

Study the Perspectives of Implementation of ERP in Manufacturing Industries

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ABSTRACT

During recent years, industries have invested considerable resources in the implementation of Enterprise Resource Planning (ERP) systems. ERP is the process of integrating all the business functions and processes in an organization to achieve numerous benefits. Implementation of ERP systems in the industries does not remain always successful as sometimes this brings partial success or complete failure. In this paper, an attempt has been made to introduce ERP systems on the basis of a case study that can help in bringing the troubled ERP systems under control. A survey of individuals and industries has been conducted on the implementation of ERP systems and some critical success and failure factors have been identified. From the case study, the industry specific objectives, the software used, and about 20 more other benefits and difficulties faced by the industries in implementing ERP are identified. These findings will help managers, practitioners and consultants to develop better strategies for supervising and controlling ERP implementation projects.

Keywords- Critical Factors, ERP, ERP Adoption, ERP Implementation, ERP Perspectives

1. Introduction

Enterprise resources planning (ERP) systems allow seamless integration of information flows and business processes across functional areas within company [1]. They support information sharing along a company value chain and help to achieve operating efficiency [2]. ERP packages offer a workflow engine to generate automated workflows according to business rules and approval matrices so that information and documents can be routed to operational users for transaction handling, and to managers and directors for review and approval. In the last few years, many new concepts and associated software have been suggested for complementing some of the functionalities of ERP systems: SCM, APS, CRM, SRM, B2B, B2C and others are now acronyms which are familiar to most of the people interested in ERP systems. The arrival of these concepts and software on the landscape of industrial management has motivated a new problem concerning their consistency and possible relation with the ERP concept. The availability of these systems on the market together with the fact that most of the large industries have already implemented their ERP solution has led ERP editors to open a little bit their products [3]. One thing that distinguishes ERP systems from “traditionally” developed systems is that they come with a kind of mould of how the processes in a company should be shaped. Instead of making a system completely adapted to the company’s processes, an ERP system offers a set of processes for the organization to follow [4]. While the main job of the system is to improve

the flow of information in an organization, it's inevitable that the business processes are affected as well [5]. The purpose of this study is to describe and analyze the factors that contribute to the successful ERP system implementation, the stakeholders of ERP system and how these stakeholders are related to CSFs (critical success factors) of ERP system implementation. Some of the researchers working on the success of ERP systems have addressed the critical issues including Project justification, rests & ERP process fits, for the industries who have adopted the ERP systems. Limited study has been conducted in the ERP implementation risks area, with most research consisting of implementation of case studies in individual organization. To sustain in the present competitive age, operational excellence is the basic success factor for manufacturing organizations [6]. This paper presents the plan of how to implement ERP judiciously & used efficiently to have the ability to raise the productivity & profits of the industries dramatically. Through this study, a roadmap for ERP's implementation has been prepared & how ERP should proceed earnestly to drive benefits out of it in real sense. So an attempt has been made to implement & observe the impact of ERP in manufacturing Industries. Industries have invested considerable resources in the implementation of ERP systems [4]. The results initially expected have rarely been reached. It becomes apparent that nowadays, results do not live up to the managers' expectations. 85% of companies consider the ERP as an investment for more than 5 years, 70% expect no more than 25% of return on investment and 50% did not even try to estimate the ROI [7]. By combining the factors of implementation with a process perspective, we examined a comprehensive framework that allowed us to investigate the issues that would dominate each implementation stage of ERP. The study brings out some relevant elements for the problem of optimization of ERP use. The purpose is also to describe and analyze the factors that contribute to the successful/unsuccessful ERP system implementations, the stakeholders of ERP system and how these stakeholders are related to CSFs/ CFFs of ERP system implementation. The Identified factors are: support from top management, business process reengineering, user's training, appropriate use o

consultants with technical and business ability, ERP system integration with old legacy system, careful selection of software and vendor, Project team composition, Strong communication inwards and outwards, Preventive troubleshooting. The paper is thus planned as follows: The next section 2 presents the Research Methodology, a case study has been presented in the section 3 and finally in section 4 conclusions and scope for future work is discussed.

