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Poonam Garg Atul Garg

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Factors influencing ERP implementation in retail sector: an empirical study from India

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Abstract

Purpose – The purpose of this paper is to explore the factors influencing the enterprise resource planning (ERP) implementation success in Indian retail sector. Additionally, the study also addresses the relationship between factors that influence ERP implementation and the success of ERP implementation empirically. Strategic, Technological, People and Project management are the examined factors.

Design/methodology/approach – Empirical data were collected through survey questionnaire from practitioner like project sponsors, project managers, implementation consultants and team members who were involved in ERP implementation in retail sector.

Findings – The results of the study has empirically verified that Strategic, Technological, People and Project management factors are positively influencing ERP implementation success. All four hypotheses were supported by results of the study.

Practical implications – This study will provide valuable insights to researchers, practicing managers and those who are planning to implement ERP in retail organization.

Originality/value – Very few empirical studies have been performed to investigate the influencing factor of ERP implementation and types of relationships between factors that influence ERP implementation and the success of ERP implementation in Indian retail sector. This study examines how Strategic, Technological, People, and Project management factors are influencing ERP implementation success in retail sector of India. Therefore, the research can make a useful contribution.

Keywords Enterprise resource planning (ERP), Retail, Cause-and-effect diagrams

Paper type Research paper

1. Introduction

Enterprise resource planning (ERP) has become a key business driver in today’s world. An ERP system is a software architecture that connects information among the different functions of an enterprise, when implemented successfully. The different organizational silos (which often function separately irrespective of dependencies) are then able to use the flow of seamless integration of information and utilize it to present an enterprise-wide “big picture” to the decision makers. This enables the decision-making process to be timely, consistent and reliable across organizational units and geographical locations. The hallmark of a successful ERP implementation lies in the long-term efficiencies (increased productivity and speed of execution) that are gained due to information integration underpinned by elimination of redundant information and resulting cost savings. Over the past few years, firms around the world have implemented ERP systems since the use of ERP has been considered as a major determinant to gain competitive advantage. ERP is a suite of application modules that can link back-office operations to front-office operations as well as
internal and external supply chains (Yang and Su, 2009). Considering the benefits mentioned previously, it is easy to see why ERP systems are accepted to be one of the most significant developments in the world and also the most accepted standard business software of the last decade (Muscatello and Chen, 2008). For effective business communication with their customers, vendors and suppliers they need to adopt to the data formats that the global organizations use. Also, they need to meet the compliance requirement of their customers’ countries. This is possible if there is a seamless flow of information across the organization (Soja, 2006). It has been observed that the effective implementation of such a system in retail segment can bring about many benefits. The most generalized ones being, cost reduction, productivity and quality improvement, better resource management, improved decision-making and planning, and organizational empowerment (Federici, 2009; Kamhawi, 2008).

Market liberalization and changing consumer behavior have shown the seeds of a retail transformation. Indian retailing is growing fast and imparting the consumer preferences across the country. The retail sector is the largest sector in India after agriculture, accounting for over 10 percent of the country’s GDP and 8 percent of employment. Over the last few years, Indian retail industry is one of the rapidly growing industries in India. Unlike the initial phase, the retail industry was not very organized, however, with the changes of tastes and preferences of the consumers. These days, the industry is getting more popular and getting organized as well. The retail industry in India is currently growing at a great pace and is expected to go up to US$833 billion by the year 2013 (www.indiaretailing.com).

The importance of ERP implementation is more highlighted when it comes to retail sector. Retailers are also trying to reap in the benefits of the technology. Retailers are using ERP for product planning, parts purchasing, maintaining inventories, interacting with suppliers, providing customer service and tracking orders. With ERP, retailers can save money in maintaining inventory, reduce the respondent time to the marketing demand, and get competence. Retail organizations are increasingly implementing ERP solutions to improve operations and provide faster customer response. ERP systems are huge and complex, involve substantial investments of time and money and bring about considerable organizational change and thus, warrant careful planning and execution for successful implementation (O’Leary, 2004). Moreover, they are not purely software system and neither is their implementation merely an IT project. An ERP system affects how a business conducts itself and an organization’s business processes, people’s jobs and information flows (Somers and Nelson, 2001).

As can be seen successful ERP implementation is an expensive proposition. The consequences of failure would be disastrous. In spite of great advancements in software development, ERP failure is fairly common. There exist different stories regarding success and failures of ERP implementation. Thavapragasam and Zhang mentioned that 75 percent of the ERP systems are failed; Parr said that many ERP systems implementation were not completed on time, and within budget. The past studies reflect that failure percentage of ERP systems is ranging from 40 to 90 percent (Zhang et al., 2003; Parr and Shanks, 2000; Thavapragasam, 2003). It is evident in the past research that 90 percent of ERP systems implementation was found behind schedule or over budget whereas the success rate is approximately 33 percent. A survey of 117 companies involved in ERP implementation lead to the finding that 25 percent ERP projects were over budget, 20 percent were terminated before implementation and 40 percent of the respondents confirmed that ERP projects’ failed to achieve business objectives (Fitz-Gerald and Carroll, 2004).
As failure rate of ERP implementation is so high and the consequent impacts are so damaging to business, there is a compelling reason for investigating the factors which may influence the success of ERP implementation in organizations (Somers and Nelson, 2001; Singh and Wesson, 2009). It is imperative for organization to study the experiences of others and learn from their practices and influencing factors. With this in mind, an empirical study was undertaken to provide some insight into those factors that may influence the ERP implementation success. Specifically, the research objectives of the study are:

- identify the factors that influence the ERP implementation in Indian retail sector; and
- the relationship between factors that influence ERP implementation and the success of ERP implementation in Indian retail sector.

