The reticence or unwillingness of end-users to adopt or use

the newly implemented ERP systems is often cited as one of the main reasons for ERP failures (Nah et al., 2004).

Factors that affect success depend on the behaviors of end-users and on the actual use of the system (Kwahk and Lee, 2008). The extent to which users often and extensively accept and utilize the ERP system plays a crucial role in the adoption of the system. It becomes more important for the organizations to examine those factors that affect the acceptance of users in order to improve the efficiency and effectiveness of ERP systems. Acceptance of users is essential for the complete success of the adoption of new ERP systems.

Therefore, the identification of user acceptance factors and how to enhance the post-implementation process are needed for further analysis. Through building on existing hypotheses and research results in IS adoption this study will explore factors influencing the attitudes of end-users, perceived benefits, and ERP system acceptance.

The first issue found is that, while there is adequate theoretical clarification in current literature about technology adoption, it fails to offer a complete solution for all kinds of technology adoptions. This shortcoming is due to the technical gap, market dynamics, technological challenges, workplace environment and users of technology. Work on innovation adoption has left a lot of room in ERP adoption to explore additional factors affecting the outcome. Even automated and technology driven factors driving the implementation of ERP for the automobile industry.

The second issue is that, although a lot of literature has been published on ERP Implementation and its various dimensions, most of the studies are not based on the Indian manufacturing sector, particularly the Indian automobile industry. Not only Indian automobile MNCs, but all SMEs have great potential in the worldwide market and expand in nearly all major business ERP software sectors if successfully introduced and if used will produce much faster growth and better control over their business operations. Therefore there is a requirement to explore the importance and effects of ERP adoption not only on Indian MNCs but also on SMEs, including the various aspects such as costs, benefits and various other factors, particularly in large size auto manufacturers, as they have a wide network of their operations and branches in other countries that need to be

monitored including large number of ancillary companies. Enterprise wide software can prove to be very efficient and effective in centrally managing the operations. Therefore, the various factors need to be understood to improve and work effectively in this area. Even SMEs are Indian economy's backbone that needs to be centered. The third aspect is that most ERP studies focus on either the success or failure factors in ERP or the process of its implementation. Very few studies discuss the advantages of ERP in a broader way, and tried to find out the real reason for ERP adoption. Because the adoption of the ERP was not analyzed in the developing countries such as India, where Pune region is well known as the IT and automobile hub. In the past, there had been many instances of failure in implementing ERP systems, either in the design or their implementation. But if proper care is taken at the initial stage only then organization will not have to suffer from any failure of the ERP system and it is possible to make full utilization of ERP and extract benefit from it.

There are companies that have adopted ERP system, but many of their branches and branch-offices still do not adopt ERP system. The reason behind it is users approach .Even ERP adoption is influenced by a number of factors. Nonetheless, the significant factors will lead to the implementation of ERP in organizations that are nontransparent in the automobile sector and the a few attempts have been made so far. The objective of this study is to provide a better understanding of the important factors that affects the adoption of ERP for the automobile industry.

1.8 Research Gap

Based on the research gap found in background of previous studies, are given as below

- Very few studies have made efforts to investigate the influencing factor of ERP implementation that influence ERP adoption and the success of ERP implementation in Indian automobile sector.
- Very few studies are available related to Indian Automobile industry; even they are related to survey only SAP for few companies in Pune and Aurangabad region.

- Previous research in ERP systems has mostly focused on developing an understanding of the capabilities that can help to generate competitive advantage. Few studies in Indian ERP are related to finding ERP advantages and disadvantage. Again few studies focus on case study of few organizations on maximum 8/10 factors separately.
- Some have studied with composite factors but with very few variables which are mostly in education, banking or construction sectors.
- There is hardly any study on ERP adoption with TAM in automobile sector.
- Very few studies found on perceived benefits and its relationship of with influencing factors and TAM.
- Most of the studies spoke about ERP related research about success, failure or implementation very few studies spoke about influencing factors and success of ERP.
- There is a hardly study found on relationship of organization type and level of employees on perceived benefits.

1.9 Research Methodology

This research work is a theoretical and analytical in nature. The first part begins with theoretical history, which presents concepts used in this study, and the theories of acceptance of technology are also discussed in support of literature review. The literature review is the other theoretical portion of this report, and is aimed at identifying and finding the most important factors relevant to the adoption of ERP systems based on previous research in this field (Yin 2003, 5-7). TAM was used with external factor, and it developed and tested with structural equation modeling. To achieve this goal, a quantitative exploratory study is used as a research method the goal of this study is to create a comprehensive view of the adoption of ERP systems by professionals working with these solutions. For this study, data collection is carried out by using a well-

developed questionnaire circulated in the automobile sector and the data was collected. Some interviews with ERP users employed in automobile companies situated in Pune region were also conducted.

1.9.1 Population

Population is aggregate of organizations from automobile sector in Pune region who adopted ERP. According to data available on internet there are more than 5000 automobile companies all over Pune. But author decided to cover companies who are registered under authentic organizations like (Automobile component manufacturing association) ACMA and (Mahratta chamber of commerce, industries and agriculture) MCCIA. So the study is undertaken by means of sample size of Automobile Industries from Pune region from ACMA and MCCIA .It includes Small scale, medium scale and large scale Industries in Pune region that have adopted ERP systems. Questionnaire was circulated to all list provided by these two. And interviews were also undertaken with a different range of staff in different industries and are supplemented by data from other sources such as site visit, notes, books, journals, magazines etc. Majority of data is collected through survey questionnaire in the form of Google form and hard copies also.

1.9.2 Sampling

Stratified random sampling method was used in this study to selects the sample. In this study, companies from Pune region as well as ERP experts available are considered for getting the responses.

1.9.3 Data Collection

1.9.3.1 Primary Data

Majority of this research work was based on the primary data collected from various automobile companies and its ancillaries. Secondary data were also considered for this

study such as articles from internal/external sources such as journals, internet, magazines, books etc.

After defining the research problem and objectives of study, the data collection method is determined. To complete this research work researcher has used both the primary and secondary data collection methods.

Interviews, observations and use of questionnaires are the three main data collection tools classified under primary sources. A standardized collection of questions is called a questionnaire. Questioning as the name imply, is distinguished by the fact that the data is collected by asking questions from people who are identified as to have the desired information. When data is collected by observation, researchers ask no questions. Instead they keep track on the objects or the actions in which they are interested. Necessary data is collected by using multiple methods. The primary data is collected afresh and for the first time, and thus happens to be original by nature. The primary data for the present study has been collected from the respondents using questionnaire method which is circulated hand to hand and Google form was created and circulated to different industries.

1.9.3.2 Secondary Data

In this research, secondary data is collected from computer science books, computer science journals, IT magazines, internet, ERP websites and literatures as a complementary to primary survey.

1.10 Objectives of the study

All auto manufacturers share a common objective — streamlined, efficient operations that maximize profitability. Automobile manufacturers meet the challenges of continually developing market where they need to do numerous things to be successful: brings innovative products back to life, reduce costs, and then be environmental friendly. ERP systems are intended to assist in the coordination of development processes at all levels and provide a suitable knowledge environment for departments.

The main objective of this study is to analyze and find out factors influencing adoption of ERP and achieve its perceived benefits in Automobile sector. This was done with framework of ERP adoption with external variables and supported with technology acceptance model (TAM) as mediating variable. Further, based on the analysis provide recommendations to automobile sector and other sector also is a key sub objective of this study.

This study examines how Organizational, Technological, Individual, and Environmental factors are influencing success of ERP implementation in automobile sector as shown in figure 1.3. Therefore, the researcher can make a useful contribution and achieve its perceived benefits. Therefore, considering the main research problem the objectives for the study are formulated. These objectives are mentioned as below:

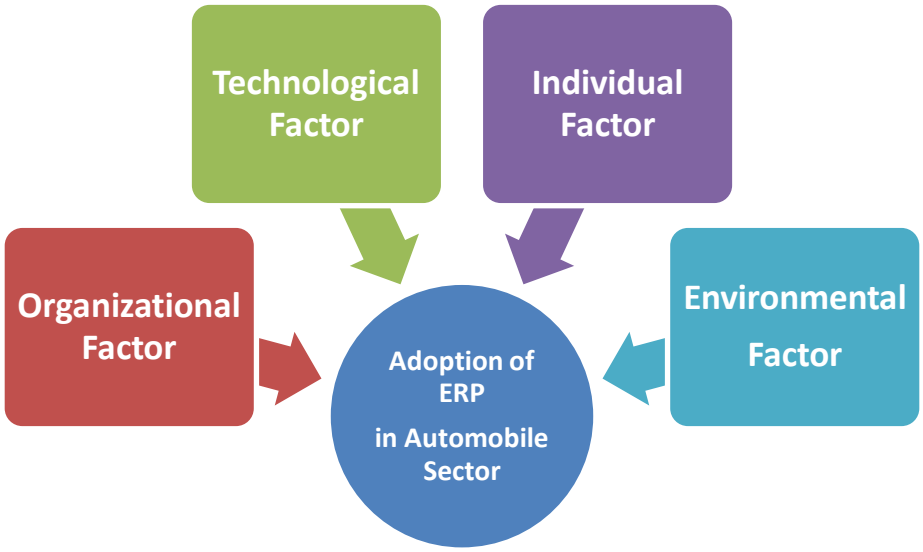


Figure 1.3 ERP Adoption influencing factors

- To understand the factors influencing adoption of ERP.
- To study the perceived benefits of ERP implementation.
- To study the impact of the factors influencing adoption of ERP on Perceived Benefits.
- To study impact of Technology Adoption Model (TAM) on perceived benefits.

- To study impact of adoption of ERP on Perceived Benefits in the presence of variable TAM.
- To study the relationship of organization type on perceived benefits.
- To study relationship of position of respondents in the organization with the perceived benefits of ERP.

1.11 Research Hypotheses

H1: There is significant impact of adoption of ERP on Perceived Benefits.

H2: There is significant impact of TAM on perceived benefits.

H3: There is significant impact of adoption of ERP on Perceived Benefits in the presence of mediating variable TAM.

H4: There is significant relationship of organization type on perceived benefits

H5: There is significant relationship of position of respondents in the organization with the perceived benefits of ERP.

1.12 Scope of the study

The scope of this study is limited to automobile sector in Pune region. That is to study ERP adoption factors in Automobile sector. Automobile companies registered under ACMA & MCCIA from Pune area were selected for the study.

It was observed during review of the literature that TAM model is predominately used for ERP adoption over the other models like TPB, TRA, UTAUT, etc. Therefore, on the basis of sound theoretical propositions and justifications, this study proposed add TAM model as a mediator.

1.13 Research Contribution

The importance of ERP systems has been increasingly recognized by organizations of all kinds. This study will provide valuable insights to future researchers, practicing managers and those who are planning to adopt ERP not only in Automobile but in other sectors too.

The main focus hereis to establish a link between the three constructs taken for the study. Here, the researcher aims to study the perception of benefits derived from ERP implementation in organizations as an outcome variable. And in this study, the automobile sector has been considered. Here the perception of the employees working in the automobile sector has been studied.

Secondly, the researcher wants to justify the inclusion of the construct "Adoption of ERP" which is explained by four factors i.e. Individual factors, Environmental factors, Technological factors and organizational factors in the study. These factors typically explain the motive of any organization to adopt ERP implementation in its system. Any organization is dependent on its internal and external environment. Hence, if the organization wants to introduce any changes in the system, it has to see how the external and internal environment respond to the changes. That's the reason the above factors were taken into consideration for adoption of ERP.

Sometimes, the research is not as simple as it seems to be. There can be multiple intervening variables that plays the role of a catalyst in the research study. Here the role of the catalyst is being played by "TAM- Technology Adoption Model". This model has been proposed by Davis in the year 1989. According to this model, TAM is used to explain the acceptance of different types of technology. To understand this better, it is required to understand what TAM consists of. TAM explicitly consists perceived usefulness, perceived ease of use, attitude and intention to use. These are cognitive factors that explain TAM and also have great influence on the employee's perception towards adoption of ERP in the organization. Hence, TAM is being used a mediating variable in the study.

The same research model can be used to conduct further study not only in automobile sector but other sectors as well.

1.14 The significance of the study

The topic taken for this research study has a vast significance in the industry. That's because, in the era of Industry4.0, the wave of automation is at its peak. And adoption of ERP in the organization's system is a step towards this technological revolution.

The need of a technology when infused with theoretical models like TAM, creates a robust study. And then these interlinked constructs are tested in an organizational context to check the respondent's view/ opinion/perception of the respondents on the adoption and implementation of a technology (here ERP).

This same model can be used to study adoption of other technological interventions in the organization.

ERP is such a tool that can be used for the following purpose.

1. Ease of accessing data
2. Fast decision making
3. Job evaluation
4. Allocating right job to the right person
5. Controlling and mistake proofing

In this research an attempt was made to combine almost all streams of research in an innovative manner. The results of this research are useful not only for mid-sized company managers / owners / decision makers but also for large companies with the aim of adopting ERP applications as this community usually has limited expertise and skills to understand the complexities. This research identifies the ERP adoptions factors for better implementation and its use.

1.15 Chapter Scheme

This section presents the chapter scheme of this entire research study. This consists of total 5 chapters which come in order as introduction, Theoretical Background to the study and literature review, research methodology, data analysis, interpretations, findings and

last chapter is conclusion, limitations, future scope and suggestions. The structure of dissertation is presented in Figure 1.4.below,

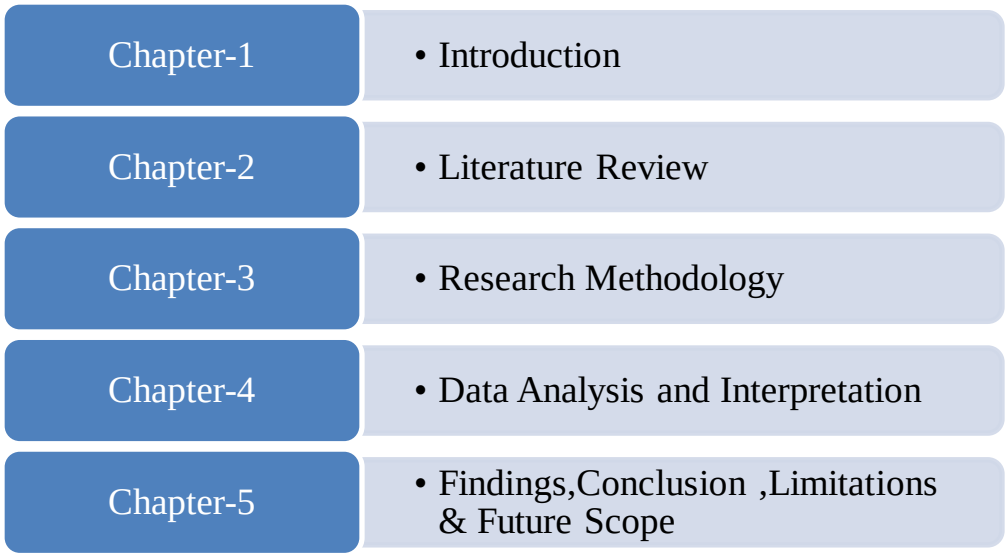


Figure 1.4: Chapter scheme

Chapter 1-Introduction

This chapter provides an introduction to the study, the problem statement, the need for the study, research gap, the objectives, hypothesis, scope, the research method and design, and significance of the study. The contributions of this research to the body of knowledge have been also summarized in this chapter. It ends with research significance of the study and the chapter scheme..

Chapter 2- Literature Review

In this chapter, an overview of an ERP system, an introduction to ERP system, its evolution and its advantages and disadvantages are described. This is followed by a review of the literature on the topic of how ERP is essential in automobile sector. This chapter includes technology adoption theories in detail and how ERP is connected with TAM. The important part of adoption is based on adoption theory describe by TAM

model is also discussed in this chapter. Lastly this chapter highlights literature on different factors influencing on adoption of ERP.

Chapter 3-Research Methodology

The detail research methodology adopted for the study is described in this chapter. It begins with the operational definition of terms used for the study and goes on to explain design of the study, the Universe, population, sampling framework, samples used, the tools for data collection and the statistical techniques used.

Chapter 4- Data Analysis and Interpretation

This chapter contains the detail data analysis of the data collected during the survey, outcomes of analysis and interpretations based on these outcomes were presented in this chapter. The data thus processed is interpreted and the hypotheses drawn are tested.

Chapter 5- Findings, Conclusion, Limitations & Future Scope

This chapter contains the research results. This also provides new ideas and opportunities for future study. This chapter presents main results from this report. This research's key contributions are summed up in the form of a conclusion. This chapter also mentions some of the research limitations and proposes guiding principle for prospect analysis.

1.16 Chapter Conclusion

This chapter provides overall description of complete research work. It gives historical background of this research study followed by introduction of ERP in automobile sector in India .Further clauses gives information about motivation of research, research questions and research problem. A detailed research gap is also explained in next clause, thereafter research methodology used for the research is explained. The important part that is research objective and research hypothesis are explained which are followed by scope of the study .A brief overview about research contribution is also described before significance of study. This chapter gives brief overview of purpose of this research work.

Chapter 2

Literature Review

This chapter begins with introduction of the literature review in clauses 2.1 and 2.2 which gives information about literature search and inclusion criteria in clause .2.3 gives detail description about ERP, its definition as written by different authors, history, modules, vendors, implementation lifecycle, its advantages and disadvantages with its benefits of adoption. Adoption of ERP in India is explained in clause 2.4. thereafter history of Indian automobile sector is explained in clause 2.5.This is followed by detailed overview of automobile sector with respect to adoption of ERP in India in clause 2.6.Reason for selection Pune region by the author is explained in clause 2.7.Followed by definitions of industry in clause 2.8. Technology adoption models are explained in clause 2.9. Selection of TAM by the author is explained in clause 2.10. Connectivity of ERP and TAM is explained in clause 2.11. Clause 2.12 includes the information of influencing factors and at the last in clause 2.13 chapter conclusions is discussed.

2.1 Introduction

The literature evaluation is the vital chapter of a research dissertation. It is a step-with the aid of step technique of identifying, searching and evaluating published and unpublished literature applicable to a specific subject matter. It's a long way crucial preliminary interest in the studies manner that helps in developing a basis for the researcher's observe (Sekaran and Bougie, 2013). It additionally helps in statistics the amount of studies contributions of the preceding researchers, research gaps, setting new studies goals. It additionally enables in checking the consistency of the results with earlier research and identifies the scope for in addition research. The literature review includes a brief and summarized description of major literature associated with the research hassle that provide tips on adopting medical strategies and methods for sporting out destiny research. The literature evaluate assists researchers in designing the studies progress map, defining the research trouble, growing studies questions and formulating studies hypotheses (Creswell ,2009).

2.2 Literature search and inclusion criteria

The well-known Boolean operators 'And', 'Or' had been used to get the predicted consequences. The set up literature seek became finished using numerous on-line and offline database assets like research gate, Scopes, IEEE Explorer, EBSCO ,Emerald and science direct. The unfastened database 'Google scholar' was considerably applied for looking and downloading relevant studies articles.

Therefore, the most relevant researches written in English language had been protected. The 'sort of the thing' has become drastically applied as a criterion for inclusion. Often magazine articles had been decided on. But, in few cases awesome dissertations and conference cases had been moreover protected for better expertise of the research context and dimensions related to it. This is combined shown with the aid of following figure 2.1

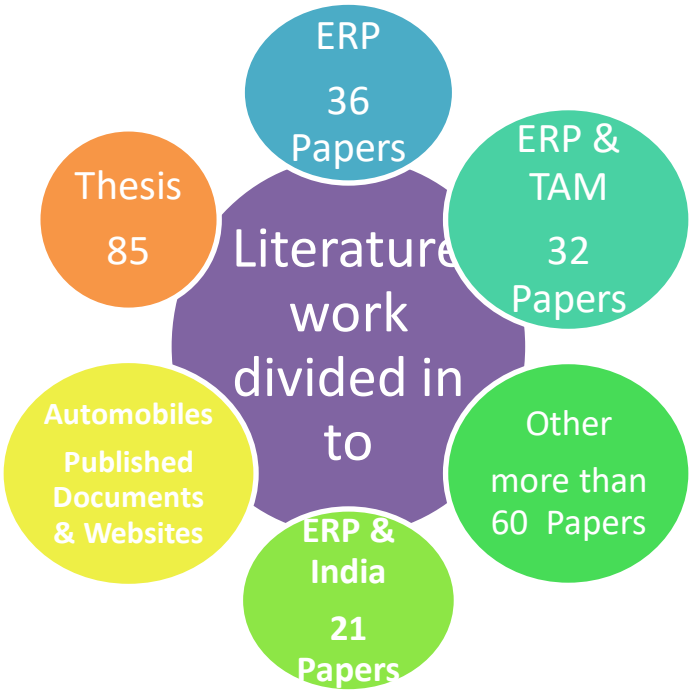


Figure 2.1: Literature study divided in different parts

2.3 Enterprise Resource Planning (ERP)

An information system (IS) is a communication system between people, involved in the collection, processing, distribution and use of information and widely used in many ways (Davis, 1993).

The Enterprise Resource Planning (ERP) program is an evolving technology which is part of the information management research discipline. In 1990 Gartner Group acquired an American consulting firm for the first time the concept of ERP (Wylie, 1990). ERP systems are the specific type of enterprise systems that integrate data across and support all of the organization's major functions in a comprehensive way. Also, ERP systems are defined as IS that integrates relative organizational tools and data through a database (Motiwalla & Thompson, 2012). The ERP program incorporates the resources of an entity in plain terms, and also includes business processes and organizational changes.

ERP systems are pre-packaged software that needs to be configured and modified to be integrated into the business processes of the organizations. The ERP system is also a complex system that affects large numbers of end-users within the organizations. A proper implementation plan and the change management plan are required (Motiwalla & Thompson, 2012). With IS investment raising omnipresent, Implementation of the ERP systems is growing strongly. ERP systems are being introduced increasingly by companies. They perceive that ERP systems can deliver high competitiveness through the acquisition of a strong market position (Robey, Ross & Boudreau 2002).

ERP systems follow three-step lifecycles like most information systems: selection, implementation, operations and post-implementations. (Yu, 2005) Researchers found that the primary objective of the domain literature was either to determine the suitability of ERP program software, select suppliers, consultants, or to identify success `factors influencing ERP selection and implementation. In the implementation phases of ERP systems, those critical successful factors were identified including: top management support, communication, training, cooperation, technological complexity.

These factors were essentially listed based on the TAM (Technology Acceptance Model). In addition, some studies focus mainly on how the cognitive considerations of end-users regarding the characteristics of the ERP system affect their attitude and voluntary mental

acceptance of the system. With respect to other research, these are based on the phases of selection and implementation. The trend of ERP development is, however, continuing to grow. More companies are introducing the ERP program into their organizations.

In terms of this study, researcher has been investigating the factors in post-implementation phases of the acceptance by end-users of ERP system adoption. The motivation behind our study for the research is quite simple.

First, researcher is looking for several tools and literatures before showing that ERP can clearly boost competitiveness by following the right and agreed framework. Second, recent research (TAM and factors) have suggested that certain factors influence the acceptance of the ERP program by the users. This will ultimately lead to successful adoption of ERP and will satisfy acceptance of Perceived benefits. As a consequence, ERP systems may be effectively implemented from a technological viewpoint, but performance depends on the behaviors of the ERP users towards and practical use of the program (Boudreau, 2002; Kwahk & Lee, 2008).

In this research authors wish to build detailed view of ERP adoption and its potential benefits. Want to give a better understanding of the attitude, behaviors and perceived benefits of the users by any means.

2.3.1 Some definitions of ERP

Following figure 2.2 shows general model of ERP which comprises of central database and different departments and people attached to that.

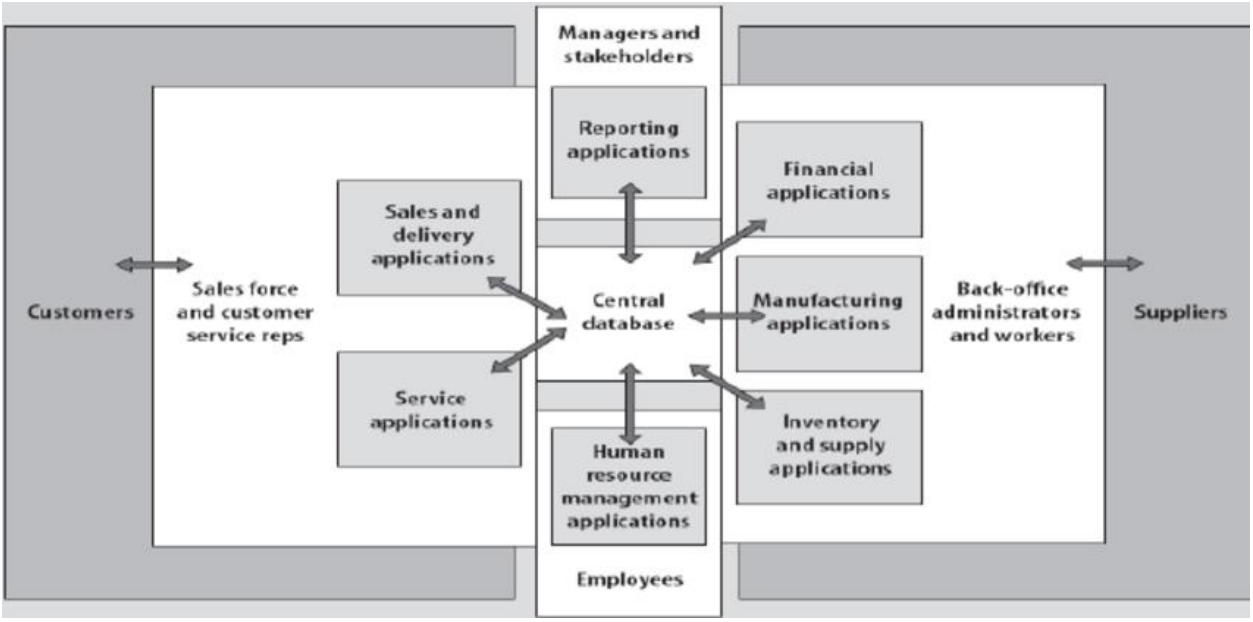


Figure 2.2: ERP systems General Model

Source-ERP Anatomy (Davenport, 1998)

ERP software is an integrated system that organizations use to combine, organize and maintain the necessary operational data. ERP systems fuse the key operations of an organization into one software system, including the departments of manufacturing, distribution, finance, human resources and customer relations. For many executives and project teams, the selection and proper implementation of an ERP software package can be an extremely complex and intimidating process. ERP software can revitalize an enterprise by streamlining and synchronizing its different departments into one single software framework, if the ERP assessment and implementation is done correctly.

Once these activities are completed without emphasis and proper preparation, there can be serious consequences for the ERP software project that will negatively impact the company for many years to come.

Enterprise Resource Planning (ERP) software is one of the software systems that incorporate customer relationship management, accounting, HR, and supply chain management functionality in one software package. Because of the complexity and number of features available by ERP software, it has typically been adopted by large

organizations but it has been shown in recent years that ERP software is also useful for small and medium-sized businesses .Nah et al. (2001) characterizes ERP as 'An undertaking asset arranging (ERP) framework is regularly characterized as a bundled business programming framework that encourages a company's administration of asset productivity and adequacy (materials, HR, fund, and so on.) by giving an all out incorporated answer for the association's solicitations for data handling, through a procedure situated co-employable methodology.

The Enterprise Resource Planning (ERP) program is, according to Koch (2006), a program that incorporates all divisions and functions within an organization into a single computer system that can meet all departmental requirements. Additionally, Addo-Tenkorang and Helo (2011) observe that a corporate resource planning system is universally accepted as a practical solution in the corporate world in order to facilitate the smooth flow of common functional information and practices throughout the organization. Thus, an ERP framework can be defined in the previous definitions as a set of an application that covers a broad variety of business functions of an organization; These include production, inventory, finance , human resources and, consequently, they are presented as a monolithic system with the aim of improving operational efficiency and effectiveness.

Companies of all sizes, small, medium or large, need to standardize their business processes, thus streamlining their operations and improving their processes' efficiency (Tarhini et al., 2015; Abbasi et al., 2015). Enterprise Resource Planning (ERP) program is an information system that helps departmental organizations organize and incorporate information.

It also provides the company with an integrated software system with structured modules for each department within the organization, with a common database for all departments, making it easier to manage, execute, store data and monitor core business processes: procurement, development and completion processes and other department’s functionalities. Enterprise Resource Planning (ERP) is a valuable method for coordinating information processes, decisions and flows through a variety of different roles and divisions within a organization (Jacobs and Weston Jr., 2007; Basoglu et al . , 2008; Koh et al., 2009).ERP is the leading approach to combine project management and

IT. Basoglu et al. (2008) defined ERP systems as integrated software solutions which are used to manage the resources of an organization. According to Wixom and Watson (2001), ERP is an integrated, personalized, packaged software-based system which handles most of the system requirements of an enterprise in all functional areas; Examples include accounting, human resources, banking, advertising, marketing, and manufacturing.

ERP systems ensure that all knowledge flows within an enterprise are synchronized seamlessly to minimize cross-functional synchronization problems in the business process (Davenport, 1998). Companies can reduce overall costs by implementing the ERP system, make accurate data available in real time and exchange information with customers and suppliers (Umble et al . , 2003, Basoglu et al., 2008). Thus, a company that implements an ERP system can have advantages such as quick and accurate gathering of information, quick decision making; low inventory cost, improved customer interaction, and improved product quality. ERP may therefore be characterized as an integrated information system that supports the business processes and functions by efficiently and effectively managing the resources of the entire organization.

2.3.2 History of ERP

Enterprise resource planning (ERP), an outcome of over four decades, has evolved as a strategic tool. It is attributed to constant changes made to the technologies that were then available to handle business more effectively and also through innovations and advancements in the field of information technology.

ERP system developed from the 1980's Material Planning System. There are different phases through which this process of evolution passed. The different phases of resource planning system creation in relation to time and the evolution of the ERP concept as shown in Figure 2.3

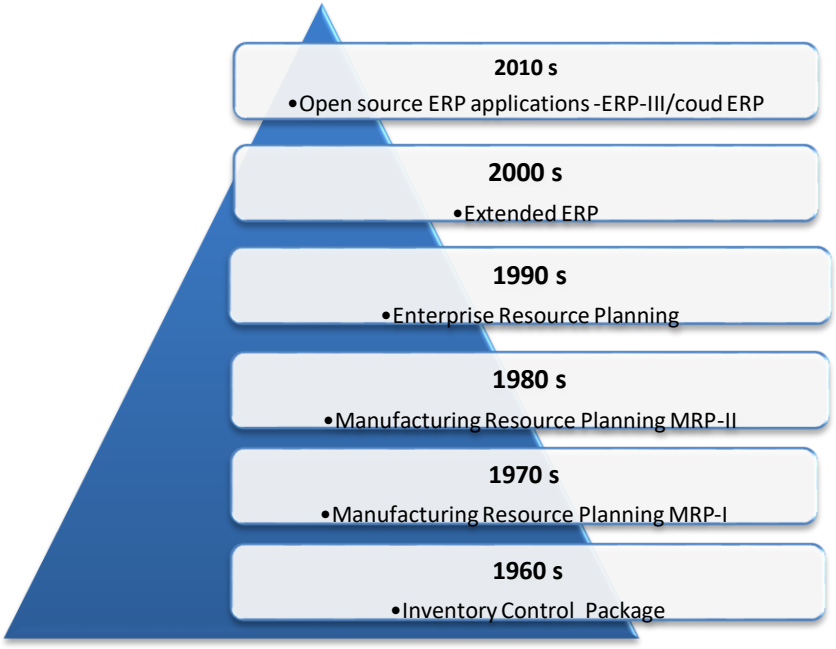


Figure 2.3: Evolution of ERP

Source- https://www.erp-information.com/history-of-erp.html

There are different opinions on the evolution of ERP; literature-based study is given below

MRP - Material Requirement Planning (MRP) is a business application which was first developed in the 1950s to allow businesses to reorder past-use materials. This software was upgraded in the 1970s enabling companies to plan material requirements based on future requirements of the product. (orlick, 1975)

MRP was the outgrowth of processing of a bill of material (BOM). MRP started its existence in the 1960s and became prominent in the 1970s. This technique fundamentally explodes the end product demand for a given product structure (which is taken from Bill of Material) obtained from the Master Production Schedule (MPS) into a complex schedule of purchase orders or production orders taking into account the inventory at hand. MRP is a simple logic but it's computationally complicated by the magnitude of data involved in a realistic situation. The entire procedure is extremely time consuming when performed manually. Using a computer to do the exercise thus becomes essential. MRP proved to be a very good inventory management technique but did not take other

organization resources into account. Which gave rise to a revamped MRP logic in the 1970s, popularly known as the MRP Closed Loop. By incorporating a module called Capacity Requirements Planning (CRP) the organization's capacity to produce a particular product is also taken into account in this technique. Hence, if there is not enough capacity available to generate, a feedback loop is given from the CRP module to MPS.

MRPII – Manufacturing Resource Planning-II (MRP-II) in the 1980s, the need to incorporate a manufacturing organization's other tools was felt (Davenport, 2000). Thus an integrated production management system called Manufacturing Resources Planning (MRP-II) evolved. APICS described MRP-II as, "It is a method for successful planning of all of the manufacturing company's resources. Ideally it covers unit organizational planning, dollar financial planning and has the opportunity to respond to 'what-if' questions by simulation. It consists of a variety of functions, each connected together: Manufacturing Resource Planning-II (MRP-II)

Over the years, other tools have evolved to automate the manufacturing process, such as the Computer Aided Design, Computer Aided Manufacturing, Computer Integrated Manufacturing, Customer Oriented Manufacturing System, etc.

Enterprise Resource Planning (ERP): (Klaus et al., 2000) some consider that MRP II is a precursor of ERP software as indicated. For example, Davenport (1996) claimed that the ERP program is a turbocharged version of MRP II, updated and improved to help producers meet the competitive challenges of the 1990s. Al-Mashari (2002) also promoted the concept that the ERP program is an improved variant of the MRP system from the 1970s and the MRP II from the 1980s. He further stated that the MRP II model had been adopted for the development of manufacturing and planning components by major ERP vendors. (Klaus et al., 2000) Some consider that as stated, MRP II is a precursor of ERP software. Davenport (1996), for example, claimed that the ERP program was a turbocharged version of MRPII, updated and improved to help producers meet the competitive challenges of the 1990's. Al-Mashari (2002) also supported the notion that the ERP system was an updated version of the 1970s MRP system and the

1980s MRP II. He further claimed that major ERP vendors had adopted the MRP II model for the production of manufacturing and planning components.

The primary aim of incorporating ERP is to manage the company efficiently and effectively in this highly competitive and fast-changing market climate. ERP is a company-wide set of tools for forecasting, planning and scheduling that connects customers and suppliers to a complete supply chain, employs proven decision-making processes and coordinates logistics, purchasing, sales , finance, marketing, operations , product development and human resources. Its objectives include high-level customer service, productivity, cost reduction, and inventory turnover, and provide the basis for effective supply chain management and e-commerce management.

Extended Enterprise Resource Planning (EERP or ERP-II): In 2000, ERP-II was introduced in an article by Gartner Publications called ERP is Dead – Long Live ERP II. It defines web-based software that gives workers and collaborators (such as suppliers and customers) real-time access to ERP systems. The role of ERP-II expands on traditional resource optimization and transaction processing of ERP resources. Instead than just handling buying, selling, and so on – ERP II is more versatile than the ERP first generation. Instead of confining ERP system capabilities within the organization, interacting with other systems goes beyond the corporate walls.

Historically, ERP is considered to have evolved from the 1970s and 1980s systems of Material Requirement Planning (MRP) and Manufacturing Resource Planning (MRP II). In 1990, The Gartner Group first coined the term Enterprise Resource Planning (ERP) to describe the next generation of MRP II software (Akkermans et al., 2002). MRP and MRP II systems were designed to systematically relate various process knowledge aspects to particular types of industry, such as manufacturing (Jacobs et al . , 2003). SAP (a German ERP enterprise) launched its R/3 product in 1992. SAP's R/3 configuration allowed its program to run on a number of computer platforms like UNIX and Windows NT for example. It also allowed third party firms to build applications that would integrate with it. By SAP, ERPs' ability to switch from a single machine system such as IBM AS-400 to several small machine installations was seen as appealing to companies,

largely due to comparatively low hardware costs compared to their predecessors. This has helped ERP grow in popularity during the 1990s (Jacob, 2007).

Another major factor in the growth of adoption of ERP software during the late 1990s has been the problem of the year 2000 (or Y2 K). Both large businesses, as well as small to medium-sized enterprises (SMEs), were eager to implement new ERP offerings as one way to tackle Y2 K updates to legacy software systems.

Consolidation within ERP is now an ongoing trend with larger ERP firms purchasing businesses with compatible products to both save on production costs and improve their consumer offering. Examples include Oracle purchasing Siebel in 2005, Ariba and Vistex and SAGE purchasing SAP, which focused their product offerings on SME's (Jacob, 2007).

ERP-III- 2010 Onwards Open source ERP applications entered the market and began to penetrate. Cloud / on-demand approach to ERP [ERP III] began maturing with the pay-per-use model.

2.3.3 ERP Modules

Different modules of ERP are available. This can be integrated or customized. Basic ERP modules are shown in following figure 2.4,



Figure 2.4: Basic ERP Modules

Source: https://www.esds.co.in/blog/basic-modules-of-erp system/#sthash.yvcAHCex.dpbs

Major ERP systems vendors such as SAP, Oracle and Microsoft provide modules that support major business functional areas such as sales order processing, purchasing, production planning, financial accounting, and human resources (Sumner, 2005). Therefore an ERP kit generally consists of modules for, among others, Financial Accounting, Human Resource, Manufacturing and Logistics, Sales and Distribution. It uses a centralized common management system for databases and provides connectivity among the various modules. This modular design is based on corporate processes rather than departmental functions. In the 1990s, ERP was a tightly integrated monolith, and an organization that wanted to install an ERP system would have to purchase the entire package, even though it would only use a few of them. But today it is quite flexible and it

is possible to buy and install individual modules without having to buy the whole package (Leon, 2008). For example, a company can only install the accounting module and then install the other modules.

The modules in an ERP system can operate in isolation, failing to provide functionality that is at the core of an ERP system, or combining the modules to form an integrated system. If the modules are used as stand-alone devices in an ERP system, then they will be no better than legacy systems.

Some ERP packages have the same set of core modules though some different modules may be offered by each provider. In a typical ERP program some of the main modules are:

- Financial Accounting
- Human Resources
- Manufacturing and Logistics
- Sales and Distribution
- Project Management

Many device modules compose the ERP program. Each module of ERP software imitates an organization's important functional area. Common ERP modules include product planning modules, the purchase of parts and materials, inventory control , product distribution, order tracking, finance , accounting, marketing, and HR. Organizations also selectively incorporate the economically as well as technologically feasible ERP modules. The ERP modules commonly used are as follows;

- **ERP Production Planning Module**

In the process of transforming Manufacturing Requirements Planning (MRP) II into ERP, while vendors have developed more robust production planning software, consulting firms have accumulated extensive knowledge of the implementation of the manufacturing planning module. Production planning optimizes the use of production capacity, parts, materials, and material capital using historical production data and sales forecasting.

- **ERP Purchasing Module**

Buying module streamlines the procurement of the required raw materials. It automates procedures for finding prospective suppliers, negotiating the price, awarding the purchase order to the supplier, and billing processes. The buy module is closely aligned with the systems for inventory management and production planning. Buying module is often integrated with the software for the supply chain management.

- **ERP Inventory Control Module**

Inventory module facilitates processes for keeping the appropriate stock level in a warehouse. Inventory management tasks include defining criteria for inventories, setting goals, providing replenishment strategies and alternatives, tracking item usages, reconciling inventory balances, and recording inventory status. Integration of the inventory management module with selling, procurement, and finance modules allows ERP systems to produce diligent reports at the executive level.

- **ERP Sales Module**

Sales income is live blood for company organizations. Sales module handles command location, order scheduling, shipping and invoicing features. The sales module is closely linked to the ecommerce websites of organizations. As part of the sales module, many ERP vendors offer online storefront.

- **ERP Market in Module**

ERP marketing module facilitates the production of leads, direct mail campaigns and more.

- **ERP Financial Module**

The introduction of the financial module ERP supports both for-profit companies and non-profit organizations. The financial module is the core of software for many ERP systems. It can collect financial data from different functional departments, and generates valuable financial reports such as balance sheets, general ledger, trail balance and quarterly financial statements.

- **ERP HR Module**

HR (Human Resources) is another widely implemented module on ERP. Human Resources module streamlines human resource management and resources management. HR modules routinely keep up an extensive worker database including contact data, pay subtleties, participation, execution assessment and all representative advancement. Propelled HR module is joined with data the executive's frameworks to permit full utilization of all aptitudes of the representatives.

2.3.4 ERP Vendors

(Jyoti S. Thesis) notes that a number of ERPs are available on the market at present. various ERPs are available in the market for various types of industries / organizations depending on the functions, area / stream of the company dealing with them. Each ERP has its own features and functionality, depending on that particular type of industry / company requirement. For example when a bank needs ERP, the software must cover banking functions and cannot be used by a hospital or educational institution to perform its functions. Thus each ERP has its own functionality.

However, for manufacturing companies, various ERPs are available in the markets which are used by manufacturing companies in the context of this proposed study.

According to the 2018 Netscribe report, major ERP manufacturers and the module are listed below,

- SAP
- Oracle
- Microsoft Dynamics
- Epicor
- Baan
- Sage
- J.D.Edwards
- Peoplesoft
- Infor
- Syspro etc.

Many other ERPs are also available in the manufacturing enterprises sector. Below is a list of some of the most frequently used ERP packages.

According to (Krishnadan, 2017) the details of ERP packages which have been widely used throughout are given,

- **SAP**

The SAP AG is the world leader in revenue-related enterprise software and software services. Its headquarters are based in Walldorf, Germany, with offices in over 130 countries including India and the USA. It was founded by five former IBM employees in Germany in 1972 and now employs more than 78,200 people. SAP is an acronym for Data processing systems, applications and products. SAP R/3 is the company's Flagship ERP product. It supports multi-language legislation, currencies, financial calendars, financial reporting and tax laws. It claims that every industry has implemented the best business practices in their solutions. With 3, 10,000 clients, SAP has installations in more than 190 countries and is the world's largest business software company and the third largest independent software provider in the world overall. SAP ERP has 12 modules and 72 sub-modules, and there are approximately 20,000 tables for identifying an organization's data requirements. SAP ERP can be integrated with other systems such as CRM, SCM and business intelligence. It releases new versions of ERP at regular intervals to incorporate changes in regulations and business practices.

- **ORACLE**

Founded in 1977, Oracle focused on offering a relational database management system. Throughout 1988, Oracle entered the ERP market beginning with the accounting system and ultimately developing and launching the ERP, SCM and CRM e-Business package. Oracle Corporation's turnover is close to 37 billion USD. Just like SAP, Oracle offers industry-specific solutions. It provides ERP solutions for over 20 industries. Oracle, headquartered in Redwood Shores, California, is the first tech corporation to introduce the Internet computing model for enterprise software development and delivery through its entire product line: Databases and relational servers, tools to support application development and decision making, and business applications. Besides providing the best applications, Oracle 's primary objective is to preserve customer investments. Oracle has demonstrated its commitment to becoming a true technology partner by acquiring Siebel

and PeopleSoft and bringing together the best and brightest industry talent and state of the art products.

- **ORACLE'S PEOPLESOFT**

PeopleSoft Inc. was founded in 1987 focusing on HRM. In 1995 it added unique approaches to its offerings for academic institutions. It also provides for manufacturing organizations with ERP solution. But the solutions of HRM and academic institutes are his flagship solutions. PeopleSoft was integrated with Oracle Corporation in June 2005. Although PeopleSoft business applications are sold under Oracle PeopleSoft Enterprise Applications, PeopleSoft Support, Training, Learning, Hosting and Financing are now incorporated into Oracle Services. It supports a very wide choice of infrastructure technology. The PeopleSoft Enterprise Performance Management (EPM) from Oracle allows companies to achieve world-class performance by aligning the right knowledge and resources to strategic objectives.EPM 9 expands the suite's strengths and continues its emphasis on usability and superior ownership experience. Its management of human capital unlocks the full value of the work force of any organization.

- **JD EDWARDS**

In 1977 Jack Thompson, Dan Gregory, and Ed McVaney started JD Edwards. It developed software for several small and medium-sized computers in the early years, eventually focusing on the IBM system in the early 1980s. It fusioned with PeopleSoft in August 2003, which was acquired in June 2005 by Oracle Corporation. Now JD Edwards is part of the Oracle Corporation and offers two solutions ranges-JD Edwards Enterprise one and JD Edwards world. It provides a full solution consisting of hardware, middleware, software and services unlike other providers of ERP solutions that only sell the software and rely on the implementation partner to choose the correct hardware, software, and service. This says that ERP has low ownership costs, needs less preparation and offers a high return on investment product. JD Edwards Enterprise One is a world-class developer of small to medium-sized enterprise business software. JD Edwards World offers the same advanced functionality to bigger companies, to small businesses.

- **MS DYNAMICS**

Microsoft was founded in the year 1975. Between 2000 and 2002 Microsoft acquired Great Plains Software, Damguard, Navision, and Solomon Software. Each of these firms had an ERP. Microsoft Dynamics is a line of applications for the ERP and CRM software. Microsoft Dynamics applications are delivered through a network of reselling partners which provide special services. Very few installations are made of these resellers without the aid and cost. Microsoft removed numerous user capabilities for accessing features like report writing in its 2013 update, the first since 2009, without the intervention and costs of members of its approved reseller network. A part of Microsoft Dynamics is Microsoft Business Solutions. Other Microsoft solutions, such as Share Point, Yammer, Office 365, Azure and Outlook, can use dynamics. The main industries of Microsoft Dynamics are the retail, utility, manufacturing, financial and public sector sectors. Microsoft Dynamics offers business solutions for small to medium sized businesses as well as enterprise. To small organizations that need a maximum of 500 concurrent users, Dynamics NAV is. For larger organizations Dynamics AX is. AX can accommodate up to 3500 simultaneous users.

- **QAD**

Founded in 1979, QAD Inc. now has a presence in over 100 countries around the world and employs over 1600 people. Pamela Lopker, who was later joined by her husband Karl Lopker, founded QAD in 1979 as a small start-up solution to resolve a wide gap in full, integrated business software for manufacturing enterprises. QAD MFG / PRO was the flagship resource planning (ERP) suite provided by QAD. In 2007, they launched their successors: QAD Enterprise Applications and QAD Cloud ERP. Built from the foundation of MFG / PRO, QAD solutions are designed to streamline the management of the financials, customers, supply chain, analytics, and system integrations of global manufacturing companies. QAD MFG / PRO is now known as the QAD Cloud ERP. It is available in 55 languages and has over 5,500 sites installed in over 95 nations.

- **RAMCO**

Ramco Systems is a part of the Ramco Group of companies, the USD 1 trillion diversified conglomerate. Ramco Systems was founded as the R&D division of Ramco Industries Limited in 1992, and later became an independent company in 1999. The Chennai-based company has 21 offices in India, Canada, USA, Australia, Asia, Middle East, South Africa, and APAC. It has more than 1600 staff and more than 1000 customers since its inception. The organization is focused on delivering creative market solutions in diverse environments that can be implemented easily and cost effectively. Ramco is a fast-growing enterprise software player disrupting the market with its HCM and Global Payroll, ERP and M&E MRO for aviation multi tenant cloud and mobile based enterprise software. To distinguish itself in the marketplace, Ramco Systems is focused on creativity and culture. It was named best HR management technology, talent management software and Payroll Software Awards at the 2015 HR vendors of the year held in Malaysia and Singapore, hosted by Human Resources. It has also been endorsed by the Aeronautical Repair Station Association (ARSA), as the preferred Next-Gen MRO IT vendor.

2.3.5 ERP implementation life cycle

For several organizations, ERP systems are the largest systems they've worked with in terms of deployment size, participation of people and financial commitment. ERP system implementations are generally very time consuming, complicated, and resource-intensive. Since the ERP system has a big size as well as an organizational influence, this complexity will be posed by the ERP system (Motlwalla & Thompson 2009). Motiwalla (2009) also points out that the introduction of ERP cannot be done in one-time; rather it requires a continuous product development and support process. There are three typical lifecycle phases of ERP implementation: Pre-implementation (pre-selection) and post-implementation stages. Nonetheless, many ERP implementations have turned into disastrous endeavors during or after the going live stage, and therefore the majority of ERP implementation successes exist in the post-implementation phase (Motiwalla & Thompson, 2009).

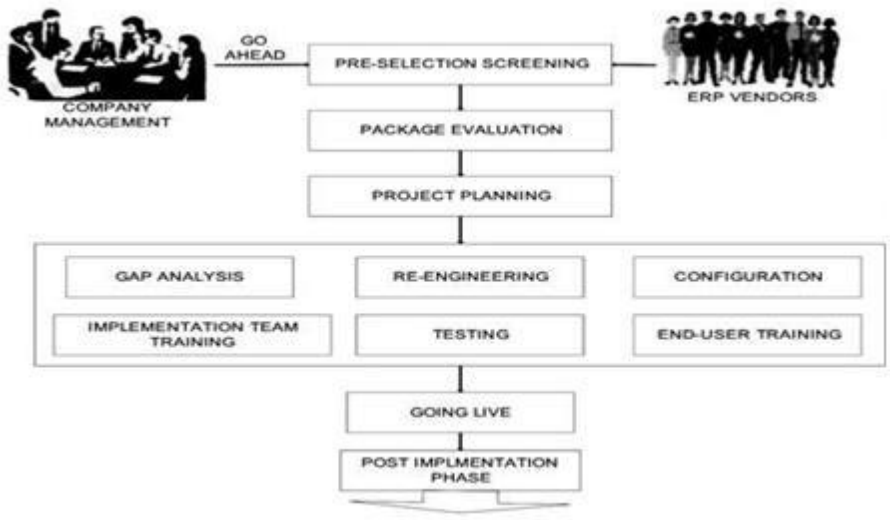


Figure 2.5 ERP implementation life cycle

Source :(Markus & Tanis, 2000)

Figure 2.5, shows the life cycle of implementation of the ERP program, in the pre-implementation process, businesses choose the ERP vendors and review the package they purchased, then project planning is required for the actual implementation of ERP software inside the business. Companies will primarily conduct six activities in the middle of the figure for the implementation process, including preparation, re-engineering, and gap analysis etc. Eventually, the company comes to the post-implementation phase, it is very critical for the success of ERP implementation as a live step to go forward.

Operation and Post-implementation phase

The post-implementation phase of ERP is the time beginning with the "go live" of an ERP system's lifecycle (Markus & Tanis, 2000). In the initial stage, known as "Stabilization," it will fix the errors, retrain end-users and balance system performance. The initial post-implementation phase will last approximately five to ten months until "normal operations" are completed. (Ross & Vitale, 2000; Shanks, 2000)The company processes and the ERP program must adapt according to experience gained after system changes.

From a technical point of view, the implementation of ERP may be successful after the stabilization stage but success depends on the attitudes of ERP end users towards the system and the actual use of the system (Boudreau, 2002; Kwahk & Lee, 2008). The maximum capacity of the program can only be achieved when workers are satisfied with their direct contact with the program (DeLone & McLean 1992; Bhattacherjee 2001; Au, Ngai et al . 2008). Similarly, organizations only gain benefit from ERP program to the degree that users routinely and comprehensively embrace and exploit them. To increase the efficacy and performance of ERP systems during the post-implementation process, organizations need to investigate factors which impact on user satisfaction.

End-users' acceptance of ERP system

While organizations have invested heavily in ERP, there are still shortcomings in implementation and less than adequate productivity improvements (Davenport, 1998). One of the most cited reasons for ERP failures is the inability or reluctance of end-users to accept or use the newly introduced ERP program (Barker & Frolick, 2003). Hence various theories applied in the user acceptance study in the ERP system will be reviewed in this part.