2. Research Methodology

The approach of this study is to provide the understanding of problem through research tools that are oriented towards determining and analyzing the fact and giving significance to the context and usage. The manner of the research chosen for this study is of a qualitative nature through an interpretive case study, where data collection consists of thorough literature review, secondary data review of documentation regarding the ERP implementation risks, observations and interviews. In order to carry out the above mentioned tasks a multi-channel survey consists of various factors and the questionnaire is adapted from prior literature. The study has been carried out in about 17 manufacturing industries in India and it consists of survey questionnaire asked for information on ERP implementation and current use in the industry: the respondent's and the industry's characteristics, the ERP project characteristics and initial contributors (budgets, timelines, user satisfaction, performance measures, benefits, operational disruptions etc.) , organizational characteristics (during and after deployment), needs of improvement /evolution & "Post-go-live" diagnostic. The responses were encoded using a mix of check boxes, open ended answers and a binary scale with 'yes' or 'no' responses. The amount of open-ended questions allowed appreciates numerous details. Given the length and comprehensive nature of the survey, this response rate is concluded to be reasonable.

3. Case Study

3.1 Case Study Highlights

- From the evolution stage, it has been concluded that projects of a new version of deployment that, according to the ERP system, could be revealed as hard and heavy projects (strongly bounded to the number of specific programs). These projects are inevitable ways for the industries to develop and to follow the evolution of the market.
- From the case study, the industry specific objectives, the software used, and about 20 more other benefits or difficulties faced by the industries in implementing ERP are identified. These findings will give an insight to the industries those are willing to implement ERP in more effective manner.
- ERP implementation remains mostly successful but in some cases it also brings partial success or failure. The success or failure of ERP depends upon a large number of organizational and technological perspectives which may have different point values depending upon the work culture existing in the industry using ERP. The evaluation/prioritizing of the contributing success/failure factors will help industries to develop better strategies for supervising and controlling ERP implementation projects.

3.2 Methodology of Case Study

- An exhaustive questionnaire is designed after a thorough literature review to evaluate the relevance of success/failure factors pertaining to organizational and technological perspectives needed to implement ERP.
- The questionnaire is divided into two parts. First part is consisting of 25 questions regarding the status of ERP implementation in the industries. The second part was consisting the award of score points on Normative scale (0-10 point scale), for the evaluation of critical success/failure factors as per unified model.
- The questionnaire was circulated to more than 50 industries through personnel visits, by post and e-mails. Interviews were held

with concerned professionals responsible for ERP implementation in about 10 industries. Seventeen filled up questionnaires were received within a given time period of month. The findings based upon the information collected during visits to industries and the questionnaire feedbacks are worked out.

3.3 Detailed Observations of Case Study

3.3.1 Key Findings

The research describes the following primary results of what Industries reflect about ERP:

- Due to the level of investment and length of time needed to implement ERP system, many industries have proceeded to implement ERP without making any return calculations.
- Most ERP implementations under-deliver business value.
- Industries do not effectively manage the organizational change of ERP.

3.3.1.1 Part –A of Case Study

➤ *The main objective of implementing ERP in Industries:*

64.7% of the industries have the main objective to be competitive in the market, 17.6% of the industries have the objective to meet customer needs and only 5.9% of the industries want to gain more profits through ERP. 11.8% of the industries have their other objectives for implementing ERP in their organization like better control over stocks and to optimize business processes.

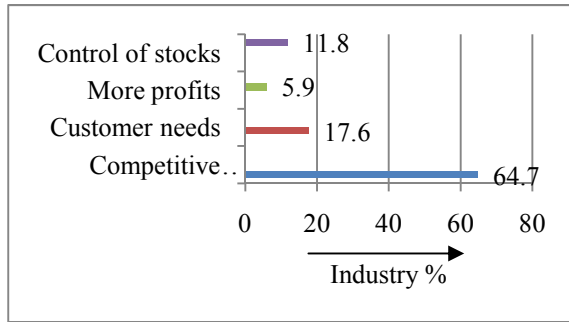


Fig. 1-Objective of Implementing ERP

- *ERP implementation remained successful/unsuccessful/Partly successful:*

According to the responses received from the industries; ERP implementation remained successful in 88% of the industries. In 12% of the industries ERP results in partial successful (failure) after its implementation. No industry has responded of complete failure.

