

# Performance Evaluation of Enterprise Resource Planning System in Indian MSMEs

Sherin P Regi

Department of Mechanical Engineering  
National Institute of Technical Teachers Training and  
Research Chandigarh, India

Dr. S. S Banwait

Professor & Dean (R&D),  
Department of Mechanical Engineering  
National Institute of Technical Teachers Training and  
Research Chandigarh, India

**Abstract**—The auto-components industry is a major subsector of the automobile manufacturing sector and the largest feeder industry that has put India on the global map for excellence and innovation. The present work seeks to bridge the gap between the Micro, Small and Medium Enterprises (MSMEs) and Enterprise Resource Planning (ERP) implementation via deducing the critical success factors (CSFs) and critical failure factors (CFFs) of the ERP system to relate to the practical proposed framework, over and above to reinforce the body of knowledge for the successful implementation of ERP system in the respective industries. The present work design involves an exploratory study to identify and evaluate the impact of various CSFs on performance measures of the ERP system implemented in Indian auto-component manufacturing industries. In the present work, a survey methodology with a statistical tool has been used with the help of structured data collection from twenty auto-component manufacturing MSME units. Based on the observations, it is pertinent to mention that only 10% and 30% of the surveyed organizations had been intensely focusing on Change Management and Business Process Management respectively. Therefore, only 10% of the organizations have been realizing the expected business benefits, wherein People-Processes-Technology implementations have been more focused than Technology-focused implementations.

**Keywords**— Enterprise Resource Planning (ERP), Business Process Management, Change Management, Critical Failure Factors (CFFs), Critical Success Factors (CSFs), ERP Benefits, Micro, Small and Medium Enterprises (MSMEs)

## I. INTRODUCTION

In the context of the Indian Economy, the Indian MSMEs are the engines of the Indian Economy, they constitute the majority of business enterprises, and are vital for employment generation and poverty alleviation. In a knowledge-based economy, Indian enterprises have challenges to provide a high-quality product at a low cost, to remain more competitive in the world. Moreover, the Indian MSMEs are desperately trying to enter the global market and establish a key position for their products [1].

Against this backdrop, Brazil, Russia, India, China, South Africa (BRICS) countries have become significant players in the world market, aiming to convince the Micro, Small and Medium Enterprises (MSMEs) to open a fresh mindset and to leave the traditional MSME framework behind. It hopes to motivate BRICS entrepreneurs to rethink and recreate the way they do business to ensure that the delivery of their products and services satisfy the needs of the 21st-century global marketplace [2].

According to the Government of India's MSMEs Development Act, 2006[1]; MSMEs in India are classified based on Manufacturing Enterprises and Service Enterprises respectively. Furthermore, Manufacturing Enterprises and Service Enterprises are further categorized with respect to the Investment in Plant & Machinery and Investment in Equipment respectively, which has been depicted in Table I and Table II respectively.

TABLE I. CLASSIFICATION OF MSMEs IN INDIA – MANUFACTURING ENTERPRISES

Type of Enterprise	Investment in Plant & Machinery (INR)	Investment in Plant & Machinery (USD)
Micro Enterprise	Up to INR 25 Lakh	Up to \$ 62,500
Small Enterprise	Above INR 25 Lakh & up to INR 5 Crores	Above \$ 62,500 & up to \$ 1.25 million
Medium Enterprise	Above INR 5 Crores & up to INR 10 Crores	Above \$ 1.25 million & up to \$ 2.5 million

TABLE II. CLASSIFICATION OF MSMEs IN INDIA – SERVICE ENTERPRISES

Type of Enterprise	Investment in Equipment (INR)	Investment in Equipment (USD)
Micro Enterprise	Up to INR 10 Lakh	Up to \$ 25,000
Small Enterprise	Above INR 10 Lakh & up to INR 2 Crores	Above \$ 25,000 & up to \$ 0.5 million
Medium Enterprise	Above INR 2 Crores & up to INR 5 Crores	Above \$ 0.5 million & up to \$ 1.5 million

The Annual Report for the FY 2018 – 19 of Ministry of MSME, Govt. of India, reveals that the MSME sector accounts for approximately 45% of the manufacturing output and 40% of the total exports of the country. Furthermore, the Ministry of MSMEs highlights that the MSMEs accounted for 29% of GDP in FY 2018 – 19 [2]. Hence, the development of the MSME sector becomes essential as it is well-thought-out to be the backbone of the Indian economy. However, despite high growth rate and good prospects, the Indian MSMEs have been endangered to certain constraints; most remarkably technological backwardness.

It is said that Information Communication Technology (ICT) can play a greater role for MSMEs as they face stiffer competition from their rival neighboring countries, chiefly; China, Philippines, Indonesia, and Thailand. Hence, the need of the hour is to upgrade the existing technology. For Indian

MSMEs to become competitive, it has to adopt the best international practices and successively upgrade the adopted technology. It is often found that the main challenges for many MSMEs are to cultivate the right skills and management practices for establishing and integrating knowledge created by external partners with in-house practices and innovation processes [3]. Nowadays, there are a wide array of automation tools and techniques such as Six Sigma Quality, Factory Automation, Design for Manufacturability, etc., designed and devised to help MSMEs and to manufacture products more efficiently and with better quality. Nevertheless, none of the abovementioned will ever yield to the full potential unless coupled with effective forecasting, planning, and scheduling processes. For yielding the full potential of automation tools and techniques, Enterprise Resource Planning is the answer, which is a direct outgrowth and extension of Manufacturing Resource Planning.

## II. LITERATURE REVIEW

In the literature review, it was found that the Indian MSMEs sector had not been given enough importance, even when it has been one of the fastest-growing sectors of the country. Many studies were conducted to identify critical factors that determine the success of ERP implementation, with various researchers doing empirical studies for the key factors. The key factors which have been identified and emphasized in determining the successful implementation of ERP in the MSMEs from the literature review have been briefly discussed to understand the current status of research.