(Krishnadan 2017) Like every other project the implementation of the ERP also has to go through different phases of implementation. There are no clear lines separating these phases, and in many cases one phase will begin before the previous phase is complete. While these phases can appear quite linear and distinct from each other, in fact, the phases are actually very dynamic in the actual implementation. Some firms select for one and only one 'Big Bang' while other firms favor sequential roll-out, the life cycle phases are identical.

a) Pre- evaluation screening

b) Package evaluation

c) Project planning phase

d) Gap analysis

e) Reengineering

f) Customization

g) Implementation team training

h) Testing

i) Going live

j) End user training

k) Post implementation (operations and maintenance)

2.3.6 ERP implementation views

C.P. Holland (1999) explains that implementations of Enterprise Resource Planning almost always require reengineering of business methods, due to the need to adapt the business processes to match the software system capabilities. That implies the necessity of traveling on the far side of ancient principles of project management.

Gupta (2000) claimed that Enterprise Resource Planning permits companies to integrate varied information about divisions. It has evolved from application of HR to management of Information Technology. Enterprise Resource Management handles everything from the entry of purchase orders to customer support for different customers. It attempts to integrate the firm's customers and suppliers as well as the production environment. For example, a procurement entered in the order module transfers the order to a producing application which subsequently sends a request for materials to the supply chain module which receives the necessary components from suppliers and uses a supply module to urge them to the manufacturing plant. Companies handle any dealing one at a time in standard application systems. They are designed around the sturdy boundaries of specific functions to be catered for by a selected application. Enterprise Resource Planning avoids these transactions as independent operations one by one and considers them to be processes of the community that conjure up business.

Jose Esteves-Sousa (1999) discovered that given the advantages of a successfully implemented implementation of the Enterprise Resource Planning framework, there is still evidence of high risk of failure in the implementation of Enterprise Resource Planning. Too often, project managers primarily concentrate on the technological and monetary aspects of project execution, while neglecting or making little effort on the un-technical issues. Hence, one of the most important analytical problems in enterprise resource planning systems nowadays is that successful implementation of the study of enterprise resource planning. The researchers gathered all the material for the analysis.

This study provides the results of an open review of the literature commitment to writing method from our grounded approach implementation of theory. Upon the commitment to write phase, it tends to get associate degree initial unified model of the key success factors in implementation of Enterprise Resource Planning.

Davenport (2000) developed that Enterprise Resource Planning provides twin advantages that do not exist in non-integrated division systems: a full business image that includes all activities of departments; and an enterprise-wide knowledge that contains all business transactions.

Themistocleous et al . (2001) analyzed that nearly all employees react negatively to changes in the organization caused by the implementation of Enterprise Resource Planning. Users are not necessarily able to adopt Enterprise Resource Planning programs, and this may hinder the understanding of the advantages provided by the implementation of Enterprise Resource Planning.

Lee et al. (2002) found that the implementation of Enterprise Resource Planning in Literature Review material management is based primarily on four steps that involve application integration, external integration, internal integration, and automation. This study proves that the time-consuming activities concerned in the method of material management are reduced and even in several cases these durations were removed after ERP was implemented. They explain that the Enterprise Resource Planning system shortens the cycle of procurement by eighty per cent. Enterprise Resource Planning systems have advantages in various areas of the material management module in the materials management space.

Oliver et al., (2002) emphasized multiple factors in ERP adoption. The researcher insist 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.

Nielsen (2002) proposed that businesses will explore the compatibility of their desires with what an Enterprise Resource Planning program can do. The implementation and use of Enterprise Resource Planning remains a key concern of IT management. Despite spectacular advances in the capabilities and functions of Enterprise Resource Planning the disturbing problems of underused systems continue. Low utilization of Enterprise

Resource Planning programs was considered to be a major challenge faced by businesses. Thus, in conjunction with the company structure transition to Enterprise Resource Planning, staff should be trained, their jobs redefined, procedures redesigned around the core Enterprise Resource Planning system processes. Implementations of Enterprise Resource Planning are found to be difficult to complete project and progress is not guaranteed.

Keizer, J., J. Halman, et al . (2002) claimed that implementation of ERP has been one of the most vital challenges of the last decade; it comes with an incredibly high rate of failure due to its high risk. The challenges inherent in the implementation of Enterprise Resource Planning are technological and social variables which should be handled effectively**.**

Majed A. & Al-Mashari (2002) in their focuses on the use of a process change management viewpoint to investigate the growth of Enterprise Resource Planning. In the context of SAP implementation, a framework is adopted to highlight the varied PCM constructs. Evidence of how these constructs are practiced is derived from a large collection of case studies of R/3 representing varied organizational experiences. This study provides basis and recommends many concepts for future analysis and research.

Voordijk et al . (2003) addressed the factors contributing to the success or failure of Enterprise Resource Planning in large building companies. From the literature review, they proved that abundant work was carried out in the implementation of ERP. Nevertheless, theory-linked analysis of inadequate Enterprise Resource Management may be missing within the literature.

Elisabeth J. Umble et al . (2003) argued that introducing ERP would be difficult and require high costs that would make businesses spend tremendous amount of time and money. Several implementations of Enterprise Resource Planning are listed as failures, because they have failed to achieve expected organization objectives. This study identifies various success factors such as steps to choose the software system and implementation procedures for a successful complete implementation of ERP. A case study of a successful complete implementation of Enterprise Resource Planning is given and mentioned in terms of those success factors.

Pnina Soffer et al. , (2003) aimed to develop a model capturing market alternatives at completely different ERP system application levels. That kind of model is needed once. Enterprise resource planning systems are aligned with the wishes of the enterprise they are enforced within. In order to help the implementation approach for Enterprise Resource Planning, the model should explain the entire scope of the practicality of the Enterprise Resource Planning system and the different business processes it supports, the interdependencies among them. This article aims to analyze the defined properties to be applied in the construction of an ERP that a modeling language can satisfy.

Joseph Sarkis et al. (2003) demonstrated that, given the belief among CEOs that some of the systems are failures, many multi-stakeholder Enterprise Resource Planning systems give many lessons for potential adopters. The basis for the success of this implementation was a vision providing visibility of the Enterprise Resource Planning system to external constituents through network connections and standardizing internal processes and necessary data technology systems to support market desires. This article tends to detail how this implementation is managed from a process-oriented perspective. The lessons gained from this initiative encourage support of academic and practitioner literature, especially in the area of large-scale management of data systems.

Vincent A. Mabert et al. (2003) submitted that thousands of corporations around the world have enforced ERP systems. Implementing a company resource planning system is usually a challenge, as it takes between 1 and 5 years. Some businesses introduce effectively while others fail. This article analyzes and identifies key variations in the approaches used by on-time and/or on / under-budget corporations compared to those that have not victimized information collected through a survey of people producing corporations that have enforced ERP systems. Regressions are used to distinguish on-time and on / under-budget teams that sponsored survey responses, and to describe the various variables that lead to on-time and on / under-budget success in implementation. The findings indicate that several different factors starting from pre-implementation to system configuration performance, the manager should be sensitive to once major systems such as Enterprise Resource Planning have been implemented.

Vincent A. Mabert et al. (2003) emphasized that ERP systems have a remarkable growth in the last five years and are now pervasive in the manufacturing sector in the

United States. This article is represented by a series of case studies and an in-depth survey. For this report, production companies were selected in the size range from millions of dollars to billions of dollars in annual capital. The key finding from this study is that companies of different sizes approach implementations of Enterprise Resource Planning differently according to their needs. The benefits from this implementation often vary according to the size of the organization. Larger enterprises report good improvements, while smaller firms report better performance.

Huigang Liang (2004) analyzes from the perspective of an Enterprise Resource Planning vendor what is being done to address discourse issues associated with the implementation of Enterprise Resource Planning. A Chinese Enterprise Resource Planning merchant's case shows 3 aspects that could be useful in achieving work between Enterprise Resource Planning systems and organizations embracing. First, Enterprise Resource Planning programs must be required to be native zed to reflect the choices for local management. Additionally, corporate resource planning frameworks should be flexible to a range of rates. Lastly, Enterprise Resource Planning should be administered progressively in associated manner. A major competition is that after performing Enterprise Resource Planning research or implementing Enterprise Resource Planning programs, analyzers and practitioners will consider the growth stages of companies as a discourse issue.

HsiuJu Rebecca Yen et al. (2004) clarified that companies around the world have invested large sums in the implementation of ERP systems. But it is difficult to implement the Enterprise Resource Planning system, and the ultimate benefits are also uncertain. Researchers say the failures are the result of business rather than technological issues. Enterprise resource planning systems affect the strategy, organization, and culture of a company. Older analysis emphasizes the need to plan a base-level implementation of Enterprise Resource Planning, but it does not offer any guidelines. Victimizing the case study methodology involving direct observation and systematic interviews at 3 US manufacturing companies, this study investigates the connection between the implementation practices of Enterprise Resource Planning and the competitive strategy of a firm. The findings ensure that the application of Enterprise Resource Planning will fit with the strategic strategy. Specific directions for creating the alignment are steered. Furthermore, the researchers tend to know two alternative variables, national culture and

government / corporate policies, as important for implementing Enterprise Resource Planning in multi-national settings.

Zhe Zhang et al. (2005) clarify that ERP is a generally accepted method for production corporations. But the effective implementation rate is poor and the supposed targets in China have not been achieved by lots of companies. This study creates a successful implementation framework for Enterprise Resource Planning by adapting different research models of information systems to detect every important success factors and success measures. Finally, discussion is formed, and the methodology for implementing Enterprise Resource Planning systems is given at the end.

Severine Le Loarne (2005), this thesis analyzes the findings of an 18-month inquiry into the implementation of an Enterprise Resource Management program inside an multinational corporation that extracts and transforms the raw material. The social impact software research goals have in a organization operating procedures and power-sharing systems. The three key findings indicate that applying the Enterprise Resource Planning Program associate isn't a neutral process. Indeed, the Enterprise Resource Planning triggers fundamental changes within the organization of means managers and assistants and tightens the management of their work. It poses, however, an unexplained feature jointly; managers circumvent protocols in order to achieve their desired objectives.

Sammon et al. (2005) noted that the prime failure rates existing in the implementation of the Enterprise Resource Planning project are due to the combined result of inadequate analysis at the project start, the complexities of the Enterprise Resource Planning market and complicated implementation.

Jones (2005) explored that ERP is intended to enable corporations to manage their data through the integration of business processes and own better information management within the organization. Effective data sharing potential should be available to implement ERP aimed at sharing information and knowledge within corporations.

Jaideep Motwani et al. (2005) suggest that many organizations are changing their IT infrastructure from functional to process-based; Enterprise Resource Planning systems are becoming one of the most widespread IT solutions of today. Not all companies, however, are successful in their implementation of Enterprise Resource Planning. Using a case study methodology based on the theory of business method modification, this

analysis attempts to know the factors which cause the implementation of Enterprise Resource Planning to succeed or fail. The findings of our comparative case study of four organizations that implemented the Enterprise Resource Planning program advise that a conservative, streamlined, incremental implementation approach backed by diligent change management, network relationships and cultural preparation would have a positive effect on other implementations of Enterprise Resource Planning. Understanding these consequences will make managers responsive to change and better prepared for implementation of Enterprise Resource Planning.

Yahaya Yusuf et al. (2006) are exploring the implementation of Enterprise Resource Planning may be a 'Triple Play' the combines individuals, technology and processes. It employs a difficult method of implementation, especially in developing countries such as China, which usually takes many years, huge amounts of funds and involves a significant reengineering of the business method. This article analyzes the unique challenges within the implementation process and offers approaches with type survey , interviews, and secondary information to incorporate Enterprise Resource Planning framework. Some specific difficulties are discussed by authors from the analysis of type performance, such as support for top management, costly and time consuming, cultural differences, technological efficiency, lack of qualified personnel and internal resistance. The difficulties are primarily due to the possession and size of enterprises. Some solutions are suggested in implementing Enterprise Resource Planning software system to overcome these difficulties. They are the option of products, the implementation team of Enterprise Resource Planning, Business Process Reengineering, Training and Outsourcing Service Provider.

Jyh-Bin rule et al. (2007) explains that the first functions of ERP are to integrate interdepartmental operating procedures and MIS modules, and to allocate an organization's resources. This article is a case study on choosing system suppliers and negotiating contracts during a construction company's implementation of ERP. After reviewing the common key success factors mentioned in the literature, this study addressed seven issues: coding, reengineering of the operating method, implementation of practicality priorities for Enterprise Resource Planning, customization, participant roles, role of advisor and contractors performance level that jointly affected

implementation. The lessons learned from the case study are important to the decision of a construction firm to incorporate an Enterprise Resource Planning program. This analysis suggests that additional case studies are needed to implement Enterprise Resource Planning systems successfully within the industry.

Qing Xu et al. (2008) analyzed the determinants of the transfer of knowledge in Enterprise Resource Planning from implementation consultants to key users, and key users to implementation consultants. An integrated model was developed, positing that the knowledge, source, recipient, and context-related aspects influenced the transfer of information. Data was obtained from eighty-five Enterprise Resource Planning-implementation projects of companies that were primarily located in China to test this model. Analytical results say all four aspects had a big influence on the transfer of information from ERP. In addition, the results revealed the role of the transfer activities as mediator, and the arduous relationship between implementation consultants and key users. The effect on transferring information from the temperament of the origin to transfer and the temperament of the recipient simply accepting information was completely mediated by transferring activities, while the impact on transferring information from the recipient's capacity to comprehend information was only partly mediated by transfer activities. The influence of exhausting relationships on the transfer of information from the communication capacity including coding and secret writing competence was absolutely mediated.

Fergal Carton et al. (2008), given the sums invested by companies in such projects, the performance rate of ERP implementation is not high. The purpose of this study is to present a case study on a successful complete implementation of Enterprise Resource Planning. The researchers took the case study of an MNC's application of Enterprise Resource Planning in the UK to analyze the validity of project management frameworks, the body of Enterprise Resource Planning knowledge. It has been found that the Enterprise Resource Planning information body is really a large structure that can shed lightweight on most main aspects of the Enterprise Resource Planning project. This study will assist ERP implementation managers at all implementation stages and help to anticipate the areas where problems arise and understand the areas where special attention is required.

Saad Ghaleb Yaseen (2009) studied in Jordan that knowledge-based pharmaceutical trade has implemented a method of enterprise resource planning to sustain competition in the domestic and foreign markets. This analysis looks at the essential factors for the successful implementation of Enterprise Resource Planning. Using a case study approach, it examines these variables in terms of the structure of a company.

Ahed Abugabah et al. (2009) their study helps users measure the benefits of Enterprise Resource Planning, and users will decide whether or not Enterprise Resource Planning will yield good results for companies. This concept is based on the fact that the consumer creates the advantages by completing tasks which lead to the achievement of goals. The research provides a summary of prior studies on the effects of Enterprise Resource Planning on user efficiency and illustrates how the application of Enterprise Resource Planning uses the theory of information systems.

S.C.L. Koh et al. (2009) analyze demand for the extent of investment in coaching and practice required to successfully implement and operate specific ERP systems for small and medium-sized enterprises (SMEs). The Enterprise Resource Planning literature indicates that a coaching model with a long training period often using external consultants may be a required requirement in order to develop and operate Enterprise Resource Planning systems effectively. During this analysis, an in-depth case study was conducted on UK-based SME specific Enterprise Resource Planning Systems merchant, which maintains that their SME-specific Enterprise Resource Planning Systems are effectively enforced and operated with only 5 days of formal coaching and no extra practice. This analysis evaluates the validity of this claim, and the idea for the coaching model used by the case firm is sufficient for users to implement and operate SME-specific Enterprise Resource Planning systems successfully.

Garg P. (2013) contended that retailers are attempting to reap the benefits of Enterprise Resource Planning. Enterprise Resource Planning systems replaced unintegrated systems with automated and rectifiable software framework in retail trade. Retail Enterprise Resource Planning effectively integrates supply and demand to assist and improve the business bottom line. Implementing Enterprise Resource Planning systems in such corporations could be a difficult task. Implementations of Enterprise Resource Planning have yielded a lot of failures than successes; only a few implementation failures are

reported in the literature as a result of a few organizations choosing to publicize their inability to implement them. The study explores and validates the prevailing literature in order to identify the important success factors that result in Enterprise Resource Planning's success in retail trade context. The results provide the researchers involved in implementing ERP with valuable insights.

Ch. Seetha Ram (2010) the researcher selected three organizations for the implementation of the Enterprise Resource Planning study which includes BPCL, TI InfoTech and ITTI. Questionnaires were sent in the 3 firms to 600 ERP users, and 202 completed questionnaires were taken for analysis. The results showed that the primary factor associated with ERP's success is standard dimensions of the quality.

Sevenpri Candra (2012) insists success in implementing ERP is a must. Enterprise Resource Planning is one of the main tools in today's business to attain business competitiveness. Enterprise Resource Planning is a method of developing and managing business to improve the productivity and efficiency of the front-office and back-office. This research is crucial to bringing in fresh thinking that identifies the key context to effective implementation of Enterprise Resource Planning backed by insights on technical capabilities and helps to know the key success factor of Enterprise Resource Planning with implementation Research was conducted using on-line survey of 150 top-level respondents who use Enterprise Resource Planning framework. This online survey has received feedback from 46 respondents. This result shows that the technical resources that the organization has will affect the effectiveness of implementation of Enterprise Resource Planning.

Abiot Sinamo Boltena (2012) analyzed that implementing ERP systems is more troubling than developing a computer application. In this article the researcher provides a case study on the implementation of a medium-sized company's Enterprise Resource Planning program in Ethiopia. I MY Pvt. Ltd. is a large incomparable metal construction and engineering of mechanical devices, and has recently adopted and enforced an Enterprise Resource Planning system. The article examines key dimensions of MIE 's implementation of the Enterprise Resource Planning system and takes a thorough look at the issues behind the implementation of the Enterprise Resource Planning method by focusing on business and technical issues as well as cultural issues in the MIE

implementation guts. The case study jointly appears at the implementation risks and reports on how MIE coped with the standard challenges faced by almost all medium-sized organizations once an Enterprise Resource Planning system had been implemented.

Rajesri Govindaraju (2012) finds that many companies have invested large investments on ERP implementations, but only a small number of them are successful with implementation. The study here aims to develop a framework that can facilitate a much better understanding of how the process can be managed to bring the advantages to the implementing organizations by realizing the potential advantages offered by ERP implementations and thus the high failure rate found in practice.

Jiantao Zhao et al. (2012) focused on the performance in implementing Enterprise Resource Planning. Enterprise resource planning plays a very important part in the management of company production and engineering. With the wide application of Enterprise Resource Planning, it is particularly necessary to analyze its application performance in order to perpetually improve its results for implementation. Project performance analysis of Enterprise Resource Planning is a holistic idea that involves multiple aspects and needs to mix qualitative and quantitative analysis. To evaluate Power Company's success in implementing Enterprise Resource Planning, this article first developed a systematic indexing framework for research. Secondly, the Enterprise Resource Planning implementation performance engineering research model was based on the grey whitens triangle feature. Therefore, this article explains the performance improvement approach of implementing the Enterprise Resource Planning project. Finally, the efficacy and feasibility of the proposed approach was checked through empirical study.

Augusto A. Pacheco-Comer et al. (2012) submitted that ERP system is necessary to optimize business. The failure rate of implementations in Enterprise Resource Planning is becoming high. A big performance problem is the selection factor. The article presents the primary findings of empirical research in which they appear to consider a relationship between corporate size and investment quantity. Business Intelligence and Client Relationship Management are other enterprise systems that may be seen as necessary to incorporate into the Enterprise Resource Planning Evolutionary process computing, Multi

Agent Structures, and Petri Nets are also used to model the Enterprise Resource Planning approach framework as procedural intelligence techniques.

Dr. Manas Kumar Sanyal & Sajal Kanti Bhadra Sudhangsu Das (2012) states ERP systems are accepted methods for Indian businesses to increase their supply chain and business performance to meet the robust international challenges they face. Enterprise resource planning provides market advantages and enhances a company's numerous wings with quick response and low selling price. However, Enterprise Resource Planning implementation entails intercalary uncertainty and ends with complete failure and loss of substantial investment eventually. This research analyzed and identified significant problems in the implementation of enterprise resource planning in the Indian industries. Ishikawa analysis was applied to detect the major problems for Indian industries as they were fully implemented throughout Enterprise Resource Planning implementation. A sampling methodology was used to gather primary data from Indian firms. The findings show that inadequate methods of implementing the program, lack of specified procedures, unsuitable design and broad flexibility designed for implementation, etc., have critical effects on the implementation of Enterprise Resource Planning.

Shahin Dezdar (2012) aims to examine the factors that make users happy with Enterprise Resource Planning and to find out whether or not the satisfaction of Enterprise Resource Planning users differs among completely different profiles of users. The study was carried out in an organization in Iran using a survey form distributed to Enterprise Resource Planning users. It gathered and analyzed 384 responses. The findings show that young users of Enterprise Resource Planning tend to be very happy with the Enterprise Resource Planning systems. Enterprise Resource Planning users with a lot of information technology experience and also a lot of educated users are very satisfied with the Enterprise Resource Planning software. The study also found that there were no variations in satisfaction between male and female users.

Young Hoon Kwak et al. (2012) aimed to provide an alternative view of user acceptance on ERP. This study incorporates the most efficient practices of implementation of the Enterprise Resource Planning system, which are consultant support, internal support and practicality choice, into the extended TAM that has constructs of belief and socio-environmental building. Empirical analyzes show that socio-environmental issues in the

context of the Enterprise Resource Planning system are significantly associated with the first TAM variables. The findings are that the advisor support negative outcome on perceived utility, however positive outcome on perceived simple use, suggests a useful reference for future analysis. Furthermore, this research would support project-based industries by offering useful insights into social control that would shift them to recognize and increase acceptance of the Enterprise Resource Planning framework by end users.

Nazli Sadat Safavi et al. (2013) addressed ERP implementation in medium-sized enterprises. Successful implementation of Enterprise Resource Planning system is essential for companies to take care of their risks. Implementation of Enterprise Resource Planning is disruptive and expensive for medium-sized enterprises. The researchers hypothesized a relationship between the risk factors of two parts of the firm, the re-engineering of business processes and the appropriate system. The study also investigates the connection between the costs involved in implementing Enterprise Resource Planning and the success of the Enterprise Resource Planning project in order to improve the Enterprise Resource Planning project in relation to SMEs.

Huseyin Ince et al. (2013) suggested that ERP is a very important tool for the planning, info flowing, execution and controlling of business processes related to the sources of the premises deployed by the companies in several places. Supply Chain Management activities are the businesses' extroverted doors to ensure shared profits of their own systems. Successfully applied and integrated Enterprise Resource Planning program and Supply Chain Management activities provide advantages in preparation, decision-making, implementation and can improve the efficiency of companies this study examines the scale of supply chain management practices and systems for enterprise resource planning, and tests the connection between competitive advantage and firm performance. The research had been extended to the executives of 138 Turkish firms. Examination of the route was used to test hypotheses for the study. Implementations of the Supply Chain Management and Enterprise Resource Planning framework have shown that the Supply Chain Management techniques and the Enterprise Resource Planning framework had beneficial impacts on company efficiency and competitive advantages.

Ravi Seethamraju et al. (2013) examined the conflicting essence of past research of the results of Enterprise Resource Planning systems on agility, and minimal study of the post-implementation effects of Enterprise Resource Planning systems on lightness. Using a cross sectional field study, this study analyzes how key shaping options affect agility in the environment of enterprise system integration, method improvement, and best practices. Process standardization has mixed agility results and relies on the level of applied standardization and whether or not prior simplification has been implemented. The inadequacies in implementation and poor method improvement before implementation of Enterprise Resource Planning are restricting agility instead of the setting enabled by the Enterprise Resource Planning system.

S. Rouhani et al. (2013) identified ERP as a model of replacement info-systems. Attaining a correct level of success in Enterprise Resource Planning, however, depends on a spread of things associated with a corporation or project setting. In this article the concept of predicting successfully supported structure profiles of Enterprise Resource Planning post-implementation was mentioned. The need to shape Enterprise Resource Planning organizations' perceptions, an expert framework was developed by leveraging the Artificial Neural Network methodology to express the relationships between certain structure variables and effective Enterprise Resource Planning. The knowledgeable role of the system is in the preparation to gain knowledge from the new companies that would like to implement Enterprise Resource Planning, and to predict the likely success level of the system. Ultimately, structure profile factors are recognized, and an ANN model is developed. Totally 171 data from companies that practiced Enterprise Resource Planning were surveyed. The qualified experienced method forecasts, with a high median correlation coefficient of 0.744, and supports the concept of positive dependency of Enterprise Resource Planning on structure profiles. In addition, a complete correct classification rate of 0.685 suggests smart predictive ability, which may promote corporations' prediction of performance in Enterprise Resource Planning prior to program implementation.

Samira Sadrzadehrafiei et al. (2013) focused on identifying the benefits of implementation of the Enterprise Resource Planning system. The competitive setting of the company is being liberalized and globalized, so the organizations want greater

interaction between their stakeholders, particularly the dry food packaging business. One of the problems facing organizations is the segregation of the corporate functions within a company. Thus, the company practiced the implementation of Enterprise Resource Planning systems to find this drawback. The Enterprise Resource Planning systems have not been sufficiently effective in distinction, and are therefore unable to realize all the intended results**.** Therefore, a complete understanding on the benefits of applying Enterprise Resource Planning is required to make the effective implementation of the program. This study seeks to identify and classify the benefits of implementing Enterprise Resource Planning system in the dry-food packaging business. The approach of this study consisted of three phases: outline the advantages of applying Enterprise Resource Planning framework from the present literatures, classify them into political, tactical, and operational advantages in every organizational role. These Benefits of Enterprise Resource Planning are summarized in this article as a finding to help managers successfully implement Enterprise Resource Planning system.

Samwel Matende & Apostle Ogao (2013) looked at user engagement during the introduction of Enterprise Resource Planning. Introducing a data system such as Business Resource that comes up with framework in a company brings improvements to how users work with it. An Enterprise Resource Planning program cuts through a corporation's numerous useful units and thus may result in user resistance if not adequately handled during its implementation. The numerous theoretical sources on Enterprise Resource Planning programs primarily concentrated on implementation of Enterprise Resource Planning, assessment of performance, and essential success factors. There are a number of user engagement studies and users' contribution to the effective implementation of Enterprise Resource Planning programs. This article discusses literature on implementation of Enterprise Resource Planning with the goal of creating a case to include users during this implementation.

Rastislav Rajnoha et al. (2013) identified implementing procedures that are critical for implementation of Enterprise Resource Planning. Business Resource Management systems are highly sophisticated enterprise management systems. An empirical and theoretical analysis of a method of implementation of Enterprise Resource Planning is conferred and stated in terms of the main factors. The main objective of this study is to

increase the efficiency of the implementation of Enterprise Resource Planning systems in industrial corporations and to reduce the risks associated with the implementation of the Enterprise Resource Planning system. The implementation of enterprise resource planning systems among industrial corporations was analyzed to form an acceptable methodology. The researcher defined the shortcomings based on the theoretical analyzes and realistic analysis accomplished by shape survey. In their view, the expected framework for implementing Enterprise Resource Planning programs in an industrial organization would remove these deficiencies. Our focus is on the most critical aspects of application of the Enterprise Resource Planning programs.

Achmad Nizar Hidayanto et al. (2013) underlined that ERP could be a product that allows companies to achieve their competitive advantage. This study was conducted to determine the firms' readiness to implement the Open Source ERP, based on 3 classes namely firm structure, change management, and project management. The research interacts with the Technical Director, Project Manager, and Chief Strategy Officer. The results showed that the firms are not prepared to embrace and adopt Open Source ERP even though the firms have ample human resources; they are poor in various ways to boost their readiness before implementing Open Source ERP

Lucian Pitic et al. (2014) analyzed the implementation of corporate resource planning in SMEs. The primary steps to introduce an Enterprise Resource Planning solution to a small or medium sized enterprise are essential for successful implementation. In this article a structured approach is projected for the analysis and selection of Enterprise Resource Planning. The Enterprise Resource Planning solution developed roadmap combines specific approaches to quality management and the selection and implementation of business-connected software. This system is based on the "keep it simple" principle that addresses several relevant dimensions and criteria within the method of selection. This focuses mainly on the ease of implementation and use of small and medium-sized businesses, the key target being the business members responsible for leading the choice process.

Ahmed A. Fares et al. (2014) attempts to ex**a**mine the motivations and thus the potential impacts of implementation of Enterprise Resource Planning in a healthcare institution in Egypt. A methodological approach for the case study has been used. In line with six

motive teams, the study investigated motives that tagged managerial-strategic, clinical-strategic, managerial-operational, technological, clinical-operational, and money motives. Five different classes have been projected for the impacts of implementing Enterprise Resource Planning; these are process, technology, patient, people and money. Results suggest that clinical operations – administrative and operations – are necessary motivational teams.

Firdous Bano (2014), dispensed with knowing key issues in Indian firms for successful full implementation of ERP. Several companies have implemented Enterprise Resource Planning and others are seeking to follow with a wait and see approach due to the uncertainty of such advanced and costly project's success. But, considering the advantages of successful complete implementation of the ERP project worldwide, it is a timely effort to find out about problems in implementation of Enterprise Resource Planning. Implementation of ERP may also be of low caliber if the downside encountered before and after implementation is not handled adequately and leads to less overall benefits from ERP. Management needs to anticipate and address such issues quickly. Case studies of implementing Enterprise Resource Planning in 2 Indian companies are established during this report. The case is developed by putting together information from published sources. The findings suggest that modification in management , internal folk coaching, and integration of enterprise resource planning with various systems are few key issues that require management attention to implement Enterprise Resource Planning.

Mustafa (2015), this study is conducted on 220 workers involved in implementing ERP in an international consumer product business to examine the Critical Success Factors and their outcomes from the user perspective of achieving Enterprise Resource Planning performance. Studies suggest that differences in Critical Success Factors are viewed as significant and have a real effect on the execution of Enterprise Resource Planning. The study shows that the performance of ERP implementation depends on the vendor's selection of ERP software, review of ERP software, testing and implementation of ERP software and, finally, help.

M. K. Gandhi et al. (2015) stressed that in a varied organization, ERP applications are enforced to change the organization's processes. Organizations face varied problems in terms of opposition, non-cooperation, confrontation, actions against the organization's

interest, etc. during the organization's implementation, for varied reasons. Some of the problems are triggered by internal workers that should be averted. These issues are sensitive, difficult and will result in delay of implementation of Enterprise Resource Planning, or typically result in failure. This research describes the key issues and offers solutions to the problems.

Sanjay Mohapatra et al. (2015) discusses the use of the Technology Acceptance Model for implementing public sector Enterprise Resource Planning in India. The Technology Acceptance Model is used to search for determinants that need to be considered at individual level for implementation of the Information System. The study used primary data survey to analyze numerous factors that wedged organizational-level implementation of Enterprise Resource Planning and thus identified determinants in the Software Acceptance Model. By tuning the structure, the structure built out of this study can be tried out in different organizations.

2.3.7 Advantages of ERP

There's no question about the value of ERP in every organization. Below are some of the key benefits listed (Garg et al, 2006)

- Reduced cycle time for Preparation
- Reduced cycle time at production
- Inventory reduced
- Reduced Order Error
- Reduced requirement of manpower
- Allows quicker reaction to changing market situations
- Improved resource utilization
- Raising customer satisfaction
- Allows globalization

ERP can improve enterprise quality and efficiency. By keeping the internal business processes of a organization running smoothly, ERP can lead to improved results which can benefit the company , for example in customer service and manufacturing.

ERP assists senior level management by supplying decision-making information. ERP enables a more agile enterprise that adapts to change better. ERP makes a business

progressively adaptable and less inflexibly organized with the goal that the association's segments work all the more solidly, boosting the business – both inside and remotely.

ERP could improve security of the data. A that monitoring system, such as the kind provided by ERP systems, helps companies to ensure that crucial company data are not more easily compromised. ERP provides greater collaboration incentives. In modern business data takes many types. Documents, files, forms, e-mails, audio and video. Nearly every data medium has its own collaboration mechanism. ERP offers a shared forum that encourages staff to spend more time working on content rather than mastering the learning curve of interacting in multiple formats through distributed networks.

- **Enhance the quality and accessibility of the data-** A unified database is the predominant feature of ERP, which connects an organization's various levels and departments. With a single data source that is collected, consolidated, organized and analyzed automatically (without largely human input), you get accurate and reliable information to guide decisions. You can control and set user permissions by ERP systems so that only the right people can access the right data whenever they need to. With most cloud-hosted ERP applications and multi-device support, when on the go, your people can access data remotely.

- **Increase Planning and Reporting-** These are a direct consequence of having one source of information. You can generate reports of any kind quickly-financial, sales, operational, inventory, procurement, administrative, etc. Similarly, ERP's analytical capabilities greatly support corporate planning by providing you with detailed insights and useful business performance and operational status metrics.
- **Enhance collaboration.** Better collaboration is another result of readily available data and company-spanning information. An ERP platform simplifies the process of communication between teams and employees by granting them on-demand access to data through organizational units.
- **Visibility improved**. ERP is cohesive and streamlined functional framework offers consistency and visibility within your company. Even on a daily basis, an example is monitoring the status of your inventory levels, letting you know current and incoming inventories, so you can handle your working capital precisely.

- **Improved supply chain.** An ERP platform can boost your supply chain, making it more responsive through better demand forecasting, improved inventory management, and, among others, efficient procurement. A well-managed supply chain opens up opportunities for creative production and helps cut costs.
- **Enhance customer satisfaction.** ERP isn't super programming, yet an assortment of utilizations to deal with various practical territories, for example, CRM, HR, money related bookkeeping, online business and others. All of these are placed under the ERP umbrella to ultimately provide the best experience and utmost satisfaction for your customers when dealing with your business, products and services.
- **Shrink time and energy.** ERP software automates tasks and procedures resulting in a substantial reduction in time, energy and money expended on routine, repetitive manual activities. This frees employee time to concentrate on other revenue enhancement tasks. In turn, ERP is encouraging the introduction of company-wide industry best practices to further boost productivity.
- **Reduce cost.** An organization of efficiently operating units that operate together redounds optimally to cut costs and increase performance.ERP software is a single set of applications and tools that can significantly reduce IT related expenses such as administration, maintenance, infrastructure needs, program licensing, and training requirements because users only need to learn one framework instead of several different programs. Acquiring an ERP suite requires considerable budget outlay, but you will find that your overall cost savings outweigh your investment over the long term.
- **Facilitate regulatory compliance**. ERPs make regulatory compliance processes easier by combining secure and validated data with built-in reports. ERP software assists in producing information that federal, state and local regulatory bodies require.
- **Facilitate data unification.** Modern businesses' life-blood is data, and ERP software is designed to handle, process, analyze, manage, and unify data across functional units and multiple organizational systems. An important aspect of data handling is to have a central repository of information that is facilitated by an ERP, allowing you

to control and determine who can see, edit and share data to ensure its reliability, accuracy and uniformity.

- **To promote structured and streamlined business.** Most ERP systems are built around proven business processes and good industry practices that help you deliver consistent and effective results. Because ERP software automates most business activities, it helps eliminate errors, facilitates planning and reporting, and supports department-wide process synergy.

2.3.8 Disadvantages of ERP:

According to (Krishnadan 2017) certain drawbacks of ERP are described below,

- The cost is too high for ERP Applications, planning, installation, setup, testing, implementation etc.
- ERP implementations are very time consuming – it can take 1-3 years (or more) for projects to be completed and fully functional.
- Too little customization does not incorporate the ERP program with the business process and too much customization can slow the project down and make upgrading difficult.
- Cost savings / payback may not be made immediately after the implementation of the ERP and it is very difficult to measure the same.
- User engagement is very critical for the effective implementation of ERP projects thus, extensive user training and a simple user interface may be crucial. But generally speaking ERP systems are hard to learn (and use).
- Additional indirect costs may arise due to the implementation of ERP-such as new IT infrastructure, upgrading of WAN connections, etc.
- It is difficult (or impossible) to migrate the existing data to new ERP systems. Equally important (where possible) is the convergence of ERP systems with other stand-alone software systems. When attempted, such tasks will consume a great deal of time, money & energy.
- ERP implementations in decentralized organizations with differentiated business processes and systems are difficult to achieve.

- Upon implementation of the ERP system it becomes a single vendor lock-in for further upgrades, customizations etc. Companies are at the sole vendor's discretion and may not be able to effectively negotiate for their services.
- ERP can cost more than less integrated solutions, or less comprehensive.
- High ERP conversion costs can increase the ERP vendor's bargaining leverage which may increase the cost of service, repair and upgrades.
- Management attention can be diverted from overcoming resistance to sharing sensitive information between departments.
- Really independent enterprise integration could create unnecessary dependencies.
- Extensive training needs draw resources from daily operations.
- ERP systems are not well adapted for production planning and supply chain management (SCM) due to the ERP architecture (OLTP, On-Line Transaction Processing).
- Harmonization of the ERP systems can be a difficult challenge especially for large firms and requires a lot of preparation.

2.3.9 ERP adoption explanation

(Rao, 2000)ERP implementation can include a number of issues including costs, technological understanding and human resource constraints. Edward et al. (2003) developed a life cycle model of the ERP system based on that provided for ERP adoption by Esteves and Pastor (1999). That included six stages of adoption, as follows:

1. **Adoption and decision-making:** early preliminary stage where preparatory work could begin leading to an appropriate decision on the selection of ERP applications.
2. **Acquisition:** Satisfy necessary criteria to promote the process of implementation.
3. **Implementation:** Implementing an ERP program in realistic terms. This involves the start to finish of the ERP project.
4. **Use and maintenance:** Post 'go live' use and continuous maintenance of the ERP application, providing support to business.
5. **Evolution:** ERP product improvements and evolution within a company.
6. **Retirement:** Removal of the application and replacement with another product.

ERP adoption is a transitional process from one state of functional operability to another. There are many factors of motivation that would help organizations adopt an ERP system. These include the ability to integrate and standardize flexible client server architecture, the ability to drive effective business reengineering, and core and support process management. On the other hand, one of the major issues that an organization faces during ERP adoption is the level of flexibility that the system provides, allowing for dynamic reconfiguration to describe new business model and process. Companies must integrate their data processing system with newly acquired business functionalities with minimal effort (Gupta, 2000).

When taking the decision to implement the ERP, the effects of conventional external variables (including cultural , economic and macro environmental factors) and organizational variables (including internal political , strategic, financial management factors) must all be considered for successful decision-making (Ugrin, 2009). In other words, when deciding on the suitability of the ERP program the internal organizational and external environmental variables should be considered collectively. Ugrin (2009) further argued that structural considerations would in certain cases outweigh conventional systemic analyzes and result in the organizational adoption of ERP even if the technology does not suit the organization. This illustrates the impact of organizational influences on the decision to pick an ERP and on the application being adopted.

Aladwani (2001) suggested adopting an ERP low cost strategy. This strategy was argued to help organizations survive in a competitive market. Organizations need to increase the adoptability rate for new applications and encourage end-user acceptance by generating the net outcome of adoption processes and effectively communicating the outcome (Amoako, 1999).

Finney (2011) identified communication as the required component for successful adoption of ERPs; especially when considering activities such as adopting change, managing change and implementing an effective knowledge transfer strategy. Effective communication from pre-planning through to implementation should be considered an integral part of ERP adoption. Law et al . (2010) stated that, in general, companies tend to remain focused on post-implementation aspects from the beginning through to ERP

implementation but completely neglect them. This might compromise the ultimate outcome of ERP, even after successful delivery of the ERP project.

Brown (2002), Al-Mashari (2002) both mention that most multinationals use ERP software packages and many small and medium-sized enterprises have now adopted or are in the process of adopting these packages. Organizations of all sizes and types are rapidly implementing ERP systems, attempting both to prevent technological obsolescence and to create sustainable competitive advantages. Choosing the right IT / IS investments and implementing them successfully can be a significant factor in maintaining the success and competitiveness of companies. ERP systems can integrate all business processes and functions to improve efficiency for organizations.

A common criticism, however, is that, when adopting ERP, companies do not give due consideration to business intangibles which produce strategic and operational long-term benefits. ERP investment evaluation as very nuanced, and as IT has become more sophisticated over time, companies may never completely understand the full range of benefits and costs associated with it. Hence, both the high degree of uncertainty and the level of investment associated with the adoption of ERP imply that project justification should take on great importance (Irani et al., 2001). The justification process for the project is a major concern for businesses considering the construction of any IT / IS infrastructure and can put at risk their competitive advantage. Adopting new technology, particularly ERP, can easily be one of the longest, most costly, and most challenging tasks a organization can undertake.

Adopting an ERP program in a company is the first step towards implementing ERP which leads to improved efficiency, increased performance and the competitive advantages discussed in the section above. There are quite a few drivers influencing adoption of ERP. In the literature, these drivers are defined as reasons why companies can adopt ERP systems, and when. Drivers are divided into three categories, namely: infrastructure, performance and capacity (Ross and Vitale 2000). Other researchers like Parr and Shanks (2000) consider various driver groups including: technology, operation, and strategy. Technology is the common driver amongst both researchers. Technology driven companies are pioneers in the adoption of ERPs as they perceived opportunities along with ERP systems deployment. Such enterprises use ERPs to consolidate all the

different business operations among the various functional areas. ERP systems, Markus and Tanis (2000), have a centralized data position to extract information and make more specific decisions. ERP adoption and implementation is not deployed by large-scale companies alone, but many small and medium-sized enterprises have also begun the process of adopting and implementing ERP systems with a competitive advantage in their market share. SMEs are seeking to restructure and streamline their internal and external operations through the implementation of ERP systems. In certain cases, SMEs were required to implement ERP systems by large-scale organizations in order to be connected to and able to continue to collaborate with external organizations. However, several small and medium-sized companies have already started the process of adopting and introducing ERP systems with a competitive edge in their market share. SMEs seek to restructure and streamline their domestic and external operations by implementing ERP systems. In certain cases, large-scale companies needed to develop ERP structures for SMEs to be linked to and able to continue communicating with outside organizations. ERPs need a well-established ICT infrastructure for a firm to function properly, and companies with strong ICT infrastructure are likely to adopt ERPs. Thus, together with the IT, an up-to - date ICT infrastructure is crucial elements for the successful implementation of ERP by large companies. Seethmraju and Seethmraju (2008) argue that there is yet to be a clear identification of what determines the CSFs for the implementation of ERP in large companies.

2.3.10 ERP adoption Benefits

The perceived advantages of ERP systems impact strongly and positively on the adoption of ERP. Both Utecht et al (2004) see companies benefiting from ERP by transforming their operating processes to enhance information management, reduce costs, streamline business processes, increase product diversity, create ties with business partners and reduce response times to customer needs. Companies that successfully implement integrative technologies have been viewed as highly competitive in the global market.

Production prospects

Investing in ERP can extend the reach of process capital of an enterprise by integrating activities and flows of information across function units, geographic units and extended partners (Sambamurthy et al., 2003).

Integration of jobs and places of work

Utecht et al (2004) states that an essential feature of an ERP program is the ability to optimize information management through various business functions and sites which can often be located in different geographic locations. Furthermore, ERP systems have the potential to take language translation into account, thus enabling more efficient contact between sites located in different countries.

Enhance customer relationships

ERP systems are designed to have the ability to communicate with suppliers and business partners, which eliminates issues with the activities between customers and suppliers, as well as supply chain business partners (Beheshti at al . , 2014). Markelevich & Bell (2006) view ERP as a forum for electronic business applications enabling businesses to minimize their production costs and control their supply chains and customer relationships better.

Cost Reduction

Gefen & Ragowsky (2004) examines the relations between the manufacturing companies market characteristics and the advantages of ERP systems in 270 manufacturing organizations. Researcher finds that businesses with an ERP program will reduce lower raw materials costs, which contributes to a higher profit margin. Sumner (2000) uses case studies to analyze seven organizations which are defined by project managers as having ERP project rationale and risk factors. They find that the cost reduction is cited as one of the main reasons for starting an ERP project along with inventory reduction and data integration.

Strategic Planning information

Companies are spending large sums of money on information systems with strategic values expected to hold. ERP's contribution to an organization's strategic value development depends on many important factors like proper implementation and efficient

management of its organizational efficiency over its lifecycle. ERP system, if properly planned, deployed, and implemented, acts as a value enhancer empowering three value generators (operational and process efficiencies, information delivery, and new knowledge creation) to contribute to an organization's strategic value creation (Dong et al, 2007).

Proper decision-making

Utecht et al (2014) look at ERP to enhance the incorporation of information or data across an enterprise's functional areas. This is vital to effective decision-making and to the gaining of competitive advantage. Businesses may make accurate and timely information available via ERP for all operations within a company. That facilitates more efficient and creative organizational decision-making. Holsapple & Sena (2005) examines the interactions between ERP systems and decision support systems based on fifty three organizations implementing ERP systems, and concludes that integrating operations and data is the most significant ERP objective, mainly because system integration can help promote informed decision-making rapidly.

2.4 ERP in India

(Thapliyal 2012) HLL, Maruti Udyog Ltd ONGC, ESSAR, BASF Godrej Soaps, Cadburys, Telco, Citibank,Century Rayon, ANZ Grindlays ACC, Blue Star, German Remedies, Rallis India Mahindra & Mahindra, Sony India Pvt are among the first Indian companies to have embraced the ERP process. Indal, Ceat Ltd., Knoll Pharmaceuticals, Kirloskar, Ford Motors and Glaxo. First-tier companies (those with turnover higher than Rs.10 billion) are introducing ERP to improve internal productivity and profitability outside. Once ERP is formed at this stage, these large corporations start to wish their suppliers similarly increased performance. Second-tier firms are therefore pressured to implement ERP, resulting in a trickle-down effect. Strengthened by the axiom that a chain is only as strong as its weakest link, Indian industry has quickly recognized that ERP must be applied at all levels in order to operate at full performance. Initially, the majority of ERP solutions were marketed to companies with more than Rs. 2 billion and generally, according to industry reports, the overall cost of deploying ERP ranged from 1

to 2 per cent of gross sales by companies .Accessible lower cost solutions to companies of comparatively small size. Although the market appears to be very encouraging for ERP implementation, there may be a problem with the timeframe for deployment. However, since many businesses who have not yet adopted ERP are pioneers in their markets, it can fairly be concluded that within the next five years they will go there for it. The ERP market should actually grow at a rate somewhere close to the rate of industrial growth. Several industry segments including Automotive, Steel, Consumer Durables, Technology, and Textiles display very high ERP penetration. Subhash Chander Verma (2013) MIDC Pimpri-chinchwad has mentioned that small-scale industries are the backbone of the Indian economy in a study of ERP factors responsible for growth, sickness and mortality of SMEs. By providing semi-finished parts at very competitive costs, they satisfy the need of large-scale industries. He also listed the factor that influences SME growth & the reasons that contribute to SME sickness.

According to (Vignesh, 2018) Enterprise Resource Planning (ERP) is the best and most effective technology available that Indian Startups can adopt to survive the competition. They concentrate on the available technologies that Startups can implement to optimize benefits by making fast and precise decisions such as ERP.

Garg and Khurana (2013) introduced selection criteria for Indian SMEs for the ERP product. The results of this research will help ERP software companies' marketing and sales department strengthen the key points and also allow end users to make educated choices when choosing the organization's ERP kit.

Medium-sized firms in India are relatively late ERP adopters (Sharma et al, 2012), and thus the adoption of ERP in medium-sized firms provides an perfect environment for studying the effect of isomorphic strain.

(Muscatello et al, 2003; Garg and Garg, 2013; Mabert et al , 2003)These programs, however, also face major challenges, including high implementation costs, the need to re-engineer business processes, extensive organizational changes and the training of large numbers of personnel. The Indian market had been highly protected before the 1990's (Dangayach and Deshmukh, 2006). Businesses of all sizes have had to compete more with multinational companies following liberalization (Wilson and Keim, 2006; Thakur and Jain, 2006). It has led to the rapid implementation of IT systems such as ERP to

boost performance, enabling the Indian Universities to provide world-class professional education standards (Thatchenkery et al, 2004; Golley and Tyers, 2012). Despite these prominent features of the Indian context, studies undertaken in India on the adoption and implementation of ERP found similarities with other countries. Ahmad et al (2014), for example, compare the twelve rationales for adoption across international and Indian firms, and find the same rationales in both. The frequency of occurrence of the rational is slightly different, but the authors do not provide possible explanations for this. Kale et al (2010) find that ERP-adopting Indian SMEs realize similar advantages and have similar success factors in other countries. Investigation of the economic and technical factors influencing the implementation of ERP in Indian retail firms finds that ' the results are largely consistent with studies in other developed countries' (Garg and Garg, 2014, p.441).

(Kale 2014) ERP systems create a systematic way of operating and provide greater accountability for the organization's work. SMEs in India are the backbone of the economy, and face global competition today. Indian small and medium-sized enterprises have been forced to adopt modern business practices and strategies which can, in effect, give SMEs a cutting edge over their competitors. Hence it becomes imperative that they look for ways to adapt to the competitive markets. For most large corporations ERP systems have become the most popular IT technique. SMEs step towards ERP systems, too. They need to take a proactive approach to ERP and see it as a business solution instead of a mere IT solution. Also though the ERP market is growing, and ERP vendors have shifted their emphasis to the SME sector, many concerns need to be addressed. First, it is important to make 'ERP conscious' of SMEs. Vendors need to micro-verticalize the ERP system to best meet SME requirements. Given that SMEs' financial resources are limited, the cost of the ERP system needs to be reduced further. On their part, SMEs need to carefully analyze their existing IT systems and record their shortcomings when building a wish list of what they want to achieve. (Confianzys Consulting Pvt. Ltd 2010) Enterprise Resource Planning (ERP) can be defined as using an integrated software package to bring together diverse business departments such as Manufacturing, Finance, Human Resources, Payroll and Sales. For practice, companies may choose to merge separate divisions where coordinated work and visibility are seen as vital to cost

optimisation and productivity. ERP is not new to the Indian market; but the Indian market for ERP is highly fragmented compared with developed markets. The Indian Packaged Computer Market Report (2009-13) by IDC placed the domestic demand for ERP at $263.3 million in 2008. SAP AG (the world leader), Oracle Corp (which has absorbed other ERP vendors such as PeopleSoft and Siebel), and Microsoft Corp., a relatively late entrant and smaller player, are the three major players on the sector. The presence of these big guns has not prevented other smaller players from attacking the market, with many of them constructing completely customized solutions and thus not adhering strictly to the definition of an ERP system.

2.5 History of Indian Automobile sector

(Srivastava, 2014) Jamshedji Tata was the first vehicle to be driven on India's roads in 1897 and the first Indian to own a vehicle in 1901. It was in 1942, before independence from India, that Hindustan Motors produced India's first car. Cars had been imported directly until the 1930s but it was a very small number. Main emergence of the automobile industries in India was in the 1940s. Hindustan was launched in 1942 and its longstanding Premier rival in 1944. These two products were built by GM and Fiat respectively. Two brothers formed Mahindra & Mahindra in 1945, and assembly of Jeep CJ-3A utility vehicles began. Post-independence, the Government of India and the private sector made efforts in 1947 to establish a manufacturing industry of automobile components to supply the automobile industry. An import substitution program was introduced in 1953 to enable the importation of fully built-up vehicles. From the 1960s until mid-80s, the Hindustan Ambassador dominated India's automobile market. However, growth in the 1950s and 1960s was relatively slow due to nationalization and the licensing raj which in many ways hampered the Indian private sector. The automobile industry began to grow after 1970 and was mainly driven by tractors, commercial vehicles and scooters, but automobiles were still a major luxury item. Price controls were abolished in the late 1970s, bringing a competitive dimension into the automobile industry. Hindustan and Premier dominated the automobile industry in the 1980s, selling superannuated goods with relatively small numbers. A few competitors began to arrive on the market during the 80's. Finally, after liberalization, foreign automakers including

Japan's Suzuki and Toyota and South Korea's Hyundai were allowed to invest in the Indian market leading eventually to the creation of an automobile industry in India. Starting in the 1980s, Maruti Suzuki was the first and most popular of these new entrants in the automobile industry.