This paper is organized as follows. Section 2 describes the theoretical background and literature review on factor influencing ERP implementation. The third and fourth section of the paper describe the research model and hypothesis and methodology adopted for this paper. The fifth section presents the data analysis and results. The next section presents the result discussion and recommendations. Conclusion, limitation and further direction of research are presented in the last section.

2. Theoretical background and literature review

In retail-based business, integration of the various business functions is an essential prerequisite. A numbers of retail chains in India have already invested in ERP system to improve their businesses. Retail chain in India heavily rely on ERP to track the supply chain, financial process, inventory, sales and distribution, overall visibility of the consumer across every channel and take customer centricity to a new level. However, many retailers in India are still using various islands of automation which are not integrated with each other to manage their core business functions. This strategy can results in somewhat lower levels of effectiveness and efficiency. Implementation of ERP systems is a highly complex process which is influenced not only by technical, but also by many other factors. Hence, in order to safeguard the success of ERP implementation it becomes imperative for the retailers to get a deeper insight into the factors which influence the ERP implementation.

To assist the understanding of influential factor of ERP implementation, cause-and-effect diagram was constructed. A cause-and-effect diagram is a tool that can be used to represent the relationship between some effect that could be measured and the set of possible causes that produce the effect (Berenson and Levine, 1996). The technique was originally developed by Kaoru Ishikawa in the 1960s and is also called an Ishikawa diagram (Ishikawa, 1985). Other names used to refer to the tool include Fishbone diagram (because of the way various causes are arranged on the diagram) and a root cause analysis diagram (because of the ability to identify possible root causes for a specific effect or problem). Cause-and-effect diagram was constructed by showing the effect or problem on the right hand side of the diagram and the major causes listed on the left hand side. The causes are often subdivided into a few major categories depending on the problem under investigation. Berenson and Levine (1996) referred to examples of categories such as manpower, methods, materials and machinery that can be used. Within each major category, specific causes are listed as branches or sub-branches. Cause-and-effect diagrams offer a number of advantages and are often used when there is
a need to understand certain processes, determine root causes to specific problems, or identifying areas for data collection, etc. (Chang and Lin, 2006; Suwignjo et al., 2000).

The nature of the problem in this study can be summarized by any one of the following statements: “what factors influence the ERP implementation?” Cause-and-effect diagram seems to be an appropriate option to analyze the factors influencing ERP implementation. The problem was simply formulated as “factor influencing ERP implementation.” The next step was to identify the main possible causes for these problems (the effect to be investigated) in order to complete the branches of the diagram. The establishment of causes was based on items identified from the literature survey and groupings were obtained through factor analysis performed during the pilot studies.

A consolidated list of influencing factors that are most cited in literatures, by various authors is shown in Table I.

Subsequent to literature survey, for identifying the causes of “factor influencing ERP implementation” a pilot study was conducted with a small sample size to understand the possible items of causes which may influence the ERP implementation in Indian retail sector. For pilot study, an initial draft questionnaire was developed containing the 29 items (questions) identified from the literature. These 29 items were incorporated into a survey questionnaire, it asked the respondents to indicate the degree they considered each item a critical failure factor by using a five-point Likert-type scale, with 1 being “strongly disagree” and 5 being “strongly agree.” Dornyei (2007) believed that in questionnaire construction process “some external feedback is indispensable when we have prepared an initial item pool.” At this point, the questionnaire with 29 items was sent to the five ERP experts to get external feedback for the content of items and as well as wording of questions, made sense and also to verify that the web application operated correctly. Dornyei alleged that “question that have been used frequently before must have been through extensive piloting.” As an integral part of the questionnaire construction, field testing is used to pilot the questionnaire at various stage of its development on a sample of people who are similar to the target samples for which the instrument has been designed (Dornyei, 2007). The questionnaire was piloted with 15 ERP consultants. The data gathered through the questionnaire were processed through a statistical software program, SPSS 17, for the factor analysis. Factor analysis is “designed to see whether each item measured the subscale it was supposed to measure to look at construct validity” (Muijs, 2004) and is particularly suited to reduce the numbers of variables to a few values that still contain most of the information found in the original variables (Kim and Mueller, 1978). Kaiser (1974) recommends accepting values > 0.5 as acceptable (values below this should lead you to either collect more data or rethink which variable to include). SPSS lists “Eigen values associated with each linear component before extraction, after extraction and after rotation” (Field, 2005). As a result of first factor analysis, four items were removed because their factor levels were not as high as required as Kaiser (1974) mentioned. Later, the five experts were asked to get their further suggestion on the 25 items. On the basis of suggestion made, the 25 items were administered by 35 consultants. However, further four items that did not work as a result of the second factor analysis were removed. As a consequence of a meticulous study, total eight items were removed from the questionnaire. Following several iterations of refinement, four causes with 21 items were identified for the factor influencing ERP implementation.