G. Buonanno et al. [4] states that ERP adoption and implementation could be a highly complex task in which strong managerial and strategic competencies are required to achieve the best fit between the business peculiarities and the system itself to deal with the unavoidable organizational impact induced by an ERP implementation. Furthermore, for long-time ERP adoption reasons within SMEs were explained only by contingency or exogenous factors.

Ngai et al. [5] mention that ERP solutions provide a lot of business benefits to the organizations; still, they have a high failure rate. The question many academicians and researchers have asked is that 'What are the reasons for the failure of ERP implementation?'. Some of the reasons cited in the literature are a lack of support of top management support, resistance from employees, poor selection of ERP system and vendor, etc. The majority of these studies have used case studies to conclude their findings and very few have used the empirical approach to study the ERP system. Thus, there is a need for a greater understanding of the CSFs involved in the implementation of the ERP system. As a result, Ngai et al. [5] defined CSFs as 'the limited number of areas in which satisfactory results will ensure successful competitive performance for the individual, department, or organization.

A comprehensive study conducted by Finney and Corbett [6] has identified the various issues that an organization faces, that hamper the success of ERP implementation. Moreover, it highlighted the importance of the organization, its participation, support from the top management and proper communication in implementing the project can help in reducing the failure rate of ERP implementation.

Sreekumar A Menon et al. [7] explored critical challenges in ERP implementation and evoked a comprehensive list of sixty critical challenges and out of which, the top twelve critical challenges were significant during ERP implementation, chiefly; project team was disbanded very quickly, interface issues, no proper testing, change management, short hyper-care support period, data cleansing, excessive customization and leadership didn't understand the complexities.

Talluri Sai Kiran et al. [8] investigated through secondary research and provided insights on success factors, failure factors and the impact of ERP implementations. Success factors of ERP implementation include organizational commitment, full support from top-level management, Business Process Reengineering (BPR) with minimum customization, effective communication procedures, suitable ERP package selection, adequate training and change management. Furthermore, it emphasized change management as the most influencing factor for the successful implementation of ERP, to support the organization's evolving business needs.

Mc Adam et al. [9] stated BPR, also known as Business Process Management (BPM) as an important factor that is critical for the success of ERP implementation. Furthermore, defining BPR as "the fundamental rethinking and radical redesign of business processes to achieve dramatic improvements in critical, contemporary measures of performance, such as cost, quality, service, and speed". The implementation of ERP requires examination of many business processes, which is believed to be one of the important and beneficial results of the implementation of the ERP system.

Change management is a primary concern of many organizations involved in ERP project implementation as stated by S.G Deshmukh et al. [10]. Many ERP implementations fail to achieve expected benefits, possibly because organizations underestimate the efforts involved in change management. Also, proposing the recurring improvisational change methodology as a useful technique for identifying, managing and tracking changes in implementing an ERP system.

Due to the complexity of implementing an ERP system, it requires the use of either internal or external experts who are knowledgeable about the installation and software. Shashank Saini et al. [11] revealed in their research on ERP implementation that ERP consultants to be involved in different stages of the ERP project implementation. Thus, it is a critical success factor and has to be managed and monitored very carefully.

Clear goals and objectives are essential to guide an ongoing organizational effort for ERP implementation as it usually exceeds the time frame for a typical business project. It is important to set the goals of the project before even seeking top management support is clearly stated by P T Kale et al. [12]. The "triple constraint" of project management specifies three often competing and interrelated goals that need to be met: scope, time, and cost goals. There must also be clear definitions of goals, expectations, and deliverables. Finally, the organization must carefully define why the ERP system is being implemented and what critical business needs the system will address.

In light of the outcome of several types of research and surveys, it has been found that the implementation of the ERP system is a more complex and expensive task for many MSMEs in India. Literature sheds light on many instances where organizations, despite making huge investments in implementing such novel Information Systems as ERP, are unable to derive significant benefits of integration. As cases of ERP failures have increased, the need of the hour is to identify the issues that will lead to a positive outcome for the implementation of the ERP system in the context of the Indian MSME sector. The present work, thus, attempts to explore the effectiveness of the ERP system implemented in Indian MSMEs through an exploratory study. The critical analysis of which will become a guideline for the Indian MSMEs to extract more benefits from the implemented ERP system and other MSMEs who are thinking to take a step in the direction towards implementing the ERP system in the coming future.

### III. MOTIVATION AND RESEARCH OBJECTIVES

Even though enough work has been done on implementing the ERP system in large organizations across the globe, the MSMEs of India are largely left untouched. This gap seeks for a more in-depth study to evaluate the effectiveness of the ERP system in Indian MSMEs, in an attempt to bridge the gap and enable a successful implementation of the ERP system.

The present work focuses on the effectiveness of the implementation of the ERP system in the auto-component manufacturing sector of Indian MSMEs. Due to the recent economic growth and increased global competitive pressure, developing countries, like India and especially the MSMEs in such countries are increasingly becoming the major targets of globalization. Thus, the need of the hour is the urgency in understanding ERP implementation issues faced by the MSMEs of developing countries, as the ERP system in such countries is still in its nascent stages. Furthermore, the Indian MSMEs face additional challenges related to non-availability of highly skilled labor at affordable costs, absence of adequate knowledge, technology, low production capacity, ineffective marketing strategy, constraints on modernization and expansions, identification of new markets, follow-up with various government agencies to resolve problems, increasing exports, enhanced competition from China and a few low-cost centers of production. However, the Indian MSMEs can convert these challenges into opportunities with a powerful IT solution like ERP, which offers multiple benefits to face global competition.