When India started its liberalization there in 1991, a number of international companies formed joint ventures with established Indian firms. In the nineties, the number of choices to choose from to the customer started to increase, while in each price class there had been normally only one choice before. By the year 2000, the Indian market had 12 big automobile companies and most was offshoots of global firms. Exports were slow to grow and small vehicle sales to tertiary markets and neighboring countries began early, and 480 vehicles were shipped to Hungary by Maruti Suzuki in 1987.

Despite some growth in the mid-nineties, exports started to drop again as other countries were better companies than Indian producers. This was not to last as India produces low-priced cars for worldwide markets today. Given the global economic crisis, global brands such as Proton Holdings, PSA Group, and Geely Holding Group have plans for India as of 18 March 2013. India's automobile industry is one of the largest compared with the world economy. Each household now has a vehicle and Indian is a home to 40 million passenger vehicles showing the automobile industry has been able to provide the correct vehicle match for this huge Indian population.

Automobile vehicles are categorized into the following different types:-

- Four wheelers
- Three wheelers
- Two wheelers

With an annual production of over 3.9 million units in 2011 and 4.15 million vehicles in 2012, India's passenger automobile and commercial vehicle manufacturing industry ranks among the top ten in the world. According to recent estimates , India has surpassed Brazil to become the world's sixth largest passenger vehicle manufacturer, and selling around three million units in 2011-12 has increased by 16 to 18 percent. India is also the fourth biggest passenger car exporter in Asia in 2011, behind Japan, South Korea and Thailand. Previously, the automobile industry had one of the highest growth rates in India, but the growth rate has recently declined to a sluggish to negative. Yet despite this fact , India

manufactured more than 3.7 million automotive vehicles in 2010 an increase of 33.9 per cent, making India the world's second fastest growing automotive market after China in that year. According to the Indian Automobile Manufacturers Association, annual vehicle sales are expected to increase to 4 million by 2015, to which 5 million were previous estimated. In 2011, the auto industry had 3,695 factories that manufactured automobile parts in all of India. The average company made an annual income of US$ 6 million, with a profit of nearly US$ 400,000.

2.6 India & Automobile sector

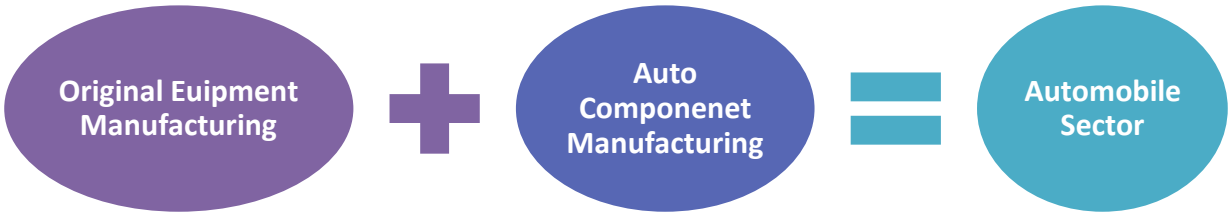


Figure 2.6: Automobile sector combination
Source: SIAM report 19-20

According to SIAM, the automobile sector is nothing more than a mix of the original equipment manufacturing organizations and the organization of the manufacture of auto parts. And India's automobile industry is among the worlds largest. During the last three decades it has seen very high rates of production. By the year 1975 or so, India had 3 or 4 car, scooter, and commercial vehicle manufacturers. Cars were built by Hindustan engines, Premier Automobiles, and Standard motors. The famous makes Vespa and Lambretta were for two wheelers. Tata motors and Ashok Leyland designed the commercial vehicles. Over the last three decades the automobile industry has experienced very high growth rates. Depending on the type of vehicle, the order of growth rates was 9 to 18 per cent. The average growth of two wheelers, for example, was around 10%, while passenger vehicles increased by 13 to 18%. India is currently third largest country in motor vehicle manufacturing. Nearly all the foreign automobile firms, such as: Suzuki, Honda, Hyundai, Ford, Toyota, Volvo, etc., have set up their plants in India. The current

rates of sales of various types of vehicles brought together amounts to USD 38.3 billion, which is approximately 8 percent of India's GDP. The explosive growth of the automobile sector has benefited the Indian economy by creating huge opportunities for jobs.

(Sarwade, 2015) The Indian automobile market is a promising industrial sector, growing enormously every year. The automobile sector has a huge opportunity to generate new wealth by taking value to the world as well as to domestic consumers. India's four-wheeler industry hasn't been able to suit its counterparts' success in other parts of the world. The primary explanation for this was the regulatory climate that existed through the mid-1990s before the deregulation. The passenger car segment saw a boom after the liberalization and many companies from India as well as abroad entered the market. Government abolished licensing with liberalization and removed restrictive trade policies. Those measures greatly benefited the automobile industry. The automobile industry in India, after Japan, South Korea & Thailand, happens to be the ninth largest in the world. India emerged as the 4th largest automobile exporter in 2009.

(Jadhav 2015) The automobile industry comprises producers of OEMs and automobile parts. The automobile industry plays an important role in any country's development and economic growth. Since 1991 the automobile industry in India has been rising with leaps and bounds due to changes in industrial policies explicitly to the liberalization and de-licensing of many segments by the Indian government. Several foreign automobile companies have entered into joint ventures with dominant Indian firms. (Wipro 2013) The Indian automobile industry is undergoing a rapid transformation and growth process, powered mainly by stable economic growth and infrastructure development. Today India has become the production hub for global automobile giant companies like Toyota, Hyundai, Honda, Suzuki, Fiat, Nissan, General Motors, Mitsubishi, Ford, Renault, BMW, Daimler etc. Two wheelers, three wheelers, luxury cars, cargo buses, multi-purpose vehicles (MPVs), commercial vehicles and auto components have generated vast jobs and growth opportunities for the automobile manufacturers. The product categories for the automobile segment are shown in Figure. 2.7.

The types of automobile vehicles are primarily divided into four groups, namely passenger vehicles, commercial vehicles, three wheelers and two wheelers. Passenger

vehicles include motorcycles, utility vehicles and multifunctional vehicles. It comprises small, medium and heavy commercial vehicles. Three wheelers consist of passenger carriers and transporters of goods. Two wheelers include motorcycles, scooters, hybrid vehicles and mopeds.

Automobile demands have increased significantly in India in the last two and half decades. Several global automobile manufacturers and Tier-1 suppliers have already developed facilities for research, production, and manufacturing in India. The Indian automobile component industry began implementing Lean practices to meet those customers ' demands. In collaboration with the Automobile Component Manufacturers Association of India (ACMA) and the Government of India, the United Nations Industrial Development Organization (UNIDO) has taken a constructive approach to assisting Indian SMEs in different clusters since 1999 in making them globally competitive.

(Modi 2012)India's automobile industry is a major player in the global economy and in India. One of recent success stories has emerged in the automobile and auto component industry. The Indian automobile industry, as in all other countries, is one of the key drivers of industrial growth and employment that will gain further importance in the coming years. Moreover, the automobile industry is connected to many other sectors in the economy and thus its indirect contribution is even greater than this. Because of its extensive economic linkages it has been treated as a leading economic sector throughout the world.

(Kumar 2015) The Indian automobile industry is seemingly bright. With post-liberalization reforms in place since 1991, India in recent years has achieved remarkable progress on the overall economic front by achieving a sustained rate of growth for its economy. The world bank and other credible sources report that India is likely to emerge as Asia's second-largest economic superpower and the world's third-largest economy in terms of purchasing power parity by 2020 (Kumar, 2007). With regard to the automobile industry, India has already become the seventh largest producer of vehicles in the world, with tremendous growth potential in other segments. Exports have also begun to flourish and Indian manufacturers are expected to be able to grab the global market in a big way. The Indian producers do, however, need to upgrade their technology and efficiency to shift from decent to excellent.

(Kamal 2017)Automobile industry is a leader in manufacturing product and process technology. This has been regarded as one of the engines of economic growth and is considered to be the economy's barometer for the domestic automobile industry. Such a belief is in line with international trends, since the performance of the automobile industry is seen as a reflection of the health of the economy in most mature economies. The sector has emerged in the Indian economy as a sunrise market.

Automobile accounts for 7.1 per cent of GDP per volume in the country. The Indian automobile industry can be divided into several segments: two-wheelers like motorcycles, scooters and mopeds. Three-wheelers, commercial vehicles like light, medium and heavy, passenger cars, utility vehicles (UVs) and tractors. Automotive vehicles are classified into different groups as shown in figure2.7 below,

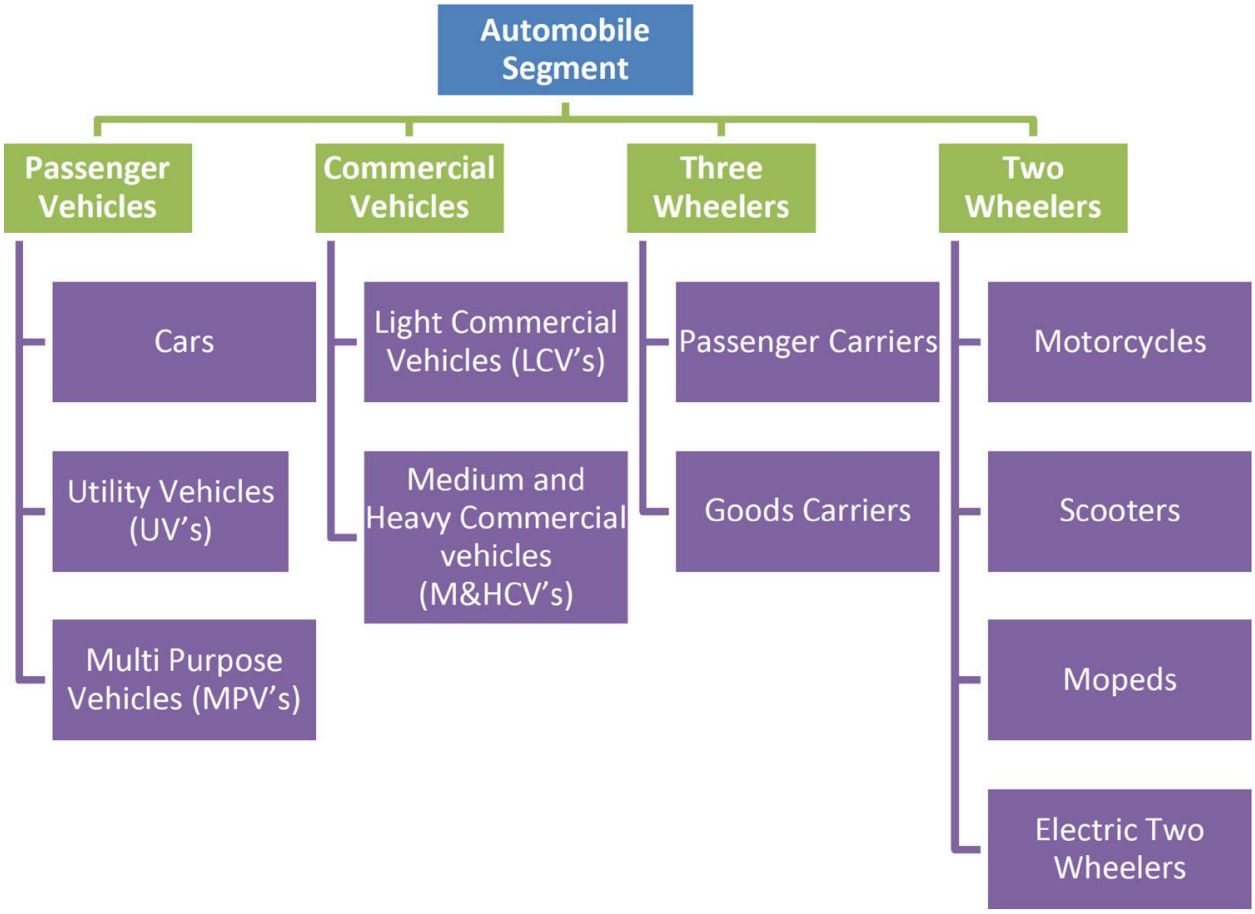


Figure 2.7: Automobile segment-Vehicle wise
Source- ACMA 2-19-20

According to Governments of India's project 'Make in India' report April 2019 following Important Points related to India's automobile sector are as follows,

- World's second-largest double-wheeler market.
- World's fourth largest commercial-vehicle market.
- 11th world's biggest passenger automobile market
- Expected to become the world's third-largest automobile market by 2030, behind China and the US alone.
- India boasts the world's fourth largest automobile market
- India has Asia 's highest three-wheelers market
- India is the world's second-largest two-wheelers manufacturer
- India ranks fifth in utility vehicle production.
- Hyundai Motors ranks second in the world's car production.

Some well-known players in India's automotive industry include: Fiat India Private Ltdm Maruti Udyog, Hindustan Motors, Ford India Ltd, General Motors India Pvt Ltd., and Toyota Kirloskar Motor Ltd. In India the production of automobiles is primarily for domestic customers. Cars with 79 per cent of India's cars dominate India's automobile industry.

2.6.1 Reasons to invest in Indian Automobile Sector

- By 2026 India will emerge as the world's third-largest automobile market, led by china and the USA.
- The 2016-26 automotive mission plan (AMP 2026) aims to drive the automobile industry to become the engine of the 'Make in India' programme, developing india as a global production centre.
- The AMP 2026 targets the automobile industry to triple revenues to us$ 300 billion and increase exports to us$ 80 billion by sevenfold.
- The world economic forum ranks India 30th on the global manufacturing index, out of more than 100 countries on manufacturing skills assessment.
- India's "Make in India" campaign has been instrumental in increasing the country's economy.

- The rural agricultural industry is experiencing an increase in its disposable income which further boosts the economy as a whole.
- The International Center for Automobile Technology (ICAT) is an automotive testing and R&D service provider sponsored by India's government, NATRiP (National Automobile Testing and R&D Infrastructure Project). ICAT is in Manesar, India's northern motorway hub.
- Private players such as Hyundai, Suzuki, and General Motors are interested in establishing an R&D base in India.
- Due to the presence of a large pool of skilled and semi-skilled workers and a strong educational system, foreign producers are keen to establish their facilities.

2.6.2 Statistics

- The automobile market can be divided into sub-sectors such as passenger cars, commercial vehicles, three-wheelers and two-wheelers. Two-wheelers hold the leading spot, holding about 80 % of the market share and 13% of the total number of passenger vehicles.
- India is the world's largest producer of two-wheelers, three-wheelers and tractors and the fifth-largest producer of vehicles in general.
- India is currently the world's fourth largest market for automobiles.
- India's annual production was 29.08 million vehicles in FY18 compared to 25.33 million vehicles in FY17, recording a healthy 14.8% growth.
- India's automobile industry followed a vigorous growth path, rising at a CAGR of 6.26 per cent in the 2018-19 fiscal years.
- In the 2018-19 fiscal years, sales of passenger vehicles increased by 2.70%, 2-wheeler by 4.86% and 3-wheeler by 10.27% compared to the 2017-18 fiscal year.
- By 2026, passenger vehicle production, commercial vehicles, two-wheelers and three-wheelers are projected to increase by 9.4 million units, 2.0 million units, 50.6 million units and 0.95 million units per year. By 2026, as outlined in the 2016-26 Automotive Mission Plan, the automobile industry has the potential to contribute about 12 per cent of total GDP and generate 65 million jobs.

Top ten Manufacturers in Automobile Industry in India

(Source- https://business.mapsofindia.com/automobile/top-automobile-companies.html)

- Tata Motors Ltd.
- Mahindra & Mahindra Ltd.
- Maruti Suzuki India Ltd.
- Hero MotoCorp Ltd.
- Bajaj Auto Ltd.
- Ashok Leyland Ltd.
- Sundaram Clayton Ltd.
- TVS Motor Company Ltd.
- Eicher Motors Ltd.
- Force Motors Ltd.

2.6.3 Automobile Mission Plan 2016-26 (Amp 2026)

According to the Indian government's automobile task strategy, India is expected to be the third-largest automobile market in the world by 2026 in volume terms. By 2026, the $74 bn automobile industry is projected to hit $300 bn.

- Currently the industry produces 25 mn automobile vehicles, 3.5 mn of which are exported. India has a good role in the international heavy-duty vehicle arena as it is the world's largest tractor producer, second-largest bus producer, and third-largest manufacturer of heavy trucks.
- Automobile Mission Plan (AMP 2026) outline India 's automobile ecosystem 's development path, including the glide path of definite research terms and policies, manufacturing ,design, testing technology, selling, import / export, use, repair and components ,services and recycling of vehicles.
- The automobile industry is expected to be the world's third largest contributing 12 per cent to GDP.
- The industry could produce US$ 300 billion in revenue and 65 million more jobs by 2026
- The automobile industry is one of the manufacturing sector’s prime movers and the initiative "Make in India." This aims to 5-fold increase vehicle exports.

Vehicle growth, particularly passenger vehicles, is expected to triple to 9.4mn units per year by 2026.

- The program also calls for India to be the world's first manufacturer / seller of small cars, two-wheelers, three-wheelers, tractors and buses; and third in commercial vehicles and heavy trucks.
- The other factors attracting global automobile manufacturers to India are the country's large middle-class population, increasing earning power, strong technical capability, and competitively priced qualified manpower availability.
- Automobile Mission Plan 2026 aims to make Indian Automobile Industry one of the world's top three in engineering, manufacturing and exporting vehicles & components; increasing its value to more than 12 per cent of India's GDP over the next decade.
- According to Maruti Suzuki India (MSIL) Chief Kenichi Ayukawa, the Indian automobile industry will contribute over 12 per cent to the country's gross domestic product (GDP) and create about 6.5 crore additional jobs over the next decade.
- The Indian automobile sector needs to contribute more than 12 per cent of the country's GDP.researcher (auto industry) aim to build almost 65 million extra jobs by 2026,
- The Indian automobile industry is contributing 7.1 percent to the GDP right now and about 3.2 crore people are directly and indirectly employed by the sector, in the last 10 ears, the overall investment made by the automobile industry has reached $35bn.
- 38% In the western region (mainly in Maharashtra)-Auto Expo 2018-19 Report

2.6.5 Performance of Auto Industry during 2018-19- Source SIAM

Manufacturing

In April-March 2019, the industry produced a total of 30.915.420 vehicles including passenger vehicles, commercial vehicles, three wheelers, two wheelers and a quadricycle

compared to 29.094.447 in April-March 2018, showing a 6.26 percent rise over the same period last year.

Domestic Sales

- Passenger Vehicle sales increased by 2.70 per cent over the same timeframe last year in April-March 2019. Within passenger vehicles, Passenger Cars, Utility Vehicle & Vans sales increased by 2.05 per cent, 2.08 per cent and 13.10 per cent respectively over the same period last year in April-March 2019.
- In April-March 2019, the total segment of commercial vehicles reported an rise of 17.55 per cent compared to the same timeframe last year. The selling in April-March 19 Medium & Heavy Commercial Vehicles (M&HCVs) grew 14.66 per cent and Light Commercial Vehicles increased 19.46 per cent.
- In April-March 2019, sales of three Wheelers increased by 10.27 per cent over the same period last year. Passenger Carrier sales were up 10.62 percent within the Three Wheelers and Goods Carrier increased 8.75 percent in April-March 2019 over April-March 2018.
- In April-March 2019, two Wheelers sales reported growth of 4.86 per cent over April-March 2018. Scooters declined by-) (0.27 percent within the Two Wheelers segment, while Motorcycles and Mopeds grew by 7.76 percent and 2.41 percent in April-March 2019 over April-March 2018, respectively.

Exports

Overall automobile exports increased by 14.50 per cent in April-March 2019. Although exports of passenger vehicles decreased by-) (9.64 per cent, in April-March 2019, Commercial Vehicles, Three Wheelers and Two Wheelers reported growth of 3.17 per cent, 49.00 per cent and 16.55 per cent respectively over the same period last year.

According to SIAM data, the product categories of the automobile sector are shown in the segments of Table y Automobile, mainly in four segments, namely passenger vehicles, commercial vehicles, three wheelers and two wheelers. Passenger vehicles include automobiles, utility vehicles and multifunctional vehicles. Commercial vehicle

incorporates light, medium and heavy commercial vehicles. Following table 2.1 and figure 2.8 shows industry wise composition of vehicle. With that table 2.2, 2.3 and 2.4 shows automobile production trend, automobile domestics trend, automobile export trend respectively from year 2014 till year 2020.

Table 2.1- (Source- SIAM website) Industry Composition vehicle wise

Domestic Market Share for 2019-20 Market	
Passenger Vehicles	13
Commercial Vehicles	3
Three Wheelers	3
Two Wheelers	81
Grand Total	**100**

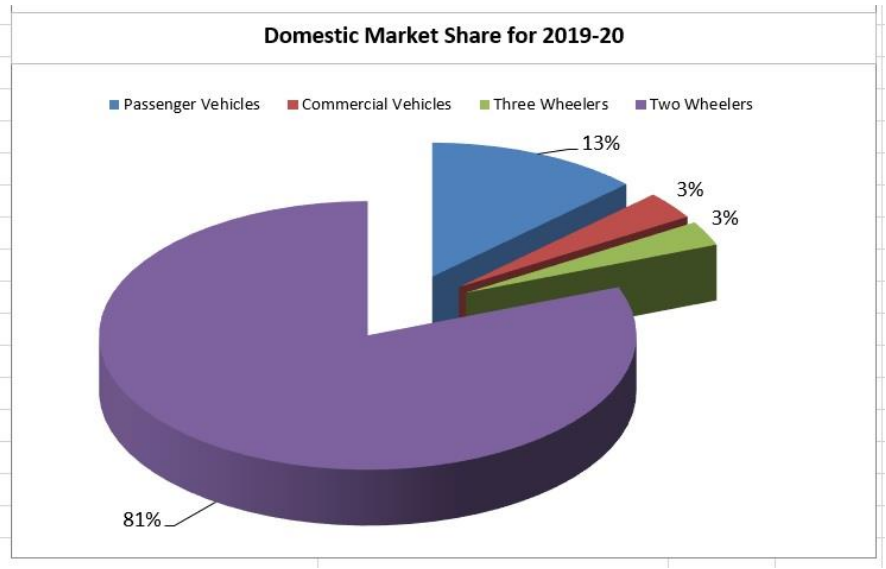


Figure 1.8 Source-(SIAM website) -Industry Composition vehicle wise

Automobile Production Trends

Table 2.2- (Source- SIAM website) Automobile production trend

Category	2014-15	2015-16	2016-17	2017-18	2018-19	2019-20
Passenger Vehicles	3,221,419	3,465,045	3,801,670	4,020,267	4,028,471	3,434,013
Commercial Vehicles	698,298	786,692	810,253	895,448	1,112,405	752,022
Three Wheelers	949,019	934,104	783,721	1022,181	1,268,833	1,133,858
Two Wheelers	18,489,311	18,830,227	19,933,739	23,154,838	24,499,777	21,036,294
Quadricycle*		531	1,584	1,713	5,388	6,095
Grand Total	**23,358,047**	**24,016,599**	**25,330,967**	**29,094,447**	**30,914,874**	**26,362,282**

Automobile Domestic Sales Trends

Table 2.3- (Source- SIAM website) Automobile domestic sales trend

Category	2014-15	2015-16	2016-17	2017-18	2018-19	2019-20
Passenger Vehicles	2,601,236	2,789,208	3,047,582	3,288,581	3,377,389	2,773,575
Commercial Vehicles	614,948	685,704	714,082	856,916	10,07,311	717,688
Three Wheelers	532,626	538,208	511,879	635,698	7,01,005	636,569
Two Wheelers	15,975,561	16,455,851	17,589,738	20,200,117	21,179,847	17,417,616
Quadricycle#		0	0	0	627	942
Grand Total	**19,724,371**	**20,468,971**	**21,863,281**	**24,981,312**	**26,266,179**	**21,546,390**

Automobile Exports Trends

Table 2.4- (Source- SIAM website) Automobile exports trend

ategory	2014-15	2015-16	2016-17	2017-18	2018-19	2019-20
Passenger Vehicles	6,21,341	6,53,053	7,58,727	7,48,366	6,76,192	6,77,311
Commercial Vehicles	86,939	1,03,124	1,08,271	96,865	99,933	60,713
Three Wheelers	4,07,600	4,04,441	2,71,894	3,81,002	5,67,683	5,02,169
Two Wheelers	24,57,466	24,82,876	23,40,277	28,15,003	32,80,841	35,20,376
Quadricycle*		334	1,556	1,605	4,400	5,185
Grand Total	**35,73,346**	**36,43,828**	**34,80,725**	**40,42,841**	**46,29,049**	**47,65,754**

2.6.6 Auto component Manufacturing Industry-

The Make in India program was initiated in September 2014 as part of a larger range of nation-building measures by The Honble Prime Minister, Mr. Modi. The program was constructed to transform India into a global hub for design and production.

In addition to the car parts sector, the automobile industry is one of India's main industries. A well-developed transport network plays a key role in an economy's growth and India is no exception to that. The automobile industry is one of the biggest on the global economy. Because of its strong forward-looking and backward linkages with several key economic segments. The Automobile Sector has a prominent place in Indian Economy's fabric. Make in India's main goals are job development and capacity enhancement in 25 economic sectors including vehicles, aviation, biotechnology, chemicals, construction, defense manufacturing, electrical machinery, computer devices, and mining. According to Make in India, there are mentions below statics relating to the automobile OEM & Automobile component sector.

- A key driver of macroeconomic growth and technological advancement in India is the automobile sector.

- India's automobile industry is a leader in many segments, especially in two-wheelers, cars and tractors.
- The US$ 51.2 billion Auto-Components industry in India is expected to grow to US$ 200 billion by 2026 as of FY 2018.
- The industry's Compound Annual Growth Rate (CAGR) stood at 10 per cent over the 2012-2018 periods.
- Exports increased by 23.9 percent to 13.5 billion US dollars in 2018-19.
- With the rise in vehicle parks in India, the aftermarket increased from US$ 8.4 billion in 2016-17 by 9.8 per cent to US$ 9.2 billion in 2017-18.
- India's automobile component industry is projected to be the world's third-largest by 2025.

2.6.7 Reasons to invest in Auto component industry

- A stable government framework with higher purchasing power, a large domestic market and ever-increasing infrastructure development has made India a favourable economic destination
- India emerges as a regional center for auto component production. Geographically closer to India are major automobile markets such as Japan, Asian, Korea, Europe and large domestic markets.
- India offers a low cost of 10-25 per cent relative to the European and Latin American offerings. Therefore, compared to other manufacturing countries India is competitive in cost.
- There are minimal export-import restrictions which make it an advantageous trade policy. In addition, different opportunities for export-oriented units and export-processing areas are available.
- India’s rising popularity into global value chains also gives the automobile product industry an impetus.
- Favorable government policy allowed by automatic route with 100 percent FDI.

- Presence of supporting infrastructures such as institutes for automotive training and centers for auto design, special car parks and virtual sezs for automotive components.
- India is the fastest growing major economy in the world with a GDP growth rate of above 7 percent.
- An expanding population and a rising middle class are likely to remain key drivers of demand.
- The supporting factors for investment are a large pool of highly skilled workers and a strong education system. Improvised R&D operations and laboratories that have been set up to carry out activities such as animations for analysis , simulation, and engineering help in additional investment prospects.
- The growth of Indian sourcing from global Original Equipment Manufacturers (OEMs) and the increased indigenization of global OEMs are transforming the country into a favored base for design and development.

2.6.8 Statistics

• The Indian automobile component industry is set to become the world's third-largest by 2025.

• automobile component industry turnover in India was us$ 51.2 billion in the 2018 fiscal year and is expected to reach us$ 100 billion by 2020. The expected increase will be due mainly to strong exports ranging from us$ 80-us$ 100 bn by 2026.

• Auto parts exports in India accounted for 4 % of total exports and exports amounted to us$ 13.50 billion in 2017-18.

• Exports from industry are projected to reach us$ 30 billion by 2020-21, rising further to us$ 80 bn by 2026. Exports rose by 23.9 per cent in 2017-18 to cross us$ 13.5 billion. Europe (34 per cent), North America (28 per cent) and Asia (25 per cent) are the major export markets.

• In 2017-18 the domestic aftermarket for automobile components was US$ 9.2 billion.

• Automobile component industry 's contribution to India's GDP will be as high as 5 to 7 percent by 2026.

• India's automobile portion contributes 2.3 percent to India's GDP. Approximately 1.5 million people are employed directly and 1.5 million are employed indirectly in this sector.

• The Automobile Mission Plan (2016-26) offers direct incremental jobs by 2026 to 3.2 mn. Achieving the goals in the Automobile Mission Plan (2016-26) requires an additional US$ 25-30bn investment.

• India's automobile component industry will rank among the world's top three in vehicle engineering, manufacturing and export.

• The Indian automobile component industry consists of both organized and unorganized sectors. The coordinated sector refers to original equipment manufacturers (OEMs) and is engaged in high-value precision instruments manufacturing. Whereas the unorganized sectors are made up of low-valued products that cater for aftermarket services.

• Motor parts, drive transmission & steering components, body and frame, suspension and brake pieces, machinery, electrical components and others such as fan belts, die-casting and sheet metal pieces are various sub-sectors of the automobile component industry in India.

• In the manufacture of forgings, stampings, castings, machining, wiring harnesses and electronic fuel injectors, India is considered competitive.

Following figure 2.9, 2.10 and 2.11 shows Indian auto component industry's turnover, exports, domestic aftermarket and size of industry given by ACAM report 2019.

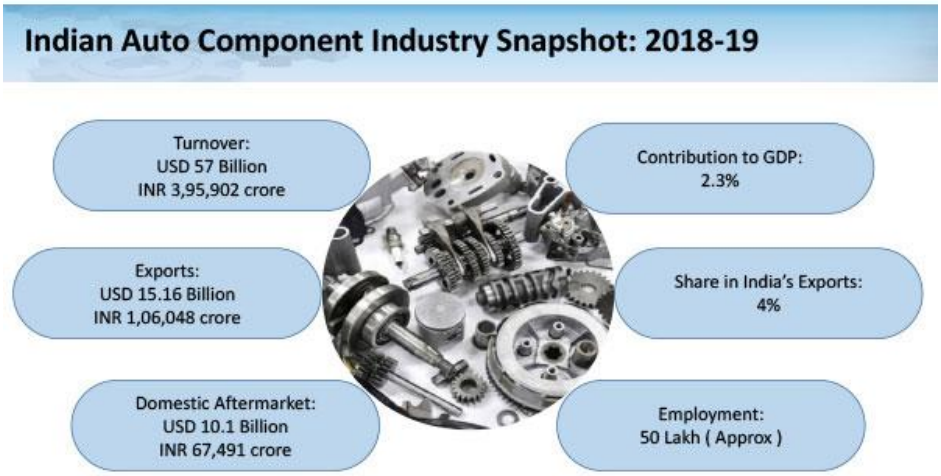


Figure 2.9 Indian Auto Component Industry snapshot

Source-ACMA Press Conference - Indian Auto Component Industry Performance Review - FY 19

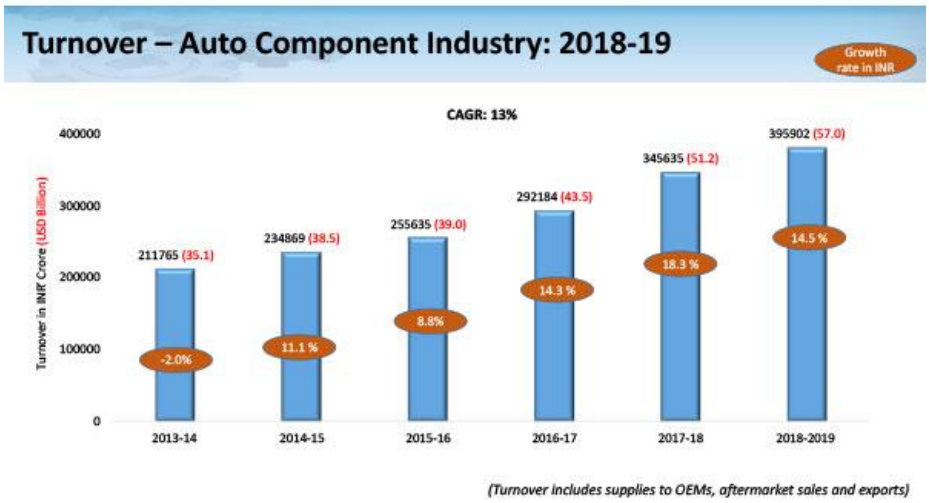


Figure 2.10 Indian Auto Component Industry Performances-Turnovers

Source-ACMA Press Conference - Indian Auto Component Industry Performance Review - FY 19

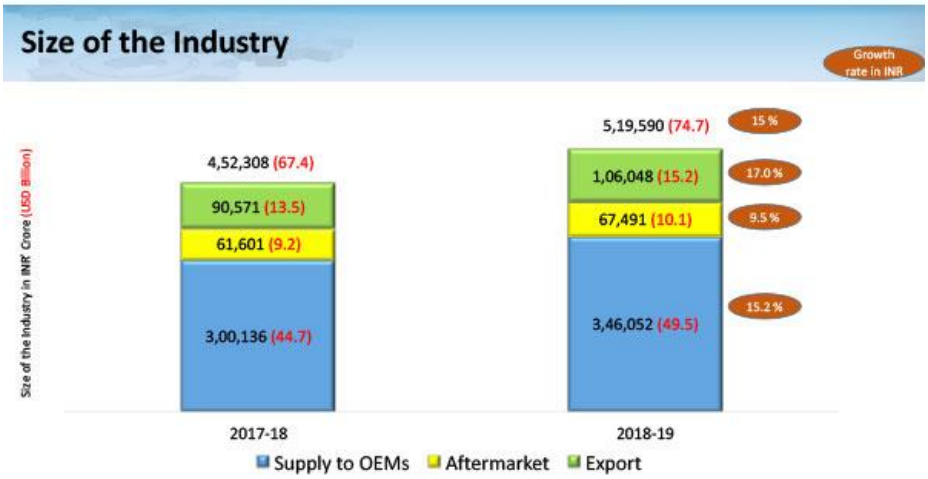


Figure 2.11 Indian Auto Component Industry Performances-Size of Industry

Source-ACMA Press Conference - Indian Auto Component Industry Performance Review - FY 19

2.7 Why Pune

According to MIDC report 2019 Maharashtra's auto sector has one of the highest industrial outputs in the nation

India

- It is among India's fastest growing and sunrise market
- The Indian automotive part industry is forecast to hit US$ 115 billion by the 20–21 financial year

Maharashtra

- Maharashtra accounts for roughly 35.1 per cent of the country's value-added car production.

- It has the country's leading automobile industry center with 21 per cent market share in India
- The Maharashtra automotive industry saw strong growth with CAGR of 21.08 per cent between 2009 and 2013.

Major AUTO Hubs

- Pune, Nashik, Aurangabad, Mumbai and Nagpur are the main automobile centers in the state.Pune is India's largest automotive hub with more than 4,000 production & ancillary units in the Pimpri-Chinchwad area alone.
- Pune has "who's who" of Indian Automotive Industry – Tata Motors, Mahindra & Mahindra and Bajaj Auto, as well as big foreign cars such as Ford, Volkswagen and Mercedes.

Dedicated Institutes

• India's Automotive Research Association is India's leading automotive research and development organization, with testing and certification in Pune

• Auto Cluster Creation & Research Institute works to grow micro, small and medium-sized enterprises (MSMEs) in and around Pune to meet OEM's expectations.

Following figure 2.12 shows why researcher selected Pune Automotive sector as a study area, as explained by table in Maharashtra's majority automotive sector is divided into five major districts such as Mumbai, Nagpur, Nashik, Aurangabad, Pune. From which the highest OEM and part manufacturing businesses are located in the district of Pune. In Pune there are almost six OEM automobile organizations; scattered location of automobile hubs shown below in figure 2.12.

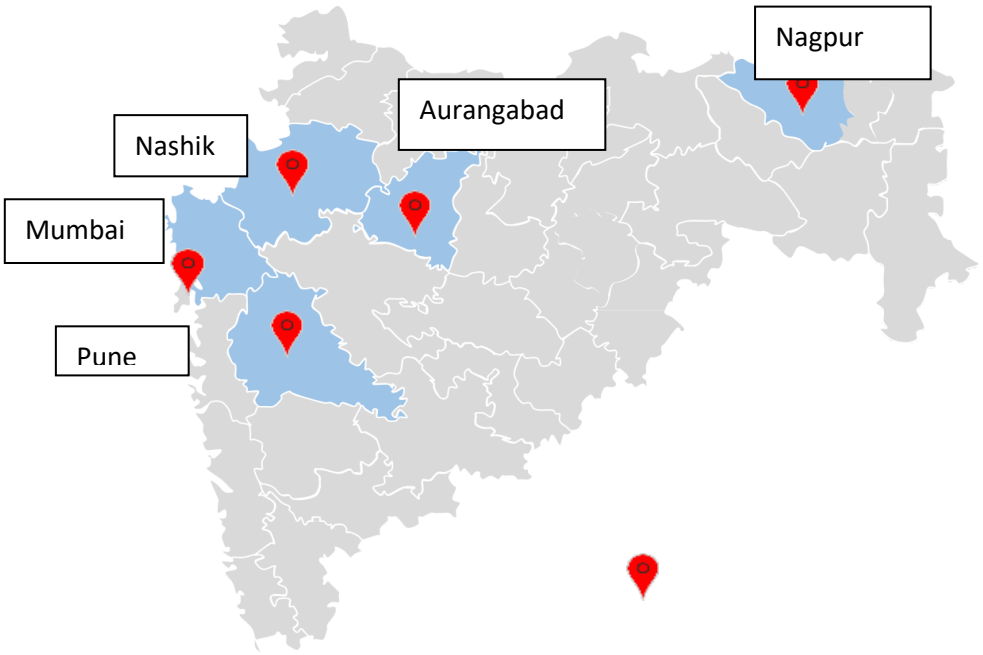


Figure 2.12 Major automobile OEM location-Maharashtra wise

Source- Source- https://www.midcindia.org/documents/20181/26611/Auto.pdf/ffcd7f15-73a1-4420-8015-7dfd073b4b78

(Source-Pune Auto Expo Report 2019) 39% Auto Industry is located in the western region (mainly in Maharashtra. Pune is Maharashtra's second largest city after Mumbai, has been an engineering center for more than five decades.

Over the past few years, the Chakan industrial area in Pune has grown into a strong automobile center. Automobile giants such as Mercedes Benz, Mahindra and Mahindra, Volkswagen have set up their manufacturing plants, in addition to the facilities for making automobile components. The area has also developed a good dealer ecosystem. Pune has also gained the attention of electronics manufacturers with the proposed investment of Taiwanese phone manufacturer in Talegaon industrial area in the pipeline. Chakan had a Special Economic Zone (SEZ) and the Maharashtra Industrial Development Corporation (MIDC) as its home. The Chakan industrial area has properties of both MIDC leasehold and Resale Freehold in it. This sector, which extends to 246 hectares, has been built by Chakan MIDC with basic and high-quality facilities.

- The automobile landscape of Pune today includes the 'who's who' of Indian and increasingly international automobile majors.
- Tata Motors is the largest, followed by Force Motors, Bajaj Auto, Mercedes-Benz, Mahindra Two-Wheelers, Volkswagen, GM, Premier Motors JCB, M&M and Fiat construction equipment.

Pune's USP

In addition to the automobile OEMs (Original Equipment Manufacturers), Pune has a range of automobile component manufacturing industries in the form of Tier-1, Tier-2 and infrastructure suppliers, including Bharat Forge, among the world's top forging companies and Sandvik 's large cutting tool facility.

- Kinetic Group Chairman Arun Firodia said the easy availability of skilled labor is the primary reason for the rapid growth of the Pune automotive sector. Pune was the first to have auto-fabricated clusters, and the other white goods.
- Pune is India's leading hub for the automobile sector; as well as one of the world's largest automobile centres. Three massive new plants from General Motors, Volkswagen and Mahindra & Mahindra were inaugurated here during the past year alone. The Chakan-Talegaon Belt has become one of the world's densest automobile clusters. The list of major companies in the Pune area is as shown below,

- **Tata Motors**

  Tata Motors www.tatamotors.com is Pune's largest producer of vehicles, and India's second. The huge Pune campus for their cars and trucks consists of their corporate headquarters, R&D Center and Manufacturing facility.
- **Land-Rover**

  Land-Rover has recently begun assembling several models near the Pimpri-Chinchwad plant at Tata Motors.

- **Bajaj Auto**

  One of the early automobile players in Pune was Bajaj Auto. They have a large base in Akurdi, Pune (R&D, Corporate, and Fabrication). Recently a large new plant at Chakan was opened. Www.bayayajauto.com

- **Force Motors (Formerly Bajaj Tempo)**

  3 Wheelers, Tractors, LCVs, and Big Trucks manufacturer. Website.forcemotors.com

- **Mahindra Two-Wheelers (Formerly Kinectic Motors)**

Scooter, Moped, and bike manufacturers. Www.mahindra2wheelers.com Kinetic Motors has been a key player in India's Mopeds and Gearless 2 Wheeler space. They include the 'Luna' and 'Kinetic Honda' in their famous models.

- **Mercedes-Benz**

  In the 1990s Mercedez-Benz entered the Indian market, initially through a partnership with the Tatas. A separate venture, Mercedez-Benz India, was set up later. The manufacturers and assemble a range of their well-known luxury cars from Pune facility. Www.mercedes.co.in

- **General Motors**

  During the last decade, General Motors entered the Indian market. The Talegaon Plant is a massive facility which started production recently. Cars made here include the new Chevy Beat.

- **JCB**

  JCB company produces construction, earth moving, and other equipment for industrial use. Its plant and design center in Talegaon opened in 2006. Homepage: http:/www.jcb.com/indica.aspx

- **Volkswagen**

  A few months back Volkswagen opened a massive new plant at Chakan Pune. Read more about this plant here: The First Polo Rolls-Off the Volkswagen Pune Plant This plant is currently geared to the production of high-volume cars such as the VW Polo and Skoda Fabia.

- **Mahindra & Mahindra**

  M&M inaugurated a major plant at Chakan. Spread over 700 acres and built with an investment of almost Rs 5,000 Crores ($1 trillion), this plant will manufacture various SUV and Commercial Vehicle models. Mahindra also plans to fabricate new Sssanyong Motors models.

- **Cummins Engines**

  In the 1960s, Cummins, the world leader in Diesel Engines, opened its Pune plant in a joint venture with the Kirloskar Group. They later decided to go solo. The Pune plant produces a wide range of diesel engines and generators, as well as a large design center.

- **Kirloskar Oil Engines**

  One of the earliest auto-players in Pune is Kirloskar Oil Engines, a member of the Kirloskar Group. Currently they manufacture a wide variety of Oil Engines for various applications.

- **Premier Motors**

  Makers of the famous 'Premier Padmini' Indian car. Current manufactured models include Diesel Pickup Trucks and Vans.

- **Fiat**

  The upcoming new Fiat Ranjangaon plant will manufacture the different models such as Punto and Linea. Www.fiat-india.com

- **Bridgestone**

  Bridgestone is having a massive new plant with a total investment of about Rs 2,600 Cr in Chakan Pune. www.bridgestone.co.in

- **Hyundai Construction Equipments**

  Hyundai Construction Equipments is located in Talegaon-Chakan .

- **Research Institutes, Suppliers & Infrastructure Players**

ARAI (Automobile Research Association of India) www.araiindia.com

  - ARAI is India's leading Automobile industry research and certification institution. It has a beautiful campus in central Pune, on top of a hill (near 'VetalTekdi').
  - Pune has a wide range of Tier-1 Tier-2 and infrastructure suppliers, in addition to the Auto OEMs (Original Equipment Manufacturers). Its leading players in the industry include:

- **Bharat Forge**

  Bharat Forge is one of the world's leading forger firms. They produce a vast array of forged auto components. Their facilities at Pune include their Headquarters, Design Center and Manufacturing Facility. www.bharatforge.com

- **Sandvik**

  Sandvik is a global pioneer in cutting instrumentation. Their plant in Pune has been operating for almost 50 years. Www.sandvik.de

- **PARI Robotics & Automation**

  PARI is one of the leading industrial automation companies and has factory automation systems deployed in several major manufacturing plants. www.parirobotics.com

- **Software & Information Technology**

  Software and IT play an increasingly important role in the manufacture of cars and automobiles. Pune is home to many leading multinational CAD / CAM / CAE Technology Leaders. These include: PTC, Siemens, Ansys, (formerly UGS). Important IT outsourcing Players include Geometric and KPIT cummins in this Pune area.

2.8 Definitions of Industry (Small/Medium/Large)

2.8.1 By Size

The number of employees in an organization depends on what constitutes a small medium and large enterprise. Different researchers have different ways of defining small and medium sized enterprises. (Burgess 2002) explained the difference in relation to a 1997 study on SMEs in Europe. (Burgess 2002) reported that 'a company with 10-99 employees is regarded as a small business,' whereas 'a business with 100 to 499 employees is regarded as a medium-sized company.'

(Duxbury 2002) indicated that the literature on how to define small and medium-sized enterprises is divided. Small business was described as "any organization with fewer than 100 full-time paying employees" and divided into three subgroups:

- Micro businesses: 2 - 9 employees
- Mid-sized businesses: 10 - 49 employees
- Larger small businesses: 50 – 99 employees.

SMEs are, according to (Coyte 2012), undertakings with fewer than 200 employees, defined in the following categories:

- 1-4 employees can be considered “micro”
- 5-20 employees can be considered “small”
- 20-199 employees can be considered “medium”
- Over 250 employees as “large”

(Duxbury 2002) stressed the need for a comparison between small and medium-sized enterprises (LE), defining small and medium-sized enterprises as any business with 100-500 full-time employees and an LE organization with more than 500 workers.

According to the European Commission [EC] (1996), "a company must have less than 250 wage earners to be listed as SMEs or an enterprise with 49 to 250 wage earners can be classified as a medium-sized enterprise. If an organization has less than 10 employees, it would be considered a very small business.

A single standardized definition that could be used across all economies was provided by the Asia-Pacific Economic Cooperation (APEC) (2003). "SMEs hire fewer than 100 people, while medium-sized SMEs hire between 20 and 99 people," according to APEC

(2003), and small enterprises employ between 5 and 19 people, and micro enterprises employ less than 5 people, including self-employed managers." APEC (2003) further defined SME as an organization with fewer than 100 employees but there were some exceptions, for example, there should not be a hard and fast rule that distinguishes a micro-enterprise from a small and medium-sized organization, but in general a micro-enterprise should have fewer than 5 employees.

2.8.2 By Economy

APEC (2003) has collected data from different sources to investigate the views of SMEs in the various economies. According to APEC (2003), SME definitions are vastly changing. These definitions could mainly be used for two separate purposes: statistical and policy or program purposes. Definitions may differ by industry based on their intent and the standard employee number concept. Capitalization, assets, sales or turnover and production capacity are also used by various economies to define SMEs.

The EC (1996) also described SMEs by reference to a company's annual turnover. Additionally, when seeking definitions, the EC (1996) stressed consideration of the total balance sheets and independence levels of each firm. It contended:

The final basic criteria for determining whether an organization is small or medium in size depends on its independence, which means that a company cannot have 25% or more of its control in the hands of a large company or held jointly by a number of large companies. (EC, 1996)

2.9 Technology Adoption

Technology in ancient times was defined as the spoken word for manual craft or cunning skill. In 1816, a Harvard University course on "application of the sciences to the useful arts" found earliest use of the word technology in the United States. The American encyclopedia of 1832 described technology as concepts, processes, and nomenclatures. About 100 years ago the use of wireless electronic communication was the starting point for the modern era. The advances in technology or new technology have brought a lot of

changes to people's life styles. It has impacted every area of human life whether it is health, education, economics, governance, entertainment etc. (Suvarna and Godavari 2012). Thus, no matter what the field is, there must have been some positive change in technology to work away to increase productivity. Every nation today strives to obtain the latest technology to the benefit of its citizens. Technological advancements are vital in the areas of business, education and health care. Technology is also perceived as an enabler or a vehicle for information sharing (Oye, Iahad and Ab. Rahim 2012).

According to Louho, Kalliojaand Oittinen (2006), the adoption or acceptance of technology is about how individuals accept and adopt certain technology for use. User acceptance of technology has been further explained as the user group's demonstrable willingness to employ IT for the tasks it is designed to support (Dillon 2001). Acceptance can therefore be seen as a function of involving the user in the use of technology. Acceptance can be further described as the critical factor in determining any technology's success or failure, and acceptance has been conceptualized as an outcome variable in a psychological process that users go through when making technology decisions (Dillon and Morris 1996). Unless accepted and used, technology is of little value (Oye, Iahad, and Ab-Rahim 2012). Therefore, understanding the acceptance of technology is vital because the most important benefit associated with access to the new technologies is increased information supply (Suvama and Godavari 2012). Researchers are strictly interested in identifying why people accept IT so that superior processes can be improved to design, evaluate, and predict how users will react to new technology.

Therefore, the researchers have examined a number of issues related to technology acceptance from individual user characteristics such as cognitive style to internal values and their effect on use behavior (Dillon 2001). The individual consumer adoption of technology for intended purposes have been modeled and forecast using theories. The main objective of each of these studies is to examine how use can be supported and also to explain what hinders technology acceptance and use (Kripanont 2007). Many researchers have proposed technology acceptability theories and models to explain and predict user acceptance with technology to account for rapid change in both technologies and their environment (Oye, Iahad and Ab-Rahim 2012). Consequently, a review of the

existing theories / models for accepting technology is important to suggest an improved model.

2.9.1 Technology adoption/acceptance theories and models:

Theories provide an explanatory set of variables that can be used to predict a given phenomenon. On the other hand, a model is described as a systematic description of a system, a theory or a phenomenon that accounts for its known or implied properties which may be used to further research its characteristics. A model is often any abstract representation of some part of the real world, designed to recognize, describe, predict or monitor a phenomenon under investigation (Burch 2003: 266).

There are various theories, studies, and models proposed to examine the factors at different stages of adoption of technology and to predict the result. Some of them include; Reasoned Action Theory (Fishbein and Ajzen 1975), Innovation Diffusion Theory (Rogers 1983), TAM (Davis 1989), Therory of Planned Behavior (Ajzen 1991), Information Systems Success Model (DeLone and McLean 1992), Combined TAM and Theory of Planned Behavior (Taylor and Todd 1995), Task Technology Fit (Goodhue and Thompson 1995), Personal Innovativeness of Information Technology (Agarwal and Prasad 1998), TAM2 (Venkatesh and Davis 2000), Unified Theory of Acceptance and Use of Technology (Venkatesh et al. 2003), User acceptance of Multimedia Messaging Service Model (Lee, Cheung, and Chen 2005), TAM3 (Venkatesh and Bala 2008), Model of Acceptance with Peer Support (Sykes,Venkatesh and Gosain 2009), and Mental Models theory (Zhang and Xu 2011) and ERP Use Model (Sternad et al. 2010). Many of them addressed the suitability and ability to forecast acceptance of technology, often presented in a sense of ERP technology.

2.9.2 End-users' acceptance of ERP system

Although organizations have invested heavily in ERP, there are still failures in implementation and fewer than satisfactory productivity improvements (Davenport, 1998). One of the most cited reasons for ERP failures is the inability or reluctance of end-users to accept or use the newly introduced ERP program (Barker & Frolick, 2003).

Hence various theories applied in the user acceptance study in the ERP system will be reviewed in this part.

There have been a large number of studies pertaining to this technology. To study this, diverse theoretical models and frameworks were applied or developed. There have been a large number of studies pertaining to this technology. For research this, different theoretical models and frameworks were applied or developed. In the following section, seven commonly applicable theories are: Theory of Reasoned Action (TRA), Theory of Planned Actions (TPB), Technology Acceptance Model (TAM), ERP Acceptance Model (EAM), Innovation Diffusion Theory (IDT) and Technology-Organization - Environment (TOE) Structure, Task-Technology Fit, and Description of each theory. Details of each theory are explained in the section below.