As per factor analysis output the total items can be grouped into four categories: Strategic, Technological, People and Project management related factors which may influence the ERP implementation in Indian retail sector. Figure 1 shows the final
<table>
<thead>
<tr>
<th>Sl. No.</th>
<th>Critical factors</th>
<th>Literature references</th>
</tr>
</thead>
<tbody>
<tr>
<td>5.</td>
<td>Organizational structure</td>
<td>Hein (2008), Jha et al. (2008)</td>
</tr>
</tbody>
</table>

Table I. Influencing factor ERP implementation (continued)
cause-and-effect diagram for the factor influencing ERP implementation with the final grouping of causes in specific categories. During the rest of the paper, these four causes and their related items will be used for further hypotheses, questionnaire development and validation.

<table>
<thead>
<tr>
<th>Sl. No.</th>
<th>Critical factors</th>
<th>Literature references</th>
</tr>
</thead>
<tbody>
<tr>
<td>22</td>
<td>Project team competence</td>
<td>Loh and Koh (2004), Nah et al. (2003)</td>
</tr>
<tr>
<td>27</td>
<td>Communication within project team</td>
<td>Falkowski et al. (1998), Nah et al. (2003), Sarker and Lee (2003), Holland et al. (1999), Wee (2000), Muscatello and Chen (2008)</td>
</tr>
</tbody>
</table>
Figure 1.
Items Influencing ERP implementation
3. Research model and hypothesis
According to the purpose of this study and factors identified from cause-and-effect diagram (Figure 1), the following theoretical research framework and hypotheses was developed and shown in Figure 2.

3.1 Strategic
Business plan and vision, top management support has been consistently identified as the most important and crucial success factor in ERP system implementation projects (Somers and Nelson, 2001). A clear business plan and vision is needed to guide the project throughout the ERP life cycle (Loh and Koh, 2004). Project management identifies three competing and interrelated constraints namely; scope, time and cost goals (Schwalbe, 2000). The primary stage of any project should begin with a conceptualization of the goals and possible ways to achieve these goals. Additionally, goals should be explained so they are specific and operational, and to indicate the general directions of the project (Somers and Nelson, 2004). Nah et al. (2003) stated that one of the biggest problems ERP project leaders face comes not from the implementation itself, but from expectations of board members, senior staff, and other key stakeholders. It is important to set the goals of the project before even seeking top management support. Many ERP implementations have failed as a result of lacking clear plans (Somers and Nelson, 2004). Top management support is the level of commitment by the senior management in the organization to the project in terms of their own involvement and the willingness to allocate valuable organizational resources (Slevin and Pinto, 1987). They must be willing to allow for a mindset change by accepting that a lot of learning has to be done at all levels, including themselves (Rao, 2000). Business process re-engineering (BPR) has emerged as one of the most for best practices. BPR can be defined as the fundamental rethinking and radical redesign of business process to achieve dramatic improvement in critical, contemporary measures of performance, such as cost, quality, service and speed approaches (Koch, 2001; Huang et al., 2004). To increase the chance of success, management must choose appropriate software that most closely suits its requirements and due to this ERP systems per se received a lot of attention in the last years; there are many ERP systems research instances and quite a lot of reviews (e.g. Esteves and Pastor, 2001; Shehab et al., 2004). Proper package selection plays a crucial role in successful implementation of ERP Normally the organization selects a package which is most users friendly, has adequate scope for scalability and covers an array of business processes where organization experiences problem. The selection of the specific ERP package is one that requires careful attention (Kraemmergaard and Rose, 2002; Yusuf et al., 2006; Al-Mashari et al., 2003; Somers and Nelson, 2001, 2004). An essential part of the ERP
selection process is the selection of the vendor who will supply the ERP system. Some critical factors related to vendors include their skills and knowledge of their system, understanding of the requirements, constraints and concerns of the organization and its industry, vendors’ longevity and ability to meet future needs, and to support and assist in the implementation process (Verville and Halingten, 2003). Vendors should be evaluated on the basis of providing support ranging from technical assistance to training. The ERP implementer-vendor partnership is a key success factor influencing ERP implementation success (Nah and Lau, 2001; Zhang et al., 2005; Somers and Nelson, 2001). Effective enterprise communication is critical to ERP implementation (Falkowski et al., 1998). Middle managers need to communicate its importance (Wee, 2000). Employees should be told in advance the scope, objectives, activities and updates, and admit change will occur (Sumner, 1999). Muscatello and Chen (2008) argued that suitable communication plans should be set up to keep senior management informed on the subject of ERP project impact, challenges, risks, and progress:

H1. Strategic related items are positively influencing the ERP implementation success.