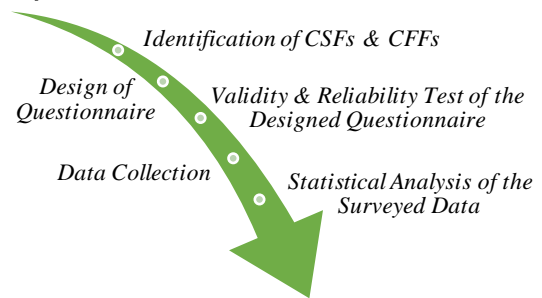
Hence, the present work seeks to fill the gap by evaluating the effectiveness of the ERP system implemented in the auto-component manufacturing sector of Indian MSMEs, as well as to enhance the body of knowledge to enable and facilitate the academicians, practitioners and MSMEs in shedding light on chalking out a suitable roadmap in consensus with the conceptual framework for the successful implementation of the ERP system in MSMEs.

### IV. METHODOLOGY

In the present work, a survey methodology with a statistical tool has been used, along with the support of structured data collected by the method of an exploratory study, to identify and evaluate the impact of various CSFs on the effectiveness of the ERP system. The present

work involved the use of quantitative as well as qualitative research methodologies utilizing empirical investigations. The data was collected from twenty auto-component manufacturing Indian MSMEs, which have been implementing ERP for the past three years or more, located in the industrially advanced cities of the north-western part of India, chiefly in the states of Punjab, Haryana and Himachal Pradesh. Structured data collection was achieved by collecting data with a formal questionnaire with a direct process, where the purpose of the research was explained to the respondent. The various CSFs responsible for the effective implementation of ERP was deduced by using the statistical software packages, such as XLSTAT 2018 and IBM SPSS Statistics 21.0, as statistical tools. The steps involved in the methodology have been consolidated and illustrated in Fig. 1.

*Review of Literature*



**Roadmap for the Successful Implementation of ERP System**

Fig. 1. Steps involved in the methodology

#### A. Survey Design and Instruments for Data Collection

The effectiveness of the ERP system was assessed based on multiple variables, which made the effectiveness measurable to carry out the analysis and formulate a conceptual model. All such variables were measured on a 5-point Likert Scale, with the values of '1 – 5' ranging from 'very insignificant' to 'very significant' respectively, which were incorporated in the questions for capturing the significance, a respondent attaches to a particular factor. Subsequently, a significant relationship of each variable with effectiveness measure was identified using the statistical software packages, such as; XLSTAT 2018 and IBM SPSS Statistics 21.0 as statistical tools. Constructs were included in the questionnaire for various CSFs influencing several effectiveness measures which were identified through the literature. Consequently, a questionnaire [13] was designed and pretested to identify and eliminate potential problems, as well as to ensure the validity and unique nature of the constructs. However, after thorough deliberations with academicians and experts involved in the implementation of the ERP system, the designed questionnaire was further refined and finalized in accordance with the feedback. The revised questionnaire [13] designed was divided into five parts, wherein the first part dealt with the Organization's Profile, which further categorized the organization w.r.t MSME. Furthermore, the second part of the questionnaire consisted of Respondent's Profile, which empirically investigated carefully into the respondent's knowledge and experience w.r.t the implementation of ERP and ERP projects. Subsequently, the third part of the questionnaire dealt with the Business and Management Profile, which further



divided into an in-depth study of the organization w.r.t;

- Awareness of ERP and its advancements, such as SaaS, PaaS, IaaS.
- Motivational reasons for the implementation of the ERP system were further categorized as follows:
  - Enforcement for adapting ERP by the suppliers and customers, MR1
  - Due to the pressure in keeping up with the competitors and the market, MR 2
  - For better communication with the suppliers and customers, MR 3
  - For reduction in inventory (in hand), MR 4
  - For reduction in cycle time, MR 5
  - For an increase in throughput, MR 6
  - For an increase in process improvement, MR 7
  - Due to the weak existing Information System (IS), MR 8
  - Need to integrate the existing IS, MR 9
  - For replacement of the legacy IS, MR 10
  - For enhanced networking in SCM and Logistics, MR 11
  - For improvement of asset utilization, MR 12
  - For organizational restructuring, MR 13
  - For the reduction of direct and indirect cost, MR 14
  - For reduction of the capital cost, MR 15
  - For reduction of the logistics cost, MR 16
  - For overall cost reduction, MR 17
  - For strategic advancements, MR 18
  - For pre-empt potential customers, MR 19
  - Consolidation of the present market, MR 20
- Feasibility study and market study
- Objectives defined in regards to the implementation of ERP
- Selection of ERP Vendor
- Approach strategy for the implementation of ERP w.r.t organizational and functional parameters:
- Significance of Business Process Management
- Expected benefits

Besides, the fourth part of the questionnaire empirically investigated the Technical Profile of the ERP adopted in the organization w.r.t type of ERP implementation process, followed by the significance of Business Process Management, project timeline and overruns, and lastly emphasizing on the type of training provided to the user. Moreover, the fifth part of the questionnaire evaluated the ERP Implementation Process by defining the perceptible and imperceptible benefits achieved by the organization, as categorized below. It also cautiously identified the various factors involved w.r.t the Critical Success Factors and Critical Failure Factors of ERP, which played a decisive role in the successful implementation of the ERP system, as mentioned below:

- Perceptible benefits of implementing the ERP system studied were as follows:
  - Inventory reduction, PB 1
  - Personnel reduction, PB 2
  - Reduced lead time, PB 3
  - Reduced planning cycle time, PB 4
  - Reduced manufacturing cycle time, PB 5