Venkatesh, V., Morris, M., Davis, G.B., and Fred D. Davis (2003) state that 'explaining user acceptance of new technology is often described as one of the most mature literature research areas in contemporary literature on information systems.' There are number of competing theoretical models that have been created as a result of previous research in information technology (IT) acceptance. Such models each have different collection of determinants of acceptance and regularly describe more than 40% of the variance in the individual intent to use technology (Davis, et al. 1989; Taylor and Todd 1995).

2.9.3 Theory of Reasoned Action (TRA)

The TRA theory was first proposed in 1975 by Fishbein and Ajzen, the theory mainly aims to explain and predict human behavior. According to TRA, the nature of a person's particular action is determined by the behavioral intention (BI), meanwhile, action purpose is influenced by both attitude and subjective norm (SN) (Fishbein & Ajzen, 1975). The structure of TRA is seen in figure 2.13.

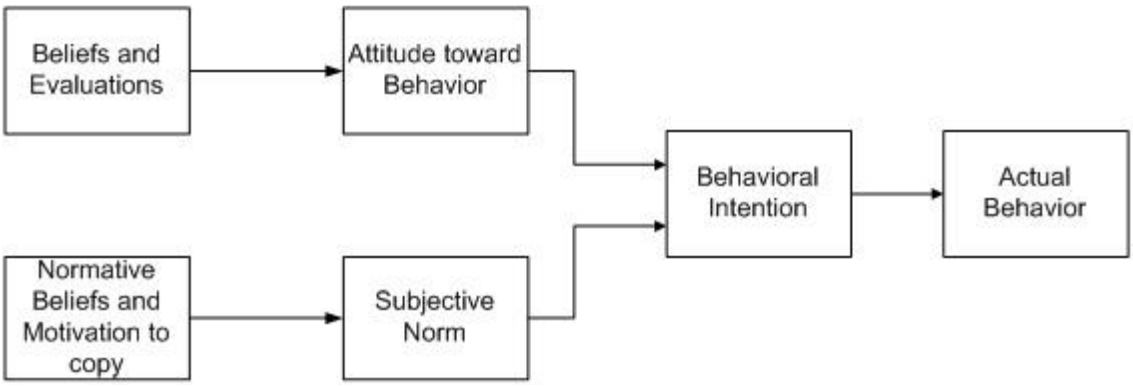


Figure 2.13 The framework of theory of reasoned action (Fishbein & Ajzen, 1975)

With regard to the ERP acceptance study, Kanungo and Bagchi (2000) applied the theory of reasoned action (TRA) in a study on user participation and involvement in the ERP system context, their research aims to identify variables that need to be explained in the context of ERP for their use in the system and to explain their use in the context of ERP, so that they know how the variables influence each other in synthesis And the analysis by Kanungo and Bagchi (2000) concluded that the reasoned action theory model can be used to analyze the use of ERP in the Indian industry context, and their research results also showed that the model can describe user behavior in comparison with other models. Indeed,researcher believe that their research is useful for ERP system acceptance analysis, butresearcher believe that the model is too easy to apply to other variables listed in the research if they intend to explain the user behavior, particularly when there are many variables that directly or indirectly influence the use of ERP system, a more elaborate one

2.9.4 Theory of Planned Behavior Model (TPB)

Theory of Planned Behavior TPB is a well-established model of intent that establishes perceptions influences intentions that in turn affect the individual's actual behaviour. Theory of Planned Behavior model or TPB expands from TRA through the adoption and additional construction dimension of presumed behavioral regulation, to compensate for circumstances in which a person does not have significant control over the desired behavior (Ajzen, 1991). As shown in figure 2.14

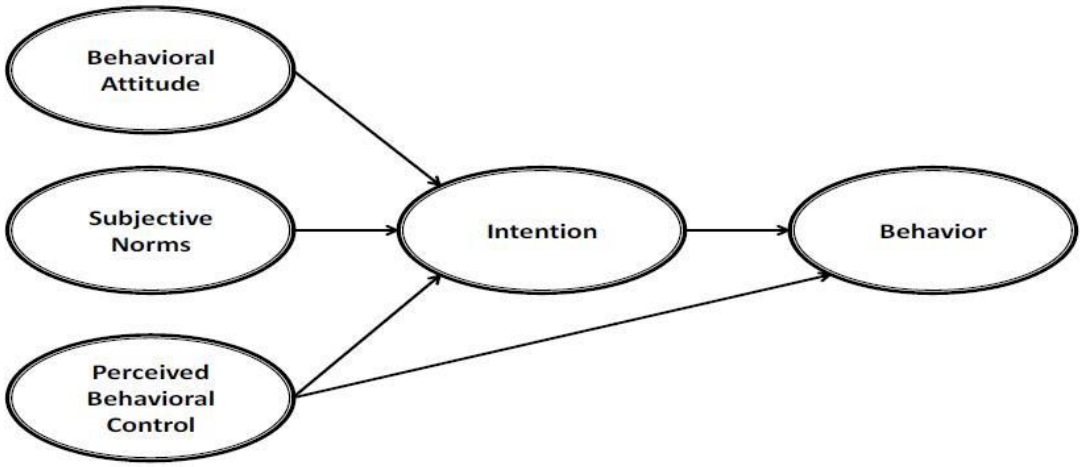


Figure 2.14. Theory of Planned Behavior (Ajzen, 1991).

TPB has three main structures, namely behavioral behaviors, subjective norms, and perceived behavioral regulation. TPB exclaims that the behavior of the individual is influenced by his or her behavioral intent, which is jointly influenced by attitude , subjective norms and perceived control of behaviour. Perceived behavioral control is a unique construct in TPB and refers to an individual's perception of the presence or absence of the required resource or opportunities required to conduct a behavior (Ajzen & Madden, 1986).

Ajzen (1991) presented a review of several studies that used TPB to predict intention and behavior in a wide variety of settings with success. Furthermore TPB was successfully extended to the interpretation of the human adoption and usage of several different technologies (Harrison 1997; Mathieson 1991; Taylor and Todd 1995).

2.9.5 Task-Technology Fit (Goodhue and Thompson 1995)

The Task-Technology Fit model is a synthesis of two theories the utilization theory and the work fit theory. This model suggests that the outcome of performance depends on the fit between the technology and the task, i.e. the technology should provide features and support that fit the task requirements. The 'fit' would boost efficiency and, therefore, technology utilization. Goodhue and Thompson (1995) describe technology as the

method used by individuals in executing their tasks and task as acts performed by individuals in converting inputs into outputs. The Task Technology Fit is defined as the degree to which a technology helps a individual perform task portfolio. It also represents the congruence between the task requirements, individual capabilities and the functionalities of the technology. As the gap between the task and the technology functionalities increases, the task technology fit is reduced, and vice versa. Abugabah and Sanzogni (2009) argue that unlike TAM, which focuses more on technology than the capacity of the technology to benefit the consumer, Task-Technology Fit model focuses on this weakness and has a direct effect on technology use as one of Task- Technology Fit's main contributions. It can still not be said to be a very effective model as it does not study the impact of other influence on users such as social and individual factors that can also have an impact on performance.

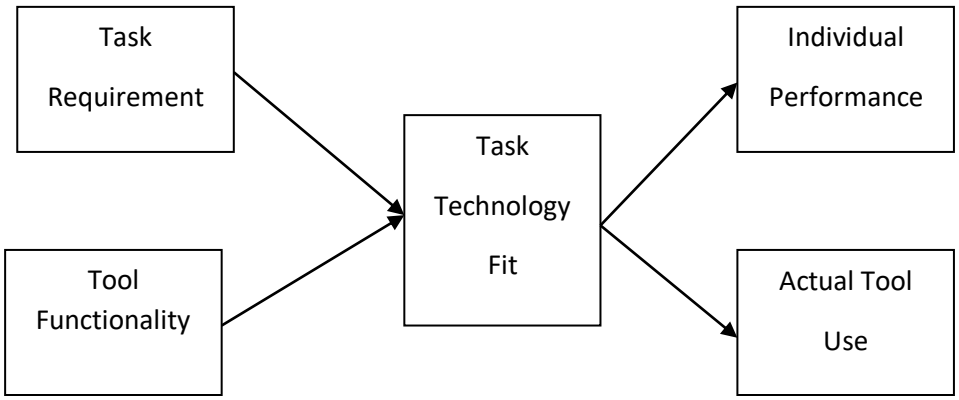


Figure 2.15. Task-Technology Fit (Goodhue and Thompson 1995)

2.9.6 Technology Acceptance Model (TAM)

Davis (1989) and Davis et al. (1989) adapted the Technology Acceptance Model (TAM) from TRA. TAM added two new constructs to TRA as seen in Figure 2: perceived utility, described as "the degree to which a person believes that using a particular system will enhance his or her job efficiency," and perceived ease of use, described as "the degree to which a person believes that using a particular system would be effortless" (Davis, 1989).

According to TAM, the attitude of a person (with respect to the use of an application) is determined by both perceived usefulness and ease of use. The two constructs are seen as a useful way of aggregating essential systems of beliefs in the sense of their usage (Taylor and Todd, 1995).

In two other aspects TAM is different from TRA. Secondly, TAM posits that perceived usefulness is also a direct determinant of the intention of a person to use an application. This direct connection diverges from TRA, where attitude mediates the effect of the beliefs on intention. (Davis 1989) based the direct relationship on the notion the "people shape attitudes towards activities in organizations that they believe will improve their job performance, above and beyond [attitude]" (p. 986). Second, because of "[subjective norm's] ambiguous theoretical and psychometric status" (Davis et al., 1989), TAM excludes subjective norm as determinant of purpose. Figure 2.16 shows TAM model.

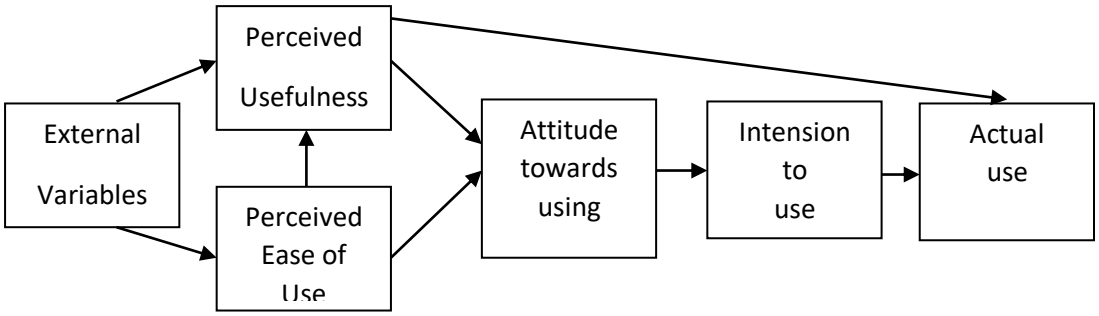


Figure 2.16 Technology Acceptance Model (Davis et.al., 1989)

In TAM, IT usage behavior is theorized to be a direct function of behavioral intention. In turn, intention is a weighted function of attitude towards use and perceived usefulness. Attitude is jointly determined by perceived usefulness and perceived ease of use. Finally, perceived ease of use is the orated being a clear determinant of perceived usefulness.. Any additional consideration not specifically included in TAM is expected to affect intentions and use only through perceived ease of use and perceived usefulness.

TAM is arguably the most influential and commonly used paradigm of research into IT adoption (Bagozzi 2007). Lee et al. (2003) provide an expansive review of a number of studies, from leading IT journals and conferences, which relied on TAM. Their review shows that relationships with TAM have generally been validated under various technologies, contexts, and tasks. However, the authors note that the relationship between

perceived user-friendliness and behavioral intent is found to be important in comparatively fewer studies compared with other relationships within the model. A similar finding was also reported by Taylor and Todd (1995), who claimed that in TAM, "the role of ease of use was equivocal and largely mediated by perceived usefulness." A possible explanation for this finding might be that when systems studied are relatively easy to use by their inherent nature, perceived ease of use may have less or no impact on IT acceptance. It's also stated that with time, the importance of ease of use shifts. Parthasarathy and Bhattacherjee (1998), for example, found that significance in post adoption to disappear.

A number of more recent studies, which used TAM with various technologies, also confirmed the theorized relationships between the models. These technologies included information systems for health care (Djamasbi et al., 2009), expert systems (Alshare et al., 2009), and e-learning systems (Lau and Woods, 2009).

To explore more deeply the issue of accepting information technology, Davis (1989) proposed the Technology Acceptance Model (TAM), which was based on the TRA model and absorbed rational internal dimensions from the theory of expectancy and self-efficacy. Different from TRA model, TAM model doesn't have the following three structures in TRA: subjective norm, normative belief and motivation to comply. Theoretically, TAM assumes that the key determinants of the adoption in organizations of information technologies are viewed as utility and ease of use (Davis, 1989).

Several studies (Adamson & shine, 2003; Brown et al . , 2002; Rawstorne, Jayasuriya & Ca-puti, 1998) have used TAM (Technology Acceptance Model) to clarify or evaluate the acceptance of end-users in an ERP system environment, the key explanation for using TAM being that it provides a framework for evaluating the effect of external variables on the internal system climate. However, the analysis by Legris (2003) also noted the TAM drawback, 1). The main target of the experiment is the student. 2) Most researchers used Microsoft office software or machine software creation tools. 3). Tools used in such inquiries are basically self-reporting. 4). The TAM model doesn't have clear elaboration for the variables that exist outside the model. Based on those drawbacks, a more detailed model and more realistic model is required for ERP framework acceptance research.

2.9.7 Technology Acceptance Model 2 (TAM2)

Based on the research conclusion of Davis (1993) and other researchers, Venkatesh & Davis (2000) improved the TAM and increased TAM's explanatory capacity. They introduced into the model the concept of "social influence process" and "cognitive instrumental process" and considered them as the definite variable of perceived usefulness; hence, the original layout was changed in which perceived usefulness is determined only by external variable and perceived ease of use. And Venkatesh & Davis (2000) named the new model TAM2, the technology acceptance model 2 is shown in figure 2.17.

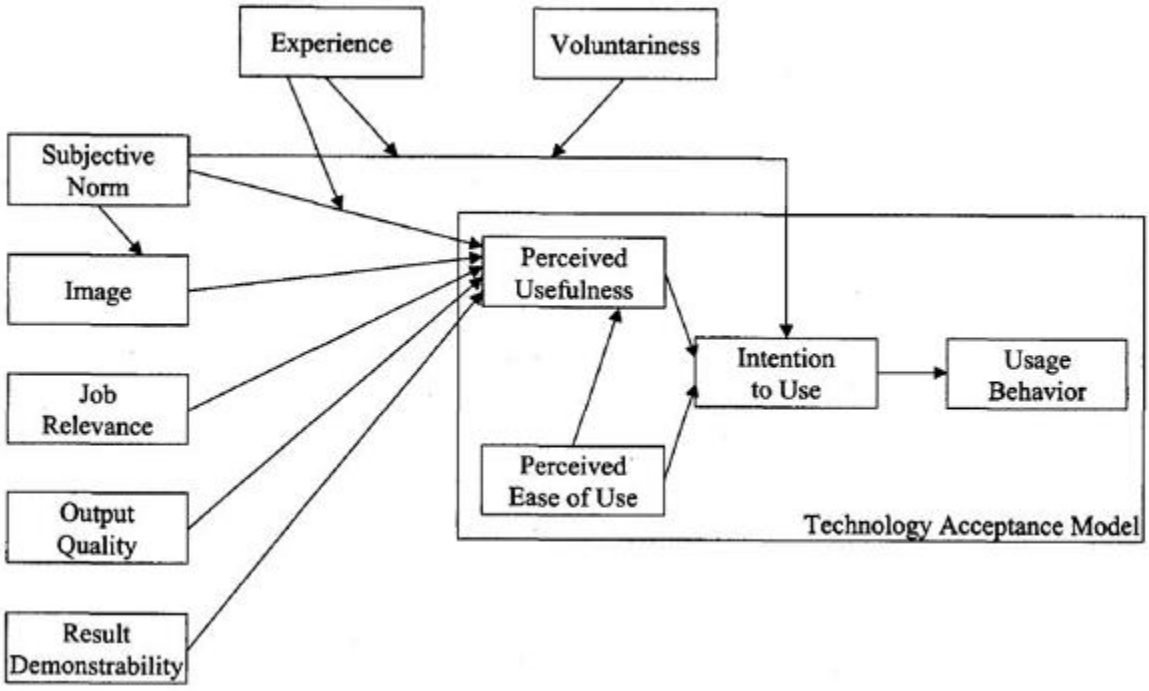


Figure 2.17 Technology acceptance model 2 (Venkatesh & Davis 2000)

Ramdani, Kawalek & Lorenzo. ,(2009) conducted a study to predict the adoption of an enterprise system by SMEs (Small Medium Enterprise), as their aim is to develop a new model for predicting the adoption of an enterprise system in SMEs, and TAM2 was used as their research model to examine the adoption of IS innovations in SMEs. And the study concluded that, as they attempt to implement enterprise structures, SMEs are affected by technical and organizational factors rather than contextual factors. Though

TAM2 is easy to apply in practice in research, according to their study, the information it collects is very limited.

2.9.8 The Technology-Organization-Environment (TOE) Framework

The Technology-Organization-Environment (TOE) paradigm was developed initially by Tornatzky et al. (1990) in order to explain the impact of contextual variables in the implementation of the invention. Within this sense, there are three factors in the context of a business that affect technology innovation acceptance, which are either technical context, operational context, and environmental (industry) external mission, or as the environment context is called. The technical background includes both the internal and external developments which are important to the organization. Organizational context refers to the existence and resources of the organization, which is influenced by the scale of the organization, the decentralization, formalization and sophistication of the management structure; whereas environmental context refers to other actors in the company, such as rivals, suppliers and government (Zhu et al. 2002).

Figure 2.18 below is the TOE Framework.

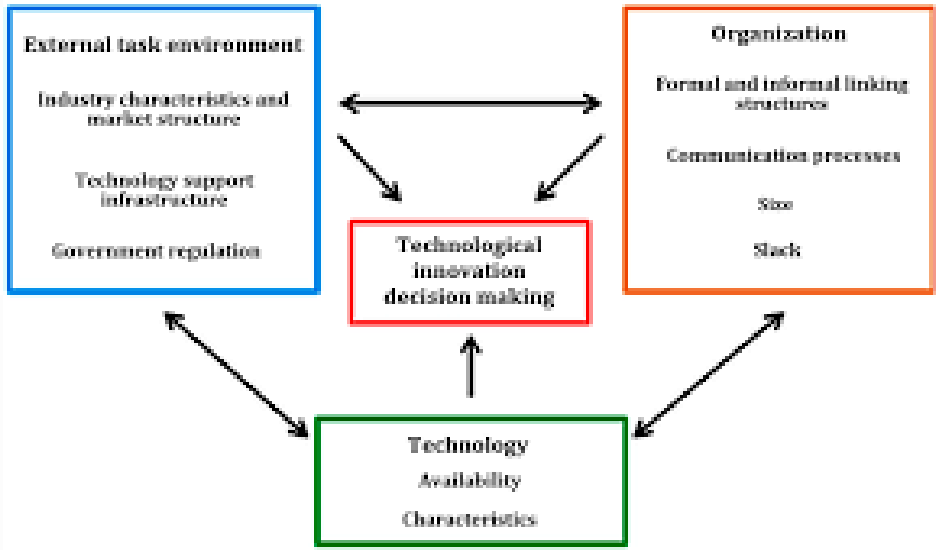


Figure 2.18: Technology-Organization-Environment (Tornatzky et al. 1990)

2.9.9 Unified Theory of Acceptance and Use of Technology

Another model that is related to both TAM and TPB is the unified theory of acceptance and use of technology (UTAUT), developed by (Venkatesh, 2003). This model, shown in Figure 5, essentially extends TAM through the addition of the social influences and facilitating conditions constructs, overlapping noticeably with TPB's subjective norms and perceived behavioral control (Benbasat and Barki, 2007). Similar to DTPB, UTAUT decomposes TPB's attitudes to perceived usefulness and perceived ease of use. (Venkatesh,2003) also add age, gender, experience, and voluntariness of use as variables that moderate the relationships between intention and use on one hand, and their antecedents on the other. With this integrated model, (Venkatesh, 2003) were able to account for 70 percent of the variance in usage intention - a percentage that indicates a considerable improvement over other models discussed in this section. This explanatory power, however, comes at the cost of less parsimony (Bagozzi, 2007).

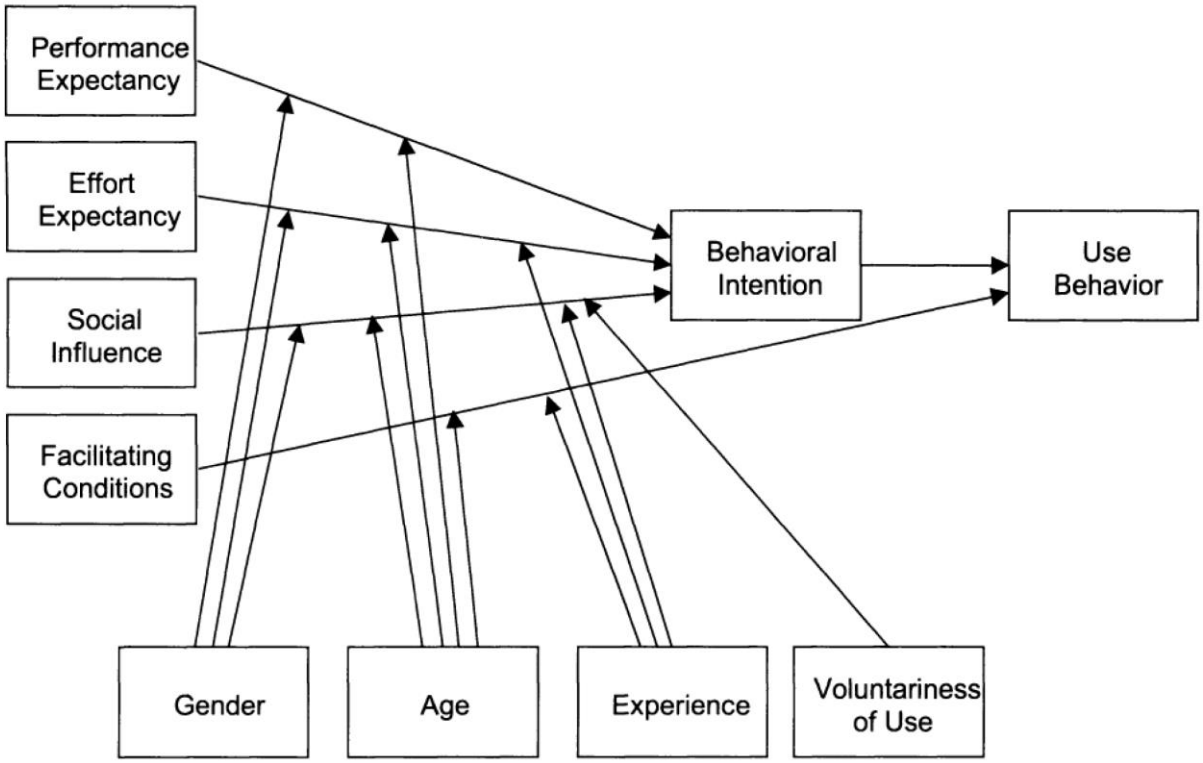


Figure 2.19: Unified Theory of Acceptance and Use of Technology (Venkatesh et al., 2003)

In a recent report, Wang and Wang (2010) found support for UTAUT as they used it to research the determinants of acceptance of the mobile Internet and to understand whether gender gaps exist in its acceptance. However, similar to DTPB, the search for papers that have used UTAUT in the last two years has resulted in only three papers, possibly an indication that UTAUT does not appear to have replaced other acceptance models.

2.9.10 ERP Acceptance Model (Sternad et al. 2010)

Sternad et al. (2011) explored a large number of external factors that influence attitudes and behavior regarding the ERP system in the post-adoption phase. They have based their theory using the acceptance model of TAM and many factors. As too many variables were involved, the external factors were grouped under three latent variables. System and technological characteristics (STC), Personal characteristics and information literacy (PCIL), and organizational- process characteristics (OPC). PCIL, comprising of four factors: computer experience, computer self-efficacy, technological innovativeness, and computer anxiety. STC, comprising of four factors: data quality, system functionality, system performance, and user manual helpfulness. OPC, comprising of five factors: social influence, fit with business processes, training and education, ERP support, and ERP communication. This model considers multiple factors that are specific to ERP technology therefore making it more suitable for this study that dwells further upon other additional areas of influence for more predictability. Of all the models studied TAM seems to be the best choice as a base model for predicting the technology acceptance as it covers the two most basic perceptions of users: usefulness and ease of use of technology. TAM describes about 40 per cent variation in intent and action (Nah et al . 2004). In many studies, TAM has been further supplemented by several factors thus increasing its predictability (Kwahk and Lee 2008, Calisir et al. 2009, Scott and Walczak 2008, Shih and Huang 2009, Venkatesh and Davis 2000, Sternad et al. 2010). One such study is that of Sternad et al. (2010) where they proposed the ERP Acceptance Model studying multiple influences.

2.10 Suitability of TAM for studying ERP acceptance:

Among the many theoretical models, TAM is widely accepted model for understanding IT adoption and usage processes. It explains much of the variance in users' behavioral intention (BI) related to IT adoption and usage across a wide variety of contexts (Hong, 2006). It forecasts a user's acceptance of IT and its use on the job (Au and Zafar, 2008) and describes the determinants of user acceptance of a wide variety of end-user computing technologies (Davis, 1986).

In the opinion of (Marangunic and Granic 2015), the constant improvement and advancement in technology, particularly ICT related applications, makes the option to decide on matters of acceptance and rejection a dilemma. In this basis, many models and theories have been developed to shed more light in the effective use of technology, and the Technology Acceptance Model (TAM) stands out from all models in addressing issues concerning the users' acceptance of digital technology. There can be no comprehensive and systematic work in the field without a considerable understanding of the context, development, and adjustment, along with the limitations of the model.

Many theories have been developed which relate to research into information literacy. They include: Diffusion of Innovation by (Rogers 1983), Theory of Reasoned Action (TRA) by Ajzen cited by (Priyanka and Kumar 2013) and Theory of Planned Behaviour by (Ajzen 1991).Despite that, the Technology Acceptance Model, in my view, is most appropriate because it helps to predict users' behaviour by considering the three components suggested by (Huda 2012). The validity of the theory has also been tested and was found to be impressive.

In many studies, TAM acts as a basis for measuring the impact of other influences on beliefs, attitudes, and intentions (Davis et al., 1989). TAM being empirically justified provides the basic theory to predict system use and is focused on technology that can assist in predicting technology acceptance (Chau and Hu 2002). TAM is perceived to be one of the most predictive, parsimonious, robust and powerful model of technology acceptance vis-à-vis other models (Venkatesh 2000, Venkatesh and Davis 2000, Liu and Ma 2006, Sternad et al 2013). Though parsimony is seen as a positive trait it also becomes a limitation as the model being simple is unable to explain the decisions and behaviors fully across a wide range of technology or in different situations (Bagozzi

2007). TAM ignores many important factors especially the subjective norms which depict the social influences on adoption decision, but is present in both Theory of Reasoned Action and Theory of Planned Behaviour from which it is linked due to theoretical and psychometric problems. The treatment with subjective norm was due to difficulty to distinguish if usage behaviour would be caused as a result of influence of referent or due to one's own attitude. Due to ignorance of the usage behaviors predicting indicators in TAM the managers may not know which levers to pull to affect the beliefs for improving technology acceptance (Liu and Ma 2006). TAM ignores coverage of group, social and cultural aspects (Bagozzi 2007). To overcome the shortcomings of the base model, modifications have been done by Davis and numerous researchers to include social and many more factors. Multiple studies in ERP have proposed different factor combinations, with TAM as the base model. TAM is found to be most suitable as a base model for this study that is extended further with many factors to overcome the limitations and increase the predictability, specific to ERP usage and in an organizational context.

Theoretically, TAM believes that the primary determinants of information technologies adoption in organizations are perceived usefulness and ease of use (Davis, 1989). Several studies (Adamson & shine, 2003; Brown et al . , 2002) used TAM (Technology Acceptance Model) to explain or analyze the acceptance of end-users in an ERP system environment , the main reason for using TAM is that it provides a basis for determining the impact of external variables on internal values , attitudes, and intent.

2.11 ERP and TAM

(Mahindroo, 2013) ERP systems have transformed the functioning of firms with regard to higher efficiency and accuracy in their operations. The coin of ERP performance also has other facet to it as well, i.e. higher failure rate, which is based on various aspects of program implementation issues both from organizational perspective and end user perspective. The end user perspective, which largely falls within the domain of behavioral sciences, was investigated using the Technology Acceptance Model (TAM) as the guiding principle. Organizations need to develop factors that impact user satisfaction

through TAM to improve the efficiency and effectiveness of implementing ERP in a real world environment.

In the rapidly changing global business environment, the adoption of enterprise resource planning (ERP) systems has been seen as a key to gaining a competitive advantage. ERP systems are information systems (IS), which provide an organization with integrated processes using a common database and shared information (Chung and Snyder, 2000; Dredden and Bergdolt, 2007). Brazel and Dang (2008) reported that ERP adoption in organizations creates positive market responses and may improve operational performance with ERP implementations (Hunton et al., 2003). Among the most important contributions of ERP systems is that they greatly reduce the time needed to complete business processes and help companies exchange information. In addition, ERP systems help business firms meet the evolving dynamic needs of customers as they can reconfigure a new framework and adapt rapidly to the needs of customers. A variety of theoretical models have been presented in previous studies to support successful ERP adoption and implementation (Calisir and Calisir 2004 Lee et al 2006). Thanks to its empirical support (Kerimoglu et al., 2008; Davis, 1989; Amoako-Gyampah and Salam, 2004; Scott, 2008), the technology acceptance model (TAM) tends to be the most widely utilized among IS / IT researchers and managers among the theoretical models. In an ERP system environment, if the company offers adequate resources to employees for their mission, employees are more likely to enjoy their job and increase their efficiency through use of the new program. Amoako Gyampah and Salam (2004) and Chung and Lee (2005) would also reduce the burden of using the system when employees who used the ERP system believed the organization had provided adequate support and knowledge, such as training.

In 1990, DePietro et al. (1990) developed a multi-perspective framework using organizational level theory called TOE (representing factors in technology, organisation, and the environment). The crux of the TOE framework was that three aspects could influence innovation and adoption in the technology (Alshamaila, 2013). These are:

• **Technology context** (or factors): Comprised of internal and external organisation-related technologies, including those already in use by a company or others on the market.

•**Organizational context** (or factors): Related to the resources and business characteristics including organizational size and management structure.

• **Environmental context** (or factors): Referred to an environment in which an enterprise conducts its business. These related to elements such as those from industry, competitors and providers of technology services.

These factors can help to predict the success of adoption of ICTs in SMEs. Kee (2013) indicated a variety of factors related to ICT adoption, some finding it more critical than others.

2.11.1 Role of external and contextual variables on the use of ERP

Researchers have different views on the factors which affect acceptance of the ERP system. A better understanding of these factors, it is said, will allow for more successful organizational strategies leading to increased program acceptance and usage (Venkatesh & Davis, 2000). Soresearcher also reviewed a number of existing literatures which explain the influence factor on acceptance of ERPs.

The technology acceptance model predicts that external variables are expected to indirectly influence technology acceptance behavior by affecting beliefs, attitudes, or intentions (Szajna, 1996). (Orlikowski, 1993) showed that implementing and using particular IT is not exclusively based on the characteristics of the IT but is also based on certain external factors such as organizational or social background, and human characteristics and attitudes etc. In his study, based on the fundamentals of human computer interactions and the theory of socio-technical systems (Land & Hirschheim, 1983, Brown 2002), technological and individual user characteristics were used as determinants of perceived usefulness and perceived ease of use. (Chang et al., 2008) considered technology, organization and user to be important actors in their study and predicted that factors relating to individuals and organizations would contribute to the adoption of ERP users' decisions together. The variables were considered as independent variables in studies employing TAM that would influence the use of ERP. In the present study, the variables were classified as organizational, technological, individual, and environmental characteristics. The outer variables considered in this analysis are as follows:

2.11.2 External Variables

Nevertheless, other scholars make use of TAM because it is for their study. Many of them applying the Technology Acceptance Model is an ongoing method of analyzing new technologies. TAM has been arguably the most influential theory in the IS. Many researchers added new variables to the Acceptance Model of Technology.

A main purpose of TAM is to provide a framework for tracking the effect of external variables on internal perceptions, behaviors, and expectations and suggests that perceived ease of use (PEOU) and perceived utility (PU) are the two most significant factors in explaining and predicting device use (Davis, 1989). Some scholars, however, confirm that PEOU and PU mediate external variables, and that any additional variable contributes little to explaining the variance in IT systems. Some scholars also say the external variables give a better understanding of what influences PU and PEOU, and their presence guides the actions needed to influence greater use of IT systems. Table 2.5 presents the external variables considered by different authors.

Table 2.5-TAM and ERP influencing variables

Author	Year	Type of Industry and Country	Sample Size	Factor identified	Factors Have Significant Influence on
SimonaSternadZabukovsek	2013	Slovenia	Industries-44 Questionnier-293	A Group of Organizational, Technological, Personal ,Work Compatibility	perceived usefulness towards ERP, perceived ease of use towards cloud ERP, Attitude toward using ERP system, conceptual factor personal characteristics and information literacy,Technology & Organizational
Hassan Alhanatleh	2016	Jordanian Education	206	Cloud ERP Technology, Employee	perceived usefulness towards cloud ERP, perceived ease of use towards cloud ERP

		Ministry			
Rajesri Govindaraju	-	SAP Users	176	Organizational, Individual	All Factors - influence end-users acceptance, perceived ease of use, perceived usefulness, perceived fit, perceived compatibility, attitude toward system use and symbolic adoption, individual an organizational contexts: personal innovativeness of IT, computer self-efficacy, argument for change, shared belief in the benefit of ERP system, and facilitating condition.
Christy Angeline	2015	SAP,Oracle, RAMCO Users	154	Organizational, Individual,Technological	Computer self-efficacy was significantly and positively related to perceived usefulness, Under organizational characteristics, both organizational support and training had a significant positive effect on perceived usefulness andperceived ease of use, Organizational support was more strongly related toperceived usefulness than

					perceived ease of use, training on the other hand was more strongly related to perceived ease of use, Perceivedusefulness and perceived ease of use significantly affect intention to use and in turn the usage of the ERP system, ERP had significant impact on the endusers'
Ravi Seethamraju	2014	SaaS 3000	300	Vendor,Technology,Organizational	evaluation process, accounting shift of investmentcosts to operating expense and challenges such as change management and value co-creation
Dong Cheng	2007		340	Change Manageemnt,BusinessProcess, LeadershipSupport,Learning Ability	change management, business process and learning ability on perceived use and ease of use
MarwaAbdulrahman Al-hadi	2017	Yemeni higher education institutions	84	Visionand objectives, top management support, business process, organizational structure, budget size, human resourcesmanagement, project management, training and education,busin	perceived ease of use and perceived usefulness (H1) and perceived ease of use have higher and direct influences on attitude toward using ERP, vision and objectives‖ have a direct impact on" business process‖,clearness of business process‖, the more perceived

				ess process re-engineering, and communication	usefulness, business process‖, project management‖ and communication and connection‖, absolutely have impact and influence on perceived ease of use‖,
KwasiAmoako-Gyampah	2004	healthcare products organization SAP Users like Allied Signal, Coca-Cola, Dow Chemical, DuPont, Eastman, General Electric, Hoechst, IBM		Project Communication, Training on ERP, Shared Belief	beliefs on attitude and the mediation effect of attitude on the behavioral intention to use an ERP system.
BooYoung Chung	2009	construction industry	281	User related and Project Related	User-Related Variables, Job Relevance, Result Demonstrability, Compatibility, System Reliability, Reporting Capability, Software Selection, Consultant Support, Information Systems Area Participation, Intermediate Variables, Perceived

					Usefulness, Perceived Ease of Use, Intention to Use/Use, User Satisfaction, Individual Impact, Organizational Impact orgimpa1al Impact, Project Success
Brenda Scholtz	2016	manufacturing industry in Bangladesh	140	Interface Usability-Navigation,Presentation and Learnabilty	PU,PEOU
VENKATESH	2012	construction industry	-	User related variable, Project related variable	ERP evaluation-function and consultant support, project success-progress and quality.
Pedro Soto-Acosta	2013	manufacturing companies	69	Project Communication, Project Champion, Training	Sheared Belief, PU, PEOU, Intension to Use
AnkitMahindroo	2012	manufacturing companies	152	PU, PEOU, System Flexibility	perceived usefulness, perceived ease of use and system flexibility on the intention to use
Samad M E Sepasgozar1	-	Construction Industry - Australia.	448	Composite Factors-Vendor, Individual, Organizational ,Project,TechnologicalFactors	Vendor-Technology-Influence Intension to USE
Ibrahim Egdair	2015	Libya	-	Organizational, Technology	ERP Use
NikenLarasati	2017	Craft Micro, Small and Medium Enterpri	222	Technology Readiness, Technology Acceptance	PU,PEOU,IU, Optimism, innovativeness, discomfort, security

		se in Yogyakarta Regency, Indonesia			
ShahinDezdar	2011	SME's Malaysia	26	Top Management, User Training, Communication	Organizational Impact, User Satisfaction
DonHee Lee	2010	SME's in South Korea	209	Composite Factor-Organizational Support	Formal support -,Training and education , Work environment Informal support - Communication-PU,PEOU,IU
Dinesh Banswal	2015	Education Sector India	-	User Participation	PU,PEOU,Attitude,Intension

Adoption of ERP systems is a considerable large investment in time, money and effort for many companies, and therefore adoption decisions have a huge impact on the organization (Davenport 1998). ERP systems are seen as business innovations, and despite their size, the deployment of ERP systems is regarded as beneficial to organizations (Seethamraju 2014). Reasons for adopting the ERP system or enterprise system are different for small and medium-sized enterprises compared to large companies, but despite the size of the enterprise, they can all benefit from adoption strategically and technically. It is also noteworthy that reasons for adopting ERP are technical, such as reducing operating costs by combining IT infrastructure with ERP system, but there are also business reasons for adoption, such as the ability to present "one face to customer." Common to nearly all businesses in reasoning adoption is to enhance process improvement and standardization through ERP system which then leads to improvements in production and operations. The "best practices" offered in the ERP system are often seen as an enabler for those improvements mentioned above. (Markus & Tanis 2000; Pan & Jang 2008; Oliver, Whymark & Romm 2005)

2.12 Proposed Factors for ERP Adoption and Implementation in Automobile Sector

Research efforts were devoted to extending the theory by examining the PU and PEOU antecedents. A better understanding of these factors, as noted by (Venkatesh and Davis 2000), would allow us to design effective organizational interventions that could lead to increased user acceptance and use of new IT systems.

Considerable empirical evidence has emerged in favor of TAM over the last two decades (Venkatesh, Bala 2008). While TAM is a model applicable to a variety of technologies, TAM constructs need to be expanded with additional factors integrated (Calisir 2009). Schwarz (Schwarz 2003) reviewed identified antecedents of cognitive factors (PEOU and PU) and categorized the factors into three groups: individual variables (such as computer experience, self-efficacy, and previous experience), organizational influences (such as management and external support and training, etc.) and technological characteristics (such as medium and interface type accessibility);

There are numerous factors which have been discussed and used several times in the literature. These factors play a significant role in the adoption and implementation of ERP which offers a better understanding of the adoption of ERP. The study of the aforementioned variables shows that they cover the organization's broad spectrum in various sectors. Such considerations provide the author with ample encouragement to find some of the most relevant ones for designing an automobile industry acceptance and implementation model for ERP. The author has selected factors that might support the development of a conceptual model for adoption of ERP in the automobile sector in future. Figure 2.20 shows proposed influencing factors,

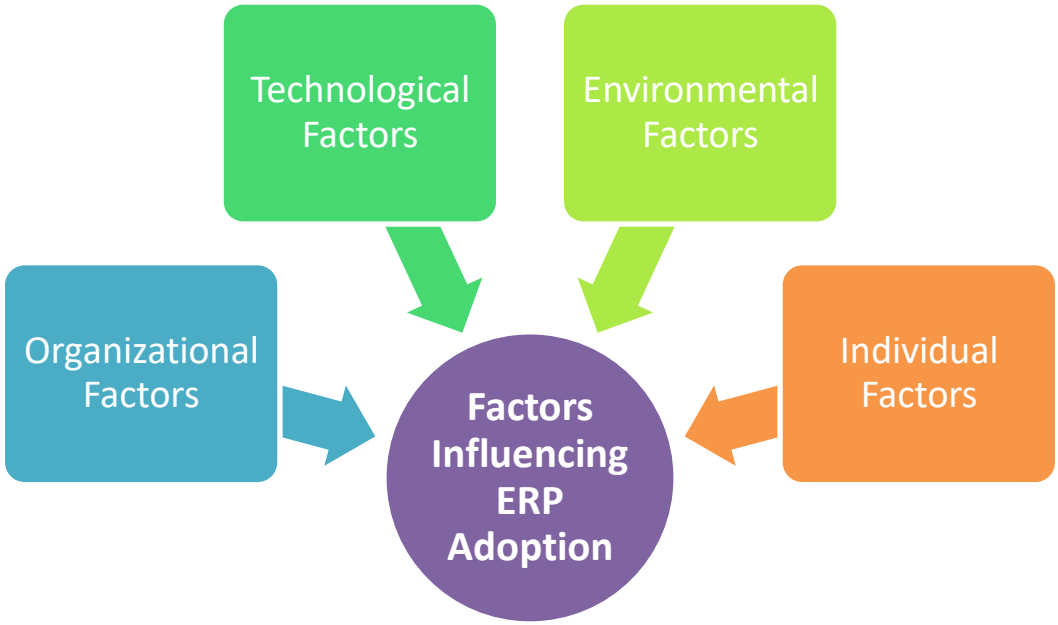


Figure 2.20 Proposed influencing factors

(Durodolu 2016) The changing information environment calls for the appropriate use of modern technology, as technology has become a tool for promoting access and using up-to – date information resources to boost productivity and growth. This article incorporated variables from four elements – organizational characteristics, system characteristics, user characteristics and other variables – to explain the procedure needed to acquire new competencies. Efficient access and use of information resources in the 21st century depends on the ability to make effective use of the information technology apparatus. Inability to demonstrate competence in this field will contribute to technology resistance that has been recognized as the key reason for impeding the adoption of new technology. This can lead many organizations to invest in the new way of doing things and yet their employees will be under-utilized. Understanding acceptance of the technology will lead to a stronger prediction of using new information technologies.

(Afaneh, 2015) Demonstrated the relationship with the ERP system between the Organizational and Technical Factors. He claimed that Organizational Factors and Technological Factors have a significant impact on the implementation of the ERP system.

This study highlighted a number of important factors which affect the acceptance of ERP implementation by end-users. Framework in this analysis is focused on technology acceptance (TAM) framework (Nah,2004), such as perceived user-friendliness, perceived usability, perceived fit, perceived consistency, attitude towards system usage and symbolic adoption, this study includes some more constructs as precedents of ERP adoption relevant to individual organizational contexts: personal IT innovation, machine sel.

(Leyh, 2014) showed that organizational factors could also be listed as part of the top 5 factors in our study (Clear goals and goals ,User training, Top management support and involvement). He showed that all factors influencing the performance of ERP system implementation projects in large-scale enterprises also influence ERP projects, even focusing on technical aspects of ERP implementation rather than primarily focusing on organizational factors because they are more relevant for large-scale enterprises.

So with theories like this, factors which are frequently came in research took collectively in four different form as shown in above figure 2.20 and detail factors are shown in below figure 2.21 In nest section, the author proposed and discussed factors that may influence ERP adoption and implementation .

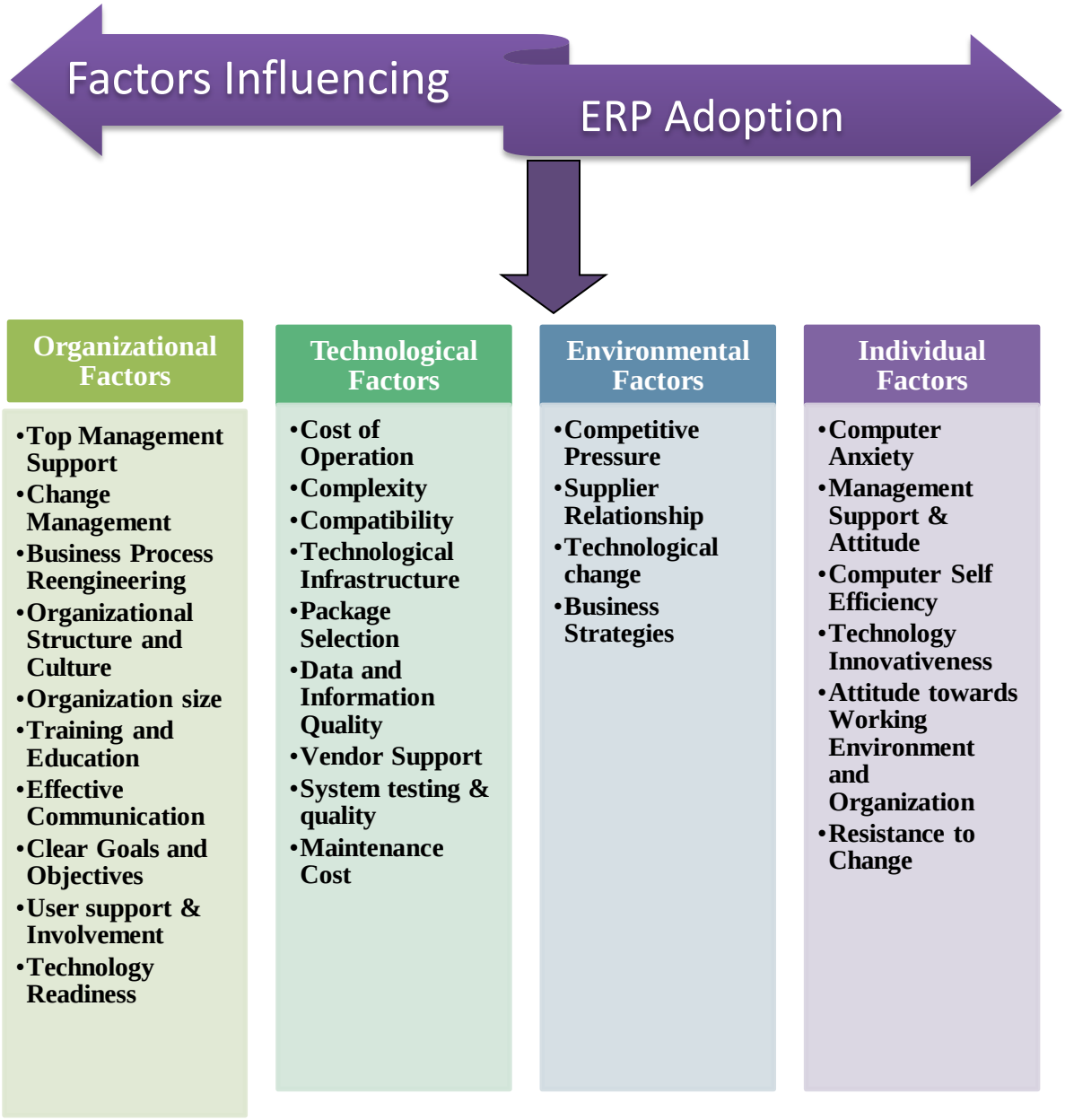


Figure 2.21 Proposed Factors and sub factors for ERP Adoption and Implementation in Automobile Sector

Table 2.6 shows frequency of each factors appearing in different literature studies by the researcher, only those factors were selected which came majority of time in the studies literature.

Table 2.6: Classification of ERP adoption Factors –Literature Appearance Frequency

Factor influencing ERP adoption	Frequency of factor appearing in literature
Top Management Support	32
Change Management	27
Business Process Reengineering	29
Organizational Structure and Culture	19
Organization size	24
Training and Education	28
Effective Communication	26
Clear Goals and Objectives	21
User support & Involvement	19
Technology Readiness	17
Cost of Operation	21
Complexity	20
Compatibility	16
Technological Infrastructure	14
Package Selection	23
Data and Information Quality	19
Vendor Support	21
System testing & quality	23
Maintenance Cost	19
Competitive Pressure	17
Supplier Relationship	18
Technological change	19

Business Strategies	20
Computer Anxiety	21
Management Support & Attitude	31
Computer Self Efficiency	17
Technology Innovativeness	15
Attitude towards Working Environment and Organization	19
Resistance to Change	20

2.12.1 Organizational Factors

(Dezdar and Ainin 2011) examine organizational factors that influence corporate resource planning, such as training and education, top management support, enterprise-wide communication etc. The study showed that a positive relationship exists between top management support, enterprise-wide communication, and ERP training and education with effective implementation of ERP.

The reason the authors explain is that organizations of all sizes have realized the strategic importance of technology to their business success, so they are willing to invest heavily in technology to improve their competitive advantages. In the same way, the role of top management engagement varies from context to context (Jang, 2010;Thiesse et al., 2011;; Li et al., 2010; Ramdani et al., 2009;Wang et al., 2010;).

Top Management Support

When adopting and implementing ERPS the most important factor is the commitment of top-level management to the strategic direction itself. Hammer (2008) is of the opinion that reengineering has to be guided from the top level. The primary ingredient for project success is top leadership, either the CEO or someone in a position to compel all parties involved in the reengineering process to comply. Responsibility on the line is said to be the key and reengineering is top-down, autocratic rather than democratic. This is without doubt a prerequisite for implementation of the strategy. Hence, top managers have to

show their ability to offer energy and commitment to the implementation process of performance management (Grint, 2011).

It is as a negotiator between business and technology (Davenport, 1998) that top management is the starting point to accept dealing with ERP or stay with the same business work. Top management support is a technique for enhancing the participation of knowledge in an institution and is an important guide for minimizing ERP implementation issues and also a reason for judging success in implementing ERP (Muinde,2016). On the basis of top management roles and commitments, they will develop policies, strategies and the overall objectives of the institution as a whole and develop strategic plans to achieve the desired goals and also build the institution's organizational structure (Grant, 2016, Goetsch, 2014).

(Dezdar,2011)he discusses how organizational factors, including top management support, affect ERP adoption The findings suggest that the top management of the business must have maximum project support and dedication if the program is to succeed. Ultimately, it is also highlighted that sufficient program-related training and education must be offered to all users to ensure that they are able to use the system efficiently and effectively, thus contributing to their satisfaction which will ultimately affect the effectiveness of implementation.

Top management support has been described as essential for innovation acquisition and distribution (Orlikowski, 1993). Executive board support is typically a key prerequisite for innovation acceptance (Liang et al., 2007). The main reasons are that it is ultimately the top managers who take the decision on adoption and the fact that IT is

Investment decisions often have wide impacts on organization. Control also exists in

Better positioning for identifying strategic growth capacity and creating long-term goals (Thiesse et al. 2011; pp. 334). The top management support is, according to Jeyaraj et al. (2006), one of the best predictors of organizational adoption of IS innovations. Top management can stimulate change through the communication and reinforcement of values through an organizational articulated vision (Thong, 1999).

Change Management

Implementing the ERP or new system forms part of corporate restructuring or re-alignment of business processes. For these situations, introduction and implementation of ERP is called a change management project, and it is handled as a transition or gradual transformation. In this type of business scenario, managing organizational inertia to accept change and associated conflicts is the first priority of top management (Al-Mudimigh et al., 2001). Activities, processes and methodologies which can support employees' issues regarding change and ERP implementation are given priority (Cooke and Peterson, 1998). Company systems and processes prior to alteration can not be consistent with expected change or improvement via ERP. Adopting ERP implementation as a change management process is advantageous in these types of cases (Woo, 2007; Umble et al., 2003). The latter indicates that it is highly essential to distinguish the requirement for change in order to continue to remain competitive. Several researchers emphasize the importance of administering and managing transformations occurring while implementing ERP (Somers and Nelson, 2001;Nah et al . , 2001; Ngai et al., 2008; Umble et al . , 2003; Nah et al . , 2003;). Change management is also reported to be vital and the IT implementation projects have major apprehensions (Somers and Nelson, 2004). The persistent improvisational modification method is a valuable modus operandi to determine, administer and train changes in projects implementing ERP (Upadhyay et al., 2011).