3.2 Technological

There are two distinctive implementation strategy of ERP implementation is found in the literature. These strategy are termed the “phased” implementation and the “big bang” implementation (O’Leary, 2004). Depending on the organizational structure, the complexity of the organization, economical issues, strategic partners, time constraints and geographical locations (Markus and Tanis, 2000), the appropriate implementation strategy should be selected. The big bang approach requires simultaneous implementation of multiple modules of an ERP package, while a phased implementation consists of designing, developing, testing and installing different modules of the same ERP package. There should be an adequate IT infrastructure, hardware and networking are crucial for an ERP system’s success. It is clear that ERP implementation involves a complex transition from legacy information systems and business processes to an integrated IT infrastructure and common business process throughout the organization. Hardware selection is driven by the firm’s choice of an ERP software package. The ERP software vendor generally certifies which hardware (and hardware configurations) must be used to run the ERP system (Al-Mashari, 2002; Yasser, 2000). This factor has been considered critical by the practitioners and as well as by the researchers (Bhatti, 2005). The “Vanilla” implementation approach is another implementation approach that focusses on minimal customization of the ERP package (Holland et al., 1999) and has been found to be a common implementation approach (McCredie and Updegrove, 1999; McConachie, 2001). Mabert et al. (2003) findings indicate that the most important motivations for implementing an ERP system are to replace legacy systems and to standardize systems. Al-Mashari et al. (2006) examines a company who approached the ERP implementation as a re-engineering initiative to change the IT infrastructure because consultants suggested that the company needed to standardize information systems to take advantage of the re-engineering effort. The project ERP systems modules are intricately linked to one another, inaccurate data input into one module will adversely affect the functioning of other module (Sum et al., 1997; Markus and Tanis, 2000):

H2. Technological related items are positively influencing the ERP implementation success.
3.3 People

Education and training provides (Ehie and Madsen, 2005; Sum et al., 1997) management and employees with the logic and overall concepts of ERP systems. The users should be trained through all stages of implementation and additional training should be provided for new employees and those who take job rotations. The potential impact of providing training is less frustrated users with a clear understanding of system usage which will save organization time and money (Jha et al., 2008). ERP Project must be looked upon as change management initiative not an IT initiative and organization should focus on change management strategies for effective implementation (Wood and Caldas, 2001; Ngai et al., 2008; Robert and Willcocks, 2007). Change management should be the effective balancing of forces in favor of a change over forces of resistance (Stebel, 1992; Siriginidi, 2000). In order to avoid the resistance of change, training is must. ERP requires changing management programs and culture. If the employees are open to sharing common values and goals and accept the change, it will be likely successful (Bingi et al., 1999; Somers and Nelson, 2001; Sumner, 1999; Zhang et al., 2003). The best practices innovative behavior of employees may be important an important measurement of ERP success (Lee and Lee, 2000). There have been strong indications that the benefits from an ERP implementation is actually derived from the change in the organization and that the ERP system is just an enabler for these changes (Martin, 1998). Some ERP literature has attempted to investigate how organizational change can be best managed through an ERP implementation (Boudreau and Robey, 1999; Baskerville et al., 2000; Edwards and Panagiotidis, 2000; Aladwani, 2001). User involvement is essential because it improves perceived control through participating in the whole project plan. User involvement is one of the most cited critical success factors in ERP implementation projects (Zhang et al., 2005). User involvement increase user satisfaction and acceptance by developing realistic expectations about system capabilities (Esteves and Casanovas, 2003):

\[ H3. \text{ People related items are positively influencing the ERP implementation success.} \]

3.4 Project management

ERP teamwork and composition is important throughout the ERP life cycle. The ERP team should consist of the best people in the organization (Buckhout et al., 1999; Bingi et al., 1999; Rosario, 2000; Wee, 2000; Loh and Koh, 2004). The team should have a mix of consultants and internal staff so the internal staff can develop the necessary technical skills for design and implementation (Sumner, 1999). The success of projects is related to the knowledge, skills, abilities and experiences of the project manager as well as the selection of the right team members. Functional team consisting of mix of consultants familiar with business processes and internal staff to defining Communication (Mandal and Gunasekaran, 2003; Holland et al., 1999; Akkermans and Helden, 2002) among various functions/levels and specifically between business and IT personnel. Both business and technical knowledge are essential for success (Bingi et al., 1999; Sumner, 1999). Project schedule/plans are the formal definition of the project in terms of milestones, critical paths and a clear view of the boundary of the project. Effective project management allows companies to plan, coordinate and monitor various activities in the different stages of implementation (Akkermans and Helden, 2002; Somers and Nelson, 2001). According to Rosario individual or group should be given responsibility to drive success in project management and the scope of project management should be established and controlled. The scope must be clearly
defined and be limited. It is also important to focus on results and constant tracking of schedulers and budgets against targets (Rosario, 2000; Holland et al., 1999; Wee, 2000). Expectations at every level need to be communicated. Management of communication, education and expectations are critical throughout the organization (Wee, 2000). Communication includes the formal promotion of project teams and the advertisement of project progress to the rest of the organization (Holland et al., 1999). Troubleshooting errors is critical (Holland et al., 1999). The organization implementing ERP should work well with vendors and consultants to resolve software problems. Quick response, patience, perseverance, problem solving and firefighting capabilities are important. Vigorous and sophisticated software testing eases implementation (Rosario, 2000):

\[ H4. \] Project management related items are positively influencing the ERP implementation success.