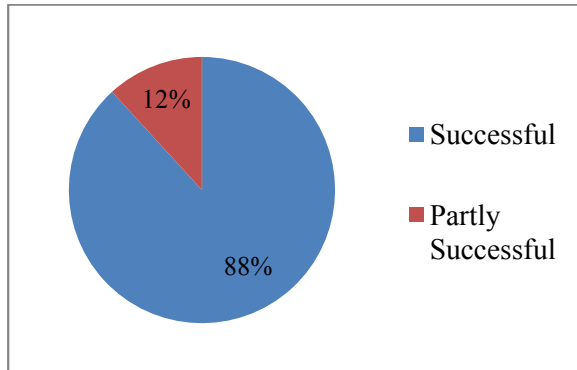


Fig.2- Status of ERP after its Implementation

- *Hiring of consultant for ERP implementation:*

94% of the industries have hired consultant for ERP's implementation and 6% industries responded that they have not hired consultant to implement ERP and responded that they have designed their own ERP system which suits the best to their business processes.

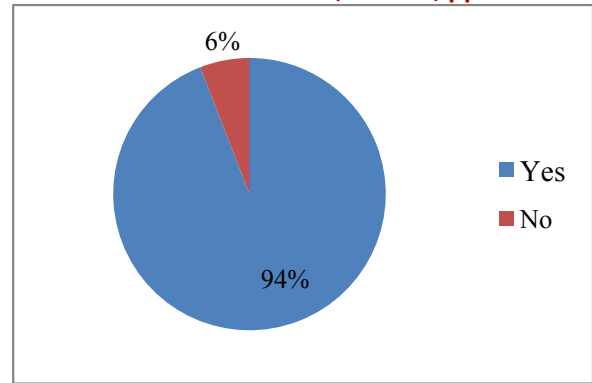


Fig.3- Hiring of Consultants

- *Nature of budget for ERP implementation:*

94% of the industries have allocated fixed budget for ERP's implementation and 6% industries responded that they have not assigned any fixed amount to the implementation of ERP in their organization.

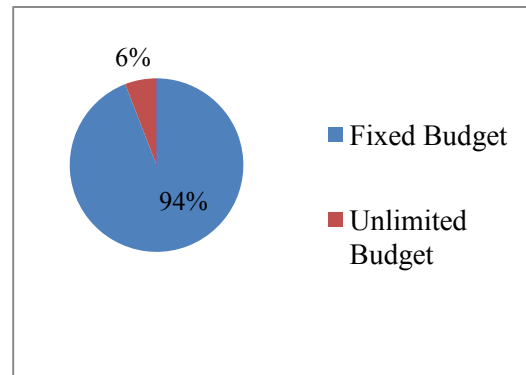


Fig. 4- Nature of Budget for ERP

- *Occurrence of over budgeting during ERP implementation:*

Most of the industries i.e. 77% of the industries haven't face problem of over budgeting and 23% of the industries have to spend more money as they initially decided to use up.

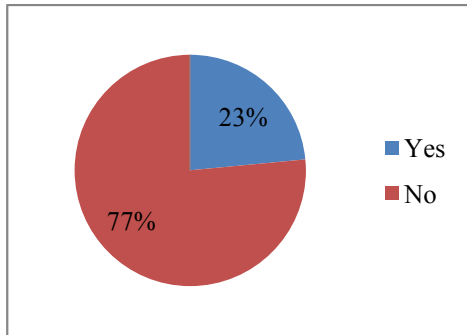


Fig.5- Over Budgeting during ERP

➤ *Support from Top/middle management during ERP:*

94% of the industries have full support from top management till the last phase of ERP implementation. Only 6% of the industries have lost the support from top management in middle way of ERP project.

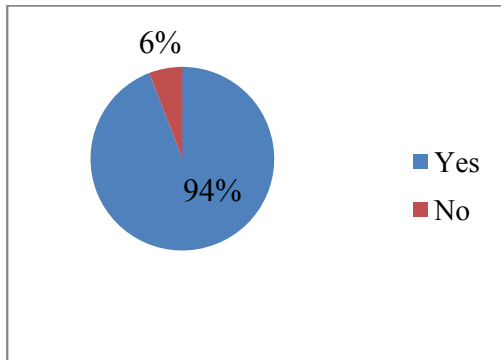


Fig.6 - Support from Top/ Middle Management during ERP

➤ *Support from primary users (End Users) during ERP:*

The result shows in almost every industry primary users were remained supportive during the whole process of ERP implementation. 82% of the industries have full support from primary users till the last phase of ERP implementation and 18% of the industries have no or little support from

primary users, so they have to face problems during the process of ERP implementation.