- Increased throughput, PB 6
- Maintenance reductions, PB 7
- Productivity improvements, PB 8
- Improved forecasting, PB 9
- Reduced error in ordering, PB 10
- Logistics cost reduction, PB 11
- On-time delivery improvements, PB 12
- Increase in sales volume, PB 13
- Improved communication, PB 14
- Management improvements, PB 15
- Financial close cycle improvements, PB 16
- IT cost reduction, PB 17
- Procurement cost reduction, PB 18
- Cash Management improvements, PB 19
- Revenue/profit increases, PB 20
- Improved competitive position, PB 21
- Imperceptible benefits of implementing the ERP system were as follows:
  - Information visibility, IB 1
  - Interdepartmental coordination and relations, IB 2
  - Improved process, IB 3
  - Customer responsiveness, IB 4
  - Cost reduction, IB 5
  - Integration, IB 6
  - Standardization, IB 7
  - Flexibility, IB 8
  - Globalization, IB 9
  - Technology, IB 10
  - Business performance, IB 11
  - Decision making, IB 12
  - Supply-demand chain, IB 13
- The various Critical Success Factors (CSFs) responsible for the successful implementation of the ERP system investigated were as follows:
  - Top management support, F 1
  - Strong MIS department, F 2
  - Quality of ERP team, F 3
  - Functional area support, F 4
  - Good implementation partner/ERP vendor, F 5
  - Strong and meaningful training programs, F 6
  - Good planning of the ERP project, F 7
  - Overall support for the ERP in the organization, F 8
  - Efficient change in management, F 9
  - Great ERP software selected, F 10
  - User's involvement and participation, F 11
  - A good understanding of the concept of ERP, F 12
  - A good IT infrastructure in place already, F 13
- The different Critical Failure Factors (CFFs) responsible for failure in the implementation of the ERP system were as follows:
  - Lack of top management support, f 1
  - Weak MIS department, f 2

- Poor quality of ERP team members, f 3
- Lack of functional area support, f 4
- Weak implementation partner/ERP vendor, f 5
- Poor training programs, f 6
- Poor planning of the ERP project, f 7
- Lack of overall support for the ERP in the organization, f 8
- Bad change in management, f 9
- Wrong ERP software selected, f 10
- Lack of users' involvement and participation, f 11
- Poor understanding of the concept of ERP, f 12
- Inadequate IT infrastructure, f 13

have been highly motivated to implement the ERP system 'for the reduction in inventory (in hand)' with the highest mean value of 4.750, followed by 91% (i.e., *eighteen of the twenty industries*) of the respondents 'for strategic business advancements' with the corresponding mean value of 4.550. Furthermore, 'for replacement of the legacy IS' in addition to 'for overall cost reduction' and 'for an increase in process improvement', were the succeeding most crucial motivational reasons to implement the ERP system, with the majority of the respondents as represented in Table III. However, the lowest mean value of 3.450 conforming to 69% (i.e., *fourteen of the twenty industries*) of the respondents have been the least motivated to implement the ERP system 'for enhanced networking in Supply Chain Management (SCM) and logistics', followed by 70% (i.e., *fourteen of the twenty industries*) of the respondents 'for better communication with suppliers and customers' with the corresponding mean value of 3.500.

**B. Sampling Method**

To narrow down the targeted population for study, the MSMEs from different industrially advanced cities of North-Western India, chiefly, Chandigarh, Mohali (Punjab), Ludhiana (Punjab), Panchkula (Haryana) and Baddi (Himachal Pradesh) were selected for data collection. The targeted population was selected due to various advantages it carries, most notably, the proximity to the three states of India (i.e. Punjab, Haryana, and Himachal Pradesh) and special tax rebates provided by the respective State Government to set up industries in the above-mentioned areas, which has resulted in emerging of the above-mentioned areas as a major industrial center in India. For the present work, twenty auto-component manufacturing MSMEs were identified from multiple resources like CII, PhD-CCI, ASSOCHAM, Directory of Industrial Associations, as well as, through individual contacts.

**V. OBSERVATIONS AND DISCUSSION**

The raw data was captured in a spreadsheet software package and then converted into a statistical software package (XLSTAT 2018 and SPSS v21.0). Reliability is one of the most critical elements in assessing the quality of the construct measures and is a necessary condition for scale validity since a statistically reliable scale provides consistent and stable measures of a construct. On performing the reliability test, the Cronbach's Alpha coefficients pertaining to the hypothesized variables ranged from 0.736 to 0.907, which exceeded the recommended value of 0.50 [14]. These values show good internal consistency among scales used for the present work.

**A. Motivational Reasons to Implement ERP System**

There are different advanced manufacturing technologies adopted by different industries to improve their productivity. However, the motivational reasons to use the ERP system are different for different MSMEs. The summary and analysis of the responses concerning the motivational reasons to implement the ERP system are as follows:

On conducting the reliability analysis, Cronbach's Alpha for the above construct was found to be 0.907, thus indicating the excellent reliability of the scale.

Further on performing Factor Analysis for motivational reasons to implement the ERP system (MR), it was revealed that 95% (i.e., *nineteen of the twenty industries*) of the respondents

TABLE III. FACTOR ANALYSIS FOR MOTIVATIONAL REASONS TO IMPLEMENT THE ERP SYSTEM

VARIABLE	MINIMUM VALUE OBTAINED (ON LIKERT SCALE)	MAXIMUM VALUE OBTAINED (ON LIKERT SCALE)	MEAN	STANDARD DEVIATION
MR 1	3.000	5.000	3.600	0.598
MR 2	3.000	5.000	3.900	0.788
MR 3	3.000	4.000	3.500	0.513
MR 4	4.000	5.000	4.750	0.444
MR 5	3.000	5.000	4.200	0.523
MR 6	3.000	5.000	4.200	0.523
MR 7	4.000	5.000	4.400	0.503
MR 8	3.000	5.000	4.300	0.733
MR 9	3.000	5.000	3.750	0.786
MR 10	3.000	5.000	4.450	0.759
MR 11	3.000	5.000	3.450	0.605
MR 12	4.000	5.000	4.150	0.366
MR 13	3.000	5.000	3.950	0.510
MR 14	3.000	5.000	4.350	0.587
MR 15	3.000	5.000	4.100	0.641
MR16	3.000	5.000	3.800	0.696
MR 17	3.000	5.000	4.400	0.598
MR 18	3.000	5.000	4.550	0.686
MR 19	3.000	4.000	3.650	0.489
MR 20	3.000	5.000	4.000	0.725

The aforementioned mean values obtained on performing factor analysis for motivational reasons to implement the ERP system have been depicted in the form of a bar chart, as shown in Fig. 2.