A comprehensive change management plan is required to prepare the organization and all stakeholders for the changes which follow an implementation (Al-Nafjan and Al-Mudimigh 2011). Change management is, according to Finney and Corbett (2007), one of the most cited CSFs in literature, which is confirmed by the number of publications examined by the researcher that involved change management.

Business Process Reengineering

In 1993, Michael Hammer, James Champy and Davenport considered the ability to reconsider, rethink and redesign the business process in order to accomplish the affected developments in serious performance measures, thus reducing costs , improving service and facilitating data flows and calling it business process re-engineering (Al-Amri, 1998),

(Davenport, 1993). In addition, change processes occur in business process reengineering that involves improvements in systems and procedures in the market environment, as well as changes in the overall technologies used, human and other organizational aspects [O'Neill, 1998, Xiang, 2014]. Whereas ERP selection processes depend on functionality, user friendliness and reliability are implemented to ensure ERP system success and facilitate data flow (Tamošiūnienė, 2013). Therefore, ERP 's best practices emerge when it has appropriate business processes and these business processes are versatile to re-engineer and also aid in the process of change management (Guha, 1993, Willmott, 20160. Impact of ERP business processes enhances thinking about re-engineering and how to manage change and all that helps in the process of integrating most business processes and also helps ERP progress towards effectiveness (Willmott, 2016, Esteves, 2016). As a result, the completion of the transition occurred in an 138rganization and thought about re-engineering according to the problems contained in the processes of the new information system (Cameron, 2015).

In this step, in discussion with the vital team members, the project manager determines the formalized procedures in which the system will work, not in technical terms, but in terms of the processes that the organization uses to accomplish various tasks, and how a business will operate after the ERP system package is in use (Al-Mudimigh et al., 2001). Modeling the business process is a detailed narrative that explains how a company is implementing ERP systems to support its business operations. In reality, BPR is a design manuscript that plays a vital role in the following steps, such as the ERP system configuration (Appelrath and Ritter, 2000; Al-Mudimigh et al., 2001). A large percentage of reengineering takes place iteratively in the ERP system implementation phase – the purpose herein is to gain the value of the ERP system benchmarks. In this perspective, companies sought to be prepared to understand the existing standards and model their core business processes from those exemplified by the program whenever and wherever possible. According to Nah et al. (2003), the organization should focus on continuing reengineering with better ideas and updates as soon as the ERP system is up and running in order to fully benefit from the potential of the ERP system. (Murray and Coffin, 2001) also point out that companies should be prepared to turn their core businesses into

software compliant and raising the customization scale needed. Other researchers argue that software should be modestly modified (e.g. Nah et al., 2003) to reduce the possibility of inaccuracies and gain from more recent software versions (Rosario, 2000). The foregoing conceptions emphasize that ERP should be viewed as an exclusive instance of IT adoption and implementation, where business process changes are significantly important to the outcomes of its adoption and implementation. The latter discussions clearly highlight the significance of the change in business process in relation to the adoption and implementation of ERP, and understanding a pragmatic insight into this association would also be crucial. On the other hand, Law and Ngai (2007) assert that it can be of benefit to provide an understanding the methods 139rganization139 aspire to adopt for establishing business process changes in relation to ERP adoption and implementation.

It is inevitable that changes are needed to current business processes when implementing an ERP, because the system‘s business processes are incompatible with those used with the legacy system (Nah, Zuckweiler, Lee-Shang Lau 2003). Such developments have led to a lot of debate about how to re-engineer the business processes of the company or to adapt the ERP to suit the business processes of the organization (Olson and Riordan 2012; Chen 2014).

Organizational Structure and Culture

In order to meet an institution‘s goals, researcher should define how tasks in an institution known as organizational structure are divided, grouped, and coordinated (Curriev, 1996). Looking for the best organized way to create integrated departments to represent the structure of the organization as well (Hasselbring, 2000). This may also be achieved through the re-engineering phase and the quest for performance of the ERP project (Walston, 2000). Organizational structure has a direct impact on system enhancement, and this enhancement will appear during project management (Duong, 2013).While failure in organizational structure is a point of failure in implementation of ERP and project management of ERP (King, 2008).

Organization culture influences the adoption of ERPs. Additionally, it has been disclosed that the organizational culture affects the application of ERP (Kiarie, 2017).

Organizations should be working on their culture of 140rganization (Sternad 2013). (Afaneh, 2015) states that the impact of organizational culture on the implementation of the ERP is positive.

Organization culture influences the adoption of ERPs. Additionally, it has been disclosed that the organizational culture affects the application of ERP (Kiarie, 2017). Organizations should be working on their culture of 140 organization (Sternad 2013). (Afaneh, 2015) states that the impact of organizational culture on the implementation of the ERP is positive. One of the main reasons certain process reengineering programs don't reach the degree of performance that the company wants is that the company or functional manager hasn't tackled the problem of changing organizational culture. Temponi (2008) claimed that a company should aim at all stages of the reengineering process to include the workers.

Given these shifts in strategic consequences, it is also important to note that organizational systems have an effect on organization and culture, which includes improvements in management structures, such as creating more agile and flatter 140 organization, but in some cases they may also create more hierarchical and centralized control as information is centralized through ERP systems (Davenport 1998) Since ERP systems may require a lot of organizational changes which emphasize the importance of managing change.

Organization size

(Rogers, 2003, p. 411) Size is usually included in organizational technology adoption studies and can be measured from several dimensions leading to innovation: total resources, slack resources structure of organizations, technical expertise of employees,.' Thus, the impact of organization size on technology adoption can be interpreted through multiple dimensions. For example, unlike small organizations, large organizations may have more resources at their disposal that can be used to implement new technology, particularly financial and technological resources (Tornatzky & Fleischer 1990).However, large organizations can suffer from inertia as opposed to small organizations (Zhu & Kraemer, 2005), a situation in which they are less agile and

inflexible to adapt quickly (Hitt, Hoskisson, & Ireland, 1990). Small and medium-sized enterprises (SMEs) may be more likely to adopt new technology in this respect than large companies. Yet also in those small and medium-sized businesses they need the tools (such as financial capital and human skills) to be able to implement new technology (J. Thong, 1999).

The size of the organization clusters the ERP market, since the adoption decision recognizes that variable is a crucial matter. Although organizations are considering the introduction of ERP systems, company size is considered significant because ERP projects are expensive and risky, there are instances from the real world where businesses have spent hundreds of millions of dollars in making the required technological and business-related improvements for ERP systems. It is also known that these ERP implementation projects can in some cases last for years. Another factor that is recognized is that smaller companies have fewer complex system requirements that contribute to different system requirements and specific organizational level adjustments needs, such as improvements in business processes and restructuring of existing structures compared to larger firms. (Buonanno, Ravarini, Faverio, Sarpola & Hallikainen 2007; Sciuto & Tagliavini 2005; Pan & Jang 2008;Laukkanen,; Markus & Tanis 2000;) Laukkanen et al. (2007) analyzed the adoption of the ERP method and the relationship between company size, by means of goals and constraints on adoption, based on data collected from 44 Finnish firms. In this study, it was found that big companies had more problems with adoption-based organizational changes, and for small businesses concerns were more based to lack of resources and awareness. (Laukkanen et al.2007).

(Lindopp, 2015) The size of the company has a major impact on the importance given by Irish companies to factors influencing ERP adoption, with similarly influenced companies. The study finds that, when adopting ERP, small businesses are primarily influenced by current considerations, such as its overall cost and money saving potential. In contrast, large companies are influenced by factors such as growth and stakeholder perception, using the adoption of ERP as a basis for ensuring future viability. The study also reveals that decisions regarding implementation in small businesses tend to be influenced by specific operational issues.

Training and Education

Training in the adoption and implementation process is important in ERPs, as it helps workers to learn the skills they need to perform their jobs. It consists of certain tasks, which are intended to enhance individual performance in or in connection with a job currently held. It is thus aimed at helping employees effectively perform their current jobs. Training and development programs are designed to educate employees beyond their current position requirements in order to prepare them for a broader, more challenging role within the organization. Education covers house classes, coaching, work rotation, workshops, and technical programs. The ultimate aim is to enhance the organization's own future performance. The general training program consists of evaluating the needs of the company, evaluating the performance of the employee and the actual training itself (Vega et. Al, 2010).

Partially, the ERP projects do not achieve the preferred profit because managers underscore the efforts involved in managing transformation (Al-Mudimigh, et. Al., 2001). The latest modifications that an ERP system may introduce can bring unenthusiastic results such as confrontation (Grabski et. Al., 2001). Other user-related threats recognized in the literature are unsuccessful communication; inadequate training; users are unable to understand the profits of the new ERP system; inadequate commitment to human resources; inadequate compassion for user resistance; failure to highlight user reporting (Huang et. Al., 2004; Ojala et. Al., 2006; Sumner, 2000) and skill loss (staff turnover).

Factors affecting the introduction of ERPs in small and medium-sized enterprises in Kenya include; top management of small and medium-sized enterprises; top effective communication; management of project team members; and training and skill development (Kiarie, 2017). ERP training is an important component of ERP implementation projects and is recommended before, during and after implementation (Bueno, 2008). Training and education on an ERP system is defined as the degree to which the user believes he / she has had sufficient formal and informal training after implementing ERP.

An organization will never take advantage of the ERP program until its workers have sufficient knowledge of how to manage the new system (Cassidy, 2016). The implementation of ERP systems without sufficient training would imply system failure (Alcivar, 2016). The aim of the user training and education program is to ensure that employees are comfortable with the system and also help to increase user skills and understanding (Elkhani, 2014). Users should be aware of the processes of ERP program and able to understand how the system operates (Rosenblatt, 2013). That is why training does not only mean operating the new system, but also recognizing and understanding the new processes within the system, even though users have strong skills, they cannot manage the operation of the ERP system (Kerzner, 2013). Therefore, to confirm the success of the ERP system, it is essential to pay attention to training, as well as having adequate training can be an indicator of robust human resource management (Gupta, 2014). Considerations of training and education should fit the management of human resources (Obeidat, 2014).

(Amoako-Gyampah, 2004) Training provides a hands-on mechanism that enables ERP users to explore the system from both a technical and a functional perspective. It allows the users to obtain information and experience first-hand. It also allows them to scan the system's PEU. Training thus helps to form the shared beliefs in the benefits of the ERP system and also affects the system's PEU. The study confirms that managers can undertake strong and effective communications initiatives coupled with effective training on ERP systems to impact core TAM variables.

(Dezdar, 2011) illustrated that adequate system-related training and education must be provided to all users to ensure that they are able to use the system efficiently and effectively, thereby contributing to their satisfaction which will subsequently influence the success of implementation.

Effective Communication

The findings on how employee involvement as well as effective communication and how they influence the implementation of ERP affirm that some key management constructs are employee involvement, communication and management of the nature of leadership should provide communication channels for employees and improve their ability to

understand each other. (Motwani and others, 2008). Top managers should have vision (shared vision) to guide the changes. Employees should take a more sensitive approach. All ERPS team members should understand the process. Top Effective communication is vital for decision making at the organization (Grint, 2011).

ERP communication issues relate to the lack of communication on ERP applications and their amendments (Kelley, 2001). As a result, ERP communications was defined as the degree to which an individual views sufficient communication with respect to the ERP system as the reason for its successful use of ERP.

The exchange of knowledge and activities between the ERP project team will be included in the communication and connection of the think team at-level of ERP implementation (Françoise, 2009). Good communication between departments and even between personnel of the institution as a whole would increase the likelihood of success of ERP through effective communication (Ramayah, 2007). In addition, communication may occur as inward communication within the project team, or as outward communication within entire institutions (Tsai, 2011). Communicating between the business and IT team is a critical success factor, while communication has the ability to cover the scope, responsibilities, and persistence of implementing an ERP project (Sternad, 2009). Communication is a obstacle in the implementation of the ERP system, and it affects the performance of the ERP system (Saadé, 2005).

(Amoako-Gyampah, 2003) There is substantial support for both project communication and training to influence beliefs about the benefits of the ERP system. The key roles that communication plays include providing and obtaining information, and building understanding among organizational participants that leads to the formation of shared beliefs among organizational participants, especially those who are the targeted users of innovation.

(Dezdar, 2011) examines how the adoption of ERP influences organizational factors such as communication. Additionally, management also needs to ensure that the entire company communicates the plans and understands them.

Clear Goals and Objectives

Business vision, goals and objectives clearly reflect the overall organizational set-up. (Buckhout, 1999) reported that a comprehensible business organization plan and project guidance vision is required throughout the ERP lifecycle, i.e. from adoption to implementation to final acceptance and use. The latter is supported by (Loh and Koh,2004) who note that an effective business plan (with clear strategic vision, defined goals and objectives) that outlines the expected tactical and significant benefits , costs, capital, and risk and timeline is all necessary. (Nah and Delgado, 2006) argue in the sense of the above definition that the emphasis on organizational business benefits should be retained in this way. Hence, it is quite understandable that it is very important to have apparent business vision, goals and objectives in place for ERP implementation projects (Doom et al., 2010). (Upadhyay, 2011) also states that for ERP ventures, the vision and mission need to clearly indicate the quantifiable goals and targets – goals and targets that need to be evident and comprehensible.

User support & Involvement

Project teams implement ERP systems, but the system itself brings about an organizational change that is a positive change to overall organizational quality performance for many. End users of the system are spread throughout the organization and their involvement is therefore very important in mapping their skills and exact departmental requirements while adopting and finalizing the ERP systems. According to (Remus, 2007), there are two end-user forms-pre-implementation and end-users post-implementation. Pre-implementation end users are essential at the requirements analysis, planning and training phases, whereas, post-implementation end users involvement is vital for acceptance and cascading the usage of the system. (Upadhyay, 2011) also illustrate that user involvement and participation reflect the attitudes and operational activities performed by end-users in the system process. The latter demonstrates an individual's emotional state, and is represented as a user's sense and individual bearing of a program. According to (Kansal, 2007), there are two key user participation domains when an organization attempts to adopt and implement an enterprise information system. Firstly, user involvement in stage of definition of 145 organization s enterprise system

needs and, secondly, user participation in implementation of enterprise systems. Researchers like (Levy and Powell, 2000) and (Upadhyay, 2011) report that lack of IT experience and knowledge usually results in limited user involvement. In order to positively impact the opinions of consumers on new technical approaches, the real advantages of implementing the ERP program were constantly being tried to repeat (Umble et al . , 2003). Otherwise, users are not encouraged to extend their support for the implementation of ERP systems, and are not eager to assist experts or consultants and incorporate the skills and knowledge transferred to users (Wang and Chen, 2006; Maditino., 2012).

Researchers such as Nah, Zuckweiler and Lee-Shang Lau (2003) and Shaul and Tauber (2013) with Rabaai (2009) have established the importance of participation in concert with good communication with users as an important CSF at all levels in organizations, believing that this factor is, in fact, essential for a successful implementation.

Technology Readiness

The degree to which a firm prepares the environment and the workforce to accept and configure new technology is referred to as IT readiness (Stratman and Roth, 2002; Finney and Corbett, 2007; Soja, 2006; 2004; Loh and Koh, 2002; Somers and Nelson). Assessment of an organization's IT readiness including its skills and infrastructure is imperative (Tarafdar and Roy, 2003; Somers and Nelson, 2004). IT skills refer to the ability of IT personnel to configure and maintain business-support information systems (Stratman and Roth, 2002). Regardless of the pervasiveness of IT in modern workplaces, companies are not optimizing organizational efficiency due to poor acceptance of new technology by employees. Strong technical expertise and training availability have been identified as essential for firms to improve their core competencies (Ravichandran and Lertwongsatien, 2005). It can be expected that companies with a higher level of technical expertise and infrastructure will master the technical aspects of business and contribute more to firm performance than companies with a lower level of technical expertise and infrastructure (Lee et al., 2007). Technical IT skills are required after the initial installation; support for post-installation is generally required to constantly refine and adjust particular system attributes (Stratman and Roth, 2002; Davenport, 1998). Since

ERP systems work in a complex market environment they have to adjust to changes in the company's strategic and operational focus. Not only should the ERP project manager and team members be technologically competent but they should also understand the company's business requirements. Expertise of a project leader is particularly critical during the chartering phase (Markus and Tanis, 2000). If project leaders at certain points of decision-making do not know what to do, this creates a significant problem. During the implementation process the skills and experience of the project team is crucial in recognizing consultants' expertise in areas where team members lack knowledge. After implementing an ERP system, the staff should be able to solve any problems without the assistance of consultants.

2.12.2 Technological Factors

(Egdair and Rajemi 2015) The importance of understanding technology variables on the relationship between ERP and efficiency is essential to the success of the device adoption process, it seems that new directions need to be explored further,this involves knowledge. Few research that addressed both organizational success and some of its variables, ERP adoption, and technical factors. The importance of understanding technology variables about the relationship between ERP and efficiency is the main issue for the success of the device adoption process, it seems that new path needs to be studied further, this involves recognition of this phenomenon and further analysis of the expansion of information in the practice of multiple factors in addition to the established factors.

The technology infrastructure has a position of up to 38.40 percent in deciding ERP implementation performance (Hasibuan, 2012). In this regard, (Dwivedi, 2002) noted that in order to determine the technological factors identified, future studies should be achieved in an empirical manner, Compatibility, Complexity, which influence the adoption of ERP.

Cost of Operation

Maybe the most benefit of using ERP in institutions is based on the cost factor. The size of the budget that was planned should be adequate to have full implementation of the ERP system. Even the cost of ERP is high due to the planning, implementation, customization and configuration costs; the advantages that the institution will have will be high. Functional fitness, overall cost, training, and integration are criteria which affect ERP implementation. In addition, the size of the budget has an effect on ERP‘s best execution, and this will depend on the project manager plan. While budget size may affect project management capability, the budget is the way to securely base project management.

Budgets and costs are key to the execution of an IT project (Upadhyay et al., 2011). As regards the implementation of ERP program, the cost depends heavily on the scale of the functions and the scope of their execution. According to (Rogers, 2002), where SMEs are concerned, the cost for a site license for about 15 end-users can be around $15,000 annually. While (Koch, 2002) reported that the typical total cost of ownership in relatively larger organizations could be around $15 million, for multinational or even large organizations on the other hand, the total cost of ownership could exceed $300 million. The total cost of ownership in connection with the implementation of ERP systems is more than just the actual cost of the software (Upadhyay, 2011). An additional inherent expense related to ERP systems is the cost of upgrading; this is because typically deployed and implemented systems require new functions every now and to remain functional and effective (Dowlatshahi, 2005). According to Koch (2002), the upgrading is typically about 30 percent of the initial ERP program budget.

For a standard ERP project, Hitt et al 2002) define the breakdown of the costs as follows:- Software licensing 16%

- Hardware 14%

- Consulting 60%

- Training and other internal staff costs 10%

Kai & Per (2007) argues that the complexity of ERP, its high cost of other implementation issues can lead businesses to re-examine their plans to acquire and implement enterprise-wide systems.

Complexity

Similar to other management information systems, enterprise resource planning programs are also viewed as very complex and hard to incorporate (Xue et al . , 2005). Aiman-smith and Green (2002) described technical complexity as the degree to which a new technology for its user is more complicated than the previous technology used for the same or similar job, and it represents an increase in the number of things that the user must do at once. The complex nature of ERP systems restricts the amount of information that users can learn before actual use (Yi & Davis, 2003). Higher complexity results in higher mental workload and discomfort (Sokol, 1994). The complexity of the ERP system may have a negative impact on the attitudes of users towards using the system (Daim, Basoglu & Kerimoglu, 2007; Chang et al, 2008). Innovation is seen as consistent with current beliefs, desires and past experiences of potential adopters. Agarwal, Karahanna, and Angst (2006) put forward four dimensions that represent the concept of compatibility: compatibility with preferred work style,compatibility with current work practices, compatibility with existing values and compatibility with previous experience .Within this article, technical flexibility is seen as one of the technological features that impact ERP useThis applies to ERP ‘s compatibility with the organisation’s current structure. The knowledge acquired from past and current experience of technology is called in technical continuity (Martinez, Ortega, and Hoyos, 2008). According to Soh, Kien, and Tay-Yap (2000) technical and data compatibility are critical to the acceptance of the system by the member of staff and employees. Enterprise resource planning services are not compatible with certain organizations’ databases and operating systems, so procedural so data compatibility are essential to employee acceptance of the program (Zhang, Lee, Huang, Zhang, & Huang, 2005). Incompatibility with technology would therefore have a negative effect on system effectiveness, performance, employee satisfaction, engagement and motivation (Erensal & Albayrak, 2008). Greater compatibility of technology advancement with current technological structures, business procedures, and the adopting unit’s interest and belief systems has been cited as

beneficial for adoption and dissemination (Cooper & Zmud, 1990; Ramamurthy & Premkumar, 1995).

Complexity is defined as how to look for innovation in IT 150rganizations. It is relatively difficult when using complexity very often, for some or all of the employees or workers to find a problem. It generates more confusion for effective implementation (Rogers, 2003), and thus raises the accreditation risk. Decisions do not consider its subsidiary to be one of the most successful companies in adopting factors of innovation (Premkumar, 1999). The inherent complexity of ERP reflects how completely free of physical and mental effort the program is, which could lead to adoption failure or success. (Rogers,1985) say that most of organizations that rely on company that provide ERP solutions would be suitable and lead to employee satisfaction, student service, customers and boost performance in case of implementation of active systems (Bradford, 2003).

Compatibility

Compatibility is referred to as the capability of an information system to exchange data with other systems. Many interviewees strongly recommended including this factor because compatibility issues of different systems are critical to the success of ERP systems implementation. These questions asked respondents about their ERP systems' ability to import and export data from / to other systems or software which they currently use.

It is widely recognized that common problems with adopting ERP systems are rooted in the poor fit between ERP systems and business processes (Road,Chen & Chen , 2009). In the implementation of ERP, systems are developed to support business processes such as manufacturing, purchasing or distribution, and thus the implementation of ERP and business processes should be closely linked (Tsai, Chen, Hwang, & Hsu, 2010).Rogers (1983) defined compatibility as the degree to which an innovation is perceived to be consistent with existing values, needs and past experiences of potent innovation. Karahanna, Agarwal, and Angst (2006) put forward four dimensions that represent the concept of compatibility: compatibility with current work practices, compatibility with preferred work style, compatibility with previous experience and compatibility with existing values. Technological compatibility is seen as one of the technological features

that affect ERP usage. This applies to ERP's compatibility with the organisation's current structure. The knowledge acquired from past and current experience of technology is called in technical compatibility (Ortega, Martinez, and Hoyos, 2008).

Innovation compatibility is defined as the degree of innovation that can be consistent with what is a single organization or department of past and potential needs values and experiences (Lee,2003), (Rogers,1985), where a consensus can be stipulated. The most important aspect is to depend on the adoption in one single function of a program or new technology (Premkumar, 2003). This is due to resistance to changing from employees to working as a natural reaction within the regulatory framework, which requires a study of so-called innovation compatibility. Adapting employees and workers to suit changes in infrastructure, values, and beliefs is important (Premkumar, 1999). In an ERP setting the technological compatibility of innovation is likely to maintain similar functionality that already exists. It must be incorporated with ERP, and it becomes easier to incorporate modern information technology than maintaining the current systems, and this improves the chances of obtaining organizational benefits (Bradford, 2003).

Technological Infrastructure

(Afaneh, 2015) states that Technological Infrastructure has positive impact on ERP implementation. IT infrastructure is an integral part of an organization's overall infrastructure which is creating an IT / IS platform (Shaw, 2000; Kamal, 2008). IT infrastructure includes computer systems and related support software needed for the creation, management and operation of IT applications, such as operating systems, database management systems, development tools and management tools (King and Burgess, 2006; Kamal, 2008). Thus, the implementation of ERP systems requires a large amount of hardware and networking infrastructure. An ERP program relies in its operation on high-level IT infrastructure. Compared to the infrastructure, obviously, the program design has a major effect on the implementation process and conclusion (Jarrar, 2000). IT infrastructure and the development of human resources both have limited influence on the implementation of the ERP. Although the necessary IT infrastructure necessary to support the ERP system is required to a large extent, the individual effort

should not be directed towards selecting the IT infrastructure. To increase the likelihood of successful implementation of ERP, organizations need to start viewing ERP as a holistic business rather than just a large-scale IT project undertaking (Ehie and Madsen, 2005) argues that the importance of ERP should be placed on offering a business solution and not essentially an IT solution. Others including (Ross, 2006) and (Doom, 2010) see IT infrastructure standardization as an important factor of success for all technological implementations.

Package Selection

Proper product selection is a key factor that will help in the efficient implementation of ERP systems in enterprises of any scale. Companies choose the kit that is most user-friendly and clearly addresses the business process needs. Significant consideration must therefore be given to selecting the proper ERP package (Yusuf et al., 2004; Al- Mashari et al., 2003; Somers and Nelson, 2001, 2004).

Umble and Umble 2002 supported software capabilities as being significant. They found that if the capabilities and needs of the software are not matched with the business processes of a company, this can lead to failure of the ERP implementation. There were two questions concerning the selection of the software. The questions raised about how well the ERP software used by the respondent's company can support its business processes as well as the software's features.

Proper package selection is a crucial feature which would result in the successful implementation of ERP systems in organizations of any scale. As far as the Indian SME is concerned, organizations choose the kit, which is more users friendly and explicitly addresses the business process requirements. Significant consideration must therefore be given to selecting the proper ERP package (Yusuf et al., 2004; Al- Mashari et al., 2003; Somers and Nelson, 2001, 2004).

ERP is known as a collection of bundled applications (Themistocleous, 2004). ERP vendors say that their systems / applications overlap in functionality, but in fact this is not the case, at least not in their entirety. Some packages, for example, are more suitable for

large and multinational 153 organizations, while others are more suitable for smaller organizations and SMEs. When it's agreed to choose a suitable product then it's time to choose a suitable version or kit element that best fits the organizational needs and needs. (Akkermans and Helden, 2002) argue here that if the selection process goes wrong at this point , the company either confronts the package and its internal business processes and strategy with eccentricity, or the need for the most critical software change, which is extremely time-consuming , costly and dangerous. The selection of the correct package in the implementation and adoption stages can be said to include crucial decisions about budgets, priorities, schedules and delivery tasks that will form the entire project. The greater the effort involved in choosing ERP packages, the greater the chances of overall performance, according to (Somers and Nelson, 2004) and (Remus, 2007). In general, an organization opts for a package that is comprehensible in its entirety, has sufficient capacity for scalability, and deals with a series of business processes in situations where organizations are confronted with problems – all this requires careful concentration (Al-Mashari, 2002; Kraemmergaard and Rose, 2002 ;Upadhyay et al., 2011; Somers and Nelson, 2004).

Data and Information Quality

ERP offers quick access to organizational data but there would be little advantages if the data is unreliable or irrelevant to the subunit business processes. Therefore, without reliable and appropriate data, the management and task productivity benefits that an organization can obtain from its ERP program are significantly limited (Gattiker, 2005). Companies should ensure improved data quality in the implementation of ERP (Sternad 2013).

Whereas the quality factor for information focuses on the quality of knowledge derived from the information systems. The quality of information is stated to be of two forms, i.e. intrinsic quality (i.e. data precision or consistency) and functional quality (i.e., the importance accurate data has in promoting the organization's work). Information or data that does not facilitate the organization's overall vision cannot claim to be of no quality,

after which it does not matter how accurate the data is. Researchers report that information quality concerns the relevance, comprehensibility, accessibility and usability of the system's information productivity (Ifinedo and Nahar, 2007). In the context of ERP systems, quality of information is about the information produced by the ERP. (Laberis, 1999) reports that the primary importance of the ERP system is its ability to restructure the flow of information within the 154 organization.

Vendor Support

Support of vendors refers to the availability of such things as vendor training regarding their systems and technical support on cloud ERP system implementation and use. Support to vendors was found to have a positive influence on the adoption of technology (Chang et al., 2007; Dedrick & West, 2003). The present study postulated that Cloud ERP systems implemented by companies would have a higher degree of Vendor support.

ERP provider or vendor for direction, assistance, technological experience and, also, needs training in the implementation process. The vendor needs to be financially stable so it can provide the highest level of support to the institution (Bingi, Sharma and Godla 1999; Al-Mashari and Al-Mudimigh 2003; Somers and Nelson 2004) in order to improve the probability of a successful on-line registration system. The data analysis illuminates the assistance and advice of ERP suppliers as one of the high activity factors suggesting that this factor has the potential to affect certain variables in the program with the greatest effect on software testing and troubleshooting. This factor is also one of the high ranking factors on the driving scale indicating that it can be influenced by extrinsic forces and can be used for interventions as it affects the system and other factors as well.

Researchers accentuate that vendor selection and relationship growth with vendors is crucial. This is because vendors are more knowledgeable about the system being supplied and possess a lot of information. In addition, it is their undertaking to offer customization, features, time and cost-saving techniques and operational training to organizations a variety of alternatives – all with regard to ERP systems (Somers and Nelson, 2004). Butler (1999) supports the latter points, who also reports that the partnership should be strategic in nature among organizations and vendors, as the experience and technical skills of vendors will most likely improve the success,

efficiency and competitiveness of an organization. Remus (2007) also reports that vendor partnership is essential before the implementation of ERP systems where post-implementation vendor support is crucial. Vendor partnerships with 155 organizations, including the installation of its advanced application versions, may extend the life cycle of the ERP systems. Vendors support various organizational activities such as technical assistance, end-user training, emergency maintenance and updates (Somers and Nelson, 2001; Remus, 2007), among others. This vendor functionality makes partnership with vendors a critical factor of success. It is also stated that the workforce of vendors is required to be competent and aware of both the business processes of the company and the overall system-wide functions of the organization. According to Zhang et al., (2002) 155 organizations need to be careful in opting for vendors. It is because vendors' assistance is essential in formulating the resulting product i.e. the ERP systems implementation. Such theoretical conjectures emphasize that the success of a project is found to be linked positively to the suitability and harmonization with the partnered IT vendor (Upadhyay et al., 2011; Kansal, 2007).

System testing & quality

In order to ensure that the system performs effectively, reliably, interacts with existing systems and follows the goals and goals set out to the project plan (Kumar, Van Hillegersberg and Experiences 2000; Fui-Hoon Nah, Lee-Shang Lau and Kuang 2001; Al-Mashari and Al-Mudimigh 2003), a range of test and simulation runs will be carried out before any system goes live.

System Testing: According to (Nah, 2003), the development and testing stages of an ERP project ought to be cautiously designed and managed. They also emphasize that before reaching the employment stage, the entire ERP infrastructure should be developed, taking into account the core needs of the implementation stage. Here, (Loh and Koh, 2004) states that reorganization at each sub-stage of the implementation process would be prevented. Using correct modeling methods, architectures, and techniques can help achieve ERP performance (Scheer and Habermann, 2000; Murray and Coffin, 2001). Thorough and rigorous software testing simplifies the deployment process according to (Rosario, 2000). The organizations involved in the implementation process of ERP should work together with their vendor partners, experts and consultants to resolve any

emerging issues in the implementation process. Evidently, machine checking has become the most critical component of performance and a clear source of failure (Nah., 2003). Literature provides a variety of examples of system testing , for example, the Gillette Company extended its arduous testing phase for five months before moving on to the Go-Live stage (CIO, 2000), while Eastman Kodak eventually concluded its largest implementation period, while at the same time accrediting the test stage as the most significant element in its successful implementation Unit monitoring has proved to be a crucial success driver for some businesses and a clear source of failure for others (Gargeya and Brady, 2005). Gargeya and Brady, (2005) say that "after months or years of growth, it might be fair to believe that both team members and executives are tired of dealing with the project and just want it to be completed. The consequence of this myopic perception, though, is that work is either reduced or missed, and the "red flags" are ignored.

System Quality: It includes the organizational and performance-related aspects of ERP systems. (Ifinedo and Nahar, 2007) report that the quality of the system is related to issues related to facilitating and gaining system knowledge, reliability, data accuracy, stability and efficiency. In the context of IS discipline, IS quality is considered to have a broader point of view compared with other rationales illustrated in the IT sector, e.g. software quality as reported by Andersson and von Hellens, 1997). Another fascinating alternate viewpoint is that researchers have concentrated narrowly on the technological features without concentrating on device quality problems (Dahlberg and Järvinen, 1997). ERP system is an integrated system that is also considered by nature as a single system-only system of information and knowledge. (Rosemann and Wiese, 1999) report that ERP systems are vital to the success of organizations in modeling and managing all business processes in a single system. This is manifestly a phenomenon as information technology and its exploitation by employing IS are factors that result in accomplishing competitive edge (Earl, 1990).

Maintenance Cost

(Basu, 2011) The investment in enterprise business applications remains the top priority for information technology (IT) particularly when the organizations need to meet regulatory compliance. Companies spend about 20%-35% of their implementation costs annually on program maintenance

2.12.3 Environmental Factors

Significant environmental variables include consumer demand, economic pressure, external pressure, internal pressure, trading partner pressure, commercial dependence, environmental uncertainty, information intensity and network strength while policy regulation is not defined as a significant variable (Musawa and Wahab, 2012; Hossain and Quaddus, 2011; Thiesse et al., 2011; Jang, 2010; Li et al., 2010; Wang et al., 2010; Salwani et al., 2009; Huang et al., 2008;

Environmental factors are the factors influencing the adoption of IT solutions. For example, the relative benefit of introducing a new technology compared to rivals (Low et al. 2011), the demand from large consumers and/or trading partners (Pan and Jang 2008; Chan and Ngai 2007), the demand from suppliers (Caldeira and Ward 2002) and the legislative and regulatory conditions (Melville and Ramirez 2008; Koumbati et al . 2006) were considered to be determinants. The relative benefit of introducing an IT solution such as an ERP program can be a major factor in contrasting adopters and non-adopters (Hunton et al . 2003). With limited resources and flexibility and solution building capabilities, the ERP model offers opportunities for SMEs to explore and leverage external tools and competencies that are not commonly accessible to them, and to better cope with external pressures.

Competitive Pressure

The level of pressure a company experiences from competitors in the same industry can be described as competitive pressure (Zhu & Kraemer, 2005). This study argues that adopting cloud ERP systems can deliver a vital strategic tool for organizations to be competitive. Organizations using computer technology will modify market laws by altering business rules as well as being able to outperform their rivals, thus generating a

competitive advantage (Porter & Millar, 1985). This study hypothesized that organizations that have implemented Cloud ERP systems would have a higher degree of Competitive Pressure than organizations that have adopted Cloud ERP systems.

Competitive pressure is often seen as a justification for implementing ERP program in the literature and in many studies it has been accepted as an significant factor for implementing any innovation. This pressure has affected the decision of small and medium-sized organizations to adopt the ERP system (Ram, Corkindale & Wu 2013). On the other hand, some studies show that competitive pressure for the adoption of ERP has no significance (Duan et al 2013; Pan & Jang 2008).

Supplier Relationship

Many SMEs make use of raw materials, labor, equipment and other supplies. This requirement leads to relationships between the industry and the firms which supply the raw materials (Kelly, 2010). In this case, ERP vendors form part of the supply chain, since they are involved in supplying ERP systems. Thus, suppliers, if successful, will have an impact on the implementation of ERPs, such as selling them at a high price to gain some of the profits from the industry. Furthermore, other suppliers besides ERP vendors are engaged in providing supporting facilities such as cheque books, furniture, stationery, among others, may provide the same analogy. When these materials are not used in good time, it would be a problem to incorporate ERP systems (Powers, 2010).

Technological change

The degree to which technology, strategies and equipment develop and transform business practices is referred to as technological change (Vonderembse et al, 1997; Nahm and Vonderembse, 2002; Chen and Paulraj, 2004; Li, 2002). The implementation of significant technological innovation will allow a firm to reduce costs and at the same time increase differentiation (Porter, 1985). With faster analysis of economic developments around the world and cooperation with partners, both new automated manufacturing technology and modern information management technology help a company recognize and explore economic opportunities. Today, information technology is especially

widespread among manufacturing firms seeking to boost competitiveness (Li, 2002). IT provides the organizations with numerous opportunities. Improved information systems offer many advantages to an enterprise and make true supply chain and integration of business processes possible (Li, 2002; Chizzo, 1998; Li and Lin, 2006). As a result, enhanced information technology, along with the manufacturing technology of the past few decades, has spurred increases in investment by firms because it brings productivity gains and market share (OECD, 2000). Those considerations were the main drivers of globalization.

Technological change, however, gives companies not only opportunities but also challenges. Due to today‘s competitive climate, the failure to capitalize on emerging technologies can lead to missed opportunities and can be particularly costly. For example, tackling technological change is critical to business success (Benamati and Lederer, 2001). Now the pace of technological progress or change is getting higher than the time it was introduced. Since the pace of technological change is high, a firm‘s cost leadership and distinction are not easily maintained. If the competitors quickly introduce new technology a company can easily lose leadership. Because of the technology‘s rapid obsolescence, organizations need to periodically inspect and invest in new systems. An organization will adapt its operating practices to reflect those changes in addition to implementing new technologies. A company may have difficulty managing its operations, as it is not easy to keep up with the technological change. The rapid technology shift continually puts pressure on organizations to invest in new, solid, and faster information systems like ERP systems if they want to survive global competition and gain competitive advantages (Li, 2002).

Business Strategies

Another approach of ERP research is to focus on business strategies that allow an understanding of ERP implementation as a company moves from one implementation phase to another (Aladwani, 2001). For an organization to implement ERP application, the three core approaches (organizational, technological, and people) may be crucial.

2.12.4 Individual Factors

It has been empirically shown that certain individual characteristics of information system users are correlated with specific rates of use of the information system (Szajna, 1993). Those will be discussed below.

Computer Anxiety

Computer anxiety reflects a degree of "the apprehension, or even fear, of a person when confronted with the prospect of using computers" (Venkatesh, 2000). Individuals with lower anxiety are much more likely than those with higher anxiety to communicate with computers (Shih, 2009).

Fear, apprehension, and anxiety about using computers tend to increase learners' negative attitudes, and deter interest in personal development. The complication in computer-human interactions can cause a multiplicity of emotional reactions, including anxiety, according to Dupin- Bryant (2002). Anxiety or nervousness arises periodically after the learning of new information. In addition, Dupin-Bryant (2002) suggests that the inability to adapt to change and transition resistance may have a detrimental impact on cognitive efficiency. This apprehension can result from machine unpredictability, public show of ignorance, and the danger of failure that may impair the attitude of learners and be unfavorable to learning

Management Support & Attitude

In introducing and implementing ERPS the most significant aspect is the dedication of top-level management to the strategic path itself. Hammer (2008) is of the opinion that reengineering has to be driven from the top level. The primary ingredient for project success is top leadership, either the CEO or someone in a position to compel all parties involved in the reengineering process to comply. Responsibility of the line is said to be the goal, and reengineering is top down, autocratic rather than democratic. It is without doubt a condition for execution of the plan. Hence, top managers have to show their ability to offer energy and commitment to the implementation process of performance management (Grint, 2011).

Without adequate support from senior management, projects may not deliver effectively as originally expected. During the study, expert indicated that management support should be considered as one of the main factors. As the importance of support for management has been evident in literature (Nguyen et al., 2013).

Computer Self Efficiency

Computer self-efficiency is defined as the degree to which an individual believes that the computer can perform a specific task / job (Shih, 2009, Venkatesh, 2008).

Computer self-efficacy is defined as the judgment of people on their computer / IS / IT operating capabilities (Compeau, 1995). (Venkatesh, 2000) provides empirical support for the direct effect of computer self-efficacy on perceived, voluntary ease of use. (Hwang, 2005) found that the self-efficacy of computers has a direct impact on perceived ease of use in a compulsory sense. (Hwang, 2005) dedicated solely to investigate the effect of machine self-efficacy on perceived ease of use. (Hwang, 2005) did not test the indirect effect of computer self-efficacy on the user's attitude and acceptance in a compulsory context.

Technology Innovativeness

Personal innovativeness towards information technology. According to the theory of innovation diffusion (Rogers, 2003), people are responding differently to a new concept, method or object because of their differences in individual creativity, a predisposed propensity to follow a creativity. The degree to which an entity is willing to try out a new IT (Agarwal, 1999) reflects personal creativity towards IT.

Personal IT innovation (PIIT) is defined as an individual's willingness to try out any new applications in information technology (adapted from (Agarwal, 1997). (Lu, 2005) provides empirical support for the direct effect of PIIT on perceived, voluntary ease of use. (Hwang, 2005) discovered the direct impact of personal IT creativity on perceived ease of use in a compulsory context. (Hwang, 2005) focused mainly on analyzing PIIT's

impact on perceived ease of use. Researcher hypothesize that PIIT would indirectly affect attitude and symbolic acceptance.

Attitude towards Working Environment and Organization

Attitude is defined as the positive or negative feelings of a person about doing the target behavior (e.g., Fishbein and Ajzen, 1975). Consequently, from a technological viewpoint, ERP systems may be introduced effectively, but performance depends on the behaviors of ERP users towards and practical usage of the program (Boudreau, 2002; & Lee, 2008). Acceptance of the ERP system in this sense means the views of ERP exports on adopting the ERP system in two companies. As discussed in the previous literature, acceptance can be seen as the actions and attitudes of the consumer (Venkatesh & Davis, 2000).

Resistance to Change

The advanced reasons for modifying the prior technology are likely to affect opinion on the value of the technology. Argument for change is defined as the understanding of the users as to why the technology was being implemented, the ability of the technology to improve customer service and manage new business opportunities, and its ability to enable greater coordination between functional units within the organization. The reasons for updating the system are likely to come from top management and those that are more personally acquainted with the latest technology in terms of the advantages that the company is expected to deliver. It is therefore necessary for top management to express a clear business strategy with quantifiable goals for the execution of an ERP (Holland, 1999). In addition, educating company leaders about the technology and its effect on the organization reduces the uncertainty surrounding the technological changes as well as the organizational transition needed for success (Govindaraju, 1998).

It provides empirical support for the direct effect of change argument on perceived usefulness, and the indirect effect of change argument on behavioral intent. Within this study researcher will investigate the indirect impact of justification for improvement on attitude and symbolic acceptance that have not been empirically examined within earlier works.

Organizations should be working on their culture of organization. Implementation of ERP would ensure improved data quality for companies (Sternad 2013).

2.12.5 TAM variables

Perceived Ease of Use

(Davis, 1989) Perceived ease of use is described as "the degree of effort anticipated by prospective users from the target system". This is deemed a crucial feature of an information system's functional consistency (Davis and Olson 1985). Three concerns were posed about perceived ease of use. Those questions were adapted from the survey items of TAM and TAM2. Both things were meant to ask respondents how user-friendly their ERP systems can be.

(Davis 1989) argued that the perceived ease of use is the degree to which an individual considers that making use of a particular system would be effortless and hassle-free; that is, ease of use means freedom from complexity and trouble. Thus, a more people generally accept and use an application that is perceived to be easier to use. (Zhu, Linb and Hsu 2012) add that Perceived Ease of Use refers to the degree to which an individual accepts that use of certain technology would be effortless and trouble-free. The system features can improve the user-friendliness of technology and system use will also contribute to the development of information literacy skills. (Nanthida 2011) lists other factors which may affect the ease of use of modern resources such as information resource characteristics, work experience, technological equipment and support, etc. The following considerations to consider when evaluating perceived ease of use are: computer self-efficacy, external control understanding, internet self-efficacy, application anxiety, information anxiety, perceived enjoyment and purpose, accessibility and behavioral intent to use.

Perceived Usefulness

Perceived usefulness is described as "the degree to which a person believes his or her job performance will be improved by using a particular program." The useful word refers to

"capable of beneficial use" (Davis 1989). In terms of perceived utility, there were four questions. Both questions were also adapted from survey items TAM and TAM2. Questions included the degree of usefulness in improving the performance, productivity and effectiveness of respondents as well as the overall perceived utility of the ERP system they are currently using.

Access to knowledge provides the opportunity for better human skills. (Lombardi 2007) noted that the development of the capacity to access accurate information is prevented by the inability of the users to embrace and use the available information strategies and techniques. According to Davis (1989: 320), perceived usefulness is the extent to which a person believes that using a particular method or technique would enhance the performance of his or her job or routine responsibility. This perception is anchored, he explains, on the consideration that the acquired capacity will reinforce performance. Additionally, Davis (1989:320) suggests that raises, promotions, incentives, and other rewards automatically motivate people for better results.

Intention to Use/Use

(Venkatesh & Davis, 2000) explains that intention to use refers to "the degree to which a person has formulated conscious plans to perform or not perform such stated future actions". In the market sense, it tests the end-user's intention to use a product until it is introduced within an enterprise. It also represents the end user's attitude toward a specific technology and can be viewed as a measure of the organization's acceptance of the technology.

In this context, questions could be raised as to whether behavioral intent is suitable, as ERP systems are basically business processing systems, and are implemented to replace legacy systems that make expected use compulsory. ERP system usage incorporates both compulsory and discretionary usage. The compulsory use reflects a base level required to perform basic job functions and use that may become optional beyond this. This has actually been observed as true for large multifunctional information technologies. Prior work referred to perceived voluntariness as significant in technology acceptance and use (Agarwal, 1997). Additionally, even if use is mandatory, effective use results in

organizational advantages, not just selective use. The value of an ERP system could lie in its efficient and effective use (Kremers, 2000). Except in cases where use is compulsory, user engagement may be beneficial if users assume they have some influence over the product of the initiative (Hunton, 1997). Last, there are variations in people's intentions even for systems where use is mandated (Hartwick, 1994). It is therefore important to analyze behavioral intent to use the technology even where use may be necessary.

Attitude to use

Rogers (1995) describes adoption as: 'The mechanism by which an entity or other decision-making group moves from the first awareness of innovation to the creation of an attitude towards innovation, the decision to accept or reject, the implementation of a new concept and the confirmation of that decision' (Davis, 1989). TAM's two central hypotheses claim that PU and PEOU positively influence the attitude of a person toward a technology, which in turn affects his or her purpose and actual use of the technology. (Davis et al., 1989) The main goal of TAM is to provide a framework for assessing the effect of external influences on internal values, behaviors, and intentions. Several studies (Umble et al., 2002; Nah et al., 2004) suggest that an ERP failure has to do with user attitudes towards ERP systems. Attitude has been defined as 'the degree to which a person has a favorable or unfavorable assessment or assessment of the behavior concerned' (Ajzen 1991: 188). The two TAM constructs decide the attitudes of the users forming the intention to use the program for actions. In the post-adoption phase, Sternad et al. (2011) explored a large number of external factors influencing attitudes and behavior regarding the ERP system. They based their theory using TAM’s acceptance model and a lot of factors, ERP systems may be successfully implemented from a technical perspective in the routine stage, but success depends on the attitudes of the ERP users towards and actual use of the system (Boudreau, 2002; Kwahk and Lee, 2008). ERP systems only benefit organizations in so far as users frequently and extensively accept and use them. Organizations need to study the factors that affect customer satisfaction to increase the reliability and efficacy of ERP systems during the operating process.

The person however tends to defend their decision by avoiding negative messages and looking for the positive messages. This means that in the confirmation stage, the attitude of the person plays a significant role (Rogers, 2003).

The same drivers of enabling ERP cause a range of changes in the quantity and quality of knowledge, business processes and cultural changes such as attitudes of employees (Loh and Koh, 2004). Then, Srivihok (1999) found that the most important factors for success in decision support application (EIS) are team communication skills and user attitude. TAM models seek to clarify the relationship between consumer behaviors, expectations, values and a technology 's actual use. TAM models postulate two major determinants of behavioral intent, namely "perceived usefulness (PU)" and "perceived user-friendliness (PEU)." These constructs relate to the generic "behavioral attitude"

Perceived Benefits

The perceived benefits of ERP systems impact strongly and positively on the adoption of ERP. Both Utecht et al (2004) and Ward (2006) see ERP benefiting organizations as integrating their operational processes to improve information flow, reduce costs, streamline business processes, increase product variety, establish links with business partners and reduce response times to customer requirements. Companies which successfully implement integrative technologies have been viewed on the global market as highly competitive.

They also found the combination of TAM and TPB in Quaddus and Hofmeyer (2007). But both hypotheses were also coupled with IDT in this analysis. By using small businesses in Western Australia as a sample, this study found vendor support as a key predictor of awareness, and perceived benefits (both direct and indirect) were significantly influenced by awareness, therefore these benefits influenced attitude. An intention to adopt a B2B trading exchange was also influenced by the attitude.

Several previous studies found that the perceived benefits correlate positively with the adoption of technology (Ghobakhloo and Tang, 2013; Abou-Shouk, Megicks, and Lim, 2013; Alam et al., 2011; Tiago and Maria, 2010; Al-Qirim, 2007; Morteza et al., 2011Tan et al., 2009).

Rogers (1983) found that the relative advantage or perceived benefits had a positive relation to technology adoption. Similarly, Kendall et al. (2001), Tan & Teo (2000), Thong (1999), and Moore & Benbasat (1991) found that the perceived relative advantage was the best predictor of innovations being adopted. In an organizational adoption decision, perceptions of favorable benefits from an innovation provide the adoption decision with economic and political legitimacy (Clemons, 1991). Also, the degree of competitive advantage is reflected in terms of economic productivity, time and energy savings and cost reduction. Wixom & Watson's initial research (2001) indicates that BIDSA can bring many benefits to an enterprise that include enabling efficient decision support and business applications (e.g. CRM, SCM), facilitating data analytics, ensuring data quality , accuracy, protection and availability; facilitating standards setting and compliance, facilitating data exchange and providing the right information.

2.13 Chapter Conclusion

This chapter gives knowledge and information in depth about ERP, its use in India and technology adoption. Enough literature about ERP with its history and implementation life cycle is also mentioned in beginning clauses. ERP status in India is explained in next clause .This chapter gives detail information about Indian automobile sector which highlights on government’s automobile mission plan 2026. How automobile hub in Pune region was important for this research study is also explained in this chapter.

This chapter will not only gives most of the adoption theories used by different authors but also explains why author selected TAM for this particular research study. At the last important part of the thesis is discussed with the help of influencing factors and TAM variables.

Chapter 3
Research Methodology

The detail of the methodology adopted for this study is discussed in chapter 3.3.1 begins with introduction. It begins by explaining the research objectives, hypothesis and research questions in clauses 3.2, 3.3 and 3.4 respectively. This is followed by research process and strategy in clauses 3.5 and 3.6. Different types of research are explained in clause 3.7. Research approaches are describes in clause 3.8. Method of data collections is explained in clause 3.9. Followed by ethical consideration in clause 3.10.Details of sample and population is given in clause 3.11 followed by time horizon in clause 3.12. Details of pilot study conducted is given in clause 3.13.This chapter ends with giving explanation about reliability and validity followed by statistical tests used in research study as explained in clauses 3.14 and 3.15 respectively and it ends with chapter conclusion mentioned in clause 3.16.

3.1 Introductions

Research methodology and architecture offers the basic blueprint for conducting research (Malhotra, 2007). The word research is nothing but combination of two words "Re" and "Search" syllables. "It's Re" Prefix meaning "Again or again or a new" and the latter meaning is "Search" "To carefully and carefully analyze" or "To check and try" They shape together a cautious, Systematic, patient study and research in some area of knowledge to set principles/policies. Research methodology is seen as a systematic approach correlated with the collection and use of research techniques and methods leading to a specific research outcome (Crotty, 1998).

Creswell (2009) submitted that a section on methodology is the most specific section of a research thesis as the section offers methodological information along with justifications for choosing or following a particular method.

Kripanont (2007) suggested that, the research process should be described in the Methodology chapter along with the methodological information relating to research

design, survey instrument creation, sampling techniques, data collection , data analysis and data management.