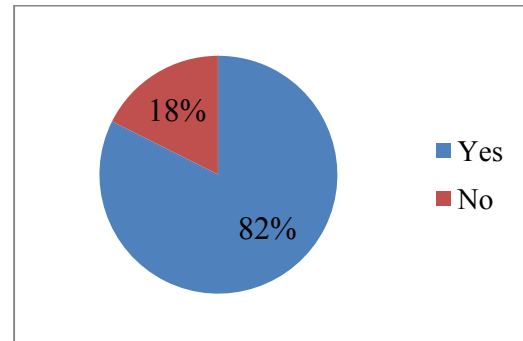


Fig.7- Support from Primary Users (End Users) during ERP

➤ *Expected targets achieved after ERP implementation:*

Maximum industries viz. 53% achieved their expected targets in the range of 80-100%. 17.6% of the companies achieved 60-80% and 23.5% of the industries achieved 40-60% of the expected targets respectively. 5.9% of the industries achieved about 20-40% of their predefined targets with ERP.

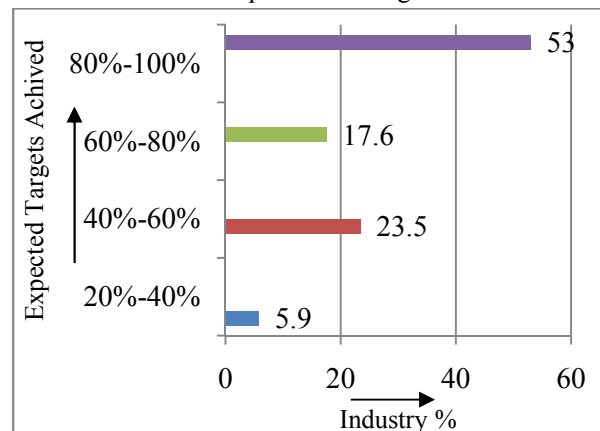


Fig.8– Achievements of Expected Targets

➤ *Percentage of financial benefits achieved after ERP implementation:*

Maximum %age of industries viz. 41.2% of the industries have achieved about 80-100% of financial benefits as expected before ERP implementation. 23.5% of the firms have

achieved about 60-80% of the financial benefits after ERP implementation. 11.8% of the firms have achieved 40-60% and 23.5% of the industries achieved 20-40% of the expected financial benefits respectively after ERP.

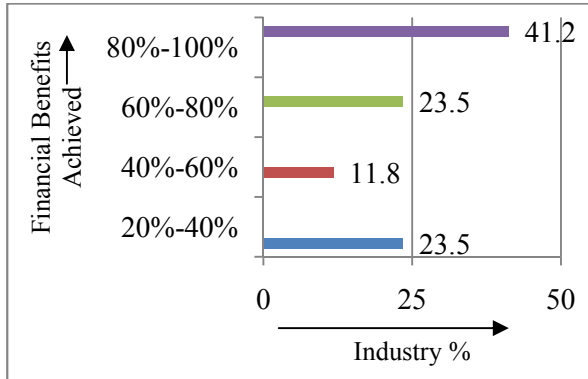


Fig.9– Achievements of Financial Benefits

- *Percentage improvement in Business processes:*

Almost all the industries achieved improvement in their business processes with ERP. 80%-100% improvement in business processes has been achieved by most of the industries viz. 41.2%. 35.3% of the companies achieved 61-80% of the expected improvement in their business processes. 17.6% and 5.9% of the industries achieved 40%-60% and 0-20% of improvement after ERP respectively.

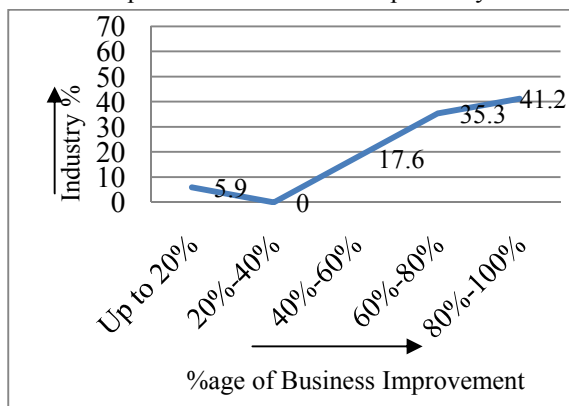


Fig.10- Percentage Improvements in Business Processes

- *Availability of Up-to-date information with ERP implementation:*

100% of the industries agreed with the availability of information with ERP. 64.7% percentage of the industries strongly agrees that they get up-to-date information and also on time. The rest 35.3% of the industries agreed that they also get up-to-date information whenever needed.