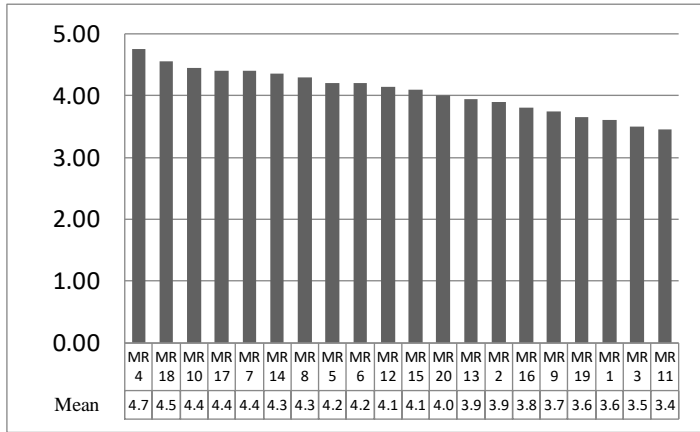


Fig. 2. Motivational Reasons to implement the ERP System

While technology-related reasons are good reasons to replace the ERP software, business-focused motivations should prioritize over technology-related benefits for the organization to maximize business benefits. MSME organizations should first define and review their strategy and objectives, then prepare their people and processes to achieve those key objectives, and finally, determine what technology is necessary to enable transformation.

**B. Benefits of Implementing the ERP System**

To evaluate the post-implementation effectiveness of the ERP system implemented in MSMEs, the expected Perceptible Benefits and Imperceptible Benefits were measured, to find out whether MSMEs did benefit from the ERP implementation, if so, then in which areas benefited more compared to others. The summary and analysis of the responses concerning the expected perceptible benefits and imperceptible benefits are as mentioned below.

**Perceptible Benefits**

On conducting the reliability analysis, Cronbach’s Alpha for the perceptible benefits was found to be 0.736, thus indicating the excellent reliability of the scale.

Further, on performing Factor Analysis for the Perceptible Benefits (PB) of implementing the ERP system, it was revealed by 90% (i.e., *eighteen of the twenty industries*) of the respondents that ‘improved forecasting’ with the highest mean value of 4.750, was the most perceptible beneficial factor of implementing the ERP system, followed by ‘improved communication’ and ‘inventory reduction’ by 89% (i.e., *eighteen of the twenty industries*) of the respondents with the corresponding mean value of 4.450. Additionally, ‘financial close cycle improvements’ and ‘reduced error in ordering’, were the subsequent most perceptible beneficial factors of implementing the ERP system, with the majority of the respondents as represented in Table IV. However, the lowest mean value of 2.700 conforming to 54% (i.e., *eleven of the twenty industries*) of the respondents reported that ‘logistics cost reduction’ was the least perceptible beneficial factor of

implementing the ERP system, followed by 67% (i.e., *thirteen of the twenty industries*) of the respondents reporting ‘cash management improvements’ with the corresponding mean value of 3.350.

TABLE IV. FACTOR ANALYSIS FOR PERCEPTIBLE BENEFITS OF IMPLEMENTING THE ERP SYSTEM

VARIABLE	MINIMUM VALUE OBTAINED (ON LIKERT SCALE)	MAXIMUM VALUE OBTAINED (ON LIKERT SCALE)	MEAN	STANDARD DEVIATION
PB 1	4.000	5.000	4.450	0.510
PB 2	3.000	4.000	3.400	0.503
PB 3	3.000	4.000	3.650	0.489
PB 4	3.000	4.000	3.650	0.489
PB 5	3.000	4.000	3.650	0.489
PB 6	3.000	4.000	3.650	0.489
PB 7	3.000	4.000	3.400	0.503
PB 8	3.000	4.000	3.650	0.489
PB 9	4.000	5.000	4.500	0.513
PB 10	3.000	5.000	3.850	0.587
PB 11	2.000	3.000	2.700	0.470
PB 12	3.000	5.000	3.850	0.587
PB 13	3.000	4.000	3.650	0.489
PB 14	4.000	5.000	4.450	0.510
PB 15	3.000	4.000	3.600	0.503
PB 16	4.000	5.000	4.200	0.410
PB 17	3.000	4.000	3.500	0.513
PB 18	3.000	4.000	3.400	0.503
PB 19	3.000	4.000	3.350	0.489
PB 20	3.000	5.000	3.800	0.616
PB 21	3.000	5.000	3.450	0.605

The above-mentioned mean values obtained on performing factor analysis for the Perceptible Benefits (PB) of implementing the ERP system have been shown in the form of a bar chart in Fig. 3.

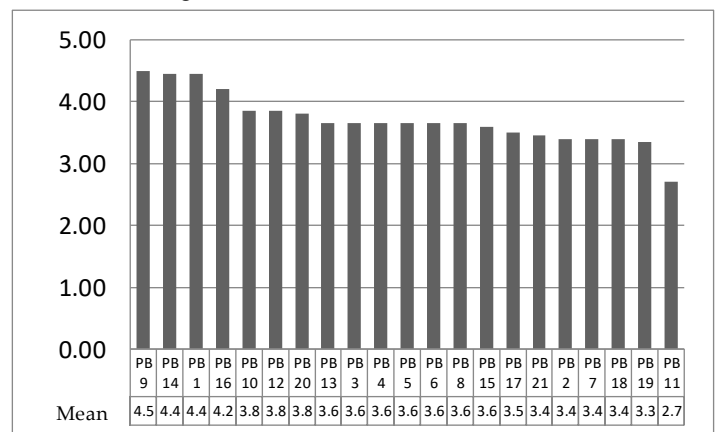


Fig. 3. Perceptible Benefits of implementing the ERP system

**Imperceptible Benefits**

Besides the perceptible benefits, there are numerous imperceptible benefits too. The Cronbach’s Alpha for the imperceptible benefits construct was found to be 0.881, thus indicating exceptionally good reliability of the scale.

