

A FRAMEWORK FOR THE IMPLEMENTATION OF ENTERPRISE RESOURCE PLANNING (ERP) TO IMPROVE THE PERFORMANCE OF BUSINESS

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ABSTARCT:

This paper presents a theoretical framework that has been developed which portrays critical success factors (CSFs) in the process of implementing an ERP system. All the critical factors were developed through extensive synthesis of the relevant literature. Also, performance benefits or measures were developed through extensive literature review. The results of the implementation framework, being tested in a case study at two Indian SMEs and some conclusions are drawn.

Keywords: Enterprise Resource Planning (ERP), Critical Success Factors (CSFs), Small and Medium Sized Enterprises (SMEs).

1. INTRODUCTION

Enterprise systems are "commercial software packages that enable the integration of transaction-oriented data and business process throughout an organization" [Markus and Tanis, 2000]. Typically, ERP systems are software packages composed of several modules, such as human resources, sales, finance and production, providing cross-organization integration of transaction-based data throughout embedded business processes. These software packages can be customized to the specific needs of each organization up to certain limits [Esteves and Pastor 2009]. Today organizations face a new challenge of increasing competition, expanding markets and enhancement in customer expectations [Umbale & Umbale, 2003]) and thus ERP systems have been developed to provide a total business system in order to improve business performance.

Due to the relative newness of the ERP field, rapid advances in ERP technologies, and the high incidences of implementation delays and failures, practitioner-oriented articles to a large extent dominate literature. Descriptive and case studies form the bulk of academic research with survey studies gaining prominence in the past four to five years. These studies, to a large extent, adopted a short-term focus by stressing the effective management of the ERP system implementation process. The critical factors approach is widely prevalent in ERP systems literature. Many failures and near failures of ERP system deployments have been attributed to the lack of a critical factors approach to ERP implementation [Umble and Umble, 2003]. In this globally competitive environment companies need to constantly improve business performance by improving their business processes. Since the 1990's more and more companies are turning to enterprise resource planning to replace obsolete process and improve business performance. Now the IT implementation dynamics have changed such that companies expect a breakeven ROI of two to three years. Doing the ERP implementation right can be rewarding; failing can be devastating. Therefore, it is very important to know the critical success factors of ERP implementation and make sure full emphasis are put on these. ERP implementation is a lengthy and complex process, and there have been many cases of unsuccessful implementations which have had major impacts on business performance [Parr and Shanks, 2000]. Moreover, an effective ERP implementation requires appropriate managerial interventions as part of the implementation process.

Critical success factors have been used significantly to present or identify a few key factors that organizations should focus on to be successful. As a definition, critical success factors refer to "the limited number of areas in which satisfactory results will ensure successful competitive performance for the individual, department or organization. Following are the 23 variables selected by author from the literature review. Top

management support, Project team competence, Interdepartmental cooperation, Clear goal and objectives, Project Management, Interdepartmental Communication, Appropriate management of expectations, Project champion, Vendor support, Careful package selection, Data analysis and conversion, Dedicated resources, Steering committee, User Training, Education on new business processes, BPR (Business process re-engineering), Minimal Customization, Architecture choices, Managing Cultural Change, Change management, Vendor partnership, Vendor tools & Use of consultants. Also, Extensive literature review was carried out for identification of various attributes of ERP outcomes which were grouped into the performance outcomes. Following are the 25 variables selected by author from the literature review. Work Simplification, Data Integration, Administration Expenses Reduces, Better Inventory Outflow, Increased Work Efficiency, Data Transparency, Information Accuracy, Business Process Improvements & Increased Capacity, Overall Productivity, Substitutability, Data Analysis, Information Availability, Data Import / Export, Information Timeliness, Production Planning Improvements, Enhances Quality of Decision Making, Data Security, Up-to-date Data Base Contents, System Extensions / Changes, Improves organization wide Communication & Departmental Cooperation, Staff Requirements Reduction, System Quality, Information Back Tracking, User Interface Flexibility, Improves Workers Participation in the Organization.

2. THE PROPOSED THEORETICAL FRAMEWORK

The theoretical framework (Figure 1) is represented by four main sets of factors, namely approach related factors, Culture, Communication & Support related factors, Project management related factors and Vision, Scope, Goal & Infrastructure related factors. A theoretical implementation process was identified by [Ibrahim, 2008] such that it is suggested that there is an explicit linkage between factors and ERP implementation phases.