TABLE1- Information from ERP system

S.No.	Information from ERP	%age of Industries
1.	Strongly Agree	64.7
2.	Agree	35.3
3.	Disagree	None
4.	Strongly Disagree	None

- *The most difficult phase of ERP implementation:*

53% of the industries found difficulties in the implementation (Testing and Go-Live) phase. So, implementation is the most important phase of ERP implementation and it has to be implemented with Utmost care.

TABLE 2- Most Difficult phase of ERP system

S.No.	Difficult phase of ERP	%age of Industries
1.	Planning	17.6
2.	Design	5.9
3.	Transition	23.5
4.	Implementation	53

- *ERP software used in industry:*

SAP as software/package for ERP implementation has been used by most (58.8%) of the industries. ORACLE is being used by 11.8% of the industries as their software package. 11.8% and 17.6% of the

industries are using BAAN and others as ERP software respectively i.e. most of the market has been captured by SAP.

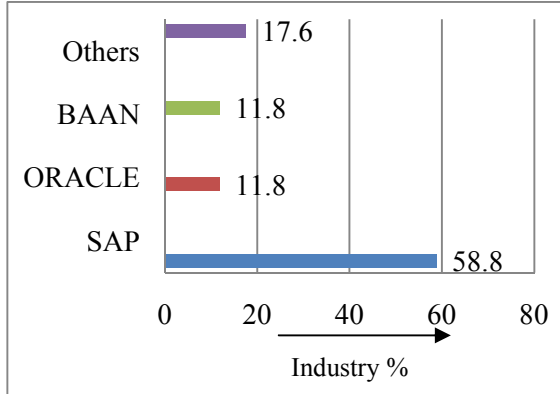


Fig.11- ERP Software/Package Used by Industries

➤ *Percentage of operational disruption during Testing & Go-Live (Inspection Phase):*

All the industries found operational disruption during the implementation phase. 47% of the industries found the minimum disruptions i.e. up to 20%, 35.3% of the industries found 41-60% of disruptions, 11.8% of the industries found operational disruption in 60-80% and 5.9% of the industries faced disruption in 20-40% range.

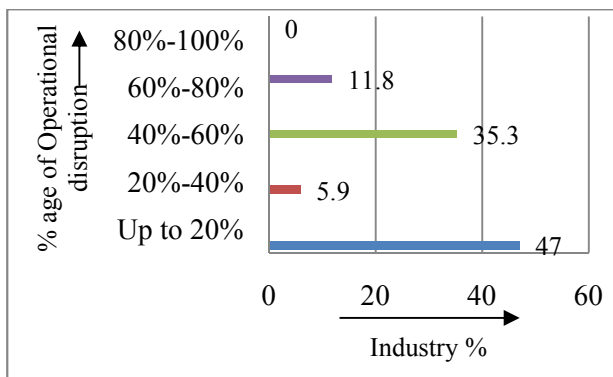


Fig. 12- Operational disruption during Testing

➤ *Delay in ERP implementation:*

Only some of the industries 18% have faced 10%-20% delay in ERP implementation. This delay may results in many losses like

over budgeting of the project. Whereas the rest of the industries didn't face any delay.

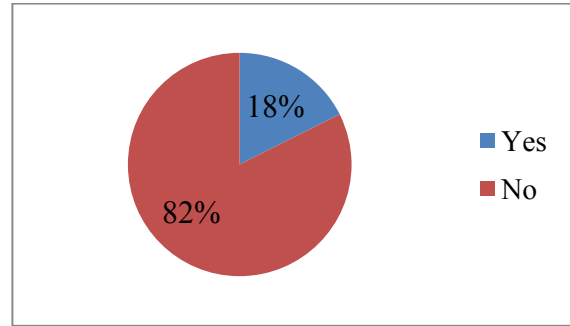


Fig. 13- Delay in ERP

➤ *Communication between management & employees during ERP implementation:*

53% of the industries have reported that there remained excellent communication between management and employees during the implementation process, while 47% industries quoted that there was Good communication between management and employees. No industry has reported of fair and poor communication.