4. Research methodology

This investigation is a theory-building exploratory study to identify and validate the relationship between factors that influence ERP implementation and the success of ERP implementation in Indian retail sector. The study used survey technique in order to understand the influencing factors of ERP implementation in this sector. This study was based on empirical data collected through a survey from practitioner like project sponsors, project managers, implementation consultants and team members who were involved in ERP implementation in retail sector. To facilitate the distribution of the questionnaire, a small web application was developed to make the questionnaire available and to capture responses. The key reasons for using a web-based system were the fact that it was the easiest way for both surveyors (us) to engage experts and the experts to respond quickly. The other reason was it was low cost technique. The questionnaire URL and a letter on sampled subjects were e-mailed. The experts were asked to respond via e-mail or fax within two weeks. An auto generated reminder e-mail was sent to the non-respondents two weeks after the questionnaires were e-mailed. After constant reminder, 215 questionnaires were received. The filled questionnaires were reviewed and 40 questionnaires were omitted due to incomplete details. Therefore 175 questionnaires were used for analysis. Before the distribution of the questionnaire, pilot study was conducted to ensure its reliability. The data were tested using the SPSS software 17.0.

Finally, statistical methods like correlation analysis and regression analysis were used to validate the relationship between influencing factor of ERP implementation and the success of ERP implementation in Indian retail sector.

5. Data analysis and results

5.1 Instrument development and validation

The development of a cause-and-effect diagram is typically followed by a data gathering process to determine those causes that have a more significant impact on the problem and how they may be addressed. The causes identified from Figure 1 were therefore converted into a questionnaire. An initial draft questionnaire was developed containing the 21 items (questions) identified with the cause-and-effect diagrams. These items had to be answered on a five-point Likert-type scale, with 1 being “strongly disagree” and 5 being “strongly agree.” As the final measuring exercise was planned to be conducted with project sponsors, project managers, implementation consultants and team members who had been involved/implementing/using ERP in
retail sector. E-mail messages were sent to four different class groups, ranging project sponsors, project managers, implementation consultants and team members, requesting they visit the web site where the questionnaire was located and to complete it. Only 175 complete questionnaires were used for validation purposes. The validation was performed along guidelines suggested by Straub and included content validation, reliability tests and construct validation (Straub, 1989).

The types of respondents who completed the questionnaire in our survey are shown in Figure 3.

5.2 Content validation
Content validation is a process whereby test items are studied and weighted for their representativeness (Kerlinger, 1986). In this study content validity was established through relevant literature sources, two initial pilot studies and the use of basic statistical tests. Reliability refers to the accuracy or precision of a measuring instrument; i.e. if the same set of objects is measured again and again with the same instrument, will similar results be obtained? One way to assess consistency is to calculate a Cronbach’s $\alpha$ coefficient (Kerlinger, 1986). Nunnally (1978) suggests that a Cronbach’s $\alpha$ value larger than 0.7 suggests good internal consistency.

Table II shows the reliability statistics of input variables. Reliability of each construct was tested through Cronbach’s $\alpha$. A value of 6 to 7 for Cronbach’s $\alpha$ is considered as a proper degree of reliability, and values above 7 are considered as a good degree of reliability (Sekaran, 2003). Therefore, we can contend that all constructs obtained a good level of reliability as the Cronbach’s $\alpha$ for construct “Strategic” is 0.866, for “Technological” is 0.925, for “People” is 0.922, for “Project management” is 0.933 and for ERP implementation Success is 0.924. Thus, these measures are relevant and can be used for correlations and regressions tests.

5.3 Construct validity
Construct validity primarily answers questions such as what factors or constructs account for variance in test performance (Kerlinger, 1986). To identify possible constructs
underlying the measuring instrument, exploratory factor analysis was employed. The factor analysis, where factors were extracted by means of the principle component method, followed by varimax rotation, yielded four factors for influencing ERP implementation. The results are shown in Table II. The Kaiser-Meyer-Olkin (KMO) measure for the combined items of the independent variables show a value of 0.824, indicating that the sampling adequacy was > 0.5 and therefore satisfactory. Barlett’s test showed a $\chi^2$ of 1,724.580 with a significance level of 1 percent, where the total variance explained was 74.316 out of four components. On the other hand, KMO for the dependent variable depicts a value of 0.820 which tells us that the sampling was satisfactory. Barlett’s test also found to be significant at 1 percent significance level.