Subsequently, on performing Factor Analysis for the Imperceptible Benefits (IB) of implementing the ERP system, it was revealed by 88% (i.e., *eighteen of the twenty industries*)

of the respondents that ‘information visibility’ and ‘decision making’ with the highest mean value of 4.400, were the most imperceptible beneficial factors of implementing the ERP system. Followed by, ‘interdepartmental coordination and relations’ as well as ‘globalization’ and ‘integration’ were the succeeding most imperceptible beneficial factors of implementing the ERP system, with the majority of the respondents as represented in Table V. However, the lowest mean value of 3.200 conforming to 64% (i.e., *thirteen of the twenty industries*) of the respondents reported that ‘flexibility’ was the least imperceptible beneficial factor of implementing the ERP system, followed by 72% (i.e., *fourteen of the twenty industries*) of the respondents reporting ‘supply-demand chain’ with the corresponding mean value of 3.600.

TABLE V. FACTOR ANALYSIS FOR IMPERCEPTIBLE BENEFITS OF IMPLEMENTING THE ERP SYSTEM

VARIABLE	MINIMUM VALUE OBTAINED (ON LIKERT SCALE)	MAXIMUM VALUE OBTAINED (ON LIKERT SCALE)	MEAN	STANDARD DEVIATION
IB 1	4.000	5.000	4.400	0.503
IB 2	3.000	5.000	4.050	0.605
IB 3	3.000	4.000	3.650	0.489
IB 4	3.000	4.000	3.700	0.470
IB 5	3.000	4.000	3.850	0.366
IB 6	3.000	4.000	3.750	0.444
IB 7	3.000	4.000	3.700	0.470
IB 8	3.000	4.000	3.200	0.410
IB 9	3.000	4.000	3.900	0.308
IB 10	3.000	4.000	3.700	0.470
IB 11	3.000	4.000	3.750	0.444
IB 12	4.000	5.000	4.400	0.503
IB 13	3.000	4.000	3.600	0.503

The above mean values obtained on performing factor analysis for the Imperceptible Benefits (IB) of implementing the ERP system have been depicted in the form of a bar chart in Fig. 4.

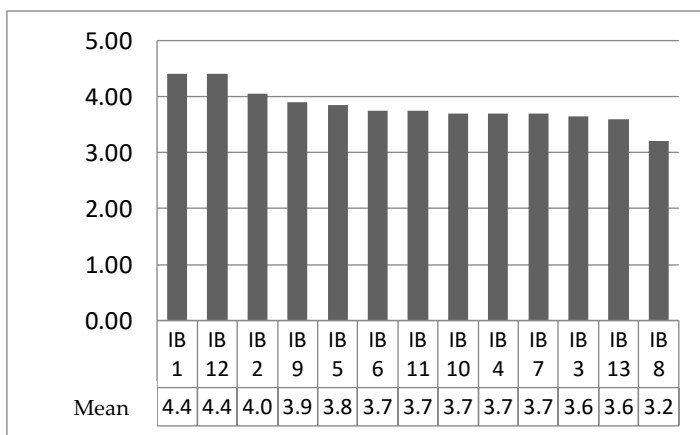


Fig. 4. Imperceptible Benefits of implementing the ERP system

Based on the summary of the analysis of variance (ANOVA), it was found that the coefficient of determination  $R^2$  is 0.635, which indicates that 63.5% of the variation in the dependent variable can be explained by all the independent variables in the present work.

Organizations are often enamored with technology, and ERP projects are mostly initiated by the IT department. While technology is certainly a powerful contributor to business benefits, technology by itself does not create benefits. An exclusive focus on technology is the one big reason for not achieving the expected benefits. Therefore, there is a significant disparity between the types of reasons for organizations to implement the ERP system and the types of benefits realized after implementing the ERP system.

C. Critical Success Factors Responsible for the Successful Implementation

Implementing an integrated ERP solution is not as much a technological exercise, but an organizational revolution. Extensive preparation before implementation is the key to success. An enterprise goes through a major transformation and the management of this change must be meticulously planned and judiciously implemented. The summary and analysis of the responses with respect to the CSFs responsible for the successful implementation of the ERP system are as follows:

The Cronbach’s Alpha for the CSFs responsible for the successful implementation of the ERP system construct was found to be 0.888, thus indicating exceptionally good reliability of the scale.

Further on performing the Factor Analysis for the CSFs responsible for the successful implementation of the ERP system (F), it was revealed by 89% (i.e., eighteen of the twenty industries) of the respondents that ‘Strong MIS department’ with the highest mean value of 4.450, was found as the major crucial factor for the CSFs responsible for the successful implementation of the ERP system, followed by ‘good planning of the ERP project’ by 88% (i.e., eighteen of the twenty industries) of the respondents with the corresponding mean value of 4.400. In addition, ‘top management support’ as well as ‘efficient change in management’ and ‘good implementation partner/ERP vendor’ were the succeeding most crucial parameters for the CSFs responsible for the successful implementation of ERP system, with the majority of the respondents as represented in Table VI. However, the lowest mean value of 3.350 conforming to 67% (i.e., thirteen of the twenty industries) of the respondents reported that ‘a good IT infrastructure in place already’ was the least crucial factor for the CSFs responsible for the successful implementation of the ERP system, followed by 69% (i.e., fourteen of the twenty industries) of the respondents reporting ‘a good understanding of the concept of ERP’ with the corresponding mean value of 3.450.