TABLE 3- Communication between Management and Employees

S.No.	Communication Status	%age of Industries
1.	Excellent	53
2.	Good	47
3.	Fair	None
4.	Poor	None

➤ *Efficiency of ERP implementation project team:*

Majority of the industries reported that their ERP project teams worked in excellent or good manner and only few industries responded that the efficiency was poor or fair.

TABLE4- Efficiency of ERP Project Team

S.No.	Efficiency of ERP Project Team	%age of Industries
1.	Excellent	53
2.	Good	29.3
3.	Fair	11.8
4.	Poor	5.9

➤ *Level of satisfaction of Employees and Executives with current ERP solutions:*

32.4% and 52.3% of the employees have excellent and good level of satisfaction with their ERP system respectively.

TABLE 5- Level of Satisfaction of Employees and Executives with ERP

S.No.	Level of Satisfaction	% age of Industry
1.	Excellent	32.4
2.	Good	53.3
3.	Fair	15.3

➤ *Time spent on different phases of ERP:*

The Planning, design, transition phases take almost 8-9 months and implementation phase take 6 months. As per the information received the implementation phase takes the maximum time (as it is the most important phase). Thus, it took about 1-3 years for ERP system to implement in an industry depending upon the size of the industry.

TABLE 6 – Time Spent (in months) on Each Phase

S.No.	Phases of ERP	Time spent in months
1.	Planning	9 months
2.	Design	8 months
3.	Transition	9 months
4.	Implementation	6 months

3.3.1.2 Part-B of case Study

- Organizational Perspectives

Response: -

a) *Sustained management support:*

It is more relevant at the beginning (Planning) and at the end of the implementation. The reason is that at the beginning senior management should help in the rollout of the project, analyze the business benefits, define the mission and scope of the project and provide the resources needed for the project. At the end, there is the need to encourage the system usage and help in the commitment of user involvement.

b) *Good project scope management:*

It is relevant at the beginning when managers define the scope and in the last two phases viz. Transition and Implementation because the scope is usually revised and changed.

c) *Effective organizational change management and business process reengineering:*

Both are more relevant in the second phase (Design). In this phase the business blueprint is defined, and the business processes are documented. There is the need to understand how the organization intends to run its business within the ERP system and the changes in the organization.

d) *Project team composition:*

It is more relevant in the first phase (Planning) because it is when the project team is established although it can be re-structured along the implementation phases and according to the implementation needs. It is not the place for people whom the boss doesn't want.

e) *User involvement and satisfaction:*

It is relevant in the phases where their know-how is important to achieve a good customization of the system to meet the organizational needs i.e. in the planning phase. They participate in the definition of business requirements, help in the analysis of the ERP configuration and in conversion of data and the testing of the system.

f) *Project champion role:*

It is relevant in all the phases. It is less relevant in the third phase (Design) than in with the others because this phase is dedicated to configuration tasks and here the role of the champion is to guarantee that everything goes according to the plan.

g) *Trust between partners:*

It is relevant at the beginning when all the stakeholders involved in the project should share their goals and knowledge and at the end when they have to analyze and again share their knowledge to finish the project with success.

h) *Strong communication inwards and outwards:*

It is more relevant at the first phase i.e. planning where there is strong need of communication between senior management and the project team in

the definition of project plan and scope, and in the final phase (Implementation) where there is the need of a strong communication with the whole organization to start the go & live of the ERP system.

i) *Formalized plan and schedule:*

Its relevance decreases during the implementation of project. The reason is that at the beginning it is important to start planning as early as possible. A good project plan will ensure a better monitorization and coordination of activities during the whole project.