Table II shows the result of factor analysis. Factor 1 could be labeled as “Strategic,” factor 2 could be labeled as “Technological,” factor 3 could be labeled as “People” and while last factor could be labeled as “Project management.”

<table>
<thead>
<tr>
<th>Construct</th>
<th>Items</th>
<th>Description</th>
<th>Factor loading</th>
<th>Cronbach’s $\alpha$</th>
<th>% of variance explained</th>
</tr>
</thead>
<tbody>
<tr>
<td>Independent variables</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Strategic</td>
<td>SF1</td>
<td>Business plan and vision</td>
<td>0.731</td>
<td>0.866</td>
<td>31.101</td>
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<tr>
<td></td>
<td>SF2</td>
<td>Top management support</td>
<td>0.734</td>
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<tr>
<td></td>
<td>SF3</td>
<td>Business process reengineering</td>
<td>0.803</td>
<td></td>
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<tr>
<td></td>
<td>SF4</td>
<td>ERP product selection</td>
<td>0.64</td>
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<td></td>
<td>SF5</td>
<td>Selection of external consultant/vendors</td>
<td>0.604</td>
<td></td>
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<td></td>
<td>SF6</td>
<td>Enterprise wide communication plan</td>
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<td>Technological</td>
<td>TM1</td>
<td>Implementation strategy</td>
<td>0.845</td>
<td>0.925</td>
<td>18.757</td>
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<td></td>
<td>TM2</td>
<td>Adequate IT infrastructure</td>
<td>0.765</td>
<td></td>
<td></td>
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<tr>
<td></td>
<td>TM3</td>
<td>Minimal customization</td>
<td>0.831</td>
<td></td>
<td></td>
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<tr>
<td></td>
<td>TM4</td>
<td>Standardization</td>
<td>0.851</td>
<td></td>
<td></td>
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<tr>
<td></td>
<td>TM5</td>
<td>Data conversion and accuracy</td>
<td>0.789</td>
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<td></td>
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<td>People</td>
<td>PM1</td>
<td>Education and training</td>
<td>0.786</td>
<td>0.922</td>
<td>14.466</td>
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<td>PM2</td>
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<td>PM3</td>
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<td>PMP2</td>
<td>Project team competence</td>
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<td>PMP3</td>
<td>Scope management</td>
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<td>PMP4</td>
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<td>PMP5</td>
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<td>Budget control</td>
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<td></td>
<td>PMF7</td>
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<td>Project management</td>
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<td></td>
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<tr>
<td></td>
<td>EIS1</td>
<td>The ERP system can help me make effective decisions</td>
<td>0.885</td>
<td>0.924</td>
<td>79.654</td>
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<tr>
<td></td>
<td>EIS2</td>
<td>With the ERP system organization saves operating costs</td>
<td>0.864</td>
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<td>EIS3</td>
<td>The ERP system can help me make effective decisions</td>
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<td></td>
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<tr>
<td></td>
<td>EIS4</td>
<td>ERP system increases customer service/satisfaction</td>
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<tr>
<td></td>
<td>EIS5</td>
<td>ERP system allows for better use of organizational data resource</td>
<td>0.829</td>
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Table II. Factor loadings – factor influencing ERP implementation
5.4 Hypothesis testing

Based on the regression analysis, results of correlations, coefficients, mean and standard deviation of all constructs are considered. Table III presents the results of the correlation analysis of all variables of this research. According to the results, average response rate for all variables are between 3.6 and 4.2. Technological with mean equal to 3.639 got the lowest rate and Strategic with the mean 4.134 obtained the highest average rate from respondents. Technological construct has the lowest standard deviation equal to 0.409 and Project management with 0.626 have the highest standard deviation.

As shown in Table III, it is reported that all the independent variables were positively influencing the ERP Implementation Success. Strategic was positively influencing the ERP Implementation Success at 0.000 significance level (r = 0.876). Similarly, Technological factors is positively influencing the ERP Implementation Success at 0.000 significance level (r = 0.609). In addition, People was positively influencing the ERP Implementation Success at 0.000 significance level (r = 0.760). Project management was positively related to Success of ERP Implementation at 0.000 significance level (r = 0.583).

5.5 Multiple regression analysis

In this study, multiple regressions were adopted to examine the relationships between independent variables and dependent variable to test our research hypotheses. To identify whether the factors including: Strategic, Technological, People and Project management factors are influencing the Success of ERP implementation (H1, H2, H3, H4), which is one of this research purposes. The result of multiple regression analysis for factor influencing the ERP Implementation Success is shown in Table IV.