The Technology Acceptance Model (TAM) proposed by Davis has been the most widely-used model for researching user acceptance and usage of information technology/information systems. Given the presence of many changes to TAM connected with the use of ERP, the researcher intends to contribute further in the field of external influences. The present work is focused on the mature use of the ERP method within this context. There has also been an extension of a limited number of external factors mentioned in already published TAM related papers regarding ERP usage. The researcher has studied the effect of external factors through the second-order factors on the TAM. The model has been empirically tested using the data collected from a survey of 434 ERP users from different automobile Industries, which has been using an ERP system since from so many years.

The objective of this study is to analyze factors influencing adoption of ERP in automobile sector. Which are given as below,

3.2 Research Objectives

As described previously in Chapter One, the objectives of this research are:

- To understand the factors influencing adoption of ERP.
- To study the perceived benefits of ERP adoption.
- To study the impact of the factors influencing adoption of ERP on Perceived Benefits.
- To study impact of Technology Adoption Model (TAM) on Perceived Benefits.
- To study impact of adoption of ERP on Perceived Benefits in the presence of variable TAM.
- To study the relationship of organization type on Perceived Benefits.

- To study relationship of position of respondents in the organization with the Perceived Benefits of ERP.

3.3 Research Hypothesis

H1: There is significant impact of adoption of ERP on Perceived Benefits.

H2: There is significant impact of TAM on Perceived Benefits.

H3: There is significant impact of adoption of ERP on Perceived Benefits in the presence of mediating variable TAM.

H4: There is significant relationship of organization type on Perceived Benefits

H5: There is significant relationship of position of respondents in the organization with the Perceived Benefits of ERP.

3.4 Research Questions

The following few research questions are selected to address the research questions,

- Considering the Automobile sector of Pune Maharashtra, what factors influence the adoption of ERP system?
- Which Organizational factors influence the adoption of ERP in Automobile Sector?
- Which Technological factors influence the adoption of ERP in Automobile Sector?
- Which Individual/Personal factors influence the adoption of ERP in Automobile Sector?
- Which Environmental factors influence the adoption of ERP in Automobile Sector?
- How Technology adoption model plays a significant role in adoption of ERP?

- How end-users' acceptance of the Enterprise Resource Planning system in Automobile sector can be improved?
- What are the Perceived Benefits from user's point of view in adoption of ERP adoption?
- Is there any difference of opinion in Perceived Benefits in Original equipment manufacturing and auto ancillaries?

A research approach is seen as a central element of research that helps researchers decide how the actual research design and field work processes are to be carried out. It is about how researchers tend to treat the study frame theory (Saunders et al., 2007).

Research has as its objective the creation of expertise. Methodology for research refers to the methodological context within which the analysis is carried out. It defines an approach to a question that can be put into action in a research method that can be explicitly described as an organizational context within which the facts are positioned so that their importance can be seen more clearly (Bryman and Bell, 2007). In other words, "Methodological insight provides a better understanding of the research carried out previously and how to proceed in the future."

This chapter will include a brief overview of methodological problems, research methodology, data collection, sample selection and test evaluation. Analysis methods may be categorized differently, the most common distinction being between quantitative approaches and qualitative approaches (Myers, 2007). Initially, quantitative techniques were used when studying natural sciences such as: experimental experiments, qualitative methods and numerical methods. A qualitative analysis is used when the researcher wants to obtain a better perspective on a specific topic or circumstance.

3.5 Research Process - Flow Chart (Kothari, 1985)

Following figure 3.1 shows steps involved in research process,

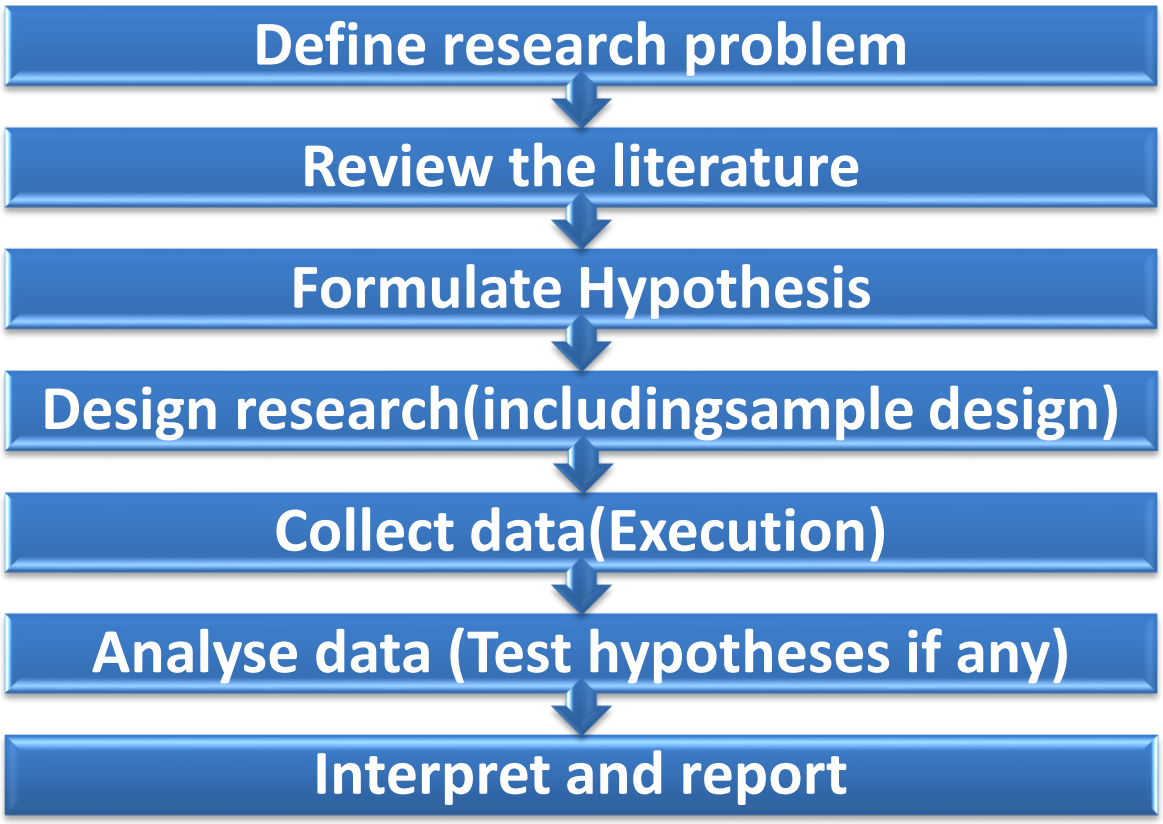


Figure 3.1 Research Process
Source-Kothari-1985

3.6 Research Strategy

There are seven categories of research strategy that could be selected by a researcher. The first is experimental research, which adopts a natural science method in order to study a phenomena or social reality. This method is often used to explain inter correlation between variable, whether a change in one variable is due to changes in another variable or not. This method is suitable for use in an exploratory study, the study to see the causal relationship between variables; but it is less useful study as it is conducted to discover a deep insight about a phenomena/situation; or a descriptive study, to illustrate an object, event or situation in accurate way; and business and management problems (Sekaran and Bougie, 2013).

The second is a survey study. The survey is one of the methods used to collect the information from, or about, people in order to explain their attitude, knowledge or behaviour (Sekaran and Bougie, 2013). It is very popular in business research. This method is usually aimed to answer the “what”, “who”, “where” and “how much” and “how many” questions, and it is suitable applied for both exploratory and descriptive research.

The third is the case study. (Robson, 2002, as cited by Saunders et al. 2009) states that the case study is "a strategy for doing research involving an empirical investigation of particular contemporary phenomenon using multiple sources of evidence within its real-life context".

(Saunders et al. 2009) describes that the fourth is action research, which is "a process of questioning, data collection, evaluation and decision-making on a course of action". Action research is best defined as the repetitive process of diagnosing, preparing, taking action and assessing with a view to solving the problem or having better solutions.

The fifth is grounded study, where the aim is usually to generate or discover a theory (Sekaran and Bougie, 2013).

The sixth is an ethnography study, which refers to “the study of social interactions, behaviours, and perceptions that occur within groups, teams, organizations, and communities” (Sekaran and Bougie, 2013). It is rooted in anthropology field.

The last is archival study, which refers to the study which is used in keeping administrative records and documents as a main source of data (Saunders et al., 2012).

The researcher can choose one of these categories or combination of two or more categories. The choice of research strategy is dependent upon the research questions and objectives, and whilst it links with ontology and epistemology considerations, it is also influenced by four other major factors, such as time constraint, the extent of existing theory, availability of resources, and accessibility of data sources (Saunders et al., 2012).

Among these categories only two of them are highly associated to quantitative research, which are the survey and the experiment study (Saunders et al., 2012).

The former is appropriate to use to test predicted causal relationship and it is suitable to answer “what”, “how” and “why” questions (Saunders et al., 2012). The experiment is appropriate for study which needs the precise measure of the size and the direction of the

effects. Then, it is also useful for explanatory research, but it is less useful for exploratory or descriptive studies (Sekaran and Bougie, 2013).The survey method is the most frequently used in the business and marketing research. It is because the survey "allows researcher to collect qualitative and quantitative data on many types of research questions" (Sekaran and Bougie, 2013), and it offers several advantages regarding its ability to cover a large number of data economically, its ability to generalize the results and its replicability due to the use of a highly structured methodology and it is also value-free. The survey is appropriately used to test the relationship between variables (Saunders et al., 2012), and it is appropriate to answer "what", "who", "where" and "how much" and "how many" questions. The survey is usually conducted over a short discrete time period, commonly known as a cross sectional study. Hence, in this regard the survey method is preferred in completing this research work.

3.7 Different Types of Research

According to (Kothari, 1985) there are different types of research as given below,

(i) Descriptive vs. Analytical: Descriptive research includes surveys and various kinds of fact-finding enquiries. The main purpose of the descriptive research is to describe the state of affairs as it currently exists. We use the term Ex post facto research quite often in social science and business research for descriptive research studies. The key drawback of this approach is that the researcher does not have much influence over the variables; he can only say what has happened or what is going on. Majority of the ex post facto research projects are used for descriptive studies in which the researcher attempts to measure things like shopping frequencies, people's preferences, or similar data. The quantitative techniques used in descriptive research are all-sorts of survey methods, including comparative and correlational methods.

(ii) Applied vs. Fundamental: Either research (or action) may be applied or fundamental (basic or pure) research may be applied. The purpose of applied research is to find a solution to an immediate problem facing a society or an industrial / business enterprise, while fundamental research is primarily concerned with generalizations and the formulation of the theory.

(iii) Quantitative vs. Qualitative: Quantitative research was focused on calculating quantities or quantities. It refers to phenomena which can be represented quantitatively. On the other hand, qualitative research examines a qualitative phenomenon, i.e. phenomena related to, or involving, consistency or nature.

(iv) Conceptual vs. Empirical: Conceptual work is that which has to do with some abstract idea or theory. Philosophers and philosophers usually use this to create new ideas or reinterpret existing ones. On the other hand, observational work relies entirely at experience or observation, often without sufficient framework and theory consideration. This is data-based analysis, drawing conclusions which can be confirmed through observation or experimentation. Also, we can call it as experimental study kind.

(v) Some other types of research are variants of one or more of the above methods, either based on the intent of the research, or the time needed to perform research, the setting in which the research is performed, or based on some other similar factor. Forms the time point of view, we may think of work as either one-time or longitudinal studies. For the former case, the study is limited to a single period of time, and in the latter case, the work is carried out over many periods of time. Study can be field-setting, laboratory or simulation work, depending on the context in which it is to be performed. Research can also be understood as clinical research or as diagnostic research. Such work follows case-study methods or in depth strategies for approaching the fundamental causal relationships. Typically, these studies go deep into the causes of items or incidents that concern us, using very small samples and very deep sampling tools for data collection. The work can be exploratory, or formalizable. Exploratory research aims at generating theories rather than testing them, whereas formalized study experiments are the ones with concrete structure and clear theories to be tested. Historical research is what allows use of historical sources such as texts, records, etc. to analyze past events or theories, including the beliefs of individuals and groups at some distant point in time. Research can also be graded as determinative and decision-oriented. While conducting concluding research, a researcher is free to pick up a question, rethink the inquiry as it progresses, and is able to conceptualize as he wishes. Decision-oriented research is often a decision-maker's necessity and, in this situation, the researcher is not free to conduct research

according to his own inclination. Operations research is an example of decision-oriented research, since it is a statistical method of providing executive departments with a quantitative basis for decisions regarding the operations under their supervision.

Most of the research to be conducted in the first part of this thesis will be based on a descriptive approach since we aim to outline existing models used to evaluate ERP-system investments. In addition, report will also document and describe what businesses consider costs and benefits with ERP systems, and this is based on empirical study findings. There will also be some explorative elements in this thesis, mainly during its early stages. Stages, when the secondary sources available to develop understanding of the research area are examined.

Descriptive investigation is more effective when the investigation involves a detailed evaluation of a particular person or a process (Collis and Hussey, 2003). Theory derivation, method explanation, judgment making and the search for alternative aspects: all of these factors are possible with the descriptive procedure (Yin, 2014, Flick, 2014). This method also helps discover the true opinions and insights of the participating study members (Haas and Springer, 2014). Descriptive work examines each of its opportunities in order to obtain full information about a subject matter. The facts and figures relating to the census are composed to take a closer look at the condition of the population, its features and to obtain a better understanding of it over a given period of time (Creswell, 2009; Miller and Miller, 2010). Under descriptive research each topic related to the topic being investigated is studied.

The study employed a descriptive survey design. Mugenda and Mugenda (2003) states that the descriptive survey as collecting data to test the hypothesis or answer questions relating to the current status of the study subject. Architecture of the descriptive study helps the investigator generalize the results to a wider population. The descriptive approach to research design has been credited because it allows variables to be analyzed and related. The study took the form of descriptive research that describes the situation as it exists. For this study, the design is preferred because it enabled a thorough study of the situation.

Saunders et al. (2012) divided the purpose of the research into three types: exploratory analysis, descriptive study, and explanatory research. Considering that our work aims to

identify factors that affect user acceptance in the ERP program, the authors agreed to start with an exploratory analysis, find out "what's going on; ask questions; analyze phenomena in a new light and try new insights" (Robson, 2002).Because the authors want to know what is happening when users utilize ERP system in their company, what they think, how they feel. At first the authors conducted a literature review, exploring different factors from the existing literatures. Then author carry out few interviews with ERP users who had been working with ERP system for many years, to determine more factors that influence users' acceptance.

As this study aim to understand the user acceptance based on the TAM model. Thus, an explanatory research is required in the second place, as an explanatory study aims to study a situation or a problem to clarify the relationships between variables (Saunders et al., 2012). Therefore a survey will be performed among ERP end users in automobiles companies to collect those data. The questionnaire in the survey will be based on the material we had from the interview and literature review. Thus, the knowledge in the ERP acceptance field will be enriched and the overall research objective is fulfilled.

For this study the research design is primarily of an exploratory and descriptive nature. It is exploratory as it involved providing insights into the research topic and understanding the problem situation at the first stage. This has led author to formulate the research issue, develop the study goals, isolate the study's main parameters and prepare the course of action for the future. The descriptive research attempts to describe systematically a situation, problem, phenomenon, service or programme; it also describes the characteristics of the respondents. It helps to make specific predictions. It can be viewed like they are better in different aspects. The research questions can be viewed as the starting point of the research. What factors influence users' acceptance of ERP system is the starting point. It determines approach, strategy, and research philosophy. Relating to the existing study and the authors generate those factors and test those factors.

3.8 Research Approaches

(Kothari 1985) The above definition of research styles illustrates the fact that two basic approaches to study exist, namely quantitative approach and qualitative approach. The former includes the quantitative generation of data which can be systematically and rigidly subjected to rigorous quantitative analysis. This method can be further sub-classified into research methods focused on inferential, experimental, and simulation. The inferential approach to research is aimed at creating a database from which to infer population characteristics or relations. Typically this means quantitative study in which a population sample is analyzed (questioned or observed) to determine its characteristics, and then it is concluded that the population has the same characteristics. Experimental approach is characterized by much greater control over the testing environment and, in this case, certain variables are manipulated in order to determine their effect on others. Simulation approach involves creating an artificial environment from which to produce relevant information and data. This allows observation of a system's (or its subsystem) dynamic behavior under controlled conditions .The term 'simulation' refers to 'the implementation of a theoretical model representing the structure of a complex process in the sense of applications for business and social sciences. Given the values of the parameters, initial conditions and exogenous variables, a simulation is performed to represent the behavior of the process over time. Qualitative approach to study includes the empirical examination of attitudes, beliefs and behavior. Research work in a situation like that is a feature of the observations and experiences of researchers. Such a research approach generates results that are not subjected to rigorous quantitative analysis, either in non-quantitative form or in form. The methods of focus group interviews, projective approaches, and in-depth interviews are commonly used. These are all discussed at length in the following chapters

3.8.1 Choice of approach

In order to answer the research questions, we carry out the research by using any or both quantitative and qualitative methods to study the factors correlation that influence the end-users' acceptance on ERP system during post-implementation phase. So the researcher has chosen both the method to conduct and complete the research. Saunders et al. (2012) have defined that in a mixed method, collection techniques and analysis procedures of quantitative and qualitative data will be used either at the same time (parallel) or one after another (sequential) but does not combine them. The method also implies that qualitative data can only be analyzed qualitatively and quantitative data will be analyzed quantitatively (Saunders et al. 2012). And the reason to choose mixed method for research is that author need to collect qualitative data to develop hypothesis that is based on literatures and interview, also need to collect quantitative data for hypothesis testing in practice.

3.8.2 Qualitative research

Particularly, interview and literature review has been chosen for exploring and researching different factors that influence the end-users' acceptance of ERP system in this study. According to Walker, Coole & McAllister, (2008), a qualitative research aims to find out and explicate the nature of phenomenon and gain holistic, comprehensive and affluent data. This study starts with literature review in order to conclude the factors of influence in the past researches.

Thereafter gradually , to get a deeper understanding on the factors that impact ERP acceptance, interviews were carried out in companies with ERP users, issues regarding user acceptance of ERP system in companies had discussed with those consultants. As Robson (2002) has mentioned, an exploratory study needs to find out what is happening; to ask questions; to assess phenomena. So after the qualitative data is obtained from questionnaire, interviews and literature reviews, respective data were coded and the concluded code has been combined and refined into factors. After the factors have been

identified, hypothesis has developed based on those factors, in this way; qualitative data are being used for an exploratory study.

3.8.3 Quantitative research

Quantitative research has been chosen for testing the hypotheses and achieving a big picture on ERP use in practice in this study. The process of testing the hypotheses is the way to explain the connection between the factors, TAM model and perceived benefits.
As Saunders et al. (2012) mentioned that to establish causal relationship between variables will be the way to conduct explanatory study. Therefore, in this study, there is need to carry out quantitative research to obtain the data to explain the connection between factors, TAM model. A questionnaire survey will be performed among employees from particular companies; the answer from the survey will be regarded as quantitative data. Quantitative data is being analyzed through statistical software in order to test the hypothesis that developed before. In this way, the connection between factors and the TAM model has been explained, and hypothesis that have been accepted were lead to their corresponding factors being accepted. Hence, this study at the end will conclude the accurate factors that influence the end-users' acceptance of ERP system in reality based on those quantitative data.

3.9 Data collection Methods

Kothari (1985) says that there are many ways to gather the necessary data at the researcher's disposal which vary considerably in terms of money costs, time and other resources. Primary data can be obtained either by experiment or by survey. If an experiment is performed by the researcher, he detects some objective observations, or data, using which he investigates the truth contained in his hypothesis. However, in the case of a survey, data may be collected by one or more of the following means:

(I) Through observation: This approach requires gathering information from an investigator's own assessment, without questioning the respondents. The knowledge

gathered refers to what is happening at the moment, and is not influenced by respondents' past actions or potential expectations or attitudes. There is no question that this method is an expensive method and the knowledge given by this method is also extremely limited as such; this approach is unacceptable in inquiries about large samples.

(II) Through personal interview: The investigator follows a rigid procedure and seeks answers through personal interviews to a set of preconceived questions. This method of collecting data is usually done in a structured manner where output largely depends on the interviewer's ability.

(III) Telephonic interviews: This type of collection of information involves interviewing respondents on the telephone itself. This is not a widely used method but plays an important role in industrial surveys in developed regions, particularly when the survey needs to be conducted in a very limited time frame.

(IV) By posting questionnaires: If this type of survey is implemented, the researcher and the respondents come into contact with each other. Questionnaires are mailed to respondents with a request for return after the same has been completed. This is the most commonly used tool in various economic and entrepreneurial surveys. Before applying this approach, a pilot study is normally performed to check the questionnaire, which exposes the questionnaire's limitations, if any. Questionnaire to be used must be prepared with great care so that it can prove successful in collecting the relevant information.

(V) By schedules: Enumerators are appointed and trained according to this process. They are given schedules that contain specific questions. In these schedules these enumerators go to the respondents. Data are collected by enumerators filling out the schedules based on responses provided by the respondents. As far as this approach is concerned, much depends on the enumerator capacity. Any occasional field tests on the enumerators' work will provide for sincere work.

When it comes to the data collection, there are three different data collection sources which can be considered. Two of these are widely used in numerous research. The author decided in this study to use only primary data gathering and secondary collection. Primary data refers to data specifically gathered for the research project being

undertaken. Secondary data refers to data that was originally collected for some other purpose for a research project. The researchers were able to generate a complementary and valid investigation with a combination of those two data sources. Tertiary data refers to international data compiled from non-using international sources in this study (Saunders et al., 2012). For this research the researcher has collected data by using both the methods i.e. primary and secondary method of data collection. Secondary data is being obtained from other sources mentioned below, and the primary data that is derived from interviews and questionnaires. Following figure 3.2 shows steps used for data collection in this study.

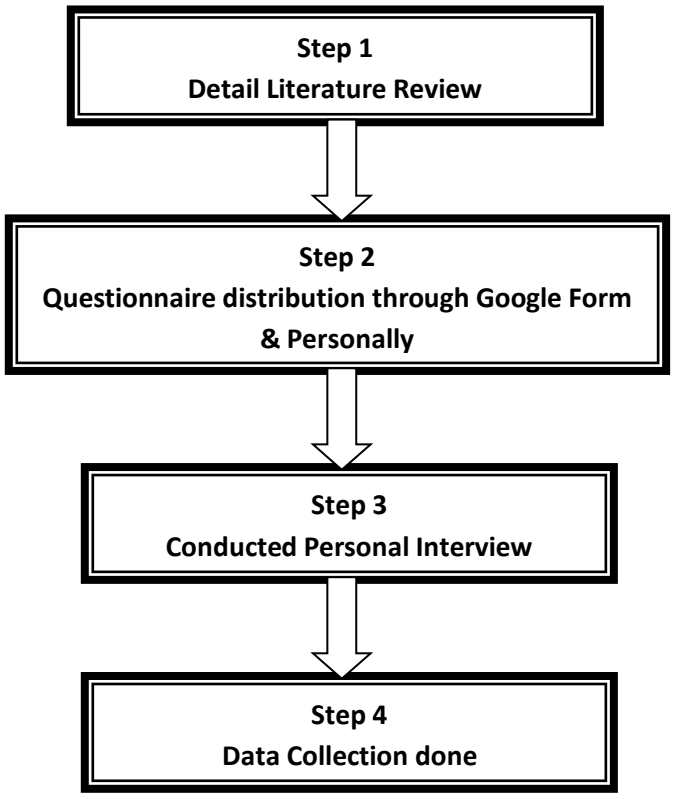


Figure 3.2 Data collection steps for study

3.9.1 Primary data

Primary data, also known as first-hand data, includes information directly gathered for the purpose of the investigation at hand. It is collected by the researcher himself for the purpose of a specific inquiry or study. There are various approaches for gathering primary data, such as observation, experimentation, questionnaire, interviews and case

study. As stated above, there are several options to collect primary data which include interviews, questionnaires and observations. In terms of the observation, it is often used for investigating human behaviors which is relevant to the users' behaviors. However it is time consuming (Saunders et al., 2012). Interviews and questionnaires are most common strategies to collect primary data. In this research the researcher has used both interviews and questionnaire method to collect primary data. Even some data is collected by personal observation.

- **Questionnaire**

The main purpose of this study is to seek factors that influence the user's acceptance of ERP system and get perceived benefits of ERP. By using previous literatures reviews and the data which is obtained from questionnaire and interviews, it helps to conclude all the factors. With all the factors author generate, the questionnaire which provided the quantitative data from users' of ERP system. In other words the questionnaire helps us to explore the factors influence the user's acceptance of ERP system. Internet-mediated questionnaire is mainly used in our survey. It is also known as self-administered and usually complete by respondents. As the respondent's perspective, it is easy respond and more convenience to fill with. As the researcher's perspective, data could be easily collected and analyzed (Saunders et al., 2012).

The components of the proposed model are ERP usefulness, ERP user-friendliness and attitude towards ERP use, each influenced by different external factors and perceived ERP benefits. The external factors are distributed among four major categories like Organizational factor, Technological factor, Individual factor & environmental factor. A structured questionnaire was prepared. All factors items were measured on a five-point Likert scale, like "strongly disagree, disagree, neutral, agree and strongly agree" taken from relevant prior research and adapted to ERP usage. Demographic information was collected as well.

In terms of the questions in questionnaire, it has been divided into two parts: general questions and professional questions. There are 13 general questions involving gender, age, positions in an organization and others. The goal is to seek factors could influence end-users' acceptance in ERP system and find out perceived benefits. Therefore, there are

large numbers of factors to explore. With the help of Technology Acceptance Model (TAM) model the researcher combined those factors into four groups.

1. Organizational Factor. 2. Technology Factor. 3. Environmental Factor. 4. Individual Factor. With the help of these combined factors professional questions were developed. On a five-point Likert scale, professional questions were assessed, ranging from "strongly disagree" to "strongly agree," taken from applicable prior study, and tailored to ERP use. The numbers of professional questions were 46. All the questions were formulated in a clear and straightforward way to make the task easier for participants. After the pilot test, the questionnaire had been distributed to the ERP users working in automobile sector. Data had been analyzed with the help of multivariate SPSS analysis software. Statistical tests were conducted to ensure the outcome relating to factors to end-users' acceptance in ERP system implementation.

The questionnaire was designed in two main areas Part I and Part-II .Whereas part-II again divided in different sector like questions as Organizational factor, Technological factors, Environmental factor , Technological factors and TAM variables. Table 3.1 below briefly summarizes the structure of this questionnaire.

Table 3.1 Structure of questionnaire

Question Number	**Content**
Questionnaire part –I (1-20)	General Information
Questionnaire part -II	
1-10	Organizational Factors
11-20	Technological Factor
21-24	Environmental Factor
25-29	Individual Factor
30-36	TAM Variables
37-46	Perceived Benefits

Questionnaire is the main tool to gather the essential data for studies. The researcher prepared online questionnaires in the form of Google form to identify the key factors influencing ERP adoption and this questionnaire was circulated among respondents.

These questions were designed to capture the degrees of agreement and disagreement on a five point Likert scale. A standard Likert scale test object is a sentence. The respondents indicate their level of agreement when reacting to a Likert questionnaire element (Catalano, 2006). Likert scale allows researchers to equate one's score with the scoring distributions from a well-defined sample population. The researcher can either measure attitudes before and after the experiment or change, or assess whether the efforts of the organization show the desired effects (Cooper et al. 2003). Upon completion of the questionnaire, each item was analyzed separately or summed up to create a score for a category. Therefore, Likert scale is also called summative scales (Dina and Misbahuddin 2010). Participants responded to a statement using the scheme below:

- Strongly disagree,
- Disagree,
- Neutral
- Agree,
- Strongly agree.

In this research the same questionnaire was circulated in the form of hard copy. Once again the respondents to whom the said questionnaire was distributed were ERP users, managers and decision makers of the respective organizations who are familiar with their organization vision, strategies and policies.

Same questionnaire was send though an E-mail with a link to the online questionnaires and short description of the study objectives were communicated to the targeted participants. Follow up emails were sent as reminders to participants who had not responded within time. At last, there were in all 434 respondents from different automobile companies were responded to the questionnaire who were mainly ERP practitioners and people who have been involved in ERP implementation practices.

Relevant questions were asked during personal meeting with the participant individuals who are the ERP users, managers and decision makers and in this way primary data was collected.

As the study is based on primary data collected by way of survey questionnaire and interview from selected Pune regions automobile firms. These firms are having their branches at various locations like Chakan, Pimpri, Chinchwad, Pune City, Pirangut and Ranjangoan.

The questionnaire is enclosed and marked as Appendix. People who were involved in questionnaire and interviewed were all ERP users including and the summary of respondents is shown in following table 3.2,

- Top management,
- Middle Level management
- Operational level people
- IT Heads,
- ERP-project-managers,
- Key users,
- Department Heads

Table 3.2 Summary of the numbers of questionnaires delivered and responded

Description Total Number	Total Responses
Questionnaire delivered by e-mail	2100
Questionnaire delivered by Hand	600
Total responses received	2700
Questionnaire returned (e-mail and online)	512
Questionnaire returned (By Hand)	487
Total responses received	999
Questionnaire incomplete (e-mail and online)	299
Questionnaire incomplete(By Hand)	266
Total incomplete response	565
Complete Response (e-mail and online)	213
Complete Response (By Hand)	221
Total responses	434
Total responses used in analysis	**434**

- **Interview**

Interviews may be defined as a deliberate conversation between two or more individuals. This will help you collect real, accurate data that is important to your research goals and questions. A further thing to remember is the degree of interview formality. Interview was carried out in three ways: organized, semi-structured and unstructured. An unstructured interview was developed as an informal conversation between the interviewer and the respondent to explore a general area in the subject of interest in depth. Semi-structured interviews were based on a list of themes and questions but these can vary from interview to interview. The structured inter-view were conducted with an emphasis of identical set of questions is existing. Structured, semi-structured, and unstructured interviews are the primary types of interviews (Saunders et al. 2012).

Interview is a qualitative method that allows capturing different views (Keen and Packwood, 1995). Nevertheless, in the sense of this study, the author has chosen one form of primary data research instrument which is a questionnaire and organized interviews.

In order to conduct a comprehensive questionnaire, the authors decided to combine with the valid and reliable data obtained from interview. The researcher has chosen semi-structured interviews as primary data collection strategy. It can give more freedom for respondent to ask for clarity of the questions. Additionally the semi-structured interviews are suitable for a qualitative analysis as it can provide more flexibility for both interviewers and respondents.

The questions and issues were developed based upon the purpose of the study, the conceptual framework, and the research questions. The authors set interviews with ERP practitioners' mangers and users who have worked in different areas of automobile sector to get an overall understanding of ERP adoption.

However, initially there were about 15 to 20 potential participants identified from each visited automobile organization for conducting interviews and validating the current conceptual model. Nevertheless, on approaching the participants the researcher realized and had to cut short the participant list to 5/6 interviewees from each organization. The reason behind this reduction in interviewees' list was their individual knowledge on ERP systems, involvement in the ERP adoption and implementation process and above all, the

5/6 selected interviewees were decision-makers in their own right with different leading responsibilities in the organization. These selected 5 interviewees from each organization were finally selected in order to understand different conceptions from their managerial capability perspective. These managers were directors of organization, project manager, ERP module managers and ERP users of that particular organization. Moreover, the inter-disciplinary nature and cross-functional managers were allowed for the richness of data in terms of getting all possible views regarding what went into the ERP adoption and implementation in an organization.

For this study the researcher has visited total 7 automobile companies including TATA MOTORS, Mahindra and Mahindra –Chakan, Hyundai Constructions-Chakan, Lumax-Chakan, Badve Engineering-Chakan, Sydemac-Bhosari, TATA Autocomp-Bhosari .From these organizational 16 interviews were conducted in OEM and 35 interviews were conducted in component manufacturing organization .And total 51 one to one interviews were conducted and the questionnaire was filled up by author only.

Interview method was conducted by the researcher at a time a pilot study. When author personally visited companies. The interviews were conducted with each company's ERP users who worked with the respective companies for 1 year and more. It is helpful for the researcher to build a comprehensive view of their ERP system acceptance. Before interview, a resource of searching the company background is needed. All the interview questions are close ended questions based on the research questions and relevant research contexts. The interview duration was approximately 20 minutes with each individual. The researcher has got the advantage of conducting interviews in terms of getting of detailed information about ERP system acceptance as an ERP user's perspective.

3.9.2 Secondary data

Secondary data can provide a useful source from which to answer, or partially to answer the research questions (Saunders et al, 2012). In order to build a comprehensive review of ERP systems adoption the researcher searched and reviewed materials such as literatures, journals, articles, books and websites.

Secondary data is the information that was gathered for any other purposes and not for the immediate analysis. Individuals or organizations collect it in response to some other issue, rather than the problem at hand. This data is primary data for the agency that collects it and becomes secondary for someone else who uses this data for the researchers own purpose. Various methods that are used for secondary data collection are publications of central, state and foreign government, journals, books, magazines, newspaper, and reports.

As explained earlier, secondary data can provide a useful source from which to answer, or partially to answer the researchers research questions (Saunders et al, 2007). In order to build a comprehensive review of ERP systems adoption researcher searched and reviewed materials such as literatures, journals and articles. Researchers also use Google scholar to search for resources. A secondary data stand useful to find out which ERP adoption factors already existed in other studies. It includes key words: ERP system, ERP system adoption, ERP system user acceptance, ERP system implementation, ERP system failure, ERP system usage, user's attitude and behavior of ERP system, Factors influencing ERP adoption and implementation etc. All the data that researcher has collected is put up into frame of reference.

Secondary data was collected from the previous research work conducted, journals, books, magazines, newspapers, company reports including annual reports. Various online journals have been also referred. The bulk of the secondary information gathered for this research was extracted from the literature. This was done by conducting a literature review of the field of information technology and ERP, in particular regarding the acceptance and use of new technology and ERP. This work has proved to be the best theoretical framework for furthering the study in other fields. Internet sources and information from both the field-relevant public and private websites were also considered, reviewed and then either used to expand general knowledge or specifically included in the study and referenced.

3.10 Ethical Considerations

During the survey and interviews on questionnaire, the researcher has got the experience of the interviewees working within companies who were involved in ERP implementations in Pune region. All interviewees were informed that, the researcher would not disclose their names while some interviewees expressed their no objection even if their names are disclosed, to avoid any ethical issues the author decided to keep all participants anonymous. This is mainly due to two reasons. First, the discussions looked at all aspects of implementations and touched on potentially sensitive areas such as project management difficulties and ERP failures. Secondly, some of the interviewees worked in competing organizations. The author assured interviewees that no commercially sensitive information would be revealed within the study and informed them that all interview recordings would be kept confidential.

3.11 Sample and Sampling Technique

All objects under consideration constitute a 'universe' or 'population' in every field of inquiry. A complete description of all the items in the 'population' is regarded as a census survey. The researcher will determine how to pick a sample, or what is popularly known as the design of the sample. Samples can be samples of likelihood, or samples of non-probability. That factor has a known probability of being included in the sample with probability samples but the non-probability samples do not allow the researcher to evaluate this probability. Probability samples are focused on simple random sampling, systematic sampling, stratified sampling, cluster / area sampling while non-probability samples are focused on convenience sampling, decision sampling and quota sampling (Kothari, 1985).

This section reports on details relevant to different decisions on sampling. Crotty (1998) believed that in the case of a smaller population, the whole population could be used for a study while in the case of a large population; a sample could be taken from the population. Hence this analysis has agreed to find a population sample for the study, taking into account the above data.

Zikmund (2003) claimed that, a small number of observations, items or data points are selected for sampling in order to generalize the results within the population as a whole. Sample design process starts with the identification of the target population (Zikmund, 2003).

The sampling methods are of two different forms, namely probabilistic and non-probabilistic sampling. The probabilistic sampling technique provides a collection based on probability .In Probability sampling, all the elements in the population have an equal chance to get select or probability of being included in the sample, while the non-probabilistic sampling is random by definition (Zikmund, 2003). In non-probability sampling, the elements do not have an equal or pre-determined chance of being selected as subject. Probability samples are used in experiments where the researcher looks for a high degree of representativeness in order to generalize the findings of the samples. However, when other considerations such as cost, time, and convenience are more important than generalizability, then the non-probability form of sampling is used.

(Kothari, 1985) gives detail about types of sampling as explain below,

Simple random sampling: This method of sampling is also known as chance sampling or likelihood sampling wherein every element out of the population has an equal chance of being included in the sample and each of the potential samples has the same probability of being chosen in case of finite universe.

Stratified sampling: If the population from which a sample is to be taken is not a homogeneous group, stratified sampling technique will be applied to obtain a representative sample. In this technique, the population is stratified into a number of non-overlapping subpopulations or strata, and samples are drawn from selected stratum. If the items selected from each stratum are based on simple random sampling of the whole system, stratification is defined as stratified random sampling, first and then simple random sampling.

This study used stratified random sampling method as automobile sector is divided in two major strata's OEM and auto component manufacturing organizations. And each organization or company has equal chance to get selected irrespective of the product they are manufacturing.

In this study the researcher has used stratified random sampling method for sampling purpose as it is interested to investigate the factors influence users' acceptance of ERP system to generalize the large organizations and companies across Pune region. Therefore, interviews and responses to questionnaire have conducted in two different groups that is OEM and auto component manufacturing organizations in Pune region.

3.11.1 Target Population

For this study author decided to consider list of companies from members from ACMA and MCCIA which are authentic bodies promoting industries. (ACMA Reports-2019-20) The Indian Automotive Component Manufacturers Association (ACMA) is the governing body that represents the interests of the Indian Auto Component Industry. A membership of over 800 manufacturers all over India contributes more than 85% of the turnover in the unified field of the automobile component industry. ACMA is an organization accredited to ISO 9001:2015. The mission of ACMA is to establish a globally competitive Industry of Indian Auto Components and to reinforce its role in national economic growth as well as to promote business through foreign alliances.

MCCIA is one of the known Chambers of Commerce founded in India prior to independence at a time when industrial activity had yet to take off. For more than eight decades now, MCCIA has played a significant role in driving the industrial and economic growth of the Pune area and the Maharashtra state. It is an Entrepreneurs' platform created by the entrepreneurs for the entrepreneurs and of the entrepreneurs. It is receptive to the Entrepreneurs' ever changing needs. It is one of the most active chambers of commerce in India and has played a major role in increasing the number of institutions in the Pune region (MCCIA Report 19-20).

Where there are 237 companies who are members of MCCIA and 107 companies who registered under ACMA from Pune region .When author tried to refer the list there are 34 companies who registered for both organizations that is MCCIA and ACMA. So in all 310 companies were considered and acknowledged for this research study.

Questionnaire was send to all concern people from that list which researcher obtained from ACMA & MCCIA. From each company on an average the researcher has selected randomly 5/6 ERP users for this study.

For the present study only automobiles companies from Pune regions are considered. The target population involves managers, supervisors, plant heads, and other employees who are using ERP in company. Therefore survey questionnaire was sent to all ERP users working in automobiles companies from Pune region. Majority of the questionnaires were sent to the respondent in physical format while some questionnaires were sent in electronic format. Few firms were mailed soft copy of the questionnaire whereas online questionnaire was also designed and hosted for the ease and convenience of the respondent

3.11.2 Sample size

While the sample size is regarded as one of the big concerns, there is no consensus on thumb rules as to the correct sample size (Hogarty, Hines, Kromrey, Ferron and Mumford, 2005).

Osborne and Costello (2004) stated that the sample size is calculated by using two parameters (a) the minimum sample size required, and (b) the sample size calculated by the item ratio issue. The general thumb rules developed suggest an acceptable sample size ranged from 50 cases (Sapnas and Zeller, 2002) to 1000 or more (MacCallum, Widaman, Zhang, and Hong, 1999).

Hair, Anderson, Tatham, and Black (1995) reported that the sample size is adequate for 100 cases. Tabachnick and Fidell (2001) claimed that a sample size of 300 cases is needed for conducting EFA. Comrey (1973) states that a sample size of 300 cases is acceptable and decent while a sample size greater than 500 or 1000 cases is excellent since the larger sample size minimizes errors.

Roberts (2006) thought that a smaller sample size is also sufficient in case of a factor identified by several products. Osborne and Costello (2004) claimed that in the case of studies employing statistical techniques such as EFA, CFA and SEM, a minimum sample size of about 400-500 respondents would be sufficient enough.

Using these justifications and the sample size ratio the researcher has targeted 434 respondents as a sample for data collection.

Questionnaire in form of Google form was circulated by E-mail to almost 2100 people from automobile sector consisting of OEM and components manufacturing. But only 512 responses were received out of which only 213 responses were complete. Physically total 600 hard copies of questionnaire were circulated out of which only 487 forms received back from which 221 were filled completely. So in all the total responses collected by the researcher were 434 which is nothing but the sample size.

Krejcie & Morgan (1970) has suggested a table for sample size determination. According to them no calculations are needed to use Table 3.3 and figure 3.3 and it is applicable to any defined population. They also stated that as the population size increases, the sample size increases at a diminishing rate and remains relatively constant at slightly more than 380 cases.

NOTE: There is no need of using the formula since the table of determining sample size has all the provisions you require to arrive at your sample size.

Table 3.3: Table for Determining Sample Size for a Finite Population

N	*S*	*N*	*S*	*N*	*S*
10	10	220	140	1200	291
15	14	230	144	1300	297
20	19	240	148	1400	302
25	24	250	152	1500	306
30	28	260	155	1600	310
35	32	270	159	1700	313
40	36	280	162	1800	317
45	40	290	165	1900	320
50	44	300	169	2000	322
55	48	320	175	2200	327
60	52	340	181	2400	331
65	56	360	186	2600	335
70	59	380	191	2800	338
75	63	400	196	3000	341
80	66	420	201	3500	346
85	70	440	205	4000	351
90	73	460	210	4500	354
95	76	480	214	5000	357
100	80	500	217	6000	361
110	86	550	226	7000	364
120	92	600	234	8000	367
130	97	650	242	9000	368
140	103	700	248	10000	370
150	108	750	254	15000	375
160	113	800	260	20000	377
170	118	850	265	30000	379
180	123	900	269	40000	380
190	127	950	274	50000	381
200	132	1000	278	75000	382
210	136	1100	285	1000000	384

Note.—*N* is population size.
S is sample size.

Formula for determining sample size

$$s = X^2NP(1-P) \div d^2(N-1) + X^2P(1-P)$$

s = required sample size.

X^2 = the table value of chi-square for 1 degree of freedom at the desired confidence level (3.841).

N = the population size.

P = the population proportion (assumed to be .50 since this would provide the maximum sample size).

d = the degree of accuracy expressed as a proportion (.05).

Source: Krejcie & Morgan, 1970

Figure 3.3 Calculations for Determining Sample Size for a Finite Population

Krejcie & Morgan (1970)

3.11.3 Sample frame

This study considered ERP users like managers, supervisors, plant heads, and other employees who are using ERP in automobile company.

3.12 Time Horizon

In general, the time horizon can be classified into two, a longitudinal and a cross sectional study. The longitudinal study (Sekaran and Bougie, 2013) is a "analysis of people or phenomena at more than just level.". The cross sectional study, in contrast, is a study of people or phenomena at one point. The implication of this condition is the former take more time, effort and cost rather than the later (Sekaran and Bougie, 2013). However, the choice of the time horizon types should not merely based on this but also be influenced by: research purposes and research question; research strategy; and time availability (Saunders et al., 2012)

Taking these aspects into account, a cross sectional study was selected in this research. The reasons for this selection are based on the factors which follow. Firstly, the cross

sectional study is often applied to a survey strategy, even more Bryman (2012) noted that "the cross sectional design is often called a survey design". Hence, the survey strategy is highly related to the cross sectional study. Secondly, as academic research, this research is also constrained by time. As suggested by Saunders et al. (2012), the cross sectional study is appropriate to be applied on this situation.

It's really critical that the research is a "snapshot" or a "diary."It involves two kinds of study cross-sectional studies and longitudinal studies. Cross-sectional is study of a particular phenomenon at a particular time (Saunders et al., 2012). As the longitudinal is a long term study change and development. Relate to present study it is more appropriate to observe the long term perspective of ERP system acceptance change and development. However due to the time and resources limitation the authors choose to adopt cross-sectional study.

3.12.1Time Line

Research has been completed within given time line for the research as shown in following table 3.4,

Table 3.4 Study Timeline

Activity	Duration
Literature review	7 months
Structured Interviews & Questionnaire circulation	4 months
Data collection	5 months
Data analysis	4 months
Conclusion and implications	4 months
Writing the thesis	7 months
Amendments and Revisions	3 months

3.13 Pilot Study

A Pilot study is a mini-version of a full-scale study or a trial run in preparation of the complete study. The latter is often termed a test of "feasibility." It may also be a clear pretesting of study instruments, including questionnaires or schedules for interviews. The appropriateness of questionnaire questions including question content, wording, sequence, form, and layout was tested. Saunders et al. (2012) note that the number of people expected to pilot the questionnaire is not exact. The numbers depend on research questions, research objectives, and the size of research project, the time and resources available and how well the questionnaire is designed. However, Saunders et al. (2012) described that the minimum numbers people in pilot study in case of questionnaire are 10; but for large survey it is usually of 100 to 200 respondents.

The questionnaire was pilot tested with a group of 51 ERP users in Mahindra and Mahindra –Chakan, TATA MOTORS, Lumax-Chakan, Hyundai Constructions-Chakan, Sydemac-Bhosari ,Badve Engineering-Chakan, , TATA Autocomp-Bhosari .Interview technique was used for data collection. Based on the results of the pilot testing, revisions and additions were made to the questionnaire. Pilot participants were included in the key initiative to collect data because they were a part of the interest community. Reliability of the questionnaire was tested with the use of Cronbach Alpha and confidence interval test.

Although most of the questions contained in this questionnaire have been adapted from previous studies and have been translated and reviewed by the experts, this questionnaire still needs to be tested pilot. This procedure was aimed to determine whether the questions were understandable; the questions were placed in good order; can capture the concept being studied; the instructions given were adequate; or whether questions are needed to be added or removed (Saunders et al., 2012).After pilot study the final questionnaire consisted of two sections, which were: section One: General information of the ERP user working in company. Company name, company address, company e-mail, type industry and number of employees etc. And section two: having questions on all influencing factors and perceived benefits.

The final questionnaire was transformed into two versions. The first was a Microsoft Word version, which was given in hard copy form and e-mail; the second was an online Google form Survey. The Word version was printed obviously for the hardcopy

distribution. Those contacted by e-mail were offered the choice of completing the survey as an e-mail attachment or online through a link and rest was circulated to as hard copy.

3.14 Reliability and Validity Test of an Instrument

3.14.1 Reliability

The reliability is the precision of the survey instrument that tests the survey instrument's stability and accuracy. The accuracy of the survey instrument is ensured by verifying the reliability of the test-retest and the reliability of the parallel-form while the quality of the instrument is verified by reliability of inter-item quality and half reliability is divided. Kripanont (2007) stated that the reliability test for inter-item consistency is primarily used, which tests for a strong correlation between items and item sub-sets.

Additionally, Churchill Jr (1979) and Nunnally (1994) claimed that evaluating the reliability coefficient is significant step in the refining of scales. Raubenheimer (2004) stated that by evaluating the reliability coefficient i.e., the internal accuracy of the products is verified. Furthermore this scholarly article also reported on a Wille (1996) proposed step by step item reduction technique. This technique is considered as a useful approach to optimizing internal consistency and ensuring that the scale is convergent and selective (Raubenheimer, 2004). This methodology has also been found applicable to questionnaires or scales of the multidimensional Likert-type. Sekaran and Bougie (2012) held that the Cronbach's alpha coefficient confirms the inter-item consistency in the case of multipoint scaled objects. To measure the latent constructs, this study used the Likert scale. For this reason the alpha coefficient of the Cronbach was determined to determine the accuracy of the inter-item. The analytical details are outlined in chapter 4-Data Analysis and Interpretations.

A research instrument's reliability enhances its ability to consistently measure what's intended. Increased reliability by including many similar items on a measure, testing a diverse sample of individuals and using uniform test procedures. To check the reliability of the research tools, the researcher selected a pilot study of 51 individuals from automotive companies in the Pune area. The internal accuracy techniques were applied using Cronbach's Alpha to check the reliability of the instruments. The coefficient was between 0.6-0.7 which suggests reliability acceptable.

In this study the researcher has used Cronbach's Alpha to test the reliability, as it uses item analysis to understand the identity of the questions on survey. Reliability refers to the extent of the consistency in result from the repeatability of measurements; high reliability means high consistency, so verifying the reliability between different variables is in the same way of verifying the survey's internal consistency. And Cronbach's Alpha<0.35 means low reliability, 0.35<Cronbach's Alpha<0.7 means acceptable, if Cronbach's Alpha>0.7, it shows high reliability.

3.14.2 Validity of instrument

Validity indicates the degree to which an instrument measures what it is supposed to measure (Kothari, 2004). The questionnaire was well structured to ensure that it remained focused, accurate and consistent in the course of the study. The validity of the research instruments were established by seeking opinions of experts in the field of study especially the researcher's supervisors. Validity of the research instruments simply implies that the conclusion of the researcher derives is correct or true.

Validity refers to the questions drawn by the researcher whether the measurements are actually hitting on the construct the researcher think they are, while the researcher can obtain specific statistics for reliability even different types, validity is more of a global assessment based on the evidence available There are three types of validity that are content validity, criterion validity, construct-related validity

3.15 Statistical Tests

- **Statistical Tool**

The statistical significance is also verified using different statistical methods. Such statistical analysis often helps to draw inferences and to make suggestions. The following sections identify the specifics and their importance regarding the statistical techniques adopted for this study respectively. When it comes to the analysis of the survey,

researcher needs to use quantitative data analysis techniques. This study uses SPSS 2000 Statistical Package for the Social Sciences, computer software that provide statistic function and solution for service as the analysis tool. And SPSS is used for the purpose of Reliability analysis, descriptive analysis, correlation analysis and regression analysis. Related analysis method will be conducted as follow:

- **Regression analysis**

As the researcher aims to test hypothesis based on the factor the researcher found, researcher need to use regression analysis to prove the relationship between dependent variable and independent variable, and in this study the researcher has use multiple regression analysis, as the researcher have designed several questions towards one factor which means there is more than one independent variable to predict a single dependent variable, therefore , regression analysis is applied to test the hypotheses.

- **Cronbach Alpha test**

Also known as Coefficient Alpha is the average of all possible split-half coefficients resulting from different ways of splitting the scale items. This coefficient varies from 0 to 1, and a value of 0.6 or less generally indicates unsatisfactory internal consistency reliability. In this research, the cronbach test was conducted to verify the reliability of questionnaire.

- **Structural Equation Modeling (SEM)**

SEM is a statistical method for analyzing cause and effect relationships (dependence relationships) among 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. In this research, SEM is used to examine the path significance and magnitude of each of hypothesized effects and the overall explanatory power of the proposed model.

- **Independent Sample T-Test**

Independent Sample T-Test is used to measure the variance of the population when there are two samples of data only. In this study, T-Test is performed to measure the equality of means of demographic variable type of organization (OEMs and ancillary components) with respect to perceived benefits.

- **ANOVA**

The ANOVA Test is a statistical technique used to explore variables difference. There are two forms of ANOVA, according to Pallant (2013), which are between group ANOVA and repeated-measure analysis of variances. An ANOVA test was conducted to determine whether those scores are statistically significant differently or not.

3.16 Chapter Conclusion

The chapter gives details of the research methods used in this research study. It begins by explaining the research objectives; hypothesis and research questions .Next clause is followed by research process and strategy .This chapter not only explained different types of research but research approaches also. Different methods of data collection used in this research study are also explained. This is followed by explanation of ethical consideration and details of samples and population. Pilot study conducted for this research study is given in next clause. At the end of chapter all statistical tests done for this research study is explained in detail.

Chapter 4

Data Analysis and Interpretation

This chapter gives detail and brief description of data analysis and its interpretation. Chapter start with introduction in 4.1, 4.2 gives details about statistical tools for data analysis.4.3 gives detail statistical analysis and interpretation used in the chapter. Dependent and independent variables, reliability, validity and interpretation of reliability and validity is explained in 4.4, 4.5 and 4.6 respectively. In 4.7 correlation analysis is explained. Whereas linear regression using mediating variable, interpretation of mediation analysis is explained in 4.8 and 4.9 respectively. 4.10 linear regressions CFA, SEM is explained in 4.10 and 4.11 Main part of this chapter is SEM path of all variables that is explained in 4.12. In 4.13 T-test and ANOVA and in 4.15 summary of hypothesis is explained lastly chapter ends with chapter conclusion in 4.16.