TABLE7- Observed Unified Critical Success Factor Model

		Critical Success Factors	Phase- 1	Phase- 2	Phase- 3	Phase- 4
Organizational Perspectives	Strategic	Sustained Management Support	8	7	6	9
		Effective Organizational Change	8	9	7	5
		Good Project Scope Management	7	8	6	5
		Adequate Project Team Composition	9	6	5	8
		Business Process Reengineering	6	8	5	8
		User Involvement and Participation	9	8	8	5
		Trust Between Partners	9	7	7	4
	Tactical	Dedicated Staff and Consultants	8	8	7	6
		Strong Communication Inwards and Outwards	9	8	3	9
		Formalized Project Plan/Schedule	5	6	7	4
		Adequate Training Program	5	6	9	9
		Preventive Trouble Shooting	5	8	6	10
		Usage of Appropriate Consultants	9	7	6	7
		Empowered Decision Makers	7	8	8	6
Technological Perspectives	Strategic	Adequate ERP Implementation Strategy	9	9	6	7
		Avoid Customization	6	9	6	5
		Adequate ERP Version	9	8	6	5
	Tactical	Adequate Software Configuration	6	7	8	5
		Adequate Legacy Systems Knowledge	7	8	9	6

TABLE-8 –Description of Phases

Phase-1	Planning	I Pre-evaluation screening II Package Evaluation
Phase-2	Design	I Gap Analysis II Customization
Phase-3	Transition	I Reengineering II Training
Phase-4	Implementation	I Testing II Go-Live

j) *Adequate training program:*

It is more relevant in phase 3 (Transition) and phase 4 (Implementation) because lack of proper training will prevent people and industries from deriving the full benefit from the ERP system resulting in failed or flawed implementation.

k) *Preventive troubleshooting:*

It is more relevant in the last phases, especially in the fourth phase (implementation) during which critical issues arise when the system is being tested. The system is actually tested under the critical conditions and the weak links are identified.

l) *Usage of appropriate consultants:*

It is relevant especially in the First phase (Planning) where managers have to decide the how, when and the numbers of consultants that they will incorporate in the project team.

m) *Empowered decision makers:*

It is more relevant in the middle phases because there is the need to quickly decide things and thus accomplish project plan/schedule on time.

- Technological Perspectives

Response:-

a) *Avoid customization:*

This should always be taking into account when managers are making decisions. The business processes are understood and mapped in such a way

that the arrived-at solutions match up with the overall goals of the industry.

b) *Adequate ERP version:*

It has the more relevance in the first phase. From the beginning until the end of the project implementation, ERP recommends that the project team follows the upgrade of software releases and should consider the adoption of new ones.

c) *Adequate software configuration:*

It is more relevant in phase 3 (Design), when the ERP system is configured. The software configuration should follow the business requirements defined in the previous phase.

d) *Adequate legacy system:*

It is less relevant at the first phase (Planning) because this phase is related with the preparation of project implementation. In the next phases the need of knowledge of legacy systems is more relevant in order to minimize the effort of configuration and help in conversion of data and the creation of interfaces.

e) *Adequate ERP Implementation Strategy:*

This critical factor is more relevant in the two phases i.e. planning and implementation. Because if the implementation strategy is not chosen properly then it may result in a failed or flawed implementation

TABLE 9 – Observed Unified Critical Failure Factor Model

		Critical Failure Factors	Score	Rank
Organizational and Technological Perspectives	Strategic	ERP system misfit	8	2
		Poor Consultant Effectiveness	10	1
		Poor IT Infrastructure	10	1
		Poor Knowledge Transfer	10	1
		Over- Reliance on heavy Customization	8	2
		Poor Project Management Effectiveness	8	2
		Poor Quality of Business Process Reengineering	10	1
	Tactical	Poor Top Management Support	6	3
		User’s Resistance to change	10	1
		Unrealistic Expectations from Top management	8	2

Response obtained: -

According to the response received from the industries poor quality of IT infrastructure, poor effectiveness of consultants, poor planning during business process reengineering and the resistance to change by the users are the most critical failure factors that were responsible for delay in ERP implementation and results in failure of ERP project in their organization. The consultants communicated ineffectively in their during the project phase due to language barriers and they just copied the ERP configuration directly from the branch office and only suggested workarounds without applying professional skills to conduct BPR to bridge the gap between ERP systems and business processes. The project team members have an unclear vision of why or how to conduct business process reengineering, and their consultants provided unprofessional guidance for conducting BPR in their organization. The project team members found it difficult to collaborate and contribute to BPR and the poor quality of BPR has led to the incorrect system configuration problems. Therefore, this