TABLE VI. FACTOR ANALYSIS FOR THE CSFs RESPONSIBLE FOR THE SUCCESSFUL IMPLEMENTATION OF THE ERP SYSTEM

VARIABLE	MINIMUM VALUE OBTAINED (ON LIKERT SCALE)	MAXIMUM VALUE OBTAINED (ON LIKERT SCALE)	MEAN	STANDARD DEVIATION
F 1	4.000	5.000	4.350	0.489
F 2	3.000	5.000	4.450	0.686
F 3	3.000	5.000	4.300	0.733
F 4	3.000	5.000	3.900	0.553



VARIABLE	MINIMUM VALUE OBTAINED (ON LIKERT SCALE)	MAXIMUM VALUE OBTAINED (ON LIKERT SCALE)	MEAN	STANDARD DEVIATION
F 5	4.000	5.000	4.300	0.470
F 6	3.000	5.000	3.800	0.616
F 7	4.000	5.000	4.400	0.503
F 8	3.000	5.000	4.250	0.550
F 9	4.000	5.000	4.350	0.489
F 10	4.000	5.000	4.250	0.444
F 11	4.000	5.000	4.250	0.444
F 12	3.000	5.000	3.450	0.605
F 13	2.000	5.000	3.350	0.813

The aforementioned mean values obtained on performing factor analysis for the CSFs responsible for the successful implementation of the ERP system have been depicted in the form of a bar chart, as shown in Fig. 5.

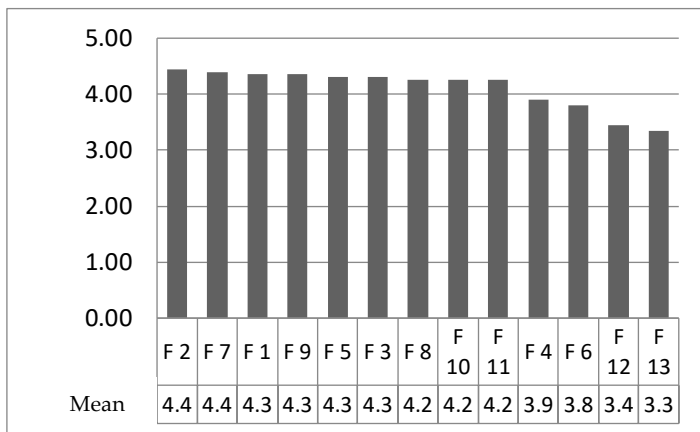


Fig. 5. CSFs Responsible for the Successful Implementation of the ERP System

Based on the summary of the ANOVA, it was found that the coefficient of determination, R<sup>2</sup> was 0.981, which indicates that 98.1% of the variation in the dependent variable can be explained by all the independent variables in the present work. It is noteworthy to mention that the aforementioned CSFs of the present work were in consensus with the observations made by Talluri Sai Kiran et al. [8], McAdam et al. [9] and P T Kale et al. [12] with respect to the manufacturing sector of the Indian MSMEs.

Moreover, gaining strong executive buy-in takes time and effort, and must ensure appeals are business-focused rather than technology-focused. Employees determine the success of an ERP implementation because their use of new technology drives business benefits. Therefore, an intense focus on change management is essential for the successful implementation of the ERP system.

#### D. Critical Failure Factors Responsible for the Failure in the Implementation of the ERP System

The ERP system in MSMEs has not been performing as originally expected moreover, ERP implementations are being infamous for taking a long time as well as costing more money than initially projected. Hence, in the last decade, MSMEs have struggled to implement the ERP system effectively, despite all

of the benefits it has to offer. This is not due to the reason that the ERP system is poorly designed, however, due to inadequate understanding of the way that an ERP system should be implemented. The consequence is either software modification, which is expensive and costs heavily in maintenance or restructuring of the organization’s business processes to fit the software. To this effect, the enterprises have ended up exceeding the planned implementation budgets, and time to implement, which in turn has led to project overruns and failures. The summary and analysis of the responses are:

The Cronbach’s Alpha for the CFFs responsible for the failure in the implementation of the ERP system construct was found to be 0.867, thus indicating exceptionally good reliability of the scale.

Further on performing Factor Analysis for the CFFs responsible for the failure in the implementation of the ERP system (f), it was revealed by 91% (i.e., *eighteen of the twenty industries*) of the respondents that ‘lack of top management support’ in addition to ‘poor planning of the ERP project’ and ‘bad change management’ with the highest mean value of 4.550, were the most crucial factors for the CFFs responsible for the failure in the implementation of the ERP system. Additionally, ‘weak MIS department’ and ‘weak implementation partner/ERP vendor’ were the following most crucial parameters for the CFFs responsible for the failure in the implementation of the ERP system, with the majority of the respondents as represented in Table VII. However, the lowest mean value of 3.400 conforming to 68% (i.e., *fourteen of the twenty industries*) of the respondents reported that ‘poor understanding of the concept of ERP’ was the least crucial factor for the CFFs responsible for the failure in the implementation of the ERP system, followed by 69% (i.e., *fourteen of the twenty industries*) of the respondents reporting ‘inadequate IT infrastructure’ with the corresponding mean value of 3.450.

TABLE VII. FACTOR ANALYSIS FOR THE CFFs RESPONSIBLE FOR THE FAILURE IN THE IMPLEMENTATION OF THE ERP SYSTEM

VARIABLE	MINIMUM VALUE OBTAINED (ON LIKERT SCALE)	MAXIMUM VALUE OBTAINED (ON LIKERT SCALE)	MEAN	STANDARD DEVIATION
f 1	4.000	5.000	4.550	0.510
f 2	3.000	5.000	4.450	0.605
f 3	3.000	5.000	4.200	0.696
f 4	3.000	5.000	3.800	0.523
f 5	4.000	5.000	4.400	0.503
f 6	3.000	5.000	3.800	0.616
f 7	4.000	5.000	4.550	0.510
f 8	3.000	5.000	4.150	0.587
f 9	4.000	5.000	4.550	0.510
f 10	4.000	5.000	4.250	0.444
f 11	3.000	5.000	4.150	0.489
f 12	3.000	5.000	3.400	0.598
f 13	2.000	5.000	3.450	0.759

The aforementioned mean values obtained on performing factor analysis for the CFFs responsible for failure in the implementation of the ERP system have been shown in the form of a bar chart in Fig. 6.