4.1 Introduction

To examine ERP users' use of ERP systems and its perceived benefits, we need to consider the TAM model. Synthesizing prior research on TAM and research on ERP systems, a conceptual model that represents the cumulative body of knowledge from TAM and ERP research over the years has been developed. Our research is focused on a group of external factors which influence the current usage of ERP in automobile sector .According to Davis perceived ease of use influences perceived usefulness while both perceived usefulness and perceived ease of use influence attitude toward using the system (Venkatesh ,Devis 2000). With this explanation researcher want to focus on influencing factors of ERP adoption with mediating variable TAM.

4.2 Statistical Tools for Data Analysis

Statistical methods had been implemented to analyze the results. Version 20 of the Statistical Package for the Social Sciences (SPSS) was used to analyze preliminary data and provide concise analyzes of the study sample such as means, standard deviations, frequencies, and relationship with the aid of ANOVA and Correlation. The measurement model was tested using Structural Equation Modeling (SEM using AMOS 20), using Confirmatory Factor Analysis (CFA). Each one of them was explained briefly in the following way.

4.2 .1 Pilot Study

A pilot survey was conducted prior to conducting the main survey. The pilot survey aimed to examine whether or not the proposed model was well designed and adapted to assess ERP performance. This also looked at how well the survey was structured for respondents to respond correctly to the questions. Based on the results of the pilot survey, the conceptual ERP success model and contents of the main survey were modified. Few demographic variables were deleted which was not useful to study. Initially a pilot study with 51 respondents was conducted to check the feasibility of the results. Personal interview has been conducted with the same questionnaire for data collection.

4.2 .2 Reliability

Zikmund(2003)defines reliability as the degree to which measurements are free of error and thus produce clear outcomes. Linked to reliability and error, the greater the reliability, the less the error (Punch, 1998).It is considered appropriate to test the reliability of Cronbach's alpha coefficient, one of the most common methods of gagging reliability(Nunnally,1994). This methodology calculates to what degree the objects in the scale are representative of the domain of the calculated construct. Nunnally(1994)recommends that an acceptable alpha range from 0.50 to 0.60 Nevertheless, Nunnally (1994) raised the degree of acceptance in the second edition of

his book Psychometric Theory, and found that for internal consistency alpha would reach the minimum of 0.70. Likewise, Nunnally and Bernstein (1994) recommend a thumb level rule that is higher than.70, with a level that is as small as 0.60 appropriate for new scales. Other writers such as Carmines and Zeller (1979) point to the need for internal consistency to be defined at least by 0.80. While different opinions on acceptability rates have been proposed, it is widely accepted that an alpha of.70 and above is appropriate. Hence this cut-off point (0.70) was used as the minimum for this analysis to determine the internal accuracy of scales.

4.2 .3 Validity

Reliability by itself is not necessary to consider an appropriate instrument (Anderson and Gerbing, 1988; Churchill, 1979).Therefore; validation is required to validate this study's constructs. According to Zikmund(2003), validity means a scale's ability to calculate what was supposed to be calculated. Validity is the relationship between the concept and its metrics (Punch, 1998). Validity means the consistency of the results of study. According to Maxwell (2002) the validity of qualitative analysis study has been debated among scholars in relation to the credibility. This refers to the accuracy or predication of outcomes, policies and programs. If qualitative research fails to reach such standards then the reliability of the results will be a issue. Maxwell (2002) also indicated that validity relates to evidence, conclusion and study, completed for a reason using a method with a particular context.

There are many ways to tackle the problems of validity, in both qualitative and quantitative studies. Researchers using quantitative methods typically deal with anticipated and unforeseen threats to the validity of the results, as opposed to qualitative researchers. For example, Maxwell (2002) argued that qualitative researchers rarely benefit from planned comparisons or sampling methods, or manipulations of statistical data. Researchers will also rule out risks to validity after initiation of the study by developing alternate hypotheses for the evidence gathered.

Two significant validity threats have been established (Maxwell, 2002), and are widely associated with qualitative research techniques. Those are:

• Researcher bias-this happens when the data are chosen based on current hypothesis or academic interests of the researcher.

• Reactivity – this is the effect of the environment or individual studies that a researcher may have.

Maxwell (2002) further argued that procedures or methods do not provide validity, but they are necessary to minimize possible validity-related risks and increase the credibility of tests. To help the validity of the findings, the researcher used secondary data literature, an online expert group, and case study interviews for this analysis. Nunnally and Bernstein (1994) say a correct construct has three significant aspects to it. Next, the build should be seen as a reasonable representation of the construction related measurable domain. Second, the construction should be the alternative measures. Finally, the structure will fit well to other interesting constructs. Taking these factors into account, this thesis analyzed three forms of validity, including substance and construct (convergent and discriminating validity). Both are linked to the scale's internal validity, and their respective objects.

4.2 .4 Content Validity

For this analysis, material or face validity is the first form to be used with. When it is evident to experts that the measures how sufficient coverage of the definition, the measure has face validity (Zikmund, 2003).In order to obtain material validity, this study follows the suggested procedures of Cooper and Schindler(2003)through identifying the current scales from the literature and conducting interviews with panel of experts(including academics and practitioners from the industry), asking them to give their comments on the instrument. The interviews were conducted as part of the previously discussed pretest methods. Since the validity of material is subjective in nature, it is not necessary to provide a more stringent empirical check (Zikmund, 2003).Therefore; it was ensured a prior that the final survey was performed as a guide to other validity measures.

4.2.5 Construct Validity

The second category used within this study is construct validity. It is specifically concerned with what the instrument is actually measuring (Churchill, 1995). In other words, it refers to how well the effects of using the measure that suits the hypotheses in which the test is constructed are obtained. In this sense, Malhotra(2007) also felt it appropriate to address the theoretical questions as to why the scales work and what conclusions can be made on the basis of the measure. Although measuring reliability and material validity develops in-house consistent sets of measuring objects, construct validity (Nunnally, 1994) is not sufficient.

Therefore, in this study, construct validity was investigated by evaluating both convergent validity and discriminant validity. Convergent validity tests whether the measurements of the same construct are strongly correlated, and discriminating validity decides whether a construct's metrics have not been too closely associated with other constructs (Sekaran, 2000).

A number of methods for assessing convergent and discriminant validity have been suggested: factor analysis, correlation, and even more advanced procedures including CFA existing in SEM. For the purposes of this study, convergent and discriminating validity was assessed by correlation. (Holmes-Smith etal., 2006). The magnitude of the direct structural relationship between the object and the latent construct (or factor) should be statistically different from zero to demonstrate convergent validity. In addition, AVE was used as a criterion to help convergent validity. In this analysis, two approaches were employed for discriminant validity. The first method tests the approximate correlations between the variables, which should not exceed 0.85(Kline, 2005).

It is consistent with Sekaran's (2006) discriminating validity definition above. That is, if the two variables are strongly correlated (greater than.85), redundant elements are excluded as a consequence of a lack of discriminating validity(Kline,2005).The second method of evaluating discriminating validity tests the pattern structure coefficient to decide if variables are empirically distinct in measurement models. The pattern coefficient is the uniform loading factor resulting from an AMOS analysis. In addition to these restrictive tests of convergent and discriminating validity, construct validity in

this study has been improved by ensuring that the model through goodness-of - fit results suits adequately with the data (Hsieh and Hiang, 2004). In this review, findings relating to the validity of the construct were published.

4.2 .6 Correlation

Correlations have been used to assess the intensity of the relation between selected dimensions. In this study, correlation analysis was done between the four TAM variables and the ERP adoption variables.

4.2 .7 Multiple Linear Regressions

Multiple Linear Regression is a prediction technique that uses multiple independent variables(Y) to find the value of the dependent variable(X). Analysis of regression explains the change in Y value with a change of unit in X, and to what extent. This also describes whether the X is having any effect on Y.

For this analysis, the mediating variable is used for regression. The following inferences can be made in the case of mediation.

In this analysis TAM is the mediating element. There will be no significant impact of the ERP adoption on perceived benefits in the presence of TAM. Yet if the regression is performed separately, then ERP implementation would have a significant effect on perceived benefits. Yet TAM cannot be separated from each other according to theory. So if TAM has to come into the model, it's got to play a mediating variable function. And as a mediating element, TAM can have a significant effect on perceived benefits. The hypothesis in the presence of mediating variable is as follows.

H0-1: There is no significant impact of adoption of ERP on Perceived Benefits.

H0-2: There is no significant impact of TAM on perceived benefits.

H0-3: There is no significant impact of adoption of ERP on Perceived Benefits in the presence of mediating variable TAM.

4.2 .8 Structural Equation Modeling(SEM)

(Tabachnick and Fidell, 2001) Structural Equation Modeling is a series of statistical techniques which allow the analysis of a set of relationships between one or more independent variables, whether continuous or discrete, and one or more continuous or discrete dependent variables.

4.2 .9 Independent sample T- Test and Analysis of variance

Independent Sample T-Test is used to measure the variance of the population when there are two samples of data only. In this study, T-Test is performed to measure the equality of means of demographic variable type of organization (OEMs and ancillary components) w.r.t perceived benefits.

Analysis of variance (ANOVA) has been used to measure the variance of the population in different ways with in samples and between samples which are related to perceived benefits. ANOVA is used to test for significant differences between two or more group means. In this study, ANOVA is done to measure the variance of demographic variables like level of users position of the respondents in the organizations w.r.t to perceived benefits.

The hypothesis of the t-test is as follows.

H0-4: There is no significant relationship of organization type on perceived benefits

The hypothesis of the ANOVA is as follows.

H0-5: There is no significant relationship of position of respondents in the organization with the perceived benefits of ERP.

4.3 Statistical analysis And Interpretation:

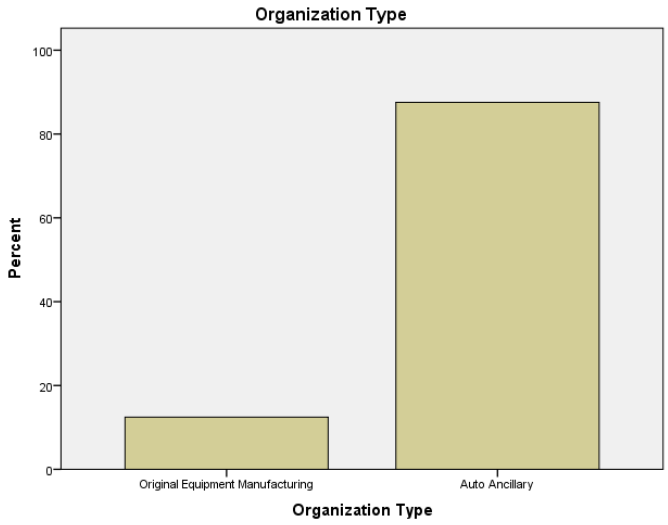
4.3.1 Descriptive Statistics

- **Type of Organization**

Table 4.1 below presents the type of industry who participated in this study that is OEM and component manufacturing industry. And graph 4.1 shows graphical representation of organization type.

Table 4.1 Organization Type

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Original Equipment Manufacturing	54	12.4	12.4	12.4
	Auto Ancillary	380	87.6	87.6	100.0
	Total	434	100.0	100.0	



Graph 4.1 Type of organization

Interpretation:-

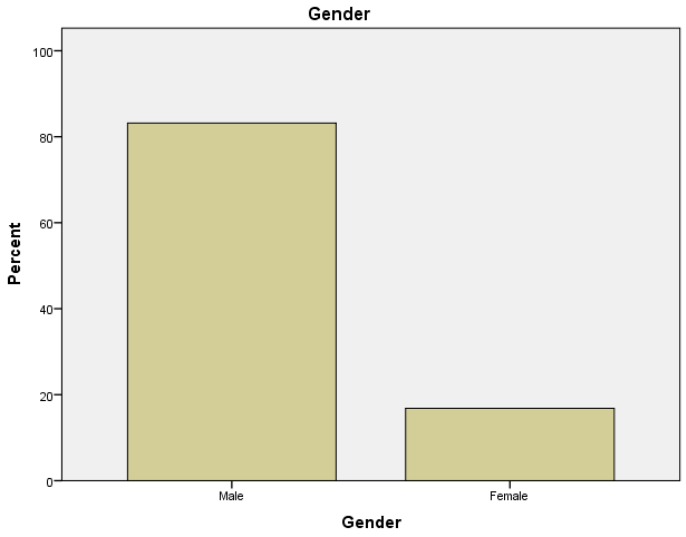
The table shows that the respondents participated in this study are dominated by auto component manufacturing ERP users to OEM ERP users. Out of 434 respondents, 12% are Original Equipment Manufacturing (OEM) organization and 87% are Auto ancillary or auto component organizations. As there are more component manufacturing companies that OEM in Pune.

- **Gender of the respondent**

Table 4.2 below presents the gender of respondent who participated in this study .And graph 4.2 shows graphical representation of gender of users.

Table 4.2 Gender of the respondent

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Male	361	83.2	83.2	83.2
	Female	73	16.8	16.8	100.0
	Total	434	100.0	100.0	



Graph 4.2 Gender of the respondent

Interpretation:-

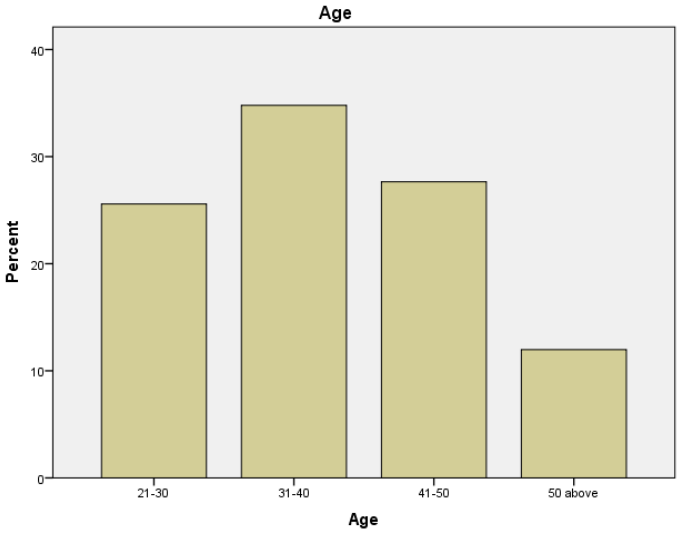
The table shows that the respondents participated in this study are dominated by Males. .Out of 434 respondents, 83% are male and 16% are female. It can be seen from the table above that the male owner/manager dominate in this sample profile.

- **Age Frequency table**

Table 4.3 below presents the age of respondent who participated in this study .And graph 4.3 shows graphical representation of age of respondents.

Table 4.3 Age of the respondent

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	21-30	111	25.6	25.6	25.6
	31-40	151	34.8	34.8	60.4
	41-50	120	27.6	27.6	88.0
	50 above	52	12.0	12.0	100.0
	Total	434	100.0	100.0	



Graph 4.3 Age of the respondent

Interpretation:-

Out of 434 respondents, 25.6% belong to 21-30 years, 34.8 % belong to 31-40 years, 27.6% belong to 41-50 years, 12% belong to 50 and above. It can be seen from the table above that the respondents between the ages 31 to 40 dominate, which indicates that the majority of owners/managers/Supervisors, ERP users in Pune are aged between 31-40 years old.

- **Position of ERP user in organization**

Table 4.4 below presents the position of respondent in an organization who participated in this study .And graph 4.4 shows graphical representation of position of respondent in an organization.

Table 4.4 Your position in an Organization

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Middle Level	301	69.4	69.4	69.4
	Top Level	98	22.6	22.6	91.9
	Operational	35	8.1	8.1	100.0
	Total	434	100.0	100.0	



Graph 4.4 Position of ERP users in organization

Interpretation:-

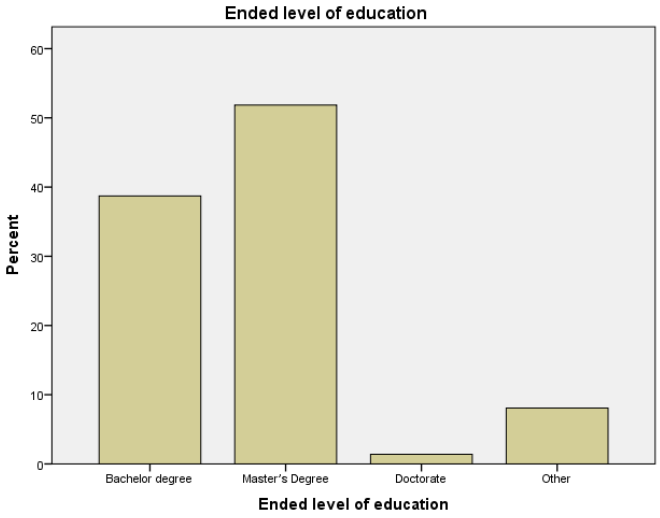
Out of 434 respondents, 69.4% belong to Middle level position, 22.6 % belong to top level position and 8.1 % belong to operational level ERP users. It can be seen from the table above that the most of middle level ERP respondents participated in study than top level ERP users. And very few operational level employees participated in study.

- **Education background of ERP users**

Table 4.5 below presents the education background of respondent in an organization who participated in this study .And graph 4.5 shows graphical representation of education of respondent in an organization.

Table 4.5 Ended level of education

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Bachelor degree	168	38.7	38.7	38.7
	Master's Degree	225	51.8	51.8	90.6
	Doctorate	6	1.4	1.4	91.9
	Other	35	8.1	8.1	100.0
	Total	434	100.0	100.0	



Graph 4.5 Ended level of education

Interpretation:-

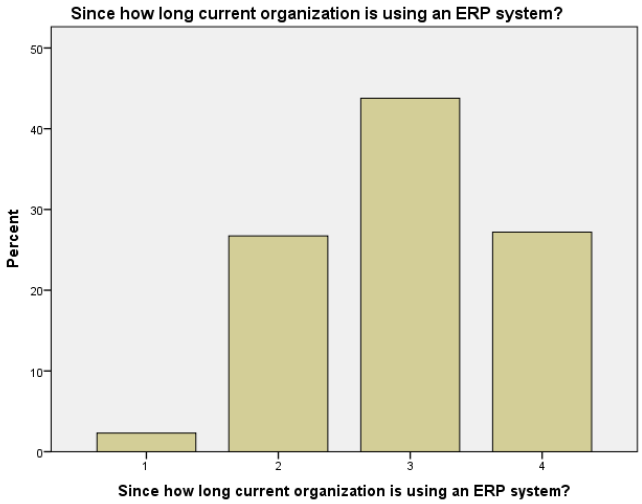
Out of 434 respondents, 38.7% belong to Bachelor degree, 51.8 % belong to master's degree, 1.4 % doctorate and 8.1 % belong to other is the educational background of ERP users. It can be seen from the table above that the most of bachelor degree and master's degree ERP respondents participated in study.

- **From How many years organizations are using ERP system**

Table 4.6 below presents the since how long organization is using ERP in an organization who participated in this study .And graph 4.6 shows graphical representation of since how long organization is using ERP in an organization.

Table 4.6 How long organization is using ERP

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Less than one year	10	2.3	2.3	2.3
	1-5 years	116	26.7	26.7	29.0
	5-10 years	190	43.8	43.8	72.8
	More than 10 years	118	27.2	27.2	100.0
	Total	434	100.0	100.0	



Graph 4.6 How long organization is using ERP

Interpretation:-

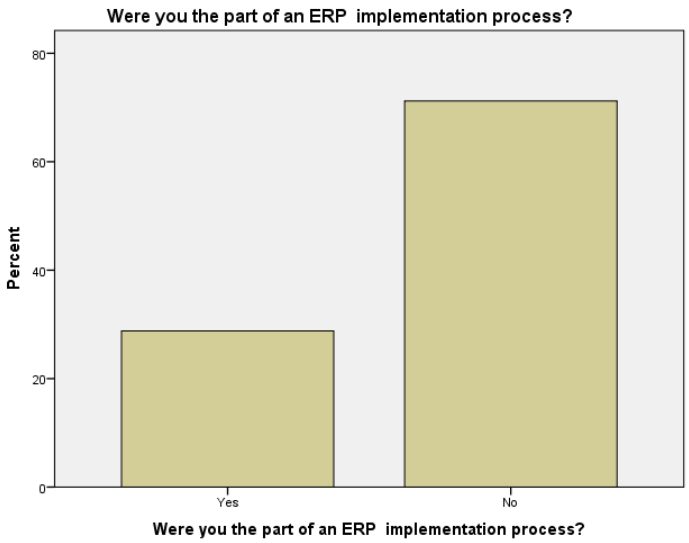
Out of 434 respondents, 2.3% belong to Less than one year, 26.7 % belong to 1-5 years, 43.8 % 5-10 years and 27.2 % belong to more than 10 years. Most of the organizations are using ERP from 5-10 years. And it can be seen from the table above that very few organizations are using ERP less than one year.

- **Was ERP user part of ERP implementation process**

Table 4.7 below presents, were user was the part of an ERP implementation process in an organization who participated in this study .And graph 4.7 shows graphical representation of the same.

Table 4.7 Were you the part of an ERP implementation process?

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Yes	125	28.8	28.8	28.8
	No	309	71.2	71.2	100.0
	Total	434	100.0	100.0	



Graph 4.7 Were you the part of an ERP implementation process?

Interpretation:-

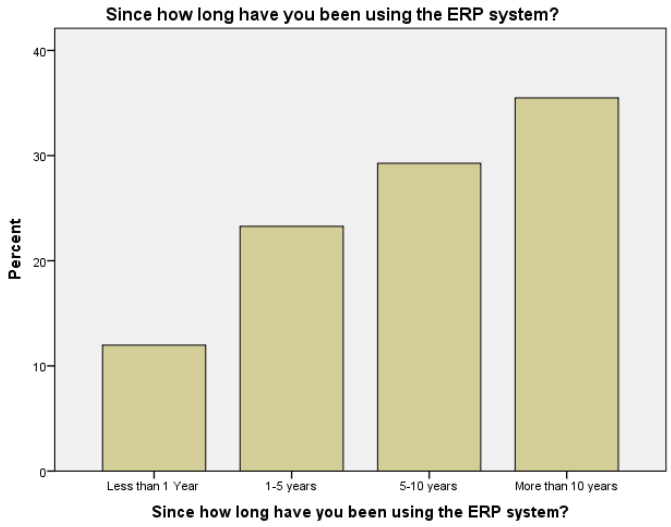
Out of 434 respondents, 28.8% people were part of ERP implementation process and majority of ERP users that is 71.2 % users were not involved in ERP implementation process.

- **From how many years ERP user is using ERP system**

Table 4.8 below presents data about since how long respondent have been using the ERP system in an organization who participated in this study .And graph 4.8 shows graphical representation of since how long respondent have been using the ERP system in an organization.

Table 4.8 Since how long have you been using the ERP system?

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Less than 1 Year	52	12.0	12.0	12.0
	1-5 years	101	23.3	23.3	35.3
	5-10 years	127	29.3	29.3	64.5
	More than 10 years	154	35.5	35.5	100.0
	Total	434	100.0	100.0	



Graph 4.8 Since how long have you been using the ERP system?

Interpretation:-

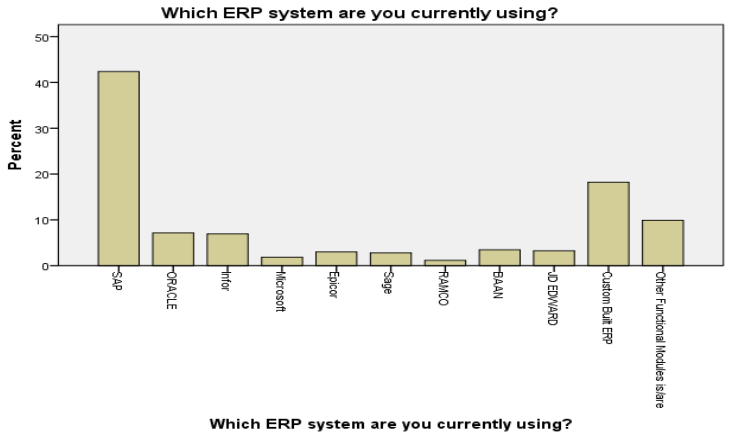
Out of 434 respondents ,12 % users are using ERP less than 1 Year, , 23.3% users are using ERP system from 1-5 years, 29.3% users are using ERP system from 5-10 years and 35.5% users are using ERP system from more than 10 years.

- **Which ERP package is organizations are using**

Table 4.9 below presents data which ERP system organization is currently using. And graph 4.9 shows graphical representation of which ERP system organization is currently using.

Table 4.9 Which ERP system is you currently using

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	SAP	184	42.4	42.4	42.4
	ORACLE	31	7.1	7.1	49.5
	Infor	30	6.9	6.9	56.5
	Microsoft	8	1.8	1.8	58.3
	Epicor	13	3.0	3.0	61.3
	Sage	12	2.8	2.8	64.1
	RAMCO	5	1.2	1.2	65.2
	BAAN	15	3.5	3.5	68.7
	JD EDWARD	14	3.2	3.2	71.9
	Custom Built ERP	79	18.2	18.2	90.1
	Other Functional Modules is/are	43	9.9	9.9	100.0
	Total	434	100.0	100.0	



Graph 4.9 Which ERP system is you currently using

Interpretation:-

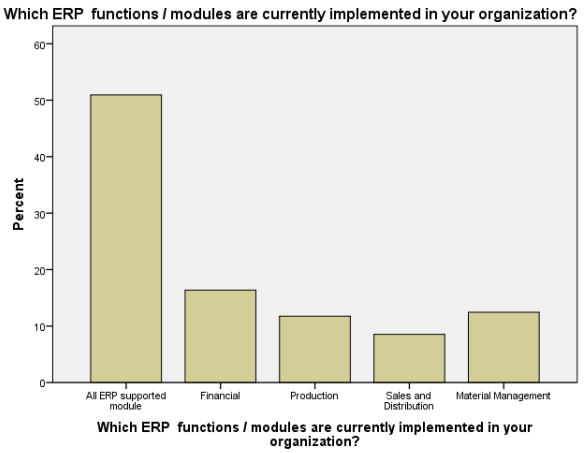
Out of 434 respondents, 42.4 % users are using SAP-ERP package .It means most of the companies are using SAP –ERP package than others.

- **Which ERP functions / modules are currently implemented in your organization.**

Table 4.10 below presents data about which ERP modules are currently implemented in an organization. And graph 4.10 shows graphical representation about which ERP modules are currently implemented in an organization.

Table 4.10 Which ERP functions / modules are currently implemented in your organization.

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	All ERP supported module	221	50.9	50.9	50.9
	Financial	71	16.4	16.4	67.3
	Production	51	11.8	11.8	79.0
	Sales and Distribution	37	8.5	8.5	87.6
	Material Management	54	12.4	12.4	100.0
	Total	434	100.0	100.0	



Graph 4.10 Which ERP functions / modules are currently implemented in your organization

Interpretation:-

Out of 434 respondents, 50.9 % organizations are working with all modules of ERP. Whereas still remaining organizations are not using all ERP packages.

- **What is turnover of organization.**

Table 4.11 below presents data about organizational annual turnover .And graph 4.11 shows graphical representation of organizational annual turnover.

Table 4.11 What is your organizational annual turnover (crores)

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Less than 10 Cr	37	8.5	8.5	8.5
	10-500 Cr	222	51.2	51.2	59.7
	500-1000 Cr	108	24.9	24.9	84.6
	More than 1000 Cr	67	15.4	15.4	100.0
	Total	434	100.0	100.0	



Graph 4.11 what is organizational annual turnover (crores)

Interpretation:-

Out of 434 respondents ,8.5 % users are working with organization having turnover Less than 10 Cr years, 51.2 % users are working with organization having turnover 10-500 Cr, 24.9 % users are working with organization having turnover 500-1000 Cr and 15.4 % users are working with organization having turnover More than 1000 Cr.

4.3.2 Descriptive statistics interpretation

All above tables give a clear explanation of demographic variable included in this study. It contains descriptive statistics of gender, education, age, experience, type of manufacturing sector and position etc. Data is majorly collected from auto ancillary components as compared to OEM companies. The gender variable is dominated by male segmentation as the target companies are manufacturing which is generally dominated by males particularly in India. All the respondents belonging to all age groups have filled in the questionnaire. Hence opinion of all age's people is taken care of.

The education category highly contributed by graduates and post graduates. The experience segment reveals most of the respondent shaves experience more than at least one year. So, there is less chance of getting responses from freshers. The responses will be more genuine as the respondents have spent a good number of years in the organization to express their views on it. The position data says that the responses were mostly collected from middle level management, i.e. the most sensible and logical level who has got the knowledge of the top-level operations and experience and empathy of operational level. Almost all organizations are using ERP from more than one year very few organizations are using ERP less than one year. This predicts that almost all automobile are using ERP software. It was seen from the data that respondents was not part of ERP implementation still he was able to use it very few respondents was part of ERP implementation. Again it has been observed that almost all respondents are using ERP at least more than one year.

The important conclusion from the study was most of the organization are using SAP as a ERP package than other ERP packages. Lastly it has been observed that only in 50 % organization all ERP modules. It means that still there is need to implement all modules in remaining 50 % organizations.

4.3.3 Descriptive Statistics for Adoption of ERP

ERP variables are explained by following abbreviations,

- Organizational Factors -ERP1
- Technological Factors- ERP2
- Environmental Factors -ERP3
- Individual Factors- ERP4

TAM variables are explained by following abbreviations,

- Perceived Use -TAM1
- Perceived ease of use- TAM2
- Intention to use -TAM3
- Attitude to use -TAM4

Table-4.12: Descriptive Statistics for Adoption of ERP (All components)

Descriptive Statistics

	N	Minimum	Maximum	Mean	Std. Deviation
ERP1	434	1.3000	5.0000	4.221889	.4172993
ERP2	434	1.0000	5.0000	4.040092	.4383530
ERP3	434	1.0000	5.0000	3.980645	.5170475
ERP4	434	1.0000	5.0000	4.049539	.5358975
Valid N (list wise)	434				

Table – 4.13 : Descriptive Statistics for Adoption of ERP (Avg of all components)

Descriptive Statistics

	N	Minimum	Maximum	Mean	Std. Deviation
ERP Avg	434	1.0750	5.0000	4.073041	.3914281
Valid N (list wise)	434				

The descriptive statistics of the variable – Adoption of ERP with four components (Organizational factors, Technological factors, Environmental factors and Individual Factors) denoted as ERP1, ERP2, ERP3 and ERP4 says that the overall means value of all the four components is 4.07 which signifies that the respondents generally agree to the fact that adoption of ERP is essential considering all the factors in account.

The overall SD is .391, a low SD implies less deviation from the mean value. Means the respondents are consistent in their opinion.

Table -4.14 Descriptive Statistics for TAM (All components)

Descriptive Statistics

	N	Minimum	Maximum	Mean	Std. Deviation
Avg TAM	434	1.0000	5.0000	4.093126	.5153300
Valid N (list wise)	434				

Table – 4.15: Descriptive Statistics for TAM (Avg of all components)

Descriptive Statistics

	N	Minimum	Maximum	Mean	Std. Deviation
TAM1	434	1	5	4.10	.828
TAM2	434	1.0000	5.0000	4.181260	.5698948
TAM3	434	1.0	5.0	4.043	.7498
TAM4	434	1.0	5.0	4.050	.5987
Valid N (list wise)	434				

The descriptive statistics of the variable – TAM with four components (Perceived Use, Attitude, Perceived Ease of Use and Intention to use) denoted as TAM1, TAM2, TAM3 and TAM4 says that the overall means value of all the four components is 4.09 which signifies that the respondents generally agree to the fact that TAM as expressed in the

theory is an essential factor that has to be considered in the study. The presence of such a variable improves the strength of the study.

The overall SD is 0.515, a low SD implies less deviation from the mean value. Means the respondents are consistent in their opinion.

Table -4.16: Descriptive Statistics for Perceived Benefits (All components)

Descriptive Statistics

	N	Minimum	Maximum	Mean	Std. Deviation
PB1	434	1	5	3.72	.970
PB2	434	1	5	4.03	.782
PB3	434	1	5	3.94	.725
PB4	434	1	5	3.74	.900
PB5	434	1	5	4.23	.815
PB6	434	1	5	3.39	.980
PB7	434	1	5	3.76	.878
PB8	434	1	5	4.12	.882
PB9	433	1	5	4.39	.784
PB10	434	1	5	4.38	.813
Valid N (listwise)	433				

Table – 4.17: Descriptive Statistics for Perceived Benefits (Avg of all components)

Descriptive Statistics

	N	Minimum	Maximum	Mean	Std. Deviation
Avg Perceived Benefits	434	1.0	5.0	3.970	.4516
Valid N (list wise)	434				

The descriptive statistics of the variable – Perceived Benefits with ten components denoted as PB1, PB2, PB3, PB4, PB5, PB6, PB7, PB8, PB9, PB10 says that the overall means value of all the components is 3.9 which signifies that the respondents realize that

the benefits derived from implementation of ERP system in the organization is beneficial considering all the factors influencing the adoption of ERP and TAM is essential. The overall SD is 0.451, a low SD implies less deviation from the mean value. Means the respondents are consistent in their opinion.

4.3 Dependent and independent variables

A) Independent variable

Adoption of ERP is an independent variable explained by:

- Organizational Factors (ERP1)
- Technological Factors (ERP2)
- Environmental Factors (ERP3)
- Individual Factors (ERP4)

TAM is the mediating variable explained by:

- Perceived Use (TAM1)
- Perceived ease of use (TAM2)
- Intention to use (TAM3)
- Attitude to use (TAM4)

B) Dependent variable

In this study, there is only one dependent variable i.e. **Perceived Benefits.**

4.5 Reliability and Validity

- **Reliability And Validity Statistics For Adoption Of ERP**

Table- 4.18: Reliability Statistics for Adoption of ERP

Reliability Statistics

Cronbach's Alpha	N of Items
.833	4

Table-4.19: Validity Statistics for Adoption Of ERP

Item-Total Statistics

	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Cronbach's Alpha if Item Deleted
ERP1	12.070276	1.575	.671	.789
ERP2	12.252074	1.521	.683	.782
ERP3	12.311521	1.362	.681	.780
ERP4	12.242627	1.365	.638	.804

- **Reliability And Validity Statistics For TAM**

Table- 4.20: Reliability Statistics for TAM

Reliability Statistics

Cronbach's Alpha	N of Items
.727	4

Table-4.21: Validity Statistics for TAM

Item-Total Statistics

	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Cronbach's Alpha if Item Deleted
TAM1	12.273425	2.240	.534	.666
TAM2	12.191244	2.556	.751	.557
TAM3	12.329877	2.700	.400	.740
TAM4	12.322965	2.933	.467	.696

- **Reliability And Validity Statistics For Perceived Benefits**

Table- 4.22: Reliability Statistics For perceived Benefits

Reliability Statistics

Cronbach's Alpha	N of Items
.712	10

Table-4.23: Validity Statistics for Perceived Benefits

Item-Total Statistics

	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Cronbach's Alpha if Item Deleted
PB1	35.98	16.504	.377	.689
PB2	35.67	17.111	.417	.683
PB3	35.75	17.073	.471	.676
PB4	35.96	17.068	.341	.695
PB5	35.46	17.337	.356	.692
PB6	36.30	16.904	.316	.701
PB7	35.94	17.020	.363	.691
PB8	35.57	16.634	.417	.681
PB9	35.30	17.692	.320	.697
PB10	35.31	17.331	.358	.692

Table No-4.24: Summary Table

Sr. No.	Indicators	Cronbach Alpha for Reliability	According to Pearson's critical value or r product moment value	Validity
1	Adoption of ERP	.833	For infinite samples in 0.05 significance level, r value is 0.073	Valid
2	TAM	.727		Valid
3	Perceived Benefits	.712		Valid

4.6 Interpretation of Reliability and Validity

Since all the variables have a reliability score more than 0.7, it is interpreted that the variables are reliable.

According to Pearson's critical value or r product moment value, for infinite samples in 0.05 significance level, r value is 0.073.

For ERP1, ERP2, ERP3 and ERP4, the calculated correlated values are 0.671, 0.683, 0.681 and 0.638 respectively. All these values are greater than 0.073(r product moment value). Hence the data of ERP is assumed to be valid.

For TAM1, TAM2, TAM3 and TAM4, the calculated correlated values are 0.534, 0.751, 0.400 and 0.467 respectively. All these values are greater than 0.073(r product moment value). Hence the data of TAM is assumed to be valid.

For PB1, PB2, PB3, PB4, PB5, PB6, PB7, PB8, PB9, PB10, the calculated correlated values are 0.377, 0.417, 0.471, 0.341, 0.356, 0.316, 0.363, 0.417, 0.320 and 0.358 respectively. All these values are greater than 0.073(r product moment value). Hence the data of Perceived Benefits is assumed to be valid.

4.7 Correlation Analysis

Table-4.25: Correlation between variables - TAM and adoption of ERP

Correlations

		ERP1	ERP2	ERP3	ERP4	TAM1	TAM2	TAM3	TAM4
ERP1	Pearson Correlation	1	.633**	.545**	.527**	.313**	.495**	.334**	.422**
	Sig. (2-tailed)		.000	.000	.000	.000	.000	.000	.000
	N	434	434	434	434	434	434	434	434
ERP2	Pearson Correlation	.633**	1	.585**	.513**	.325**	.501**	.322**	.422**
	Sig. (2-tailed)	.000		.000	.000	.000	.000	.000	.000
	N	434	434	434	434	434	434	434	434
ERP3	Pearson Correlation	.545**	.585**	1	.581**	.389**	.518**	.401**	.381**
	Sig. (2-tailed)	.000	.000		.000	.000	.000	.000	.000
	N	434	434	434	434	434	434	434	434
ERP4	Pearson Correlation	.527**	.513**	.581**	1	.437**	.572**	.436**	.428**
	Sig. (2-tailed)	.000	.000	.000		.000	.000	.000	.000
	N	434	434	434	434	434	434	434	434
TAM1	Pearson Correlation	.313**	.325**	.389**	.437**	1	.712**	.276**	.312**
	Sig. (2-tailed)	.000	.000	.000	.000		.000	.000	.000
	N	434	434	434	434	434	434	434	434
TAM2	Pearson Correlation	.495**	.501**	.518**	.572**	.712**	1	.404**	.514**
	Sig. (2-tailed)	.000	.000	.000	.000	.000		.000	.000
	N	434	434	434	434	434	434	434	434
TAM3	Pearson Correlation	.334**	.322**	.401**	.436**	.276**	.404**	1	.332**
	Sig. (2-tailed)	.000	.000	.000	.000	.000	.000		.000
	N	434	434	434	434	434	434	434	434
TAM4	Pearson Correlation	.422**	.422**	.381**	.428**	.312**	.514**	.332**	1
	Sig. (2-tailed)	.000	.000	.000	.000	.000	.000	.000	
	N	434	434	434	434	434	434	434	434

**. Correlation is significant at the 0.01 level (2-tailed).

Interpretation of Correlation

From the data in the correlation table, it is observed that there is a fair and medium correlation between the variables of adoption of ERP and the same is also observed among the variables of TAM. Except TAM3 and TAM 4 with TAM1 which shows very low correlation.

4.8 Linear Regression Using Mediating Variable (Mediation Analysis)

At first, the decision has to be made whether, the study should have a mediating variable or not. For this, in SPSS, Perceived Benefits was taken as the dependent variable and two blocks of independent variables were taken. One block represented Adoption of ERP as independent variable and the other block represented TAM as the independent variable. The following is the result that was obtained.

Table-4.26: Variables

Variables Entered/ Removed

Model	Variables Entered	Variables Removed	Method
1	ERP4, ERP2, ERP3, ERP1[b]	.	Enter
2	TAM1, TAM3, TAM4, TAM2[b]	.	Enter

a. Dependent Variable: Avg Perceived Benefits

b. All requested variables entered.

Table-4.27: Model Summary

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.692[a]	.479	.474	.3274
2	.735[b]	.540	.531	.3093

a. Predictors: (Constant), ERP4, ERP2, ERP3, ERP1

b. Predictors: (Constant), ERP4, ERP2, ERP3, ERP1, TAM1, TAM3, TAM4, TAM2

Table-4.28: ANOVA table for significance value

ANOVA[a]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	42.331	4	10.583	98.739	.000[b]
	Residual	45.980	429	.107		
	Total	88.311	433			
2	Regression	47.665	8	5.958	62.300	.000[c]
	Residual	40.645	425	.096		
	Total	88.311	433			

a. Dependent Variable: Avg Perceived Benefits

b. Predictors: (Constant), ERP4, ERP2, ERP3, ERP1

c. Predictors: (Constant), ERP4, ERP2, ERP3, ERP1, TAM1, TAM3, TAM4, TAM2

Table-4.29: Coefficients

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	.847	.172		4.912	.000
	ERP1	.123	.052	.114	2.375	.018
	ERP2	.171	.050	.166	3.389	.001
	ERP3	.192	.042	.220	4.613	.000
	ERP4	.283	.038	.336	7.394	.000
2	(Constant)	.654	.165		3.958	.000
	ERP1	.062	.050	.057	1.236	.217
	ERP2	.114	.048	.110	2.347	.019
	ERP3	.140	.040	.160	3.482	.001
	ERP4	.182	.039	.216	4.679	.000
	TAM1	-.005	.026	-.009	-.190	.849
	TAM2	.177	.045	.224	3.918	.000
	TAM3	.050	.023	.083	2.168	.031
	TAM4	.093	.030	.124	3.079	.002

a. Dependent Variable: Avg Perceived Benefits

Interpretation of the above analysis:

Clearly it can be seen that in the initial model where only Adoption of ERP was the independent variable, its relationship with Perceived Benefits are significant.

But when in the second block, TAM was included as another independent variable, it is observed that some components of adoption of ERP i.e. ERP1 became insignificant. And also, the value of significance of ERP2 has increased.

This analysis interprets that TAM can be considered as a mediating variable in this study.

So now, the regression for mediation analysis is performed.

Mediation Analysis: Mediator variable is the "middleman" between an independent variable and the dependent variable.

Types of Mediation

Represents Significant Path

……> Represents Insignificant Path

Figure 4.12 shows indirect mediation and figure 4.13 shows partial mediation

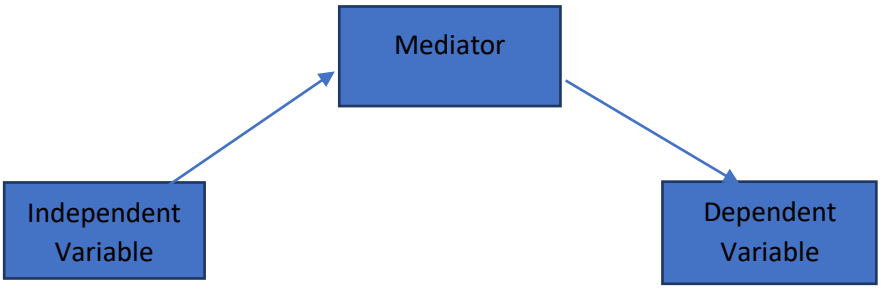


Figure 4.12 Indirect Mediation

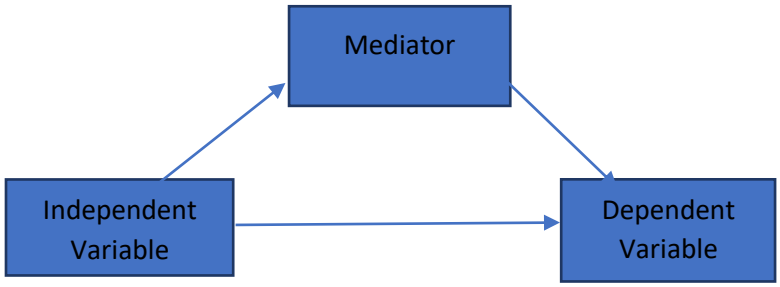


Figure 4.13 Partial Mediation

Figure 4.14 shows full mediation

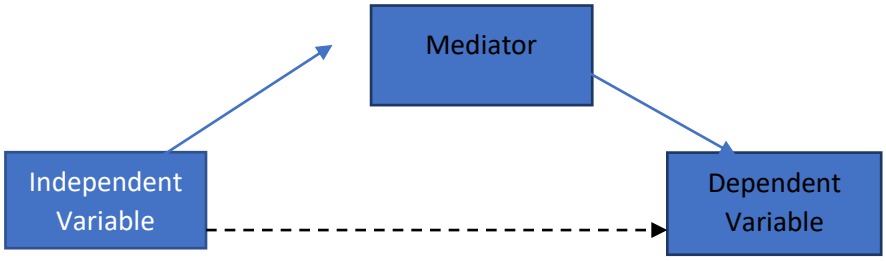


Figure 4.14 Full Mediation

In the absence of the mediating variable in the model,

1. Relation between IV and DV should be significant
2. Relation between IV and MV should be significant
3. Relation between MV and DV should be significant

But after, the mediating variable is added to the model, the following changes happens

1. Relation between IV and DV should be insignificant
2. Relation between IV and MV should be significant
3. Relation between MV and DV should be significant

But sometimes, it may happen that the relation between IV and DV in the presence of MV is significant. In that case, partial mediation can be considered.

The results of the SPSS data analysis are as follows.

Table-4.30: Variables-SPSS

Variables Entered/Removed[a]

Model	Variables Entered	Variables Removed	Method
1	Avg TAM, ERP Avg[b]	.	Enter

a. Dependent Variable: Avg Perceived Benefits

b. All requested variables entered.

Table-4.31 Model Summary

Model Summary[b]

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Durbin-Watson
1	.725[a]	.525	.523	.3119	1.945

a. Predictors: (Constant), Avg TAM, ERP Avg

b. Dependent Variable: Avg Perceived Benefits

Table-4.32: ANOVA for significance value

ANOVA[a]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	46.377	2	23.189	238.336	.000[b]
	Residual	41.933	431	.097		
	Total	88.311	433			

a. Dependent Variable: Avg Perceived Benefits

b. Predictors: (Constant), Avg TAM, ERP Avg

Table-4.33: Coefficients

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.	Collinearity Statistics	
		B	Std. Error	Beta			Tolerance	VIF
1	(Constant)	.609	.158		3.859	.000		
	ERP Avg	.550	.052	.476	10.626	.000	.548	1.824
	Avg TAM	.274	.039	.313	6.980	.000	.548	1.824

a. Dependent Variable: Avg Perceived Benefits

Table-4.34: Collinearity Diagnosis

Collinearity Diagnostics[a]

Model	Dimension	Eigenvalue	Condition Index	Variance Proportions		
				(Constant)	ERP Avg	Avg TAM
1	1	2.989	1.000	.00	.00	.00
	2	.008	19.552	.59	.00	.53
	3	.003	29.939	.40	1.00	.47

a. Dependent Variable: Avg Perceived Benefits

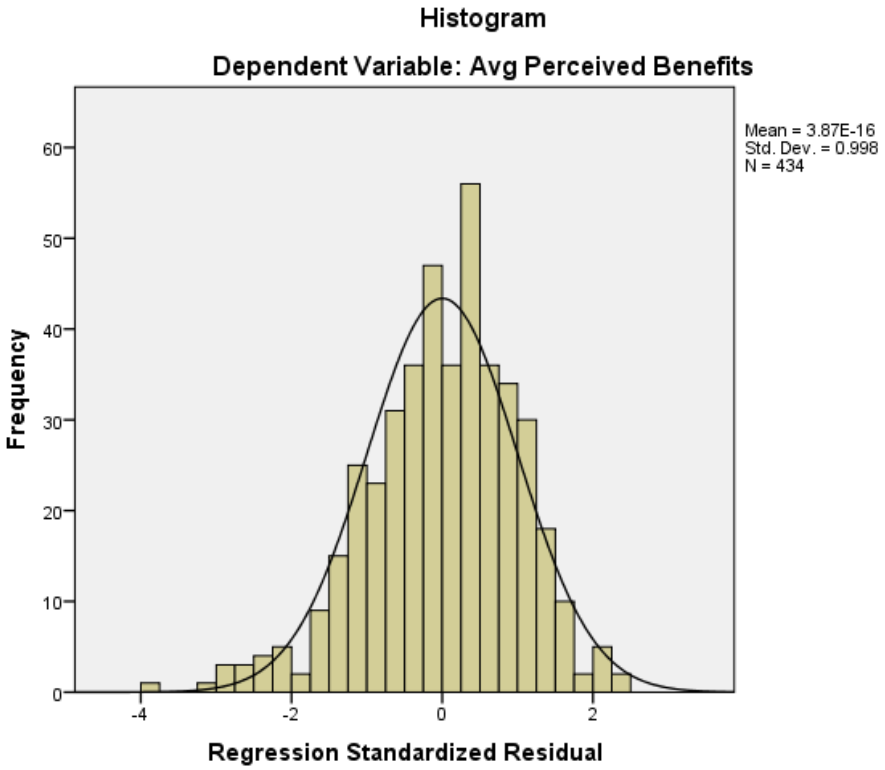


Figure-4.14: Normal Distribution of Residuals

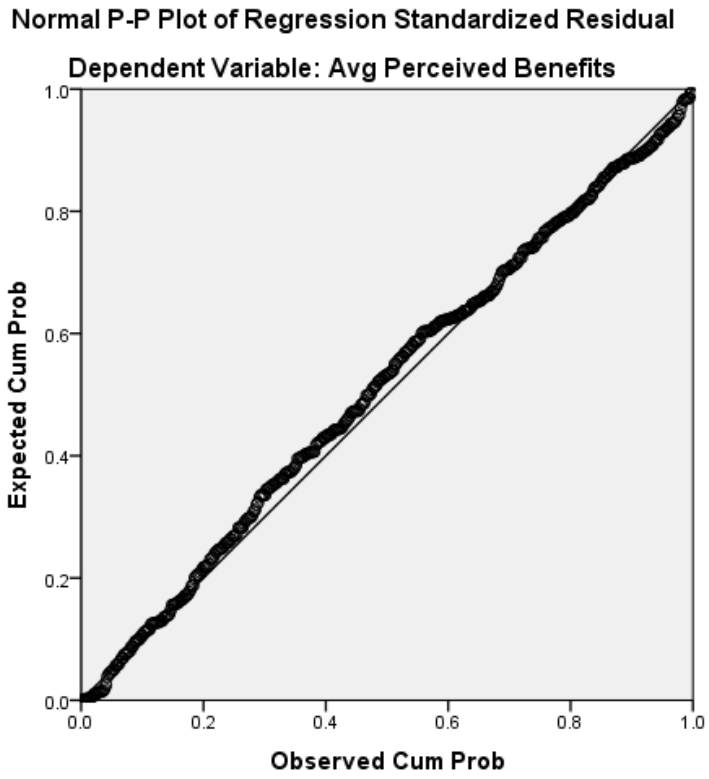


Fig-4.15: Normal P-P Plot of Residuals for Homoscadasticity

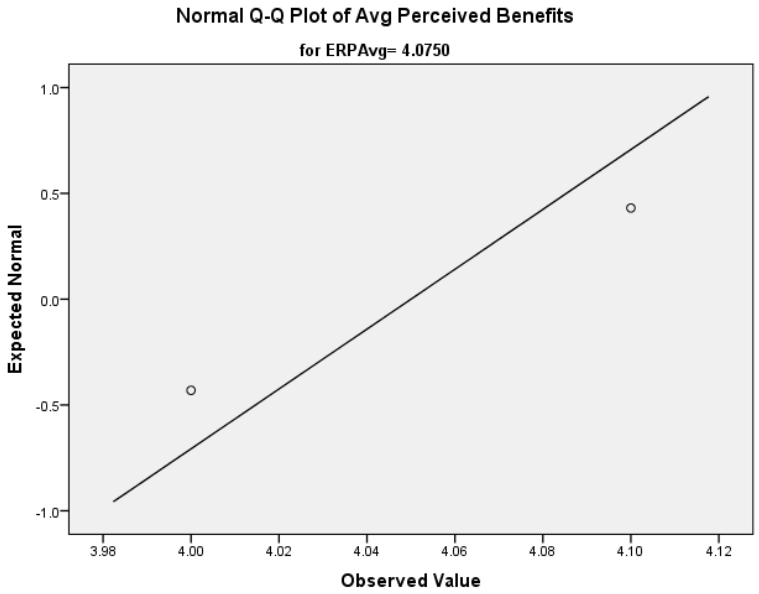


Fig-4.16: Normal Q-Q Plot of Adoption of ERP and Perceived Benefits for linearity assumption

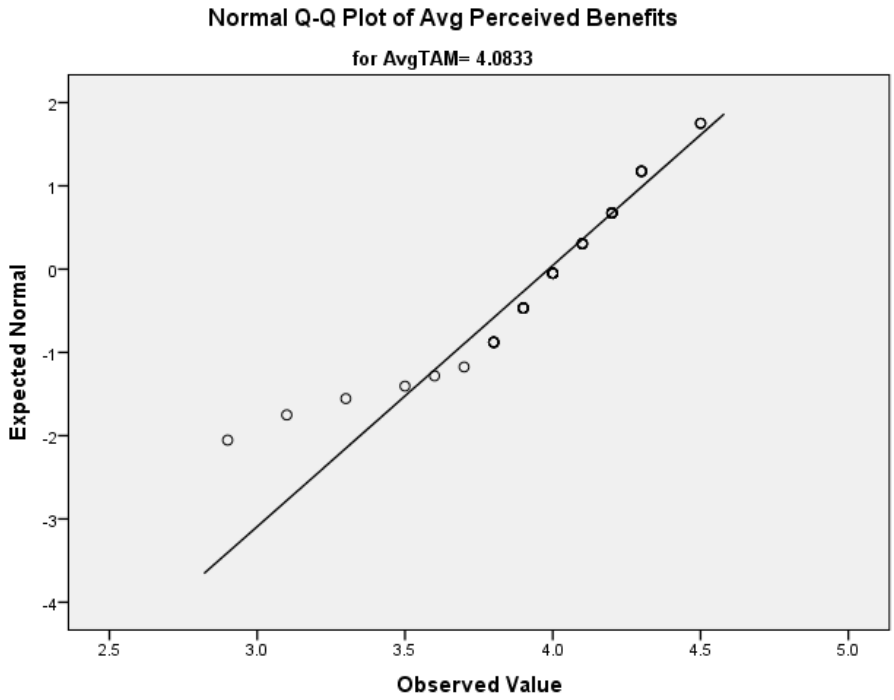


Fig-4.17: Normal Q-Q Plot of TAM and Perceived Benefits for linearity assumption

4.9 Interpretation of Mediation Analysis

Partial mediation is observed here in this model. As in the presence of the mediating variable (TAM) also, the independent variable (Adoption of ERP) and dependent variable (Perceived Benefits) are significant.