As TPM (Total Productive Maintenance) is the philosophy and practice of preventing loss of productive machine time. It involves everyone in identifying, monitoring and correcting the root cause of each of the losses. Out of the eight pillars of TPM, Office TPM is one of the pillars. Office TPM must be followed to improve productivity and efficiency in the administrative functions. This includes analyzing processes and procedures towards increased office automation. Apart from the direct benefits of TPM, the office TPM have indirect benefits too i.e. higher confidence level among the employees as well as neat, clean and attractive work place and favorable change in the attitude of the operators. As we are going towards globalization, to compete with other worldwide industries, it is necessary to move our Indian SMEs towards modern trend development in all sectors of SMEs. So, author found that, Office TPM is another best tool along with ERP for making Indian SMEs competitive and effective. Also office TPM focuses on identifying and eliminating effectiveness losses in administration activities (i.e. under performance, duplication, waste, lack of value etc.).

3. RESEARCH METHODOLOGY

The purpose of this paper is to identify and interpret the critical factors that affect Enterprise resource planning (ERP) System and organizational performance and statistically validate if any correlation exists between them. In order to drive this purpose, a model developed through the extensive literature review is taken as the foundation. The instrument developed for collecting the data contains 23 input variables (Independent variables) and 25 output variables (Dependent variables). These are the critical areas where there is chance of improvement which will affect the performance of an organization. When developing measures, all factors should be alien with organizational objectives. The goal is to couple Critical Success Factors (CSFs) with organizational performance in order to stay aligned with the organization in a very complex, ever-changing environment.

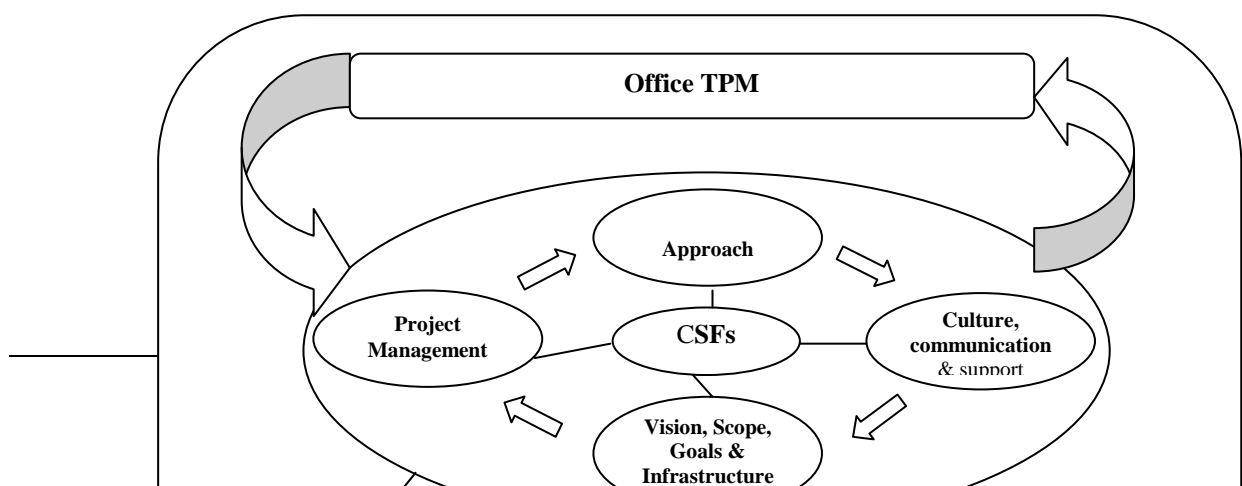


Figure 1: Proposed Theoretical Framework for Successful ERP Implementation at Indian SMEs.

A survey method is used to collect the data. The data collected was factor analyzed for establishing the reliability and validity of the instrument. To test the causal relationship multiple regression analysis was carried out. The main reason for employing multiple regressions is to determine the minimum number of a set of variables, which are most strongly related to the dependent variable, and to estimate the percentage of variations in the dependent variable. Model is developed by collecting the data from Indian small and medium-sized enterprises (SMEs). The hypothesis is tested and model is validating by conducting case studies. Figure 2 shows the test model whereas figure 3 shows the structural coefficients of the derived model.