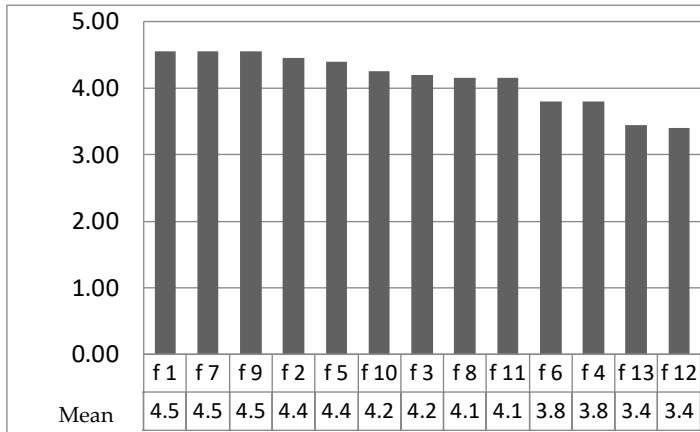


Fig. 6. CFFs Responsible for the Failure in the Implementation of the ERP System

Although none of the MSMEs believes that ERP is a failure, the majority of the surveyed respondents have not yet achieved the predetermined objectives and benefits to the utmost extent. Moreover, it is pertinent to mention that the aforementioned CFFs of the present work are in concurrence with the observations made by Ngai et al. [5], Finney and Corbett [6], Sreekumar Menon [7], Talluri Sai Kiran et al. [8], S G Deshmukh et al. [10] and P T Kale et al. [12] with respect to the factors responsible for the high failure rate of ERP implementation in the MSMEs.

Technology-focused projects typically only include a software initiative and no budget for fixing processes and integrating people. Moreover, the tendency to pursue a technology initiative often comes from technology constraints to growth or the need to integrate digital tools.

While most organizations have been using ERP consultants; organizations are still struggling with their projects in terms of budget and timeline overruns. This is due to the lack of focus on change management and business process management, as also cited by Shashank Saini et al. [11]. Furthermore, it gives the impression that the ERP consultants are not setting realistic expectations regarding the organizational and process challenges that inevitably occur. Data issues also cause project overruns. Therefore, investing in data strategies and migration initiatives early, especially database performance will be a key effectiveness indicator for any ERP implementation. Furthermore, the way a database handles big data warehousing and querying, it is essential and important to implement Artificial Intelligence (AI) tools. This is further evidence that technology-focused implementations are less successful than people-process-technology focused implementations.

#### E. Conceptual Framework for Successful Implementation of ERP

In respect of the observations and discussion of the present work, a conceptual framework for the successful implementation of the ERP system has been formulated to enable the academicians, practitioners, and MSMEs on chalking out a suitable roadmap in consensus with the conceptual framework for the successful implementation of the ERP system and extracting benefits to its utmost potential, as represented in Fig. 7.

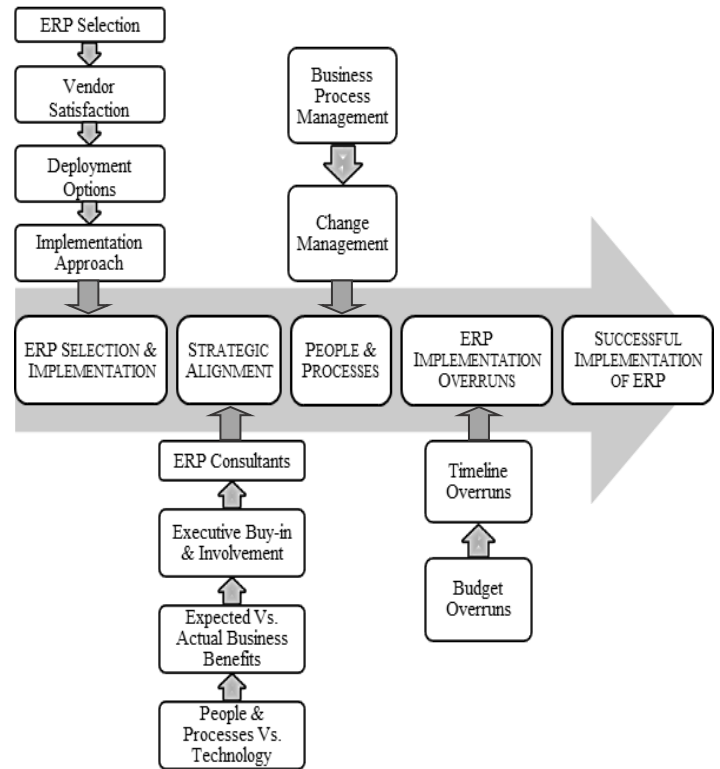


Fig. 7. Conceptual Framework for Successful Implementation of ERP

## VI. CONCLUSION

The conclusion drawn from the study emphasizes that only 10% and 30% of the surveyed MSMEs have been intensely focusing on “Change Management” and “Business Process Management” respectively. As a result, only 10% of the surveyed organizations have been realizing the expected business benefits.

- While technology-related reasons are good reasons to replace ERP software, business-focused motivations should be prioritized over technology-related benefits for the MSMEs to maximize business benefits.
- It’s important to begin business process management activities as early as possible, thus enabling the stakeholders to understand the scope of change related to anticipate business impacts moving from a current state to a desired future state.
- Employees determine the success of the ERP implementation because their use of new technology drives business benefits, as a result, it requires an intense focus on change management.
- Gaining strong executive buy-in takes time and effort, and should ensure demands are business-focused rather than technology-focused.
- One way to reduce the risk of budget overruns is effectively managing project scope. Investing upfront during the ERP selection phase can reduce implementation costs.
- To avoid timeline overruns, it is crucial to set a realistic timeline by accounting for all essential project activities.

Nevertheless, it would be thought-provoking for future researchers to elaborate on the effectiveness of the ERP system

concerning the change management, to pave the way for Indian MSMEs to embark on the digital MSMEs.

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