H1 postulates “Strategic” related items are positively influencing the ERP implementation success. Results in Table IV indicate that there is a positive influence

<table>
<thead>
<tr>
<th></th>
<th>Mean</th>
<th>SD</th>
<th>Strategic</th>
<th>Technological</th>
<th>People</th>
<th>Project management</th>
<th>ERP implementation success</th>
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</tr>
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<tr>
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<td>3.639</td>
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<td>sig. (2-tailed)</td>
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<td>175</td>
<td>175</td>
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<td>175</td>
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<tr>
<td><strong>People</strong></td>
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<td>0.632</td>
<td>0.683</td>
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<tr>
<td><strong>Project management</strong></td>
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<td>0.683</td>
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<tr>
<td>ERP implementation success</td>
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<tr>
<td>Pearson correlation</td>
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</tbody>
</table>

Table III. Mean, standard deviation and correlation results.
of strategic related item on ERP implementation success ($\beta = 0.852$, $t$-value = 22.266, $p$-value = 0.000), demonstrating support for $H1$. $H2$ postulates “Technological” related items are positively influencing the ERP implementation success. Results clearly indicate that there is a positive influence of technological related item on ERP implementation success ($\beta = 0.829$, $t$-value = 20.299, $p$-value = 0.000), confirming the support for $H2$. $H3$ explains that “People” related items are positively influencing the ERP implementation success. Results also confirms that there is a positive influence of “People” related item on ERP implementation success ($\beta = 0.843$, $t$-value = 21.422, $p$-value = 0.004), confirming the support for $H3$. The results of this research support the suggested hypothesis ($H4$) that there is positive influence between “Project management” related items on ERP implementation success ($\beta = 0.788$, $t$-value = 17.521, $p$-value = 0.007).

Table IV also reports the $R^2$. The $R^2$ was 0.797 indicating that 79.7 percent of the variation in ERP implementation success could be explained by the four independent variables and the $F$-value of 84.304 was significant at 0.01 significance level.

6. Result, discussion and recommendations

The findings from this study shows that the four factors, namely Strategic, Technological, People and Project management together explained 79.7 percent of the variance in the ERP implementation success in Indian retail sector.

From Figure 4 it is clear that “Strategic” related items had the major influence on ERP implementation success with the highest $\beta$ coefficient of 0.852 and were significant. The “People” related item was found to be statistically significant with a beta coefficient of 0.843 and ranked second in terms of relative importance.

<table>
<thead>
<tr>
<th>Variable</th>
<th>Standardize $\beta$</th>
<th>$t$-value</th>
<th>$p$-value</th>
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<td>Strategic</td>
<td>0.852</td>
<td>22.266</td>
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<tr>
<td>Technological</td>
<td>0.829</td>
<td>20.299</td>
<td>0</td>
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<tr>
<td>People</td>
<td>0.843</td>
<td>21.422</td>
<td>0.004</td>
</tr>
<tr>
<td>Project management</td>
<td>0.788</td>
<td>17.521</td>
<td>0.007</td>
</tr>
</tbody>
</table>

Table IV. Multiple regression analysis

$F$-value: 84.304 (0.000)

$R^2$: 0.797

Adjusted $R^2$: 0.762

Figure 4. The analyzed research model
“Technological” and “Project management” related items have also significant influence in the ERP implementation success in Indian retail sector.

The results of this study lead to several management implications for different parties of interest are explained below. Researchers, practicing managers and those seeking to implement ERP in retail organization can also use the findings in this study as a vehicle for improving ERP implementation success in Indian retail sector:

- It is recommended that top management should clearly define the business plan and vision so that it can set the direction of ERP project. There should be a justification for the ERP investment and the change should be tied directly to the strategic alignment of the company. A business plan that outlines proposed strategic and tangible benefits, resources, costs, risks and timeline is critical. Once the vision is approved by top management, broadcast the vision to the entire company.

- Once the business plan and vision are in place, the commitment of top management is recognized as one of the most influential items for ERP implementation success. So it recommended that top management of the retail organization should provide sufficient financial support and adequate resources for building successful system.

- The retail organizations want to achieve performance improvements such as improve customer service, cut operational costs and become world-class competitors. It is recommended for an Indian retail organization that they should do reengineering business processes during implementation of ERP. This option offers a world-class efficient and effective process with built in measures and controls.

- Selection of the right product for the organizations is the fundamental prerequisite to implement ERP system successfully. If the wrong choices are made, the organization faces either a misfit between package and business processes and strategy, or a need for major modification, which are time-consuming, costly and risky. So it is recommended for the managers of retail organization to conduct a careful preliminary analysis and develop a plan for selecting the right ERP product for their organization.

- Implementing an ERP package is a complex and costly undertaking, so vendor selection is one of major influencing factor. ERP vendor should be good enough to understand the business process and able to match with the new integrated software. So it is recommended for retail organizations to select the right ERP vendor and implemender consultants who have prior experience in implementing the software with similar companies.

- Enterprise wide effective communication is one of the most influential items for ERP implementation success. So it is recommended for mangers of retail organization to have a strong and effective communication throughout the various stages of the ERP implementation. Open and honest communication across the organization is of paramount importance to satisfy the information needs of users, and to prevent the circulation of unfounded rumors.