4. CASE STUDY AND MODEL VALIDATION

The objective of the case study is to compare the derived model of researcher and the perception of case study respondents on the linking between the critical success factors of ERP implementation and the organizational performance measure indicators. For the purpose of accomplishing these objectives two small and medium enterprises were chosen as sample units for the study. The study was conducted in industries that have already implemented this initiative. The case study helps in evaluating the ERP implementation and overall performance. Using the derived understanding the empirical study was conducted on these two SMEs based on a structured questionnaire. The developed research instrument was administered amongst 25-30 respondents having adequate knowledge of Enterprise Resource Planning system modules and varying industrial experience. The questionnaire contained a set of 20 linkages between the ERP implementation factors and performance measure indicators. The respondents were solicited to put their marks on the five point Likert Scale based on their experiential perception. Then, their responses were analyzed statistically to validate the derived model.

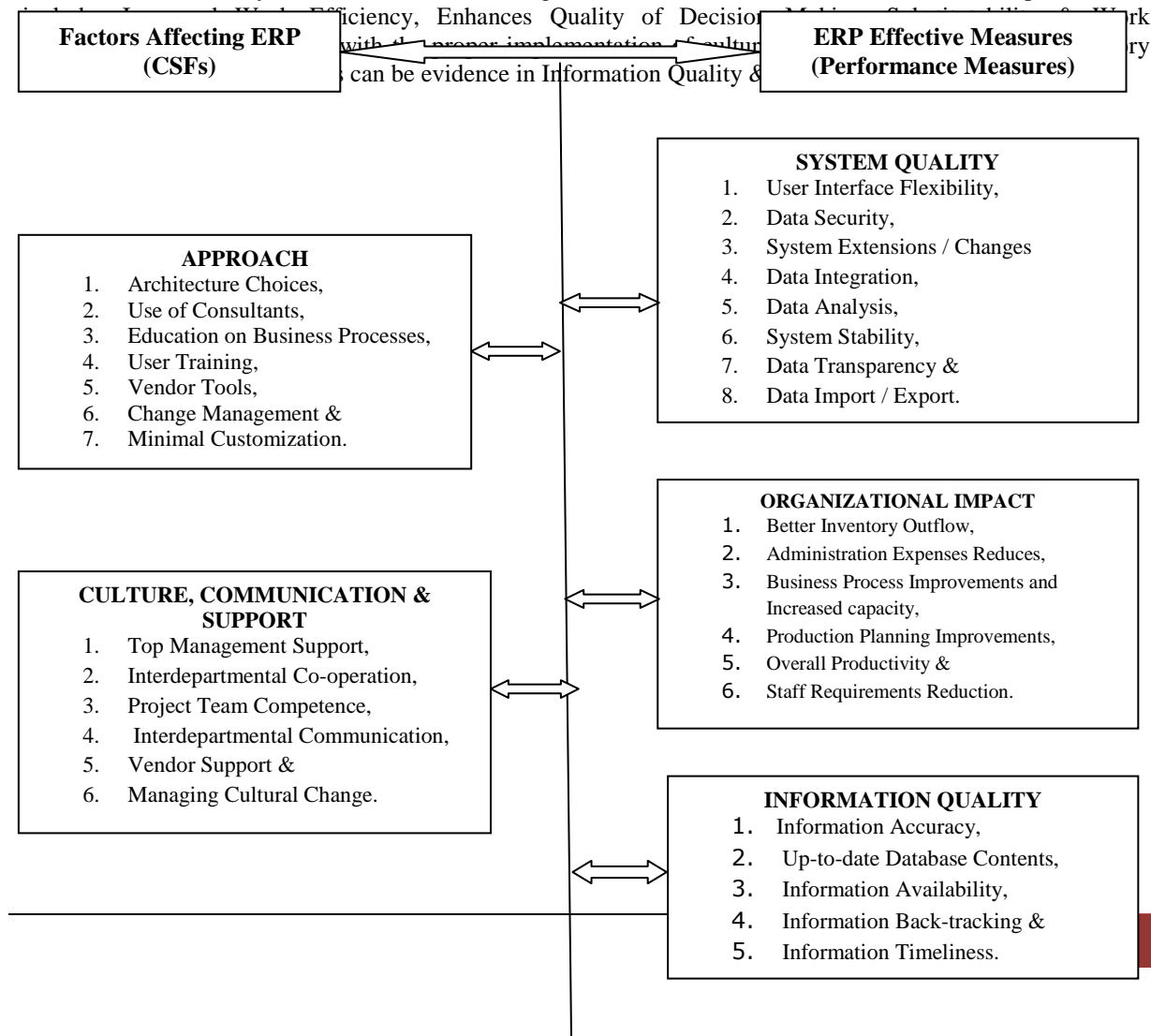
To validate the test model, validation questionnaire was distributed among the 30 employees of each of the study industries of different department having varying experience. 26 filled questionnaires were collected. The data was analyzed by doing the statistical analysis (using F test, with an alpha level of 0.05) to check whether significant differences exist between the scores. The finding of the analysis shows that, there was an average score less than 4 & the negative difference between the scores of six questions. After observing all these relationships, we conclude that, from this case study analysis, the derived test model was validated and found to be reliable as most of the relationships between Implementation factors and Performance measures are found to be significant.