The R^2 value is 0.525 and the adjusted R^2 value is 0.523. This implies that the independent variable- adoption of ERP influences the dependent variable- Perceived Benefits to the extent of 52.5% in the presence of mediating variable (TAM).

4.10 The model of linear regression is considered ideal, if it satisfies certain assumptions.

- **Assumption of Scale:** The dependent, the independent variable and mediating variable should be in interval scale. According to the study, all these variables are in interval scale. Hence, this assumption is satisfied.

- **Assumption of Linearity:** The value of x and y should be such that when plotted in a graph, it should form a straight line. This can be seen in the Scatter Plots. According to this study, in fig no-4.17, the graph plot between adoption of ERP and Perceived Benefits forms a straight line. Also, if the Fig No-4.17 is observed, almost the x and y (i.e. TAM and Perceived Benefits) forms a straight line with very few outliers. With both these graphs, it is assumed that the assumption of linearity is satisfied.

- **Assumption of Normality:** The Shapiro Wilks value is 0.685 which is > 0.05. This clearly conforms that the independent variable- Adoption of ERP and Perceived Benefits are normally distributed. The Shapiro Wilks value is 0.787 which is > 0.05. This clearly conforms that the independent variable - TAM and Perceived Benefits are normally distributed.

- **Assumption of Multicollinearity:** Independent variables and mediating variables should not be highly correlated with each other. This assumption is tested using Variance Inflation Factor (VIF) values (should not be more than 10 or 5) and Tolerance (should not be < .2). In this study, VIF value is 1.8 for both adoption of ERP and TAM which is less than 5. And the Tolerance limit is .548 which is greater than .2. Hence, there is no multicollinearity amongst the independent variables and the mediating variables.

- **Assumption of Independence:** Residuals should be un-correlated. This assumption is tested by Durbin-Watson in model summary table of regression.

The value should lie between 0-4. value near to 2 indicates that residuals are uncorrelated. Value>2, negative correlation and value<2, positive correlation. In this study, the Durbin Watson value is 1.945 which is less than 2 and near to 2. Hence, it is proved that the residuals are uncorrelated.

- **Assumptions of Homoscedasticity:** This assumption states that the variance of error terms is similar across the values of the independent variables. A plot of standardized residuals versus predicted values can show whether points are equally distributed across all values of the independent variables. In the residual plot in this study, it is observed that the residuals almost lie on the regression line. Hence the assumption of homoscedasticity is satisfied.

4.11 Structural Equation Modeling

As a supplementary study, this work performed Structural Equation Modeling (SEM) to analyze the validity of the proposed research model. It is a powerful model building technique associated with exiting theories, but it is relatively new and still unpopular in most areas of research. The results using SEM are compared with those given in the previous section for regression analysis to see if there are any variations or additional findings with respect to the study model.

Structural Equation Modeling (SEM) is considered a second-generation data analysis technique that can be used to check the degree to which IS work meets established high-quality analytical criteria by evaluating the validity of statistical conclusions. It is a hybrid technique that includes aspects of confirmatory factor analysis, analysis of pathways and regression. Most methods of the first generation, such as linear regression, can evaluate at one time only one degree of relationship between independent and dependent variables. Nevertheless, by simultaneously modeling the relationships between multiple independent and dependent structures (Gefen et al., 2000; Gerbing and Anderson, 1988), SEM is able to address a series of interrelated research questions in a single, systematic and thorough study.

(Tabach nick and Fidell, 2001)Structural Equation Modeling(SEM)is a collection of statistical techniques that allow for the study of a set of relations between one or more independent variables, either continuous or discrete, and one or more dependent variables, either continuous or discrete.SEM 's primary aim is to describe the pattern of a sequence of interrelated relationships of dependency simultaneously between a number of latent or non-observable constructs, each determined by one or more observable variable SEM is focused on the concept of causal relationships where a shift in one variable(x1) is expected to result in a change in another variable. (Joreskog and Sorbom, 1996)SEM not only aims to analyze latent constructs, particularly the analysis of causal links between latent constructs, but is also effective for other types of analyzes, including estimating variance and covariance, conventional linear regression, test hypotheses and confirmatory factor analysis. (Anderson and Gerbing, 1988)SEM also has the ability to determine the uni-dimensionality, durability and validity of each construction.

In addition , it offers simultaneous overall testing of model fit and individual parameter estimation tests, thereby ensuring sufficient fit for the data as best model.

Arbuckle's (2005) structural equation modeling software AMOS20 was used to explore statistical relationships between the items of each factor and between the factors of independence (i.e. ERP adoption), mediation (i.e., TAM). Furthermore, the researcher may specify, estimate, evaluate and present the model in a causal path diagram to show hypothesized relationships between variable paths. The empirical model can be put to the test for goodness off against the hypothesized model. Any causal paths which do not match the original model may be modified or omitted.

- **Structural Equation Modeling analysis and results**

Modeling of the Structural Equation Modeling (SEM) is used to test the theoretical model hypotheses. The two-stage method suggested by Anderson and Gerbing (1988) was adopted for conducting the SEM study.

- **Measurement Model -Specifying the causal relationship- Stage One**

The study was carried out in the first stage (measurement model) by defining the causal relationships between the observed variables and the theoretical constructs underlying them. To this end, confirmatory factor analysis was performed using AMOS 20. Following this, the structural model (second stage) specified the pathways or causal relationships between the underlying exogenous and endogenous constructs.

- **Structural Model(Testing of the Hypotheses)- Stage Two**

Once all constructs in the measurement model (stage one) have been validated and achieved satisfactory fit(Anderson and Gerbing,1988), a structural model can then be tested and presented as a second and main stage of the analysis. The portion of the model specifying how the latent variables are interrelated (Arbuckle, 2005). The structural model is intended to specify which latent constructions directly or indirectly influence the values of other latent constructions in the model.

4.12 SEM Path diagram

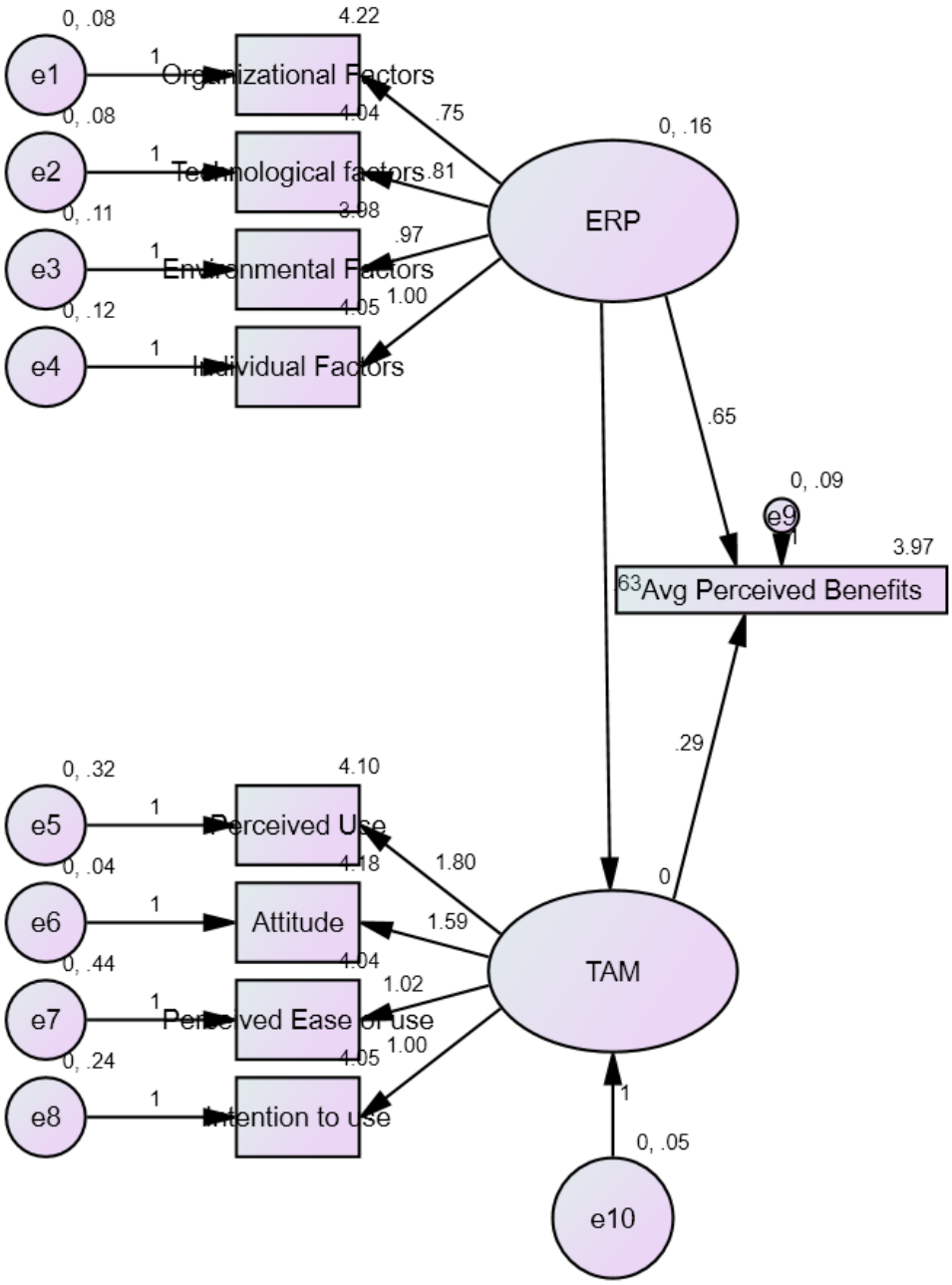


Figure-4.18: SEM Path diagram for the above mediation analysis

Notes for Model (Default model)

- **Computation of degrees of freedom (Default model)**

Number of distinct sample moments:	54
Number of distinct parameters to be estimated:	29
Degrees of freedom (54 - 29):	25

Table-4.35: Computation of degrees of freedom (Default model)

- **Result (Default model)**

Minimum was achieved

Chi-square = 127.949

Degrees of freedom = 25

Probability level = .000

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

			Estimate	S.E.	C.R.	P	Label
TAM	<---	ERP	.627	.064	9.746	***	par_7
ERP4	<---	ERP	1.000				
ERP3	<---	ERP	.974	.063	15.513	***	par_1
ERP2	<---	ERP	.811	.053	15.232	***	par_2
ERP1	<---	ERP	.754	.051	14.866	***	par_3
TAM4	<---	TAM	1.000				
TAM3	<---	TAM	1.025	.126	8.143	***	par_4
TAM2	<---	TAM	1.588	.129	12.344	***	par_5
TAM1	<---	TAM	1.799	.159	11.303	***	par_6
AvgPerceivedBenefits	<---	TAM	.288	.089	3.226	.001	par_8
AvgPerceivedBenefits	<---	ERP	.652	.079	8.213	***	par_9

Table-4.36: Regression Weights: (Group number 1 - Default model)

- **RMR, GFI**

Model	RMR	GFI	AGFI	PGFI
Default model	.009	.961	.916	.446
Saturated model	.000	1.000		
Independence model	.116	.388	.184	.291

Table-4.37: RMR, GFI

- **Baseline Comparisons**

Model	NFI Delta1	RFI rho1	IFI Delta2	TLI rho2	CFI
Default model	.931	.900	.943	.918	.943
Saturated model	1.000		1.000		1.000
Independence model	.000	.000	.000	.000	.000

Table-4.38: Baseline Comparison

- **RMSEA**

Model	RMSEA	LO 90	HI 90	PCLOSE
Default model	.098	.081	.115	.000
Independence model	.341	.328	.354	.000

Table-4.39: RMSEA

- **Results of goodness of fit test for CFA model are shown in Table 4.40.**

S.No.	Particulars	Criteria	Indicators
I	**Chi-square Test** Chi-square value Normed Chi-square	P>0.05 <3.0 or <5.0	P= 0.00 5.1
II	**Fit Indices** GFI AGFI NFI IFI	>0.90 >0.90 >0.90 >0.90	0.961 0.916 0.931 0.943
III	**Alternative indices** CFI RMSEA RMR	>0.95 <0.05 <0.05	0.966 0.098 0.009

Table4.40: Results of Goodness of Fit Test for Confirmatory Factor Analysis Source: Hairet al.

It can be inferred from the above table that the values of different goodness of fit indices are well within the desired limits. The normed chi-square is 5.1, GFI is 0.961, AGFI is 0.916, NFI is 0.931, IFI is 0.943, CFI is 0.943 RMSEA is 0.098 and RMR is 0.009.Furthermore, and more importantly, the factor loadings in respect of all the items included in the model exceed 0.5 and are highly significant at 5% level of significance. Such findings therefore indicate that the available data rightly fits into the conceptual model proposed.

Hence, the purpose of the structural model in this thesis is to test the underlying hypotheses in order to answer the research questions outlined in Chapter one. The hypotheses were represented in 19 specified parameters to determine the relationships between the constructs under consideration.

(Tabachnick and Fidell, 2001; Kline, 2005)To test the goodness-of-fit structural model indices are analyzed to determine whether the proposed structural model matches the data. If it did not fit, the requirement was to respective the model until one was achieved

which displayed both acceptable statistical fit and indicated a theoretically meaningful representation of the observed data

Because the assumptions underlying structural equation modeling were met, the parameter estimates for the coefficient were examined along with the fit indices for the overall model. Parameter estimates are important for SEM research, as they are used to produce the model's estimated population covariance matrix (Tabachnick and Fidell, 2001). The values of coefficients are obtained by dividing the variance estimate by its Standard Error (S.E). That is, when the t-value called the Critical Ratio (C.R.) exceeds 1.96 for a regression weight or standardized estimates, the parameter is statistically significant at the levels of.05.

In the path diagram shown in Fig-4.12, the values for the paths connecting constructs with a single-headed arrow represent standardized regression beta weights. The values shown on the edge of the frames, as in the calculation model, are variance estimates in which the sum of variance in the measured variables is clarified by latent variables or causes, and values next to the double headed arrows indicate correlation.

In the path diagram presented in the fig-4.12 exogenous constructs. Adoption of ERP constructs (Organizational Factors (ERP1), Technological factors (ERP2), Environmental factors (ERP3) and Individual Factors (ERP4)) have single headed arrow pointing toward them. A necessary assumption of SEM is that the exogenous constructs are assumed to be correlated. (Kline, 2005)This is because correlations between each pair of exogenous constructs must be estimated, even though no correlations are hypothesized.

Mediating Constructs (TAM1, TAM2, TAM3, and TAM4) have single-headed arrow leading to them. Straight arrows (or single-headed arrow) indicate causal relationships or paths, whilst the absence of arrows linking constructs implies that no causal relationship has been hypothesized. The error terms (e) represent and an error due to measurement of the constructs they indicate. The parameter (z) represents the residual errors in the structural model resulting from random error and/or systematic influences, which have not been explicitly modeled.

4.13 T-TEST AND ANOVA

Independent sample T-test is carried out between the type of organization from where the response has been taken and Perceived Benefits from ERP.

Independent sample T-test is carried out in this case since there are only two samples. The dependent variable is in interval scale whereas the independent variables are in categorical scale.

One-way ANOVA test is carried out between the position of the respondents in the organization and perceived benefits from ERP.

Here One-way ANOVA is carried out since there are more than two samples. The dependent variable is in interval scale whereas the independent variables are in categorical scale.

T-Test for samples OEMs (Original Equipment Manufacturers) and Auto Ancillary companies on Perceived Benefits,

Table -4.41: Group Statistics- T-Test

Group Statistics

	1- OEMs, 2- Auto Ancilliary	N	Mean	Std. Deviation	Std. Error Mean
Avg Perceived Benefits	1	54	4.085	.5803	.0790
	2	380	3.954	.4287	.0220

Table -4.42: Independent Sample T-Test significance value

Independent Samples Test

		Levene's Test for Equality of Variances		t-test for Equality of Means						
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference	
									Lower	Upper
Avg Perceived Benefits	Equal variances assumed	2.613	.107	2.009	432	.045	.1315	.0654	.0029	.2601
	Equal variances not assumed			1.604	61.487	.114	.1315	.0820	-.0324	.2954

Table -4.43: Summary Table

Independent sample T -Test between type of organization and Perceived Benefits	T-test significance value	Value for homogeneity of variance
	.045	.107

- **Interpretation of Independent sample T-Test**

In the Independent sample t test, the significance value is less than 0.05 which implies the rejection of the null hypothesis i.e. there is a significance difference between the type of organization and perceived benefits. This signifies the opinion of people working in OEMs and Auto Ancillaries differ. They perceive the benefits of ERP differently

The value of homogeneity of variance is greater than 0.05 which implies that equal variance is assumed between the groups. This means that both the sample group's responses are homogenous.

One-way ANOVA for samples Positions like senior level, middle level, operational level and others on Perceived Benefits

Table -4.44: One-way ANOVA- significance value

ANOVA

Avg Perceived Benefits

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	.092	2	.046	.226	.798
Within Groups	88.218	431	.205		
Total	88.311	433			

Table -4.45: One-way ANOVA Post-HOC Test

Multiple Comparisons

Dependent Variable: Avg Perceived Benefits

	(I) Position	(J) Position	Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval	
						Lower Bound	Upper Bound
Tukey HSD	1	2	.0308	.0526	.829	-.093	.155
		3	.0340	.0808	.907	-.156	.224
	2	1	-.0308	.0526	.829	-.155	.093
		3	.0033	.0891	.999	-.206	.213
	3	1	-.0340	.0808	.907	-.224	.156
		2	-.0033	.0891	.999	-.213	.206
LSD	1	2	.0308	.0526	.559	-.073	.134
		3	.0340	.0808	.674	-.125	.193
	2	1	-.0308	.0526	.559	-.134	.073
		3	.0033	.0891	.971	-.172	.178
	3	1	-.0340	.0808	.674	-.193	.125
		2	-.0033	.0891	.971	-.178	.172

Table -4.46: Summary Table-one way ANOVA

One-Way ANOVA Test between Position and Perceived Benefits	ANOVA test significance value	Value for homogeneity of variance
	.798	.895

Interpretation

In the One-way ANOVA, the significance value is greater than 0.05 which implies that the null hypothesis is accepted i.e. there is no significance difference between the position of a respondent and the perceived benefits derived from ERP. This is a good sign that irrespective of the position one is in the organization, they all feel the need for implementation of ERP. This signifies the importance of ERP implementation in

organizations. Irrespective of the positions, the requirement of automation of systems and process is of highest priority.

The value of homogeneity of variance is > 0.05 which implies that equal variance is assumed between the groups.

4.15 Summary of Hypotheses

Table 4.47 shows the results of testing the hypotheses of the research.

Table-4.47: Summary of Results-Hypothesis

	Hypotheses	**Results**
H1	There is significant impact of adoption of ERP on Perceived Benefits.	Accepted
H2	There is significant impact of TAM on perceived benefits.	Accepted
H3	There is significant impact of adoption of ERP on Perceived Benefits in the presence of mediating variable TAM.	Accepted
H4	There is significant relationship of organization type on perceived benefits	Accepted
H5	There is significant relationship of designation /position of respondents in the organization with the perceived benefits of ERP.	Rejected

4.16 Chapter Conclusion

This chapter gives detail description of data analysis and its interpretation .Different statistical test used in the study is explained with its interpretation. This chapters starts with demographic variables interpretation. Thereafter it shows analysis and interpretation related to ERP adoption variables and TAM variables used in the research study. This is followed by interpretation of perceived benefits with ERP and TAM .Which shows that all assumed hypothesis are accepted after statistical test. This signifies relationship between ERP and TAM with perceived benefits.

Chapter 5
Findings, Conclusions, Limitations and Future Scope

This chapter starts with introduction as mentioned in clause 5.1 followed by findings in clause 5.2 .With this findings from demographic and statistical point of views are discussed in clauses 5.3 and 5.4 . Clause 5.5 and 5.6 discuss about detail findings on research question and conclusion. In clause 5.7 and 5.8 theoretical and practical contribution is given. In clause 5.9 limitations of the research study and clause 5.10 refers to scopes for future. 5.11 gives generalizability of study .Lastly in clause 5.12 chapter conclusion is given.

5.1 Introduction

ERP systems' most important contributions are that they significantly reduce the time required to complete business processes and facilitate the sharing of information (Olhager and Selldin, 2003; Lee et al., 2010). Organizations give their workers a better working atmosphere, because they have more productive processes. ERP systems can be effectively introduced from a technological perspective in the routine phase of the ERP lifecycle but full performance depends on the willingness of ERP users to use the delivered program (Kwahk and Lee, 2008). Most studies which use TAM on ERP systems focus on phases of selection and implementation. Post-implementation focused research are rare (Sun et al., 2009; Shih and Huang, 2009; Lee et al., 2010). Most of these studies consider a limited number of factors that affect the acceptance and utilization of ERP systems. The purpose of this study was to extend the number of factors observed that influence user acceptance. Since a great number of external influences from literature were found by researchers. This motivates researcher to move on.

TAM has been used since it is the most commonly used and empirically validated model for describing practical use of IS (Davis, 1989; Davis et al., 1989; Amoako-Gyampah and Salam, 2004; Lee et al., 2010). Researcher concentrated on external influences based on previous work on this topic and their impact on the actual use of ERP systems. The current work strengthens understanding of how multiple external factors in the routine

stage can affect perceptions about ERP systems by integrating four classes of external factors: organization, technology, environment and individual. One significant contribution of this research is to recognize external factors for enhancing the efficiency and effectiveness of the use of ERP and its potential benefits. The implications for researchers and practitioners are that external TAM factors appear to improve usage of ERP through influencing factors. The managerial implications of this research are that the external variables mentioned in this research should be taken into account if the organization wishes to maximize business performance and enhance customer satisfaction with ERP and gain its benefits.

5.2 Findings

- This study provides a comprehensive picture about ERP adoption by Automobile sector in Pune region. This comprehensive picture certainly gives a better understanding for the automobiles owner/managers and it is useful for them to make a decision related to the use of ERP in their business. For example, by knowing the benefits of ERP and its impact on the automobile industry, the owners will be encouraged to further improve the level of their adoption.
- The comprehensive picture about ERP adoption by these Pune's automobile organizations is also useful for the Maharashtra government, MIDC, SIAM, ACMA and other organizations also in making policies related to the development of automobile sector. For example, this study provides insight into the extent of ERP adoption by Pune's automobile organizations. This information is useful for Maharashtra government, SIAM and ACMA in mapping the level of ERP usage, so that it will be easier for them to make effective programmes and initiatives tailored to automobile sector needs.
- In addition to this, academics and practitioners also can understand the factors that facilitate and provide benefits to the automobile companies in adopting ERP. This study provides empirical support about the important role of each individual factor also in adopting of ERP by the automobile organizations in Pune region.

- Due to a lack of studies conducted into automobile sector in developing countries, especially in India, this study brings a new, possibly fresher and more comprehensive perspective on the adoption of ERP by automobile sector.

5.3 Finding on Demographic Variables

Out of 434 ERP users below mentioned findings are depend on demographic variables,

- Types of organization-12% are Original Equipment Manufacturing (OEM) organization and 87% are Auto ancillary or auto component organizations. As there are more component manufacturing companies than OEM in Pune.
- Gender-83% male and 16% are female. It can be seen from the table above that the male owner/manager dominates in this sample profile.
- Age-25.6% belongs to 21-30 years, 34.8 % belong to 31-40 years, 27.6% belong to 41-50 years, and 12% belong to 50 and above. It can be seen from the table above that the respondents between the ages 31 to 40 dominate, which indicates that the majority of owners/managers/supervisors, ERP users in Pune are aged between 31-40 years old.
- Position-69.4% belongs to middle level position, 22.6 % belong to top level position and 8.1 % belong to operational level ERP users. It can be seen from the table above that the most of middle level ERP respondents participated in study than top level ERP users. And very few operational level respondents participated in study.
- Education-38.7% belong to Bachelor degree, 51.8 % belong to Master's Degree, 1.4 % Doctorate and 8.1 % belong to other is the educational background of ERP users. It can be seen from the table above that the most of bachelor degree and master's Degree ERP respondents participated in study.
- From how many years company is using ERP-2.3% belong to Less than one year, 26.7 % belong to 1-5 years, 43.8 % 5-10 years and 27.2 % belong to More than 10 years. Most of the organizations are using ERP from 5-10 years. And it can be seen from the table above that very few organizations are using ERP less than one year.

- Was user involved in ERP implementation-28.8% people were part of ERP implementation process and majority of ERP users that is 71.2 % users were not involved in ERP implementation process.
- From how many years user is using ERP-12 % users are using ERP less than 1 Year, 23.3% users are using ERP system from 1-5 years, 29.3% users are using ERP system from 5-10 years and 35.5% users are using ERP system from more than 10 years.
- Which ERP software company is using-42.4 % users are using SAP-ERP package .It means most of the companies are using SAP ERP package than others.
- Which module is implemented-50.9 % organization are working with all modules of ERP. Whereas still 49.1 % organizations are not using all ERP packages.
- Annual turnover-8.5 % users are working with organization having turnover Less than 10 Cr , 51.2 % users are working with organization having turnover 10-500 Cr, 24.9 % users are working with organization having turnover 500-1000 Cr and 15.4 % users are working with organization having turnover more than 1000 Cr.

The above data gives a clear explanation of descriptive statistics of Gender, education, age, experience, type of manufacturing sector, position, from how many years organization is using ERP, has been employee part of implementation process, from how many years employee is using ERP system, how many months it took to implement ERP system in an organization and gross turnover of company. Most of the companies involved in this study were from auto component manufacturing industry than OEM. The gender variable is dominated by male segmentation as the target companies are manufacturing which is generally dominated by males particularly in India. All the respondents belonging to all age groups have filled in the questionnaire. Hence opinion of all age group people is taken care of.

The education qualification of the respondents is mainly graduates and post graduates. The experience segment reveals most of the respondents have experience of more than at least one year. So, there is less chance of getting responses from freshers. The responses will be more genuine as the respondents have spent a good no of years in the organization to express their views on it. The position data says that the responses were

mostly collected from middle level management, i.e. the most sensible and logical level who has got the knowledge of the top-level operations and experience and empathy of operational level. Most of the organizations are using ERP from 5-10 years and very few organizations are using ERP less than one year. So all companies are having habit of using ERP system for at least more than one year. Again it's observed that it is not required to be part of ERP implementation process as there are very less people who were part of ERP implementation process. It means to use ERP in effective manner it is not at all required to be part of ERP implementation process. It is seen that majority of companies are using SAP as ERP package in their organization than other ERP packages. So researcher can say that there is great demand of SAP software package. Last and major findings of this study is it is observed that only 50 % of organizations are using all modules of ERP where as remaining 50 % are using either only one modules or combination of two three modules. It means full utilization of ERP system is not done by that organizations, which lead to unsuccessful ERP implementation.

5.4 Findings on Statistical Calculations

5.4.1 Reliability and validity findings

Since all the variables have a reliability score more than 0.7, it is considered that the variables are reliable. For all factors correlated values are given here. For Organizational Factor value is 0.671, Technological factor value is 0.683, Environmental factors value is 0.681 and Individual factor value is 0.0638. All these correlated values are greater than 0.073(r product moment value). Hence the data of ERP is assumed to be valid.

For Perceived Usefulness, Perceived Ease of Use, Intention to Use ERP and Attitude towards Using ERP, the calculated correlated values are 0.534, 0.751, 0.400 and 0.467 respectively. All these values are greater than 0.073(r product moment value). Hence the data of TAM is assumed to be valid.

For all considered ten perceived benefits variables the calculated correlated values are greater than 0.073(r product moment value). Hence the data of Perceived Benefits is assumed to be valid.

5.4.2 Findings for Adoption of ERP

From all 434 ERP users working in either OEM or auto component manufacturing organizations are consistent in their view that adoption of ERP requires these four components Organizational factors, Technological factors, Environmental factors and Individual Factors.

Even as the overall means value of all these four components is 4.07 which signify that the all ERP users totally agree to the fact that adoption of ERP is essential considering all the factors in account. All these factors play important role in adoption of ERP in automobile sector.

5.4.3 Findings for TAM

All ERP users are consistent in their opinion that use of variables included in TAM, which is already proven theory by Davis in 1986 are important for and gives strength for adoption of ERP in an automobile sector.

All TAM variables including Perceived Use, Attitude, Perceived Ease of Use and Intention to use signifies that the respondents totally agree to the fact that TAM as expressed in the theory is an essential factor that has to be considered in the study. The presence of such a variable improves the strength of the study.

5.4.4 Findings for Perceived Benefits

All ERP users from automobile sector realize that the benefits derived from adoption of ERP system in the organization is beneficial considering all the factors influencing the adoption of ERP and TAM is essential. They perceive that all the benefits that an organization is getting because of the successful implementation of ERP.

The following are the perceived benefits:

- ERP provides new business opportunities for an organization.
- ERP allow accomplishing specific task more quickly.
- ERP usage enhances the productivity of an organization.
- ERP allows us to purchase product and services for the business.
- ERP system provides integrated, timely, accurate and reliable information for decision making.
- ERP improves CRM & Supply chain.
- ERP increase organizations profitability.
- ERP system helps in controlling and monitoring several projects simultaneously in an organization.
- ERP system makes data analysis easier.
- ERP program helps with the efficient control of inventories.

5.4.5 Findings of Correlation analysis between variables - TAM and adoption of ERP

It is observed that there is medium correlation between the organizational factors, technological, environmental factor and individual factors. And even there is good relationship observed in all ERP adoption variables and TAM variables.

5.4.6 Findings of ANOVA table

From the Analysis it is found that there is significant relationship between ERP influencing factors and perceived benefits. But when, TAM has been included as another independent variable, it is observed that it gives strong relationship to perceived benefits. Findings suggest that influencing factors and TAM together achieve ERP success or its benefits.

In the One-way ANOVA it is found that there is no significance difference between the position of a respondent and the perceived benefits derived from ERP. This is a good sign that irrespective of the level of position one is in the organization, they all feel the need

for implementation of ERP. This signifies the importance of ERP implementation in organizations. Irrespective of the positions, the requirement of automation of systems and process is of highest priority.

5.4.7 Finding of T-Test

According to the T-test findings, there is a significance difference between the type of organization and perceived benefits. This signifies the opinion of people working in OEMs and Auto Ancillaries differ. They perceive the benefits of ERP differently.

5.5 Findings on Research Questions

In the first chapter of the study it has been already discussed about research questions.

Findings of the study are as follows:

- Considering the Automobile sector of Pune Maharashtra, what factors influence the adoption of ERP system?
    - There are four major factors which influence ERP adoption in automobile sector they are organizational factor, technological factor, environmental factor and individual factor.
- Which Organizational factor influence the adoption of ERP in Automobile Sector?
    - Top Management Support, Change Management, Business Process Reengineering, Organizational Structure and Culture, Organization Size, Training and Education, Effective Communication, Clear Goals and Objectives, User support & Involvement and Technology Readiness are the important organizational sub factors which mutually influence ERP adoption in automobile sector.
- Which Technological factors influence the adoption of ERP in Automobile Sector?
    - Cost of Operation, Complexity, Compatibility, Technological Infrastructure, Package Selection, Data and Information Quality, System

functionality and Performance, Vendor Support, System testing & quality and Maintenance Cost are the important technological sub factors which mutually influence ERP adoption in automobile sector.

- Which Individual/Personal factors influence the adoption of ERP in Automobile Sector?
    - Computer Anxiety, Management Support & Attitude, Computer Self Efficiency, Technology Innovativeness, Attitude towards Working Environment and Organization and Resistance to Change are the important individual sub factors which mutually influence ERP adoption in automobile sector.
- Which Environmental factors influence the adoption of ERP in Automobile Sector?
    - Competitive Pressure, Supplier Relationship, Technological change, Business Strategies and Compliance to stakeholders are the important environmental sub factors which mutually influence ERP adoption in automobile sector.
- How Technology Adoption Model plays a significant role in adoption of ERP?
    - TAM with four components (Perceived Use, Attitude, Perceived Ease of Use and Intention to use) signifies that the respondents generally agree to the fact that TAM as expressed in the theory is an essential factor that has to be considered in the study. The presence of such a variable improves the strength of the study.
- How end-users acceptance of the Enterprise Resource Planning system in Automobile sector can be improved?
    - Organization should focus on above organizational, technological, environmental and individual factor to implement ERP successfully. So that there will be full utilization of ERP system which will achieve perceived benefit discussed below. This is nothing but successful adoption of ERP in automobile sector.

- What are the perceived benefits from user's point of view and how ultimately it will lead to success of ERP adoption?
    - ERP provides an organization with new business opportunities. ERP allows the accomplishment of specific tasks faster. ERP usage improves an organization's productivity. ERP enables us to buy goods and services for the company. ERP program offers critical, timely, accurate and reliable decision-making information. ERP is boosting profitability for organizations. ERP system helps in the simultaneous monitoring and control of several projects in an organization. ERP system enables data analysis. ERP system helps in effective inventory management.
- Is there any difference of opinion in perceived benefits in Original equipment manufacturing and auto ancillaries?
    - There is a significance difference between the type of organization and perceived benefits. This signifies the opinion of people working in OEMs and Auto Ancillaries differ. They perceive the benefits of ERP differently

The study analyzed factors influencing adoption of ERP system in Automobile companies from Pune region which contributed for growth and development of company. The study gives important perceived performance of ERP implementation across Automobile companies in Pune region. The study not only proves relation of adoption of ERP on Perceived Benefits but also shows impact of TAM on perceived benefits. With this there is impact of adoption of ERP on Perceived Benefits in the presence of mediating variable TAM. And the study proves the importance of TAM in adoption of ERP influencing factors on perceived benefits.

5.6 Conclusions

ERP systems, which can be called as the backbone of the organizations which requires to fully utilizing by all ERP users. This study is descriptive study aiming to explain which factors influence ERP adoption in Pune's automobile sector. There are a lot of benefits recognized in ERP systems and view of these factors is very coherent between previous literature and the study. Organizations need to consider on different factors while

adopting ERP. Adoption of this IT innovation requires careful planning so that full utilization of the ERP system is done for better achievement of ERP success.

This study highlighted a number of important factors that influence end-users' acceptance of ERP adoption or implementation and its benefits. Model in this research is based on technology acceptance (TAM) model , such as perceived ease of use, perceived usefulness, attitude toward system use and intension to use ERP, this study includes four more group variables constructs as the antecedents of ERP adoption that related Organizational factor, Individual factors, Environmental factor & Technological factor. These four factors further more divided in different factors.

This study has presented the survey on ERP adoption in OEM and automobile component manufacturing industry Pune. The study has illustrated the survey of ERP users that use ERP. And ERP Benefit survey to the automobile sector in Pune region has been portrayed through this study.

Many studies which use TAM on ERP systems concentrate on phases of selection and implementation. Post-implementation focused research are rare (Sun et al., 2009; Lee et al . , 2010;Shih and Huang, 2009). Most of these studies consider a limited number of factors which influence the acceptance and use of ERP systems. The aim of this research has been to increase the number of observed factors that influence user acceptance and usage in the lifecycle's routine or mature stage. TAM has been used since it is the most commonly used and empirically validated model for describing actual use of IS (Amoako-Gyampah and Salam, 2004; Lee et al., 2010; Davis, 1989). Author focused on external factors and their influence on the actual use of ERP systems based on published research about this issue. The present research enhances our understanding of how multiple external factors can influence adoption of ERP systems in the routine stage by incorporating four groups of external factors: like organizational, technological, individual and environmental factors. One important contribution of this research is the identification of the external factors for the improvement of the efficiency and effectiveness of ERP. The implications for researchers and practitioners are that external factors with the help of mediating factor of TAM to improve ERP usage and ultimately success of ERP in achieving its benefits. 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.
It is essential that organizational, technical, individual and environmental factors of ERP adoption are considered in the organization because the success of IT innovation adoption is dependent on many different variables associated with these factors. Even though the ERP focus is on IT innovation adoption, it is essential to understand that the factors driving adoption are based on various issues in the organization, and not just to technological topics, to be able to reach the benefits of ERP adoption. This has been also proven in the study where the users of ERP systems were an essential part of the adoption process. With technology being so readily available to organizations, understanding how it affects an organization's employees is important. Increasing productivity can be instrumental in evaluating the various factors that influence the workers. There are few factors which influence adoption of technology like ERP that are Organizational factor, Technological factor, Individual factor and Environmental factor. This together with TAM factors influence adoption of ERP and hit the target.

ERP users from automobile sector agreed on these above factors. So the research concludes following important variables are most important to look for successful implementation of ERP. And there is need of following things care should be always taken in an automobile organization.

- There is always need of top management support in implementing any decision in an organization.
- ERP adoption always involves process of change management.
- Most of the times ERP adoption involves re-engineering of the business process.
- Organizational Structure and Culture has always positive impact on ERP adoption.
- Organization size is the major impact factor on ERP adoption.
- For successful ERP adoption it is important and necessary to give training and education to users of the technology.
- For not only successful ERP adoption but doing any work in smoother way it is important to have effective communication.

- Without proper organizational goals and objectives ERP adoption is impossible.
- If the users of any technology are not involved in using that system it is highly impossible to adopt ERP in an organization.
- If any organization want to implement the technology then technology readiness in all aspects is important for successful ERP adoption in an organization.
- The important factor of ERP adoption is operational cost which is important to decide the success of its adoption.
- Implemented ERP package should not be too much complex because it will affect using by user and which can cause failure of using ERP.
- Whatever is the ERP package used an organization should insure smooth functionality of an organization.
- Technological infrastructure is important to ERP program adoption.
- Proper selection of packages is the key to successful implementation of ERP.
- For effective adoption, high quality organizational data and information is essential.
- Without ERP vendor's support is highly impossible to adopt ERP.
- ERP program is capable of testing Business Operation and maintaining consistency.
- ERP cost of maintenance is critical for deciding on the progress of its adoption.
- The implementation of ERP makes it possible to try to overcome competition on the market.
- Always ERP program should be able to embrace technical change for its successful adoption.
- ERP program allows company owners to determine effective management plans for the enterprise.
- ERP operating system helps users of that system to minimize computer anxiety.
- Support from management and a positive attitude is critical for successful adoption of ERP.
- Efficiency of using computer is not that much important for using ERP system. Trained ERP user can easily use system in better way.

- ERP program promotes creative process control technologies for all applications
- ERP system makes work easier for all organizations.
- ERP system overcomes resistance to alterations in relation to legacy applications.

5.7 Theoretical contribution

The research in ERP implementation spectrum has been about adoption influencing factors and its benefits. Nevertheless, an attempt has been made in this research to merge the two research sources in creative way. This study contributes to ERP implementation and adoption theory, specifically in relation to automobile sector. The model for ERP adoption in automobile sector is the core theoretical contribution. The model has been designed utilizing existing literature to identify influencing factors for ERP adoption. The model presented in this study encapsulates the adoption factors across technology, organizational, people and environmental domains. It has been observed from the study that attention may be needed to support automobile sector by providing context details that could be useful for their ERP adoption perspective.

5.8 Contributions to practice

It has been noted from the study that automobile sector owners and management lack of knowledge and resources required for the ERP adoption, so this model presents an opportunity for them to benefit from following a structured approach to ERP adoption or implementation. Automobile sector manager/decision maker will be benefited by:
Until starting an ERP project, have a clear understanding of the necessary factors and information. Furthermore, it will provide an understanding of the activities while planning, executing and understanding of the factors associated to the technical, organizational, individual and environmental domains of the ERP implementation. This research will benefit not only midsize but small business managers and big organizations owners to use the model findings as a checklist. The research findings will help all type of automobile companies to mitigate the risks associated to ERP implementation failures and change resistance by applying relevant tools and techniques for a successful project success. Another interesting subject would be to study companies who have already

adopted and eventually implemented ERP systems and find out what missing factors were the meaningful factors care should be taken to achieve its success. This will focus on what are the organizational technological, individual and environmental implications of ERP adoption from user's point of view.

5.9 Limitations of the study

Even though this study provides a comprehensive understanding about the ERP adoption by automobile sector in Pune, this study has a few limitations also.

- This research is a cross-sectional analysis, and is therefore restricted to a single stage. As a strategic decision, the decision-making processes related to ERP adoption by automobile sector might develop over time but because of the inherent time constraint of the cross sectional study, these longitudinal perspective were not investigated. Future studies might then consider the extent to which cross sectional data needs to be supplemented by longitudinal data, which in itself would need some further consideration about the time period over which decisions about ERP adoption are made. However, the majority automobile companies in the study had only adopted ERP (less than five years). To be able to capture the longitudinal perspective and investigate the causality of the influencing factors and the automobile sectors decisions, a future study might need to consider the appropriateness of a longitudinal study.
- One of data collection methods used in this study has been an on-line questionnaire. This method has several drawbacks, one of which is associated with a risk that the questionnaire is not completed by the right person as desired by the researcher. This has been minimized by sending the questionnaires directly to the automobile sector ERP users via their personal e-mail or by hand to hand. This has been done in this study. Even though there is the possibility it is not completed by the right person, however the researcher has to acknowledge the completed questionnaire in good faith.
- In this research, researcher studied organizations from Pune region only. Therefore, further research should investigate more organization from

Maharashtra or India in order to obtain a clearer and better picture of ERP adoption and the factors influencing ERP adoption.

- The present study has been carried out with the regular job of teaching and other assignments related to job. So, there has been time constraint for researcher to carry out research.
- There has been non-availability of sufficient literature specific to ERP implementation in automobile sectors. If some published research study would have been available, it may perhaps have helped in making the study still better.
- Because of time limitation, twenty nine factors have been identified in four categories. Future research could also examine other factors to ERP adoption.

5.10 Scope for Future Research

- Based on the interview result, it has been found that some of the OEM and auto components manufacturing organizations in Pune had adopted ERP but they had stopped using it few years ago. And many organizations even not implemented important ERP modules in some departments also. Further study could focus on this issue of whether lapsed adopters would, for example ever become re-adopters.
- A cross sectional study is being adopted in this research further longitudinal study can dome for details understanding of ERP implementation at each stage of ERP life cycle.
- To identify the clusters based on ERP usage.
- To carry out the correspondence analysis between type of industries and external factors.
- To study the influence of some other factors which are not used in this study on ERP implementation.
- Examine the role of external factors in multiple stages of the ERP lifecycle.
- To carry the same research in other parts of country.
- To carry the same research in other Sectors.

5.11 Generalizability

The purpose of this study has been to analyze influencing ERP adoption factors, with an objective to develop a staged adoption model that could be useful for automobile sector managers or owners. These influencing factors of ERP are standardized and does not concentrate explicitly on a particular market, size or form of automobile industry. Thus, the study could be useful for any type of automobile organization or auto component manufacturing organization planning to implement ERP. Furthermore, this study could be applicable for researchers, ERP professionals and ERP project managers to assist them whilst conducting research into ERP adoption in not only automobile sector but in any other sector also.

5.12 Chapter Conclusion

This study provides a comprehensive understanding about the ERP adoption by automobile sector in Pune. This study is not only focused on the factors that influence automobile sector in Pune but it also focus which are the post adoption benefits.

This study contributes to theory and practice, and it also provides both implications and recommendations for several sectors also in order to enhance the use of ERP in business, particularly in all automobile sector including OEM and components manufacturing.

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Questionnaire

Factors Influencing Adoption of Enterprise Resource Planning (ERP) System in Automobile Sector –Pune Region

PART-I-General Information

Your Name- _____

Organization/Company Name- _____

Your e-mail id- _____

(Please tick for below questions answer)

Organization Type-

- Original Equipment Manufacturing
- Auto Ancillary

Gender

- Male
- Female

Age

- 21-30
- 31-40
- 41-50
- 50 above

Ended level of education

- Bachelor degree
- Master's Degree
- Doctorate
- Other

Your position in an Organization

- Middle Level
- Top Level
- Operational
- Other

Number of employees in your organization

- Less than 100
- 101-500
- 501-1000
- More than 1000

How many months it took to implement ERP in your organization

- Less than 9 months
- 9-18 months
- 18-24 months
- More than 24 months

Since how long current organization is using an ERP system?

- Less than 1 Year
- 1-5 years
- 5-10 years
- More than 10 years

Were you the part of an ERP implementation process?

- Yes
- No

Since how long have you been using the ERP system?

- Less than 1 year
- 1-5 years
- 5-10 years
- More than 10 years

Which ERP system are you currently using?

- SAP
- ORACLE
- Infor
- Netsuite
- Microsoft
- Epicor

- Focus
- Sage
- RAMCO
- BAAN
- JD EDWARD
- Custom Built ERP
- Other Functional Modules is/are

Which ERP functions / modules are currently implemented in your organization?

- All ERP supported module
- Financial
- Production
- Sales and Distribution
- Human Resource Management
- Material Management
- Other

What is your organizational annual turnover (crores)

- Less than 10 Cr
- 10-500 Cr
- 500-1000 Cr
- More than 1000 Cr

PART-II - ERP Project related Factors

Below mentioned are 48 identified factors responsible for successful ERP adoption. Please rate the factors on 5 point likertscale. Where rating 1 means that you strongly disagree and rating 5 means that you strongly agree with the statement. Your sincere response can help in evaluating these factors empirically.

1 -Strongly Disagree
2 -Disagree
3 -Neutral
4 -Agree
5 -Strongly Agree

All are compulsory questions.

Sr.No	Question	1 Strongly Disagree	2 Disagree	3 Neutral	4 Agree	5 Strongly Agree
1	ERP adoption is not possible without Top Management Support	①	②	③	④	⑤
2	ERP adoption involves process of Change Management	①	②	③	④	⑤
3	ERP adoption involves re-engineering of the business process	①	②	③	④	⑤
4	Organizational Structure and Culture has positive impact on ERP adoption	①	②	③	④	⑤

5	The Size of organization has major impact on ERP adoption	①	②	③	④	⑤
6	For successful ERP adoption users Training and Education is important	①	②	③	④	⑤
7	For successful ERP adoption Effective Communication is important	①	②	③	④	⑤
8	For successful ERP adoption Organizational Goals and Objectives must be clear	①	②	③	④	⑤
9	For successful ERP adoption Users support and Involvement is essential	①	②	③	④	⑤
10	For successful ERP adoption organization should have Technology Readiness	①	②	③	④	⑤
11	ERP operational cost is important to decide the success of its adoption	①	②	③	④	⑤
12	Complexity of ERP package is major factor for its successful adoption	①	②	③	④	⑤
13	ERP insure smooth functionality of an organization	①	②	③	④	⑤

PTO.....

14	Technological infrastructure is essential for adoption of ERP system	①	②	③	④	⑤
15	Proper package selection is important for successful ERP adoption	①	②	③	④	⑤
16	High quality of organizational data and information is important for successful adoption	①	②	③	④	⑤
17	ERP vendor's support is important for its successful adoption	①	②	③	④	⑤
18	Do you agree that an ERP system is capable of testing and ensure quality of Business Process	①	②	③	④	⑤
19	ERP Maintenance cost is important to decide the success of its adoption	①	②	③	④	⑤
20	ERP adoption makes it easier to overcome market competitiveness	①	②	③	④	⑤
21	Integrating Supplier relationship is important for successful adoption of ERP system	①	②	③	④	⑤
22	For successful adoption, ERP system should be ready to accept	①	②	③	④	⑤

	technological change					
23	ERP system is useful in deciding organizational Business strategies	①	②	③	④	⑤
24	Do you feel that operating ERP system helps in reducing computer anxiety	①	②	③	④	⑤
25	Management support and positive attitude is important for successful ERP adoption	①	②	③	④	⑤
26	Efficiency of using computer is important for using ERP system	①	②	③	④	⑤
27	ERP system supports innovative technology for managing all process	①	②	③	④	⑤
28	ERP system makes work easier	①	②	③	④	⑤
29	ERP system overcomes the resistance for change in reference to legacy application	①	②	③	④	⑤
30	Using the ERP system will help the user in improving their job performance and productivity	①	②	③	④	⑤
31	ERP system is easy to use ,learn and makes task effortless	①	②	③	④	⑤

32	Interaction with ERP system, is clear and understandable	①	②	③	④	⑤
33	I can access the functions important for executing the business process anytime using ERP system	①	②	③	④	⑤
34	Using ERP in an organization enhance organizations performance in all sense	①	②	③	④	⑤
35	I like using the ERP system to perform my job	①	②	③	④	⑤
36	I think it is valuable to use ERP in an organization.	①	②	③	④	⑤
37	ERP provides new business opportunities for an organization	①	②	③	④	⑤
38	ERP allow to accomplish specific task more quickly	①	②	③	④	⑤
39	ERP usage enhance the productivity of an organization	①	②	③	④	⑤
40	ERP allows us to purchase product and services for the business	①	②	③	④	⑤
41	ERP system provides integrated, timely ,accurate and reliable information for decision making	①	②	③	④	⑤

42	ERP improves CRM and SCM	①	②	③	④	⑤
43	ERP increase organizations profitability	①	②	③	④	⑤
44	ERP system helps in Controlling and monitoring several projects simultaneously in an organization	①	②	③	④	⑤
45	ERP system makes data analysis easier and helps in making better future decisions	①	②	③	④	⑤
46	ERP system helps in proper Inventory Management	①	②	③	④	⑤

☺ Thank you for your valuable time and efforts. ☺

Your Name and Signature **Company Seal/Stamp**