- Clearly define the implementation strategy in advance so that it gives a strategic direction which should favorably influence the project execution. There are two type of Implementation strategy – first “big bang” approach where on a scheduled cut-off date, entire system is installed throughout the organization in
one go. All users move to the new system and manual/legacy systems are discontinued. On the flip side, risk element is much higher and resources for training, testing and hand holding are needed at a much higher level, albeit for a shorter period of time. Second “phased implementation,” where roll out is done over a time period. This method is less focussed, prolonged and necessitates maintenance of legacy system over a period of time. But, phased implementation is less risky, provides time for user’s acquaintance and fall back scenarios are less complicated.

- The most influencing factor for the ERP implementation success is an adequate infrastructure to support the complexity of ERP system and with better performance. So it’s essential to choose the appropriate IT infrastructure depending on the size and structure of an organization.

- It is recommended that retail organization should adopt minimum customization or no customization strategy. Customization is costly and not good for scalability and future upgrades in any ERP project. Little bit customization is ok, but too much customization will affect your ERP project. It will increase your project duration, budget, and increase the risk of implementation failure. ERP permit organizational standardization across different locations among the retail chains at different location. This is possible when there is a minimal customization in the ERP system.

- ERP implementation success is highly dependent on success of data conversion and accuracy. The data residing in the legacy systems needs to be migrated to ERP system. Inaccurate data input into one module will adversely affect the functioning of other modules. So it is recommended that data should be checked and tested after conversion by the project members and key users before it is released into production server.

- Success of ERP implementation depends on successful training and education. It is recommended that all the users must be trained in the ERP basics, overview of the system and its working, how an action by an employee triggers a host of events throughout the organization, how automation will help, what processes are changed and so on. Training and education helps to improve the quality of ERP project results and to meet user’s expectations. It is also advisable to the consultants that they should create a knowledge base and train the people so that the knowledge stays in the organization when the consultants leave the project.

- The enterprise wide change management is the key influential factor for ERP implementation success. It is recommended that during the change management initiatives, employees should be involved, carefully address the employees concerns, and making available the support group to mitigate the effect of resistance to change and enhance implementation success. Support group comprised of business and change specialists who can develop a plan of how the changes will be communicated with the business.

- User involvement is one of the most influential factors in ERP implementation projects. It is recommended that user should be involved during the entire ERP implementation process. This will deliver a better fit in relation to business processes and acceptance between the end users and the ERP system with less resistance.
ERP teamwork and composition is most important throughout the ERP life cycle. It is recommended that team should consist of the best people in the organization and the team should be cross-functional team consisting of mix of consultants and internal staff.

The competence of the project team is another key influential factor for the success of ERP implementations because the more experienced and skilled recourse would be able to understand and explain new concepts and business processes easily and quickly. This will ensure the smooth implementation and rollouts with minimal errors.

The scope of ERP project should be clearly defined. It is recommended that retail organizations should clearly define the scope, timeline and cost. Also it is extremely important to set the right expectations with all the project stakeholders so that there should not be any scope creep at the time of user acceptance test.

The success of ERP implementation depends on effective project communication. It is recommended that communication within the project team should be done in timely and effectively manner so that there should not be any communication gap within the project team.

It is recommended that organizations must have effective project management to control and monitor ERP implementation process and budget. ERP project should be periodically monitored by project team members in order to explore long term benefits of the organization.

Testing and troubleshooting of the ERP implementation process is important due to ERP’s critical role and complexity. It is recommended that the testing should be executed by functional end user personnel – not just a couple of IT people running through the process by themselves. Functional testing ensures that all business features are tested, including the software and hardware involved in running the ERP system.

7. Conclusion, limitations and further direction of research
This study has succeeded to examine the influence of factors (identified from cause-and-effect diagram) on the ERP implementation success. This research presents several interesting findings. First of all, this study has contributed to academic research by producing the empirical evidence to support the theories of influencing factor and ERP implementation success. The research has empirically verified that Strategic, Technological, People and Project management factors are positively influencing ERP implementation success. Second, the results are largely consistent with prior studies conducted in other developed countries. Despite the useful findings of this empirical study, it has some limitations that need to be highlighted:

• The finding of this study may not be generalized for other geographic areas.

• Although we have considered widely accepted factors drawn from literature, which may influence the ERP implementation in Indian context. There might be possibility that there are some factors which are less important were not included in the research.

These limitations pave the way to future studies. To enhance the generalization of the findings, future studies could be conducted using similar parameters in other retail organization in different geographic areas.
References


Further reading


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Professor Poonam Garg is a PhD (Computer Science). She has 20+ years of experience in teaching, research and consulting. Presently she is working as a Professor with Institute of Management Technology, Ghaziabad, India. Her current research interests are in the areas of enterprise resource planning, developing heuristics and meta-heuristics particularly genetic algorithm, Tabu search and simulated annealing-based meta-heuristic for various optimization problem such as cryptanalysis of various encryption algorithms and project management. Her teaching interests are in enterprise resource planning, software project management, cryptology and network security, information security, networking concepts and planning. She has published many papers in different international/national journals and has ten edited books. She has served many international conferences as a Conference Co Chair, Conference Track Chair and member of program committee. Professor Poonam Garg is the corresponding author and can be contacted at: pgarg@imt.edu

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