4.1 Derived Model Findings

Figure 3 shows the structural coefficients of the derived model. Relationship between the ERP implementation factors and performance measure indicators are as follows.

'Approach' was one of the four factors affecting ERP. Total seven critical success factors were identified after grouping in this category which includes Architecture Choices, Use of Consultants, Education on Business Processes, User Training, Vendor Tools, Change Management & Minimal Customization. As an input factor, Approach leads to the improvement in all the five output factors or ERP performance measure indicators i.e. System Quality (which consists of User Interface Flexibility, Data Security, System Extensions / Changes, Data Integration, Data Analysis, System Stability, Data Transparency & Data Import / Export), Organizational Impact (which consists of Better Inventory Outflow, Administration Expenses Reduces, Business Process Improvements and Increased capacity, Production Planning Improvements, Overall Productivity & Staff Requirements Reduction), Information Quality (which includes Information Accuracy, Up-to-date Database Contents, Information Availability, Information Back-tracking & Information Timeliness) , Individual Impact (which includes Information Accuracy, Up-to-date Database Contents, Information Availability, Information Back-tracking & Information Timeliness) & Workgroup Impact (which includes Improves Workers Participation in the Organization and Improves Organization wide Communication & Departmental Co-operation). As there was a positive and strong relationship between all the performance measure indicators, we can say that, all the CSFs grouped in Approach are important for the enhancement of all the identified 25 performance benefits of an Indian SMEs.

'Culture, communication & Support' was the second ERP Implementation factor. Total six critical success factors of ERP implementation grouped in this category and which includes the Top Management Support, Interdepartmental Co-operation, Project Team Competence, Interdepartmental Communication, Vendor Support & Managing Cultural Change. There was a positive and strong relationship observed between the performance indicator factor Information Quality (which includes Information Accuracy, Up-to-date Database Contents, Information Availability, Information Back-tracking & Information Timeliness) and Individual Impact (Which