exercise gives us an insight that the management of ERP implementing teams must take care of the failure factors with highest scores and scores in descending order are identified as tables 10, 11 and 12. Due to top management’s insufficient financial resource provided for the implementation budget, a low performance IT infrastructure hardware was proposed by the consultants and project manager so as to reduce the costs of ERP implementation. The poor IT infrastructure contributes to the slow processing capability of the ERP system. Due to a limited knowledge of the formalized business processes and ERP systems, as well as work overload during the implementation process, users resist the change. This contributes to user’s resistance to participate in BPR, a lack of use of the ERP system, and poor quality of data entered into the system which results in failure and losses in ERP implementation. Thus, during the ERP project, consultant’s effectiveness, IT infrastructure, Business Process Reengineering and user’s resistance are the

most critical factors of all. So, while implementing ERP, these factors must be given high priority to all other factors.

TABLE 10- Failure Factors of High Relevance

Score	Failure Factors
10	1. Poor Consultant Effectiveness
10	2. Poor IT Infrastructure
10	3. Poor Knowledge Transfer
10	4. User's Resistance to Change
10	5. Poor quality of BPR

According to the responses received from the industries Poor consultant effectiveness, Poor IT infrastructures, Poor knowledge transfer, User's resistance to change are the most critical factors that may results in failure of the ERP systems and must be gripped with utmost care.

TABLE 11- Failure Factors of Normal Relevance

Score	Failure Factors
08	1. ERP system misfit
08	2. Inadequate Resources
08	3. Unrealistic expectations from Top Management
08	4. Poor Project Management Effectiveness
08	5. Over- Reliance on Heavy Customization

TABLE 12- Failure Factors of Least Relevance

Score	Failure Factors
06	1. Poor Top Management Support
05	2. High Turnover Rate of Project Team members
05	3. Too tight Project Plan/ Schedule

According to the responses received from the industries, Poor Top Management Support, High Turnover Rate of Project Team members and too tight Project Plan/ Schedule are the factors of least relevance in the implementation of ERP systems.

4. Conclusions and Scope for Future

4.1 Conclusions

In the present research work, the results of the study show that ERP implementation is a versatile information tool to achieve competitive advantage in the market and has a lot of potential for the small industries which are being continuously threatened by modern economic turbulence. In manufacturing industry, successful implementation of ERP has been mostly limited to large organizations. Literature review has also yielded little evidence of any such implementation in small or medium scale industry. The highlights of the case study suggest that the adopters of ERP must devote more attention in Transition, Implementation phases of ERP systems out of all phases. Top Management support is the most important factor in an ERP implementation followed by strong communication inwards and outwards and adequate training program. Training is perhaps the most misjudged activity of the ERP implementation lifecycle. Lack of proper training can prevent people and industry from deriving the full benefit from the ERP systems resulting in failed or flawed implementation. Consultants should have in-depth knowledge of software and industry should be able to manage well these consultants. Consultants should be assigned a liaison officer-a senior manager-who can act as the guide and intermediary between them and the implementation team. Industries should avoid customization to implement ERP within their budget. Understanding and identifying the CSFs/CFFs are essential to increase the chances the successful implementations of ERP. This study identifies CSFs and CFFs that are relevant to the ERP implementation projects across industries. However, it is also found that the industries engaged in ERP implementation differed significantly in performance

concerning CSFs and CFFs. The result from analysis also showed a correlation between IT professionals and several CSFs/CFFs such as selection of ERP system, user training and involvement, sustained management support, effectiveness of consultants, ERP project team, effective communication plan and IT infrastructure.

4.2 Scope for Future Work

Application of ERP system in Indian industries is still in nascent stage and during research review; it was observed that the awareness level on the latest information tools like ERP is limited among managements of some large industries only. In this context, the following aspects need attention for future research:-

- Apart from manufacturing sector, process sector is highly cost and energy intensive and includes industries like paper mills, sugar mills, fertilizer plants etc, where an attempt can be made to implement ERP system over various systems and sub systems to considerably integrate the whole business processes.
- ERP can also be implemented over other SME industries like foundries, power looms, rolling mills etc. to integrate the whole information in their organization.
- To validate the found results using existing suitable methods like ANOVA, TAGUCHI etc.
- To formalize CSFs relevance analysis and develop a general framework to analyze the CSFs relevance in mostly used ERP systems.

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