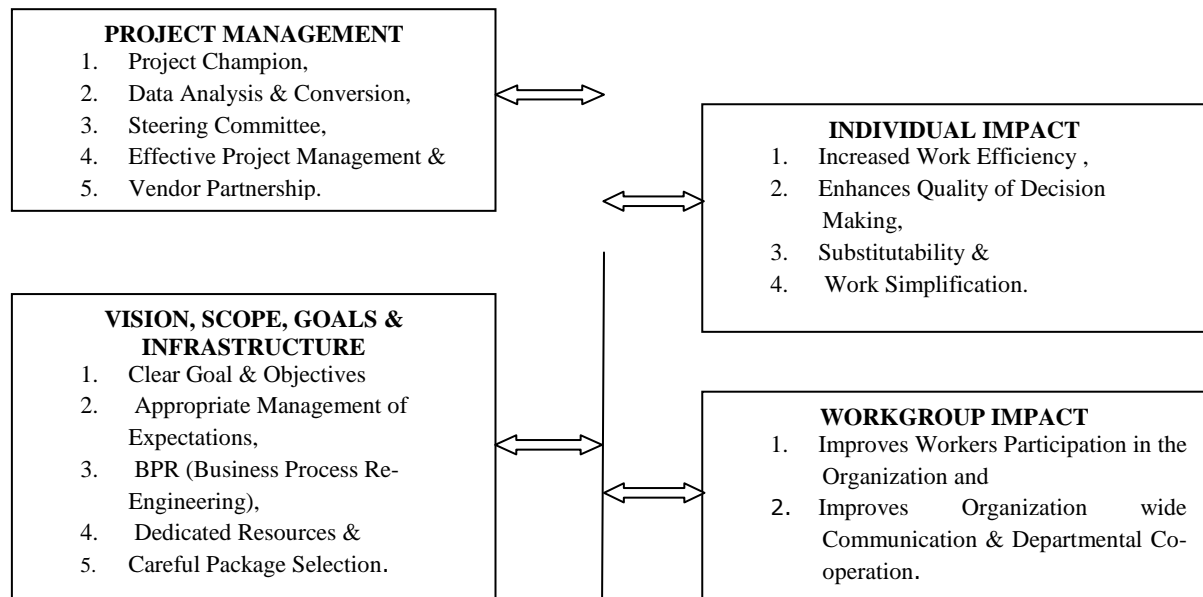


Figure 2:Test Model

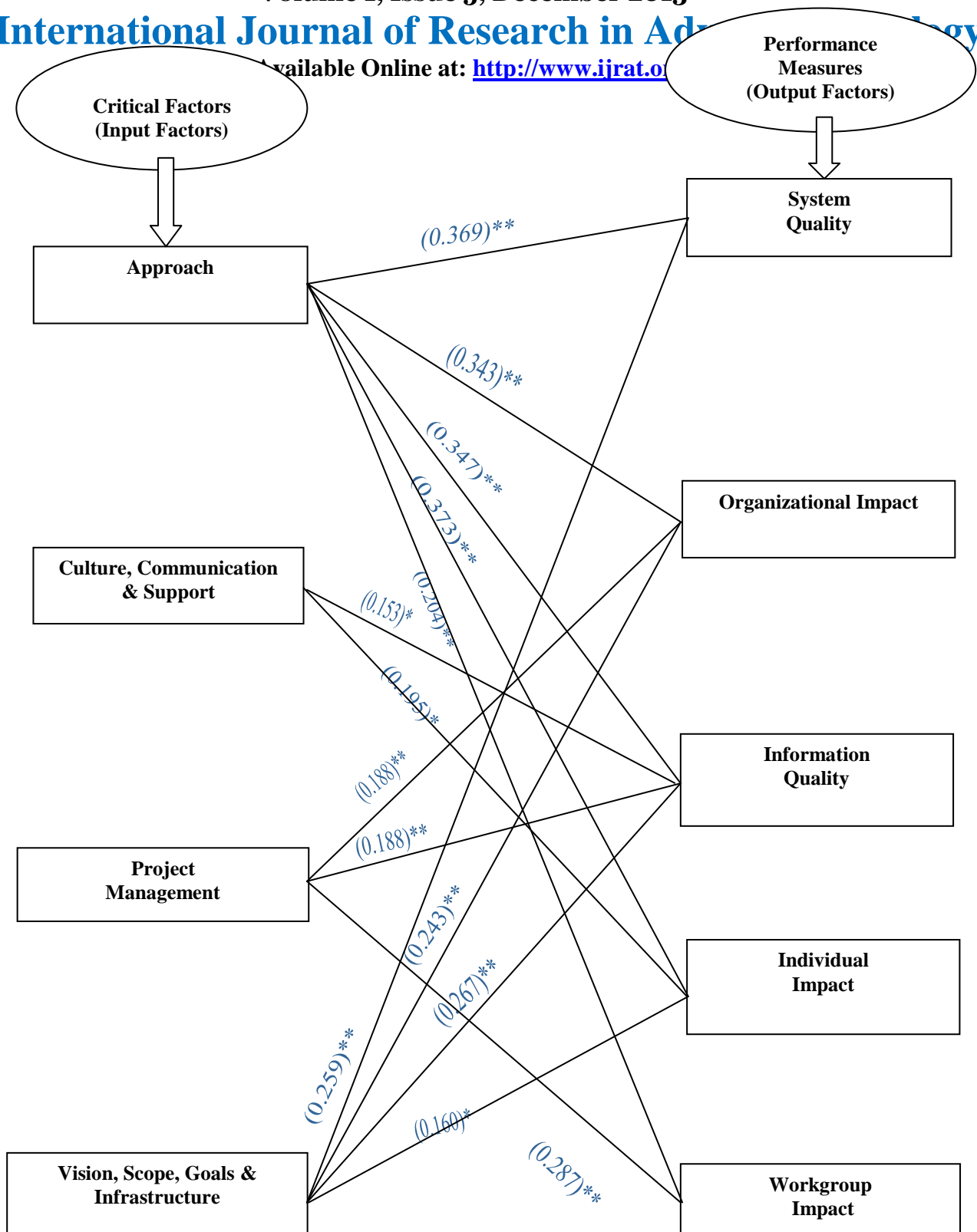


Figure 3. Structural coefficients of the derived model.

‘Project Management’ was the third ERP Implementation Factor. Total five critical success factors were identified in this category. They are Project Champion, Data Analysis & Conversion, Steering Committee, Effective Project Management & Vendor Partnership. There was a strong and positive relationship observed between the ERP Implementation factor Project Management and performance measure factors Organizational Impact (which consists of Better Inventory Outflow, Administration Expenses Reduces, Business Process

Improvements and Increased capacity, Production Planning Improvements, Overall Productivity & Staff Requirements Reduction), Information Quality (which includes Information Accuracy, Up-to-date Database Contents, Information Availability, Information Back-tracking & Information Timeliness) & Workgroup Impact (which includes Improves Workers Participation in the Organization and Improves Organization wide Communication & Departmental Co-operation). It means that, proper implementation of Project Management category factors leads to improvement in performance measure indicators- Organizational Impact, Information Quality and Workgroup Impact. The Project Champion plays a major role in this category as project champion is the one who has power to set goals and legitimize change. The steering committee also makes desirable improvements in almost all the performance measures in general but, it can improve the organizational impact, information quality and workgroup impact category in particular.

'Vision, Scope, Goals & Infrastructure' was the fourth ERP Implementation factor. Total five critical success factors were identified in this category and they are Clear Goal & objectives, Appropriate Management of Expectations, BPR (Business Process Re-Engineering), Dedicated Resources & Careful Package Selection. There was a strong and positive relationship observed between this ERP implementation factor and the performance measure indicator factors namely, System Quality (which consists of User Interface Flexibility, Data Security, System Extensions / Changes, Data Integration, Data Analysis, System Stability, Data Transparency & Data Import / Export), Organizational Impact (which consists of Better Inventory Outflow, Administration Expenses Reduces, Business Process Improvements and Increased capacity, Production Planning Improvements, Overall Productivity & Staff Requirements Reduction), Information Quality (which includes Information Accuracy, Up-to-date Database Contents, Information Availability, Information Back-tracking & Information Timeliness) & Individual Impact (which includes Information Accuracy, Up-to-date Database Contents, Information Availability, Information Back-tracking & Information Timeliness). With proper implementation of the above category CSFs in Indian SMEs, almost all the performance measure indicators or performance benefits will be improved.

5. CONCLUSION

From the statistical analysis, instrument shows the relationship between the critical success factors which are very important while implementing ERP system and its impact on organizational performance indicators for Indian SMEs. This helps top management in taking decisions while formulating policies, in strategic planning. The emphasis on these factors in the right context can help Indian SMEs in realizing greater benefit through such improvement strategies.

In the first phase of this research study, ERP was characterized as a 23 independent (CSFs) and 25 dependent (Performance measures) variables system that included all of a firm's business applications. The identification of these distinct variables through a synthesis of literature facilitates the use of a systems approach to understanding ERP thus providing a foundation for the second phase of the study. Further, cross-study comparisons yielded 5 performance measures to evaluate ERP implementation benefits as well as 4 CSFs for facilitating system deployment. A theoretical model was developed to illustrate the relationships associated with ERP system implementation. The model indicated that different ERP system implementation statuses result in differential performance benefits accruing to firms; and CSFs influence the relationship between ERP system implementation status and changes in performance. Data were gathered through a cross-sectional survey of Indian SMEs that had implemented ERP systems for testing the linkages proposed in the model. Multiple linear regression and univariate ANOVA were used for hypotheses testing.

Acknowledgments

The author is thankful for all the previous researchers for their constructive comments and findings.

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